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Book of Abstracts

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I. Astroparticle Physics / 855

”Pi of the Sky”: modelling of the detector response for more effective search for optical GRB counterparts.

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“Pi of the Sky” is a robotic telescope project aiming for continuous observation of a large part of the sky with high temporal and optical resolution using wide field-of-view CCD cameras. Its primary goal is to look for optical afterglows associated with the gamma ray bursts (GRB), but it is also well suited to study any kind of short timescale astrophysical phenomena. The prototype apparatus with two cameras has been installed at Las Campanas Observatory in Chile in 2004. Most significant observations, including extraordinarily bright prompt optical emission of GRB 080319B are biefly discussed.
A wide field-of-view CCD cameras suffer from large image distortion effects. Dedicated setup has been designed and built for detailed laboratory studies of the camera’s behaviour, including point-spread-function (PSF) and CCD sensitivity measurements. The aim of the study is to prepare realistic model of the detector response, which would help to understand the detector performance in more details and to improve measurement precision.

IV. Detectors (LHC and R&D) and Accelerators / 715

A Large TPC Prototype for an ILC Detector

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A Time Projection Chamber (TPC) is a candidate for the central tracker of the future International Linear Collider (ILC) detectors. TPCs have already demonstrated very good performance in past collider experiments. However the tracking system of the ILC should have a very good track momentum resolution (delta(1/pt) ~ 5 10**-5 /GeV/c), which is an order of magnitude more precise than in previous experiments. To achieve this resolution, the Linear Collider TPC (LCTPC) groups are pursuing R&D activities to determine the best state-of-the-art technology for the TPC using Micro Pattern Gas Detectors (MPGD) readout instead of the Multiwire Proportional Chamber (MWPC) readout.
The MPGDs under investigation are the Gas Electron Multiplier (GEM) and the Micromesh Gaseous (MICROMEGAS) detectors as well as a new concept combining a gas amplification on top of a CMOS pixel readout chip (TimePix). To study these technologies, a Large Prototype TPC (LPTPC) has been built, with a diameter of about 750 mm and a length of about 600 mm, which allows to measure tracks with up to 125 space points with pad readout. Since end of 2008, the LPTPC has been inserted into a 1.25 Tesla superconducting magnet, installed in a DESY test beam area. The LPTPC, alternatively equipped with the GEM or the MICROMEGAS readout, is exposed to an electron beam of up to 6 GeV. With both technologies the preliminary results look very promising. A first TimePix endplate module, consisting of 8 chips and a triple-GEM stack will be tested in June 2009 at the LPTPC.
The LPTPC is not only a testing bed for several readout techniques based on MPGDs it is also an opportunity to understand the issues which arise when constructing such a large TPC. In this presentation, we will report on the setup, the production and the commissioning of the LPTPC as well as the first results of the test beams with the different readout technologies.

II. Flavour Physics / 872

A New Expected Upper Limit on the Rare Deacay Bs to mu+mu- with the D0 experiment

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II. Flavour Physics / 704

A Study of Large $\sin 2\Phi_{B_s}$ with High Mass Fourth Generation t'

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The Standard Model predicts the CP violation phase $\Phi_{B_s}^{\rm SM} = \arg M_{12} \simeq \arg(V_{ts}^* V_{tb})$ in B_s–$\bar{B}_s$ mixing is very small, of $calO(\lambda^2\eta) \simeq -0.02$, any finite value of Φ_{B_s} measured at the Tevatron would mean New Physics. Recent hints for finite $\sin 2\Phi_{B_s}$ have appeared from CDF and DO experiments at the Tevatron Run II. We consider the possibility to account for it with the 4th generation t' quark. Considering recent direct search bounds, we set the mass to be near the unitarity bound of 600 GeV. Combining the measurement values of Δm_{B_s} with $calB(B_d \to X_s \ell^+ \ell^-)$, together with typical f_{B_s} values, we find a sizable $\sin 2\Phi_{B_s}^{\rm SM4} \sim -0.3$. Using a typical value of $m_{b'} = 580$ GeV, we get a narrow range of values, $0.089 < |V_{t'b}| < 0.100$, from the constraints $\Gamma(Z \to b\bar{b})/\Gamma(Z \to \text{hadrons})$, $calB(K^+ \to \pi^+ \nu\bar{\nu})$ and Δm_{D^0}. Finally, we use the ZFITTER code to check the global fit deviation.

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A Study of Z->e+e- and Z->mu+mu- Events Produced at Low Transverse Momentum Using a Novel Technique with the D0 Detector

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Using a novel technique we present a precise measurement of the low transverse momentum region of Z boson production in proton-antiproton collisions at 2 TeV centre of mass energy. The measurement is corrected for experimental acceptance and resolution and is presented in bins of Z boson rapidity. The full currently available D0 Run II data set in the dielectron and dimuon channels is employed.

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A modified BESS model as an effective description of the strong electroweak symmetry breaking

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Facing the plethora of alternative hypotheses for the mechanism of electroweak symmetry breaking (ESB) it is highly desirable to typify its phenomenology using the effective Lagrangians. The BESS (Breaking Electroweak Symmetry Strongly) model effectively describes a Higgsless ESB mechanism accompanied by a hypothetical strong triplet of vector resonances. The model couples the vector resonances universally to all SM fermion generations. We have modified the model by allowing direct interactions of the vector triplet with the third quark generation only. This is motivated by the extraordinary mass of the top quark which is close to the ESB scale. In addition, we have introduced new Lagrangian terms admitted by the model's symmetries. Our modifications of the BESS model can significantly relax the low-energy limits on the original BESS model's parameters. Here, beside formulating our model, we present its basic phenomenology and compare it to the original BESS model. Our preliminary calculations suggest the possibility to use some of the LHC processes to detect the new vector resonances. However, to make a final assessment a more involved and realistic analysis is needed.

VII. Standard Model Electroweak Physics / **412**

A new top jet tagging algorithm for highly boosted top jets

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A new top jet tagging algorithm ({\tt CATopTag}) is presented, that uses the Cambridge-Aachen jet finding algorithm to decompose highly boosted top jets into subjet components and examine kinematics of those subjets. It is found that this algorithm has a rejection rate of approximately 98\% for non-top jets with $p_T = 600$ GeV/c, while retaining approximately 46\% of top jets with $p_T > 600$ GeV/c.

VI. QCD in Hadronic Physics / **788**

A systematic study of the strong interaction with PANDA

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The physics of strong interactions is undoubtedly one of the most challenging areas of modern science. Quantum Chromo Dynamics (QCD) is reproducing the physics phenomena only at distances much shorter than the size of the nucleon, where perturbation theory can be used yielding results of high precision and predictive power. At larger distance scales, however, perturbative methods cannot be applied anymore, although spectacular phenomena - such as the generation of hadron masses and confinement - occur. Studies using charmed quarks and gluon-rich matter have the potential to connect the perturbative and the non-perturbative QCD region, thereby providing insight in the mechanisms of mass generation and confinement. Experimental data in this intermediate regime are scarce and so-far studied mostly with electromagnetic probes. A large part of the program will be devoted to charmonium spectroscopy, gluonic and multi-quark excitations, open and hidden charm in nuclei, electromagnetic formfactors, rare decays, and gamma-ray spectroscopy of hypernuclei.

The physics program of the anti-Proton ANnihilation at DArmstadt collaboration, PANDA, will address various questions related to the strong interactions by employing a multi-purpose detector system at the High Energy Storage Ring for anti-protons of the upcoming Facility for Anti-proton and Ion Research, FAIR.

In this presentation, I will give an overview and motivation of the physics program of the PANDA collaboration. A status report of the present research and developments for the PANDA detector design and the feasibility of the physics program will be presented with a perspective towards future activities.

Plenary Session 3 / **962**

ALICE

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IV. Detectors (LHC and R&D) and Accelerators / **713**

ALICE TPC - design and performance

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ALICE is the dedicated heavy ion experiment at the LHC. The detector is optimised to register heavy ion collisions, up to Pb-Pb, as well as p-p ones. The main tracking device of the ALICE experiment is the Time Projection Chamber - TPC. We will present design of the detector and its performance. The current status of the detector and the capabilities to underlying physics, based on the cosmic rays tests, will be shown as well.

Plenary Session 3 / **940**

ATLAS

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ATLAS Electroweak Measurements with early data

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The large W and Z cross sections expected at the LHC allow for several measurements involving electroweak bosons already in the early data. The W and Z cross sections can be measured with good accuracy with 10-100 pb-1. These cross-sections are presently predicted with about 5% uncertainty. The ratio of W and Z cross-sections in particularis not affected by the uncertainty on the machine luminosity and will thus be one of the first tests of the detector and analysis chain performance. The Z momentum and rapidity distribution measurements will quickly surpass the predictions in precision, and thus
allow to constrain PDFs and QCD calculations. Also the W charge asymmetry will quickly become precisely measured. ATLAS strategies and expectations shall be discussed, using selected examples of expectations for measurements.

IV. Detectors (LHC and R&D) and Accelerators / **1006**

ATLAS Inner Detector: Commissioning with Cosmics Data

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The ATLAS experiment at the CERN Large Hadron Collider (LHC) has started taking data last autumn with the inauguration of the LHC. Determination of vertex position and charged particle tracks is performed in the Inner Detector which consists of pixel and microstrip Silicon sensors and transition radiation tubes. In this talk construction and commissioning of these three detectors will be presented.

The Pixel Detector is the innermost detector of the ATLAS experiment with approx. 80 million readout channels. After connection of cooling and services and verification of their operation the ATLAS Pixel Detector is now in the final stage of its commissioning phase. Prior to the first beams expected in Autumn 2009, a full characterization of the detector is performed.
The SemiConductor Tracker (SCT) is made up from silicon micro-strip detectors processed in the planar p-in-n technology. Sensors are assembled into 4000 modules with 6 million readout channels. The completed SCT detector was operated for many months under realistic conditions. Calibration data has been taken and analysed to determine the noise performance of the system. In addition, extensive commissioning with cosmic ray events has been performed both with and without magnetic field. The cosmic muon data has been used to align the detector, to check the timing of the front-end electronics as well as to measure the hit efficiency of modules.
The ATLAS Transition Radiation Tracker (TRT) is the outermost of the three sub-systems of the ATLAS Inner Detector. It consists of close to 300000 thin-wall drift tubes (straws) providing on average 35 two-dimensional space points with 0.17 mm resolution for charged particle tracks with $p_T > 0.5$ GeV within $|\eta| < 2$. Transition radiation X-rays, generated by particles with $\gamma > 1000$ in the special

material between the straws, are absorbed in the Xenon based gas mixture and give rise to large signal
amplitudes. The front-end electronics implements two thresholds to discriminate the signals: a low threshold (< 300 eV) for registering the passage of minimum ionizing particles, and a high threshold (> 6 keV) to flag the absorption of transition radiation X-rays. The talk will report on the commissioning and first operational experience of the TRT detector and its sophisticated o#-detector systems for cooling, active gas, low- and high- voltage, data acquisition and control. Initial performance studies, based on the reconstruction and analysis of several million cosmic ray tracks, and
from beam-halo or beam-splash events from single beams in LHC, will be described.
All three sub-detectors were run in standalone and in a combined mode (also with other ATLAS subsystems). The current status of the Pixel, SCT and TRT detectors will be reviewed, including results from recent data-taking periods, and from the detector alignment. We will report on the commissioning of the detector, including overviews on services, connectivity and observed problems. The commissioning and running experience will then be used to extract valuable lessons for future silicon detector projects.

II. Flavour Physics / **777**

ATLAS preparations for precise B-decay measurements sensitive to BSM phenomena

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The LHC experiments will perform sensitive tests of physics phenomena beyond the Standard Model (BSM). Investigation of the decay of beauty hadrons represents an alternative approach to direct BSM searches. The ATLAS efforts concentrate on those B decays that can be selected by the first and second trigger levels. The most favorable trigger signatures will be for B hadrons decaying to μμ, either directly or via a J/psi meson. Using the J/psi trigger ATLAS will be able to collect unprecedentedly high statistics of Bs->J/ψφ decays, allowing measurements of CP violating effects, which are predicted by some BSM models to be significantly larger than the Standard Model. The di-muon trigger will also give ATLAS access to potentially large numbers of rare B->mumu decays, which may also be sensitive to BSM physics. The strategy is to carry on the di-muon channel programme into the nominal LHC luminosity phase. The expected performance of the ATLAS trigger and event selection with respect to these two channels will be discussed.

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ATLAS preparations for precise B-decays measurements sensitive to BSM phenomena

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The LHC experiments will perform sensitive tests of physics phenomena beyond the Standard Model (BSM). Investigation of decays of beauty hadrons represents an alternative approach in addition to direct BSM searches. The ATLAS efforts concentrate on those B decays that can be selected already at the first and second trigger levels. The most favorable trigger signature will be for B hadrons decaying to J/ψ ->μμ. Using this trigger ATLAS will be able to accommodate unprecedentedly high statistics in so called Golden LHC channel: Bs->J/ψφ allowing a measurement of the CP violation effect, where BSM models predicted values are significantly higher than SM. In the rare decays sector,

these are purely di-muon decays, and families of semi-muonic exclusive channels. Already with 1 fb-1 the ATLAS sensitivity in the di-muon channels will be comparable to today worlds statistics. The strategy is to carry on the di-muon channel programme up to nominal LHC luminosity. In particular in each of these two experiments the Bs→μμ signal with 4.3 sigma significance can be measured combining low luminosity samples with those of one year of LHC operation at a luminosity of 1034cm-2 s-1. This precision allows excluding or confirming the SM unambiguously.

IV. Detectors (LHC and R&D) and Accelerators / **928**

ATLAS upgrades for the sLHC collider

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With LHC about to start collisions, plans are advancing on detector upgrades necessary to cope with the scenario of the super-LHC collider, with ten-fold increase in the collision rate.
The expected experimental conditions and the current detector studies, including an entirely new inner tracker system, are summarized. The detector technologies being considered for the upgrade of the Muon spectrometer are described.

Plenary Session 4 / **955**

Accelerator R&D

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IV. Detectors (LHC and R&D) and Accelerators / **190**

Alignment of the ATLAS Inner Detector tracking system

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The Large Hadron Collider (LHC) at CERN is the world largest particle accelerator. It will collide two proton beams at an unprecedented center of mass energy of 14 TeV. ATLAS is equipped with a charge particle tracking system built on two technologies: silicon and drift tube based detectors, composing the ATLAS Inner Detector (ID). The alignment of the tracking system poses a challenge as one should solve a linear equation with almost 36000 degrees of freedom. The required precision for the alignment of the most sensitive coordinates of the silicon sensors is just a few microns. This limit comes from the requirement that the misalignment should not worsen the resolution of the track parameter measurements by more than 20%. So far the proposed alignment algorithms are exercised on several applications. We will present the outline of the alignment approach and results using real data from cosmic rays and large scale computing simulation of physics samples mimicking the ATLAS operation during real data taking. The full alignment chain is tested

using that stream and alignment constants are produced and validated within 24 hours. Cosmic ray data serves to produce an early alignment of the real ATLAS Inner Detector even before the LHC start up. The impact of the alignment on physics measurements will be discussed.

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An overview of the b-Tagging algorithms in the CMS Software

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The CMS software contains a widespread set of algorithms to identify jets originating from the weak decay of b-quarks. Different physical properties of b-hadron decays like lifetime information, secondary vertices and soft leptons are exploited. The variety of selection algorithms range from simple and robust ones, suitable for early data-taking and online environments as the trigger system, to highly discriminating ones, exploiting all the information available. Their performance is evaluated, in the long term and startup scenarios.

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Anomalous WW gamma quartic and trilinear coupling in photon-induced processes using forward detectors at the LHC

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We present a new method to test the Standard Model expectations at the LHC
using photon-induced WW production. Both W decay in the main ATLAS or CMS
detectors while scattered protons are measured in forward detectors.
The sensitivity to anomalous WW gamma quartic and triple gauge coupling can be improved
respectively by more than three orders of magnitude or
a factor 30 compared to the present LEP limits.

VII. Unified Theories, Strings, Non-perturbative QFT / 49

Anomalous WW gamma quartic and trilinear coupling in photon-induced processes using forward detectors at the LHC

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We present a new method to test the Standard Model expectations at the LHC
using photon-induced WW production. Both W decay in the main ATLAS or CMS
detectors while scattered protons are measured in forward detectors.
The sensitivity to anomalous WW gamma quartic and triple gauge coupling can be improved
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a factor 30 compared to the present LEP limits.

I. Astroparticle Physics / 711

ArDM, a 1t liquid argon detector for dark matter searches

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We are assembling a 1t liquid argon detector at CERN using the two-phase technique to detect both charge and luminescence produced by recoil nuclei from WIMP interactions. We have investigated background suppression capabilities and impurity effects in argon using the scintillation light and its decay time. We are studying ways to efficiently collect and detect the VUV-light to reach a detection threshold of 30 keV in a large liquid argon detector, and to efficiently suppress background from neutrons and electrons. First results for the light collection efficiency in the 1t detector will be presented.

Joint EPS - EFCA meeting / 1015

Astroparticle physics and relations with the LHC

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V. QCD at Colliders / 373

Automatic calculation of one-loop amplitudes

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In order to deal with the data from the experiments at LHC for the
study of elementary particles, signals and potential backgrounds for
new physics have to be under control at sufficient accuracy. In
particular, hard processes with high multiplicities, involving many
particles or partons, cannot be neglected. On top of that, such
processes have to be dealt with at the next-to-leading order (NLO)
level to, for example, reduce the scale dependence of observables and
to have a better description of the shape of their distributions.
Several fully automatized programs exist to perform leading order
calculations for any hard scattering process. At NLO, several

calculations exist for multiplicities up to 7 external particles, but no automatic tools to achieve this for arbitrary processes. The calculation of one-loop amplitudes, necessary in any NLO calculation, is a major bottleneck. An algorithm is presented, to automatically compute any one-loop amplitude, for all momentum, color and helicity configurations of the external particles.

II. Flavour Physics / 418

B physics prospects of CMS with the first LHC data

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B physics will be one of the key physics themes at the Large Hadron Collider (LHC). B hadrons are an ideal tool for advancing our current understanding of the flavour sector of the Standard Model (SM), and searching for effects originating from physics beyond the SM, thanks to the large production rate and the fact that B hadrons are relatively easy to trigger on and identify due to their long lifetime and high mass. The interplay between strong and electroweak effects in the production and decay of B hadrons makes them a unique test ground for both forces. The integrated luminosity collected by the CMS experiment during the first LHC running period 2009-2010 is expected to be about 300 pb^-1. In this talk, we present the estimated sensitivities of CMS with this first LHC data. The first B physics measurements with the CMS experiment include charmonium production (both prompt J/psi production and J/psi's from B decays), Upsilon production, exclusive final states B->J/psi K(*), b-quark production, and bbbar correlations.

II. Flavour Physics / 670

B-CP anomalies, "4th generation" and the LHC

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Although the CKM-paradigm works to an accuracy of ~20%, there are by now several indications that suggest the need for beyond the Standard Model CP-odd phase(s). The value of sin 2β measured via the goldplated (tree) mode, B $\longrightarrow$ ψK s is smaller than the value deduced by using improved lattice matrix elements. The value of sin 2β measured via 'penguin-dominated' (loop) decays tends to be even smaller still. There is also a rather large difference between the direct CP asymmetries in $\longrightarrow$ K − π + and B − $\longrightarrow$ K − π 0 that is rather difficult to understand. More recently, CDF and D0 are finding about a 2.2σ signal in CP asymmetry in the corresponding gold-plated mode B s $\longrightarrow$ ψϕ. If true, this would be consistent with the indications of new CP-phase in penguin b $\longrightarrow$ s transitions seen at B-factories. A brief discussion of some of the BSM scenarios that could be the underlying cause of these deviations is given. In particular, we emphasize that the data are quite suggestive of a fourth family with m′ t in the range of 400–600 GeV as perhaps the simplest BSM candidate which 'naturally' explains the data. This picture leads to significant repercussions for the LHC which will be explored.

Baryon number transport at LHC energies with the ALICE experiment

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Particle yields along with the ratios of particle production in hadronic interactions are important indicators of the collision dynamics. In particular, the detailed analysis of the baryon spectra as well as that of $\bar{p}/p$ and $\bar{\Lambda}/\Lambda$ ratios are of great importance since they allow to determine the carrier of the baryon number (BN): is the BN carried by the valence quarks or by the gluonic field?

The Large Hadron Collider (LHC) will provide p+p collisions up to a center-of-mass energy of $\sqrt{s} = 14$ TeV and Pb+Pb collisions up to $\sqrt{s_{NN}} = 5.5$ TeV. The ALICE experiment, due to its particle identification capabilities, will allow us to study several baryon species (p, $\bar{p}$, Λ, $\bar{\Lambda}$, Ξ, Ω) at mid-rapidity ($|y| < 1.0$) with a wide transverse momentum coverage ($0.3 \approx\leq P_T \approx\leq 5$ GeV/c) and high precision.

Since the two dominant transport mechanisms for the BN produce only small differences in the observed baryon ratios, it is mandatory to understand in great detail the sources of the systematical uncertainties of these measurements. In this presentation, the expected performance of the ALICE detector setup regarding the baryon spectra, the rapidity, transverse momentum and energy dependence of the $\bar{p}/p$ and $\bar{\Lambda}/\Lambda$ will be discussed and the limits for the systematical uncertainties of these measurements will be given.

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Baryonic B decays at BABAR

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Baryonic B-decays at BABAR

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Baryonic Bd decays at BELLE

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II. Flavour Physics / 917

Baryonic Bd decays at Belle

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Study of $B^+ \to p\bar{\Lambda}\pi^+\pi^-$ at Belle

We study charmless B^+ decays to $p\bar{\Lambda}\pi^+\pi^-$ final state using a 605 fb^{-1} data sample collected at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric energy e^+e^- collider. There are significant signals found with $p\bar{\Lambda}$ mass peaking near threshold. The branching fraction as well as the differential branching fraction as a function of the mass of the $p\bar{\Lambda}$ system are presented. We also search for intermediate three-body decays using the same final state particles. Observation or evidence of possible intermediate three-body decays are reported.

Observation of $B^0 \to \Lambda\bar{\Lambda}K^0$ and $B^0 \to \Lambda\bar{\Lambda}K^{*0}$ at Belle

We study the charmless decays $B \to \Lambda\bar{\Lambda}h$, where h stands for π^+, K^+, K^0, K^{*+}, or K^{*0}, using a 605 fb^{-1} data sample collected at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric energy e^+e^- collider. We observe $B^0 \to \Lambda\bar{\Lambda}K^0$ and $B^0 \to \Lambda\bar{\Lambda}K^{*0}$ with branching fractions of $(4.76^{+0.84}_{-0.68}(stat.)\pm0.61(syst.))\times10^{-6}$ and $(2.46^{+0.87}_{-0.72}\pm0.34)\times10^{-6}$, respectively. The significances of these signals in the threshold-mass enhanced mass region, $M_{\Lambda\bar{\Lambda}} < 2.85$ GeV/c^2, are 12.4σ and 9.3σ, respectively. We also update the branching fraction $\mathcal{B}(B^+ \to \Lambda\bar{\Lambda}K^+) = (3.38^{+0.41}_{-0.36}\pm0.41)\times 10^{-6}$ with better accuracy, and report the following measurement or 90\% confidence level upper limit in the threshold-mass-enhanced region: $\mathcal{B}(B^+ \to \Lambda\bar{\Lambda}K^{*+}) = (2.19^{+1.13}_{-0.88}\pm0.33)\times10^{-6}$ with 3.7σ significance; $\mathcal{B}(B^+ \to \Lambda\bar{\Lambda}\pi^+) < 0.94\times10^{-6}$. A related search for $B^0 \to \Lambda\bar{\Lambda}\bar{D}^0$ yields a branching fraction $\mathcal{B}(B^0 \to \Lambda\bar{\Lambda}\bar{D}^0) = (1.05^{+0.57}_{-0.44}\pm0.14)\times10^{-5}$. This may be compared with the large, $\sim 10^{-4}$, branching fraction observed for $B^0 \to p\bar{p}\bar{D}^0$. The $M_{\Lambda\bar{\Lambda}}$ enhancements near threshold and related angular distributions for the observed modes are also reported.

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Behavior of the longitudinal structure function in NLO analysis at low x

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Behavior of the longitudinal structure function in the next- to- leading order of the perturbation theory at low x, based on of the exponent λg gluon
distribution and λS structure function from the Regge- like behavior at this limit is
presented. This approach shows, the longitudinal structure function has the hard-Pomeron behavior. All the results can consistently be described within the frame work of PQCD, which essentially shows increases as x decreases.

VII. Standard Model Electroweak Physics / **892**

Beyond the SM searches with top (D0)

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The top quark is the heaviest elementary particle known today. It is therefore an excellent candidate to search for new physics. We present searches for physics beyond the Standard Model involving top quarks. The analysed data corresponds to up to 4 fb^-1 of integrated luminosity, collected by the D0 detector at the Femilab Tevatron collider. We present various searches for new physics in the production of single top quarks such as searches for W' bosons and charged Higgs bosons. We also discuss searches in the production of top quark pairs such as searches for new resonances, Higgs bosons produced in association with top-antitop quark pairs and present a measurement of a forward backward asymmetry. Furthermore, we present a simultaneous measurement of the ratio of branching fractions, R=B(t -> Wb)/B(t -> Wq), with q being a d, s, or b quark, and search for new particles in top quark decays, such as charged Higgs bosons. We set limits in various supersymmetric models.

VII. Standard Model Electroweak Physics / **790**

Beyond the SM searches with top (LHC)

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The top quark is the only known fermion with a mass of the order of the Electroweak Symmetry Breaking Scale. New Physics, beyond the Standard Model, might be probed by studying the production of the top quark in proton-proton collisions at high energies in the new hadron collider, the LHC. High mass resonances, extra-dimensions, new flavor dynamics, 4th generation of quarks are some of the possibilities to be explored. Specific experimental techniques for event reconstruction and for background control are required to probe the new physics that might underly beneath top quark events. In this talk an overview of some of these experimental techniques is given along with the expected sensitivity of the CMS and ATLAS experiments to new physics scenarios that might influence the production of the top quark at the LHC.

IV. Heavy Ions / **196**

Bjorken Flow of the Quark-Gluon Plasma and Gauge/Gravity Correspondence

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The contribution presents a brief summary of the Gauge/Gravity approach to the study of hydrodynamic flow of the quark-gluon plasma formed in heavy-ion collisions, in a boost-invariant setting (Bjorken flow). Considering the ideal case of a supersymmetric Yang-Mills theory for which the AdS/CFT correspondence gives a precise form of the Gauge/Gravity duality, the properties of the strongly coupled expanding plasma are put in one-to-one correspondence with the metric of a 5-dimensional black hole moving away in the 5th dimension and its deformations consistent with the relevant Einstein equations. Several recently studied aspects of this framework are recalled and put in perspective. New results in collaboration with Guillaume Beuf and Michal Heller on the early time expansion towards the hydrodynamical regime will be sketched.

VI. QCD in Hadronic Physics / **971**

Bottomonium Studies at BaBar

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I will summarize selected studies in bottomonium physics carried out by the BaBar experiment, including bottomonium decays to open charm, the study of chi_bJ(1P) radiative decays, and the search for
the eta_b in hadronic transitions.

II. Flavour Physics / **888**

Branching fractions and charge asymmetries in charmless hadronic B decays at BABAR

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Bs decays at BELLE

II. Flavour Physics / **925**

Bs decays at Belle

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Observation of $B_s \to J/\psi\eta$ and Search for $B_s \to J/\psi\eta'$

We report the first observation of the CP eigenstate decay $B_s \to J/\psi\eta$ and a search for the decay $B_s \to J/\psi\eta'$. The results are based on 23.6~fb^{-1} of data collected at the $\Upsilon(5S)$ resonance with the Belle detector at the KEKB asymmetric e^+e^- collider.

Search for $B_s \to hh$ decays

We present a study of $B_s \to hh$ decays, where h stands for charged or neutral K or π. These results are obtained from a data sample collected on the $\Upsilon(5S)$ resonance with the Belle detector at the KEKB asymmetric energy e^+e^- collider.

Measurement of $calB(B_s \to D_s^{(*)+} D_s^{(*)-})$ and Estimate of $\Delta\Gamma_{CP}$

We report a measurement of the branching fractions for the decays $B_s \to D_s^{(*)+} D_s^{(*)-}$ using a large data sample collected at the $\Upsilon(5S)$ resonance with the Belle detector at the KEKB asymmetric energy e^+e^- collider. In the heavy quark limit, this branching fraction is directly related to the width difference between the CP-odd and CP-even B_s states.

Observation of $B_s \to D_s^{*-}\pi^+$ and $B_s \to D_s^{(*)-}\rho^+$ at Belle

The large data sample being recorded with the Belle detector at the Υ(5S) energy provides a unique opportunity to study the poorly-known B_s meson. Following our recent measurement of $B_s \to D_s\pi$ in a sample of 23.6~fb^{-1}, we extend the analysis to include decays with photons in the final state. Using the same sample, we report the first observation of three other exclusive B_s decays with large branching fractions, $B_s \to D_s^{*-}\pi^+$, $B_s \to D_s^-\rho^+$ and $B_s \to D_s^{*-}\rho^+$.

Search for Baryonic Decays of B_s

We report results from a study of B_s^0 meson baryonic decays at Belle. We search for $\bar{B}_s^0 \to \Lambda_c^+\pi^-\bar{\Lambda}$, $\bar{B}_s^0 \to pK^-\bar{\Lambda}$, $\bar{B}_s^0 \to \Sigma_c^0\bar{p}K^+$, and $\bar{B}_s^0 \to \Lambda_c^+\pi^-\bar{p}K^+$ modes. The analysis is performed using a large sample of data at the Υ(5S) energy collected with the Belle detector at the KEKB asymmetric-energy e^+e^- collider.

IV. Detectors (LHC and R&D) and Accelerators / 756

CERN Upgrade Plans for the LHC and its Injectors

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The primary goal of CERN and the LHC community is to ensure that LHC is operated efficiently, that it achieves nominal performance in the shortest term, and that its performance steadily improves. Since several years the community has been discussing the directions for maximizing the physics reach of the LHC by upgrading the experiments, in particular ATLAS and CMS, the LHC machine and the CERN proton injectors, in a phased approach. The first phase comprises construction of LINAC4 and the LHC IR upgrade, with the goal of increasing the LHC luminosity to 2 to 3 10^34 cm-2s-1, while maximising the use of mature magnet technologies and of the existing infrastructure. These two projects were approved by Council in December 2007 and are scheduled for completion, together with ATLAS and CMS upgrades, in 2014. The second phase foresees further substantial improvements in the injector chain, with replacement of the aging PS and its booster with SPL and PS2, modifications in the existing SPS, and finally with significant modifications of the magnet technology for the LHC interaction regions and upgrade of the infrastructure. Completion of this phase around 2020 should allow to increase further the luminosity of the LHC towards 10^35 cm-2s-1. In this report, a summary is given of the on-going projects and studies for the upgrade of the LHC and its injectors.

IV. Detectors (LHC and R&D) and Accelerators / 200

CMOS Pixel Sensors for High Precision Beam Telescopes and Vertex Detectors

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CMOS sensors of the MIMOSA (standing for Minimum Ionising particle MOS Active pixel sensor) series are developped at IPHC since a decade and have ended up with full scale devices used in beam telescopes and in demonstrators of future vertex detectors. The sensors deliver analogue, unfiltered, signals and are therefore limited to read-out frequencies of ~1 kframe/s. Since a few years, a fast architecture is being developed in collaboration with IRFU, which aims to speed up the read-out by 1-2 ordres of magnitude. The first full scale sensor based on this architecture was fabricated recently and is being tested. Made of 660,000 pixels (18 m pitch) covering an active area of ~2 cm2, it delivers zero-suppressed binary signals, which allow running at ~10 kframes/s. It will equip the beam telescope of the E.U. project EUDET and serve as a forerunner of the sensor equipping the 2 layers of the PIXEL detector of the STAR experiment at RHIC. The contribution to the conference will overview the main features and test results of this pioneering sensor. It will next describe its evolution towards read-out frequencies approaching 100 kframes/s, as required for the vertex detectors of the CBM experiment at FAIR and at the ILC. Finally, the issue of radiation tolerance will be addressed, in the context of a newly available CMOS process using a depleted substrate. A prototype sensor was fabricated in a such CMOS process. The talk will summarise beam test results showing, for the first time, that fluences of 1014 neq/cm2 may be tolerable for CMOS sensors. Overall, the talk provides an oveview of the status and plans of CMOS pixel sensors at the frontier of their achievements and outreach.

Plenary Session 3 / **941**

CMS

IV. Heavy Ions / **428**

CMS Experiment at LHC: Detector Status and Physics Capabilities in Heavy Ion Collisions

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The Large Hadron Collider at CERN will collide protons at $\sqrt{S} = 14$ TeV and lead ions at $\sqrt{S_{NN}} = 5.5$ TeV. The physics program of the Compact Muon Solenoid (CMS) includes the study of heavy ion collisions. The high energies available at the LHC will allow high statistics studies of the dense partonic system with hard probes: heavy quarks and quarkonia with an emphasis on the b and Υ, high p_T jets, photons, as well as Z^0 bosons. The CMS detector consists of a 13~m long, 6~m wide superconducting solenoid providing a uniform 4~T magnetic field. Charged particles will be measured with a large acceptance, high resolution silicon tracker consisting of pixel and strip detector layers. The tracker is surrounded by electromagnetic and hadronic calorimeters located inside the magnet while the muon detector is outside. The central detector will be complemented by CASTOR and a ZDC. The tracking system and the muon detector provide hermetic coverage for particles with $|\eta| \leq 2.4$. The high granularity, high resolution calorimeters will provide hermetic coverage for $|\eta| \leq 7$. The CMS data acquisition system, with its reliance on a multipurpose, high-level trigger system, is uniquely qualified for efficient triggering in high-multiplicity heavy ion events. The CMS detectors will allow a wide range of unique measurements in nuclear collisions. The excellent calorimeters combined with tracking will allow detailed studies of jets, particularly medium effects on the jet fragmentation function and the energy and p_T redistribution of particles within the jet. The large CMS acceptance will allow detailed studies of jet structure in rare jet$-\gamma$ and jet$-Z^0$ events. The high resolution tracker will tag b quark jets. The muon chambers combined with tracking will study production of the Z^0,J/ψ and the Υ family in the central rapidity region of the collision. In addition to the detailed studies of hard probes, CMS will measure charged multiplicity, energy flow and azimuthal asymmetry event-by-event. We will present the latest status of CMS preparations for LHC startup as well as the detailed studies of the CMS capabilities using the full detector simulation and reconstruction.

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CP - conserving and CP- violating properties of Bs mesons with the D0

II. Flavour Physics / **865**

CP violation in hadronic penguin modes

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II. Flavour Physics / **916**

CP-conserving and CP-violating properties in semileptonic Bs decays with the D0 experiment

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A search for CP violation has been performed in a sample of semileptonic Bs decays corresponding to approximately 5 fb^-1 of data collected by the D0 detector in Run II at the Fermilab Tevatron collider.

A time-dependent fit to the distributions of Bs candidates yields the flavour-specific asymmetry
as_fs = [-1.7 pm 9.1 (stat) +1.2-2.3 (syst)] x 10^-3, corresponding to the most precise measurement to date for this CP violation parameter. Furthermore a search for the semi-inclusive process Bs to Ds(*)Ds(*) has been performed on a data sample of 2.8fb^-1. 26.6 pm 8.4 signal events are observed with a significance of 3.2 standard deviations above background, leading to a branching ratio of 0.035 pm 0.010 (stat) pm 0.011 (syst). Under certain theoretical assumptions, these double-charm final states saturate CP-even eigenstates in the Bs decays, resulting in a width difference of DeltaGamma_s(CP)/Gamma_s = 0.072 pm 0.021 (stat) pm 0.022 (syst).

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CPV and CPT in B0 decays at BELLE

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II. Flavour Physics / **926**

CPV and CPT in B0 decays at Belle

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Measurement of ϕ_3 with a Dalitz Plot Analysis of $B^+ \to D^{(*)}K^+$ Decay

We present an update of the measurement of the unitarity triangle angle ϕ_3 using a Dalitz plot analysis of three-body neutral D decays from $B \to D^{(*)}K$ process. The results are based on a large sample of $B\bar{B}$ decays recorded at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB e^+e^- collider.

Measurement of CPT Violating Parameter

CPT is expected to be a fundamental symmetry with no significant deviations. Nonetheless we can introduce an artificial perturbation parameter to the $B^0 - \bar{B}^0$ mixing system that violates CPT symmetry. The CPT violating parameter, which is a complex number but expected to be zero, can be probed through proper time difference distributions in correlated B meson pair decays. We present a measurement of the CPT violating parameter using a large data sample collected at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB energy-asymmetric e^+e^- collider.

Measurement of CP-violating Parameters in the $B \to K^0_S K^+ K^-$ Time-dependent Dalitz Plot Analysis

We present a measurement of CP-violating parameters in the B^0 decays with $K^0_S K^+ K^-$ final state including $B^0 \to \phi K^0_S$ using a time-dependent Dalitz plot analysis. The results are based on a large data sample of $B\bar{B}$ pairs collected on the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric-energy e^+e^- collider.

Improved measurement of CP asymmetries in $B^0 \to (c\bar{c})K^0$ decays

We present results on time-dependent CP asymmetries in the B decays to neutral charmonium final states using a large dataset collected at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric-energy e^+e^- collider.

V. QCD at Colliders / **369**

Central exclusive photoproduction at the LHC

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Protons and antiprotons at collider energies are a source of high energy Weizs\"acker–Williams photons.
This opens up a possibility to study at the LHC exclusive photoproduction of heavy vector mesons at energies much larger than possible at the HERA accelerator.
We present the results of detailed studies of various distributions for the production of heavy quarkonia (e.g. rapidity, transverse momenta, azimuthal angles), including absorptive corrections.
We give predictions for LHC energies. Our calculations are based on modelling the photoproduction amplitudes in a k_t-factorisation approach which is checked against HERA data.
We also discuss the exclusive photoproduction of Z^0 bosons.

based in part on:

Exclusive photoproduction of Upsilon: From HERA to Tevatron.
A. Rybarska, W. Schafer (Cracow, INP) , A. Szczurek (Cracow, INP & Rzeszow U.) . May 2008. 12pp.
Published in Phys.Lett.B668:126-132,2008.
e-Print: arXiv:0805.0717 [hep-ph]

Exclusive photoproduction of $J / psi in proton-proton and proton-antiproton scattering.
W. Schafer (Cracow, INP) , A. Szczurek (Cracow, INP & Rzeszow U.) . May 2007. 18pp.
Published in Phys.Rev.D76:094014,2007.
e-Print: arXiv:0705.2887 [hep-ph]

III. Higgs and New Physics / **791**

Challenges for long-lived massive particle searches at the LHC

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Studies of the CMS and ATLAS collaborations are presented on the sensitivity to searches for long-lived massive particles. Such particles appear for example in particular SUSY, Extra Dimensions and Hidden Valley models. We show the challenges to trigger and reconstruction posed by such particles, and how CMS and ATLAS plan to solve them. Particular emphasis is given to possible early discoveries, ie with 100 pb-1 or less. In special cases, long-lived particles may come to rest in dense material, and decay at much later times; these can be searched for by triggering during periods with no beam-beam collisions.

VI. QCD in Hadronic Physics / **976**

Charm and strange particles production at ZEUS

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Inclusive K0sK0s production in ep collisions at HERA was studied with the ZEUS detector using an integrated luminosity of 0.5 fb-1. Enhancements in the mass spectrum were observed and are attributed to the production of f2(1270)/a20(1320), f2'(1525) and f0(1710). Masses and widths were obtained using a fit which takes into account theoretical predictions based on SU(3) symmetry arguments, and are consistent with the PDG values. The f0(1710) state, which has a mass consistent with a glueball candidate, was observed with a statistical significance of 5 standard deviations. However, if this state is the same as that seen in gamma gamma->K0sK0s, it is unlikely to be a pure glueball state.

The production of excited charm, D_1(2420)^0 and D_2^{}(2460)^0, and charm-strange, D_{s1}(2536)+/-, mesons in ep collisions was measured with the ZEUS detector at HERA using an integrated luminosity of 126 pb^-1. Masses, widths and helicity parameters were determined. The measured yields were converted to the rates of c quarks hadronising as a given excited charm meson and to the ratios of the dominant D_2^{}(2460)^0 and D_{s1}(2536)^\pm branching fractions. A search for the radially excited charm meson, D^*(2640)+/-, was also performed. The results are compared with those measured previously and with theoretical expectations.

II. Flavour Physics / **881**

Charm decays at BABAR

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II. Flavour Physics / **924**

Charm decays at Belle

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Dalitz plot analysis of the decay $D^0 \to \pi^+\pi^-\pi^0$

We report preliminary results of the Dalitz plot analysis of the decay $D^0 \to \pi^+\pi^-\pi^0$ using a 532 fb^{-1} data sample collected with the Belle detector at the KEKB asymmetric-energy e^+e^- collider. The fit model includes the intermediate vector resonances $\rho(770)$, ω, $\rho(1450)$, and $\rho(1700)$, the scalar states $\sigma(600)$, $f_0(980)$, $f_0(1370)$, and $f_0(1500)$ as well as the tensor state $f_2(1270)$. The asymmetry between the two flavour samples - D^0 and $\bar{D}^0$ - has been also estimated.

Search for D^0 leptonic decays with Belle

We present a search for the rare D^0 leptonic decays, $D^0 \to e^+e^-$, $\mu^+\mu^-$, and the decays $D^0 \to e^+\mu^-$ which are forbidden in the Standard Model. Limits on the branching fractions for these decays are obtained using the well measured $D^0 \to \pi^+\pi^-$ decay channel for normalization. The search is performed using a large sample of D^0 decays recorded by the Belle experiment corresponding to an integrated luminosity of 660 fb^{-1}.

Study of $D^+_{(s)}$ decays to $K_S\pi^+$ and K_SK^+

Using 605 fb^{-1} of data collected by the Belle detector at the KEKB asymmetric energy e^+e^- collider, we study the decays of $D^+_{(s)}$ mesons to $K_S\pi^+$ and K_SK^+ final states. We report branching fractions normalized with respect to Cabibbo-favored modes, $\Gamma(D^+ \to K_SK^+)/\Gamma(D^+ \to K_S\pi^+)$ and $\Gamma(D^+_s \to K_S\pi^+)/\Gamma(D^+_s \to K_SK^+)$.

Study of $\eta_c^{(')}$ properties in $B \to \eta_c^{(')}K$ decays

Reconstructed B decays to a charged kaon and an η_c-type charmonium from a data sample of 535 million $B\bar{B}$ meson pairs collected in the Belle experiment at the KEKB e^+e^- collider have been used to study properties of the η_c and its first excitation, the $\eta_c(2S)$. We use the decay mode $K_SK\pi$ to study the effects of interference between charmonium signal and B decays into the same final state without an intermediate charmonium. Taking this interference into account we obtain masses, widths, and decay branching fractions of the η_c and $\eta_c(2S)$ mesons. The results agree with the world average values; for the first time, interference effects are taken into account.

Measurement of the inclusive decay $D^0 \to \phi X$ and of
exclusive decays of the D^0 particle involving a K^+K^- pair

Using data collected by the Belle detector at the KEKB storage ring and applying a novel method of completely reconstructing events up to a D^0, with a K^+K^- pair "left over", the branching fraction of the inclusive decay of $D^0 \to \phi X$ has been measured with high precision. In addition, the exclusive branching fraction $D^0 \to K^+K^-$ has been determined with good precision. Furthermore various branching fractions of D^0 decays involving a K^+K^- pair have been measured for consistency: $D^0 \to (K^+K^-K^0)_{nonres}, \phi K^0, K^+K^-\pi^0, \phi(K^+K^-)\pi^0, and$\phi(K^+K^-)\omega^0.$Resultspresentedinthestudyarepreliminary.$

Observation of the doubly Cabibbo-suppressed decay $D_s\hat{} + \toK\hat{} + K\hat{} + \pi\hat{}-$

We report the first observation of the doubly Cabibbo-suppressed decay $D\hat{}+_s\toK\hat{}+K\hat{}+\pi\hat{}-$ using 605 fb$\hat{}\{-1\}$ of data collected with the Belle detector at the KEKB asymmetric-energy $e\hat{}+e\hat{}-$ collider. The branching ratio with respect to its Cabibbo-favored counterpart $\mathcal{B}(D\hat{} + _s\toK\hat{}+K\hat{}+\pi\hat{}-)$ / $\mathcal{B}(D\hat{}+_s\toK\hat{}+K\hat{}-\pi\hat{}+)$ is (0.229$\pm$0.028$\pm$0.012)

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Charm decays at Belle

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We study the decay properties of the D_s^+ using a large data sample
collected by the Belle detector at the KEKB asymmetric energy e^+e^- collider. Measurements of the relative branching fractions of K_S pi and K_S K
states, the observation of the doubly Cabibbo-suppressed decay Ds+ -> K+K+pi- are presented, and other properties are presented.

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Charm mixing and CPV at CDF

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The CDFII detector at the Fermilab Tevatron has now collected more than 5 fb-1 of data, and using an impact parameter trigger has has collected the largest existing samples of D*+ -> D0pi+ , where D0 decays as D0-> h+h- (with h = K or pi). We present updated measurements of decay rates in these channels, which allow precise measurements of CP violation and flavor mixing in the charm sector.

V. QCD at Colliders / 860

Charmed Meson Production Deep Inelastic Scattering at HERA and Extraction of F2(ccbar)

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Inclusive production of D*mesons in deep inelastic scattering at HERA is studied. The data were taken with the H1 detector in the years 2004 to 2007 and correspond to an integrated luminosity of ~350 pb^-1. D* mesons are reconstructed in their decays D-> *D0 + pi_slow -> K + pi + pi_slow.* *The visible range for the measurements covers the pseudorapidity interval |eta(D)|* <1.5, transverse momenta pT(D*)>1.5 GeV, and inelasticity in the scattering process 0.02 < y < 0.7.
The cross sections are measured for low photon virtualities, 5 100 GeV^2. Single and double differential
cross sections are measured and compared to predictions from the next-to-leading order calculation HVQDIS and the leading order Monte Carlo programs RAPGAP and CASCADE.

The charm contribution to the proton structure, F2(ccbar), is determined for the kinematic region 7 GeV^2 < Q^2 < 440 GeV^2 and 10^-4 < x_bj < 3 * 10^-2 by extrapolating the visible D* meson cross section measured by the H1 collaboration to the full phase space using the NLO QCD calculation HVQDIS, based on DGLAP evolution, and CASCADE, a LO Monte-Carlo program including parton showers based on CCFM evolution.

The production of D+/- and D0 mesons has been measured with the ZEUS detector at HERA using an integrated luminosity of 133.6 pb^-1. The measurements cover the kinematic range 5 < Q2 < 1000 GeV2, 0.02 < y < 0.7, 1.5 < pT(D) < 15 GeV and |eta(D)|<1.6. Combinatorial background to the D meson signals is reduced by using the ZEUS microvertex detector to reconstruct displaced secondary vertices. Production cross sections are compared with the predictions of next-to-leading-order QCD which is found to describe the data well. Measurements are extrapolated to the full kinematic phase space in order to obtain the open-charm contribution, F2(ccbar), to the proton structure function, F2.

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Charmonia and bottom production measurements with J/psi events at LHCb

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We report on the possibilities of measuring charmonia and bottom production with the LHCb experiment. Using reconstructed J/psi decays to mu+ mu-, both the prompt J/psi and b -> J/psi production cross- sections in pp collisions at LHC energies will be determined in the J/ psi eta range 2-5. Due to the very large statistics, this analysis will be possible very early after the LHC start. Other charmonia related measurements will also be discussed, such as that of the J/psi polarization at production or of the production of some of the new X, Y and Z states.

IV. Heavy Ions / **570**

Charmonium resonance production from quark coalescence

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We have considered a relativistically invariant quark coalescence model to predict hadronic resonance productions in heavy ion collisions. We extended our model - which has been applied earlier for strange and non-strange hadrons - to describe charmonium meson ratios, namely J/psi, Psi' and xi_c, at RHIC energies.
In the applied quark coalescence model the widths of the produced mesons and resonances plays an important role and determines the yield of these particles.
In the charm sector the values of meson width have a special structure, which feature enhances the importance of meson width and the effective gluonic widening in the population of the different charmonia channels.
We display our numerical results at RHIC energies.

VI. QCD in Hadronic Physics / **832**

Charmonium-like particles at Belle

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From a Dalitz plot analysis of $B \to K\pi^+\psi'$ decays, we find a signal for $Z(4430)^+ \to \pi^+\psi'$ with a mass $M = (4442^{+15+19}_{-12-13})\mathrm{MeV}/c^2$, width $\Gamma = (107^{+86+74}_{-43-56})$ MeV, product branching fraction $\mathcal{B}(\bar{B}^0 \to K^- Z(4430)^+) \times \mathcal{B}(Z(4430)^+ \to \pi^+\psi') = (3.2^{+1.8+5.3}_{-0.9-1.6}) \times 10^{-5}$, and significance of 6.4σ that agrees with previous Belle measurements based on the same data sample. In addition, we

determine the branching fraction $\mathcal{B}(B^0 \to K^*(892)^0\psi') = (5.52^{+0.35+0.53}_{-0.32-0.58}) \times 10^{-4}$ and the fraction of $K^*(892)^0$ mesons that are longitudinally polarized $f_L = (44.8^{+4.0+4.0}_{-2.7-5.3})\%$. These results are obtained from a large data sample collected near the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric energy e^+e^- collider.

The CDF collaboration recently reported a narrow structure $Y(4341)$ near the $J/\psi\phi$ threshold with a statistical significance of 3.8 σ. A similar study is performed in the $B \to J/\psi\phi K^+$ mode to verify whether or not this new structure is present in Belle data.

We also have searched for a charmonium-like state in the process $\gamma\gamma \to \omega J/\psi$ in the mass region, 3.9-4.2 GeV/c^2. This may be related to one or more of the three charmonium-like states reported in the similar mass region.

VI. QCD in Hadronic Physics / **968**

Charmonium-like results from BABAR

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Several charmonium-like states above $D\bar{D}$ threshold have been discovered at the Belle and BABAR B-factories. Some are produced via Initial State Radiation ({\it e.g.} $Y(4260)$ and $Y(4350)$) and some are observed in B meson decays ({\it{e.g.}} $X(3872)$, $Y(3940)$. The Belle observations of the $Z(4430)^-$, $Z(4050)^-$, and $Z(4248)^-$ states have generated much interest, since these states must have minimum quark content ($c\bar{c}d\bar{u}$), and hence would represent the unequivocal manifestation of a four-quark meson state. I shall report BABAR results on the $Y(4260)$, $Y(4350)$, $X(3872)$, $Y(3940)$, and describe the \babar\ search for the Z(4430)^-.

Plenary Session 5 / **1026**

Closing

V. QCD at Colliders / **904**

Combination of H1 and ZEUS Deep Inelastic ep Scattering Cross Section Measurements and NLO-QCD analysis

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Deep inelastic scattering cross section measurements previously published by the H1 and ZEUS collaborations are combined. The procedure takes into account the systematic error correlations in

a coherent approach, leading to a significantly reduced overall cross section uncertainty by cross calibrating the various data sets. The analysis is based on data with momentum transfers Q^2 > 0.045 GeV^2 collected by the H1 and ZEUS collaborations between the years 1995 and 2000. This combined HERA-I data set, of neutral and charged current inclusive cross sections for e+p and e-p scattering, is used as the sole input for a next-to-leading order (NLO) QCD parton distribution function (PDF) fit. The consistent treatment of systematic uncertainties in the joint data set ensures that experimental uncertainties on the PDFs can be calculated without need for an increased chi^2 tolerance. This results in PDFs with greatly reduced experimental uncertainties compared to the separate analyses of the ZEUS and H1 experiments. Model uncertainties, including those arising from parametrization dependence, are also carefully considered. The resulting HERA PDFs have impressive precision compared to the global fits.

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Combined Upper Limit on Standard Model Higgs Boson Production at D0

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We present the combination of the searches for the Standard Model Higgs boson at a center-of-mass energy of sqrt{s}=1.96 TeV, using up to 5 fb-1of data collected with the D0 detector at the Fermilab Tevatron collider. The major contributing processes include associated production (WH and ZH) and gluon fusion (gg to H to WW(*)). The significant improvements across the full mass range resulting from the larger data sets, improved analyses and inclusion of additional channels are discussed; we expect sensitivity to a Higgs boson with a mass around 160 - 170 GeV with this data set.

III. Higgs and New Physics / 816

Combined Upper limit for SM Higgs at the Tevatron

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We present the combination of the searches for the Standard Model Higgs boson at a center-of-mass energy of sqrt{s}=1.96 TeV, using up to 5 fb-1of data collected with the CDF and D0 detectors at the Tevatron collider. The major contributing processes include associated production (WH and ZH) and gluon fusion (gg to H to WW(*)). The significant improvements across the full mass range resulting from the larger data sets, improved analyses and inclusion of additional channels are also discussed.

IV. Detectors (LHC and R&D) and Accelerators / 663

Commissioning and Performance of the LHCb Vertex Detector

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The LHCb Vertex Detector, VELO, is a crucial component of the experiment. We describe the preparations for taking data. New results from beam related LHC events are presented togethed with a summary of recent radiation studies on the VELO modules including high rate testsat CERN and testbeam studies at Fermilab. Developments of the online and offline infrastructure are described. Projections of the performance of the detector for physics data during 2009 and 2010 are given and its impact on physics performance discussed.

IV. Detectors (LHC and R&D) and Accelerators / **476**

Commissioning of the ATLAS Liquid Argon Calorimeter

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The Liquid Argon calorimeter (LAr) is one of the main sub-detectors in the ATLAS experiment at the LHC. It provides precision measurements of electrons, photons, jets and missing transverse energy produced in the LHC pp collisions. The LAr calorimeter has been installed in the ATLAS cavern and filled with liquid argon since 2006. The electronic calibration of the readout system, a critical system for precision measurements, has been continuously exercised in the commissioning phase, resulting in a fully commissioned calorimeter with its readout and a small number of problematic channels. A total of only 0.02% of the read out channels are dead beyond repair and 0.4% need special treatment for calibration.

Throughout the last two years a large amount of calibration data has been collected. Cosmic muon data, first triggered via specially developed trigger boards on the LVL1 output of the Tile calorimeter and later with the standard ATLAS LVL1 calorimeter trigger, have been recorded at various stages of commissioning. In Sept 2008, with the first single beams circulating in the LHC ring and a near full readout of the calorimeter, events resulting from beam-gas interactions and beam-collimator splashes were recorded.

We present here the LAr electronic calibration scheme, the measured stability of the pedestal, the pulse shape and the gain, and the expected calibration procedure for LHC running. We also present the calorimeter performance study based on the cosmic muon and LHC beam events. With the reconstructed muon minimum ionizing signal in the calorimeter, the uniformity of the barrel electromagnetic calorimeter can be checked. The timing alignment as measured from the data can be compared to the expectation. The high energy depositions in the calorimeter readout cells, either from catastrophic energy loss of the cosmic muons or from beam interactions, are used to validate the signal shape of calorimeter response derived from the calibration pulse.

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Commissioning of the ATLAS reconstruction software with first data

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Looking towards first LHC collisions, the ATLAS detector is being commissioned using all types of physics data available: cosmic rays and events produced during a few days of LHC single beam operations. In addition to putting in place the trigger and data acquisition chains, commissioning of the full software chain is a main goal. This is interesting not only to ensure that the reconstruction, and monitoring chains are ready to deal with LHC physics data, but also to understand the detector performance in view of achieving the physics requirements. The recorded data have allowed us to study the ATLAS detector in terms of efficiencies, resolutions, channel integrity, alignment and calibrations. They have also allowed us to test and optimize the sub-systems reconstruction as well as some combined algorithms, such as combined tracking tools and different muon identification algorithms. The status of the integration of the complete software chain will be presented as well as the data analysis results.

IV. Detectors (LHC and R&D) and Accelerators / **74**

Commissioning of the Silicon Strip Detector (SSD) of ALICE

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The Inner Tracking System (ITS) of the ALICE experiment, consists of six cylindrical layers of silicon detectors, the Silicon Pixel Detectors (SPD), the Silicon Drift Detectors (SDD) and the Silicon Strip Detectors (SSD). It covers the central pseudo-rapidity region ($|\eta| < 1.0$) for all vertices located within the length of the interaction diamond ($\pm 1\sigma$).

The outer layers of the ITS consist of double sided Silicon Strip Detectors mounted on carbon-fiber support structures. The SSD is crucial for the connection of tracks from the main tracking device of ALICE, the Time Projection Chamber (TPC), to the ITS and also provides dE/dx information to assist particle identification for low-momentum particles. The detector consists of 1698 modules each one having 1536 p and n-side strips, resulting in total to more than 2.6 million channels. The SSD has been actively participating in all the testing, commissioning and run activities as well as in all the data taking periods of the ALICE experiment, making it the largest working double sided detector in the world. It has registered large statistics of cosmic data in 2008 and is included in the initial detector configuration of ALICE for the first LHC collisions.

In this talk, the latest results from the commissioning of the SSD with cosmics will be presented. The hardware status of the detector, the front-end electronics, cooling, data acquisition and issues related to the on-line monitoring will be shown. In addition, the procedures implemented and followed to address the alignment with the rest of the ITS sub-detectors along with both on-line and off-line calibration strategies will be described. Finally, results from simulations as well as from the reconstruction of cosmic data demonstrating the performance of the detector will be presented, proving that the SSD is ready for the forthcoming proton-proton data taking.

IV. Detectors (LHC and R&D) and Accelerators / **387**

Commissioning the CMS pixel detector with Cosmic Rays

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The Compact Muon Solenoid (CMS) is one of two general purpose experiments at the Large Hadron Collider. The CMS experiment prides itself on an ambitious, all silicon based, tracking system. After almost 20 years of design and construction the CMS tracker detector has been installed and commissioned. The tracker detector consists of ten layers of silicon microstrip detectors while three layers of pixel detector modules are situated closest to the interaction point. The pixel detector consists of 66M pixels of 100um*150um size, and is designed to use the shape of the actual charge distribution of charged particles to gain hit resolutions down to 12 um. This presentation will focus on commissioning activities in the CMS pixel detector. Results from cosmic ray studies will be presented, in addition to results obtained from the integration of the pixel detector within the CMS detector and various calibration and alignment analyses.

IV. Detectors (LHC and R&D) and Accelerators / **398**

Commissioning the CMS trigger with cosmic rays

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The CMS trigger system must reduce an input data rate from the LHC bunch-crossing frequency of 40 MHz to a rate which will be written to permanent storage. This online event selection is performed in two steps. At the first level (L1) the rate is reduced to 100 kHz, based on calorimeter and muon trigger subsystem information. Then the selected events are forwarded to the high level trigger (HLT), which further reduces the rate to 100 Hz using sophisticated software. The CMS experiment has collected over 300 million cosmic ray events. This has provided an excellent opportunity to test the trigger and prepare for the collision data. In this presentation, we show analysis results from the cosmic ray trigger data and discuss about the preparations for collision data taking.

Plenary Session 4 / **965**

Conference Summary/Outlook

I. Neutrino Physics / **632**

Constraining nonstandard neutrino-electron interactions

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There is currently a strong effort to build models containing the neutrino mass pattern observed in recent experiments. Most of this models implies nonstandard interactions that can be parametrized in terms of effective four-fermion operators in the low-energy limit. In this talk I will show the status of some of the constraints to these parameters obtained from reactor, accelerator, and solar neutrino data. I will also discuss the perspectives of some experimental proposals to improve these bounds. I will concentrate mainly on the nonstandard interaction of the neutrino with electrons.

III. Higgs and New Physics / **77**

Constraints of new physics theories using Gfitter

Authors: Andreas Hoecker[1] ; Doerthe Ludwig[2] ; Henning Flaecher[1] ; Joerg Stelzer[3] ; Johannes Haller[4] ; Klaus Moenig[3] ; Martin Goebel[2] ; Matthias Schott[1] ; Max Baak[1]

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Physics beyond the Standard Model (SM) can change the prediction of the electroweak precision observables. Such effects can be parametrised in terms of effective, so-called {\it oblique} parameters. A global fit of the electroweak SM, as recently performed with the Gfitter package, allows one to determine the oblique parameters and to derive constraints on new physics. In this talk, the Gfitter results for the oblique parameters are presented together with constraints on various new physics models.
In addition, we report independent fit results for a model with an extended Higgs sector (2HDM) using mainly observables from the B and K physics sectors and results from fits including Supersymmetric scenarios.

VII. Unified Theories, Strings, Non-perturbative QFT / **198**

Construction of the ground state of Matrix Theory: Near the Origin

Author: Maciej Trzetrzelewski[1]

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We explicitly construct a (unique) Spin(9)xSU(2) singlet state, involving only the fermionic degrees of freedom, corresponding to the supermembrane/M-theory matrix-model. Any ground state of the theory evaluated at the origin must be proportional to the state. (based on arXiv:0809.5270).

Correction of the Cooper-Frye prescription

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We consider a single-particle spectrum of secondary hadrons created in relativistic nucleus-nucleus collisions. The particles are radiated from the system (fireball) which exhibits a sharp kinetic freeze-out: space-like and time-like hypersurfaces separate the exited (interacting) system of particles from its noninteracting stage of the evolution process. The standard and widely used method to get the spectra is the so-called Cooper-Frye prescription (CFp), that treat the system at the decay stage of evolution as a locally equilibrated ideal gas at a space-like hypersurface. Meanwhile, this prescription presents some serious problems, because, usually, the freeze-out hypersurface contains nonspace-like sectors. We propose a certain correction of the CFp which allows to drop out the problem. We prove that the corrected prescription is valid for both pieces of the freeze-out hypersurface, for the space-like and for the time-like as well. It is important to note, that the problem of negative contribution to the spectra, caused by integration over a time-like piece of the hypersurface, emerges for a "model" distribution function (MDF), for instance when one takes a distribution function defined for local thermodynamic equilibrium. Meanwhile, there is no such a problem for a "true" distribution function, which can be obtained, for instance, from the transport Boltzmann equation. We show also, that even for MDF the corrected CFp gives a right result. Indeed, in this case the integration over the time-like piece of the hypersurface gives negative contribution which is compensated by the positive contribution obtained as a result of integration over a proper piece of the space-like hypersurface.

I. Cosmology and Gravitational Waves / **835**

Cosmic Microwave Background anisotropies and primordial gravitational waves

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In many viable theoretical models primordial gravitational waves are predicted as a consequence of the early evolution of the Universe. Such waves will unavoidably leave an imprint on the Cosmic Microwave Background (CMB) anisotropies, which would be particularly noticeable in the so-called B-mode polarization. The precise measurements of the CMB polarization anisotropies are therefore one of the most promising ways to constrain the amplitude of the primordial gravitational waves and thus differentiate between different competing models of the early Universe.

In this talk I will briefly review the physics of the CMB anisotropies, present the current status of the experimental effort in this field and describe the major hurdles which need to be overcome before a reliable and precise measurement can be delivered.

I. Astroparticle Physics / **665**

Cosmic Ray Signatures from Decaying Gravitino Dark Matter.

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If R-Parity is broken, a Gravitino LSP can still act as Dark Matter due to the Planck scale suppression of the decay width. Within this framework, we study cosmic ray signatures of models with trilinear R-Parity Violating couplings. The signals are compared with cosmic ray measurements from PAMELA and Fermi/LAT. It is shown that leptonic operators (LLE) can successfully reproduce the electron/positron anomalies seen by PAMELA and Fermi. Moreover, the absence of any deviation from expected background in the PAMELA anti-proton data is shown to produce significant constraints on LQD and UDD couplings. Finally, we discuss the importance of upcoming photon data on resolving the source of these anomalies.

I. Cosmology and Gravitational Waves / 979

Cosmology and Dark Energy

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I will review our current knowledge of cosmological parameters, with dark energy as a guideline. I will briefly present some methods and preliminary results from the third year sample of the Supernova Legacy Survey (SNLS). I will then discuss the future instruments and surveys.

Plenary Session 2 / 949

Cosmology and Dark Energy

VI. QCD in Hadronic Physics / 484

Coupled channel description for X(3872) and other XYZ mesons

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In the last years a number of exciting discoveries of new hadron states have challenged our description of the hadron spectroscopy. Among the several charmonium states (X(3940), Y(3940), Z(3930)) the most mysterious one is the well established $X(3872)$. It was first discovered by the Belle Collaboration in the $J/\psi\pi\pi$ invariant mass spectrum of the decay $B \to K^+\pi^+\pi^- J/\psi$. Its mass and relative decay rates outlines a puzzling structure. The $\gamma J/\psi$ and $\gamma\psi'$ decay rates suggest a $c\bar{c}$ structure whereas the ratio $X(3872) \to \pi^+\pi^-\pi^0 J/\psi$ to $X(3872) \to \pi^+\pi^- J/\psi$ which is almost 1 indicates a large isospin violation incompatible with a traditional charmonium assumption. On the other hand the $X(3872)$ mass is difficult to reproduce by the standard quark models. The state appears to be too heavy for a $1D$ charmonium state and too light for a $2P$ charmonium one.

In this work, we have performed a coupled channel calculation of the 1^{++} sector including both $c\bar{c}$ and DD^* states. The calculation was done in the framework of the constituent quark model of Ref. [1]. Two and four quark configurations are coupled using the $^3P_0$ model.

All the parameters are taken from the previous calculation in the $c\bar{c}$ sector including the γ parameter of the $^3P_0$ model [2], so the calculation is parameter free.

We first perform an isospin symmetric calculation including $^3S_1$ and $^3D_1$ DD^* partial waves. If we neglect the coupling to $c\bar{c}$ states we don't get a bound state for the DD^* molecule in the 1^{++} channel, neither in the $I = 0$ nor in the $I = 1$ channels. When the coupling to $c\bar{c}$ states is included we find an almost pure $c\bar{c}(1^3P_1)$ state with mass $3467\,MeV$ which we identify with the $\chi_{c_1}(1P)$ and two states with significant molecular admixture. One of them with mass $3865\,MeV$ is almost a DD^* molecule bound by the coupling to the $c\bar{c}$ states. The second one, with mass $3936\,MeV$, is a $c\bar{c}(2^3P_1)$ with sizable DD^* component. We assign the first state to the $X(3872)$, being the second one a candidate to the $X(3940)$.

When the mass difference between neutral and charged states is included a large D^0D^{*0} component is found which dominates for large distances and breaks isospin symmetry in the physical state.

If we extend the same model to other XYZ charmonium states we get a 2^{++} at M=3968 MeV which can be identified with the Z(3930), but we do not find any candidate for the Y(3940).

As a summary, we have shown that the $X(3872)$ emerges in a constituent quark model calculation as a mixed state of a DD^* molecule and $\chi_{c_1}(2P)$ state. This framework may explain simultaneously the isospin violation showed by the experimental data and the radiative decay rates. We interpret the $X(3940)$ as the $\chi_{c_1}(2P)$ state with a significant DD^* component. Within the same model the Z(3930) appears as a 2^{++} charmonium state.

[1] J. Vijande, F. Fern\'andez, and A. Valcarce, J. Phys G {\bf 31}, 481 (2005).
[2] J. Segovia, A.M. Yasser, D. R. Entem, F. Fernandez Phys. Rev. D {\bf 78}, 114033 (2008).

VI. QCD in Hadronic Physics / 834

Cross-section measurements at Belle

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The differential cross section for the process $\gamma\gamma \to \eta\pi^0$ has been measured in the kinematic range 0.84 GeV $< W <$ 4.0 GeV, $|\cos\theta^*| < 0.8$, where W and θ^* are the energy and π^0 (or η) scattering angle, respectively, in the $\gamma - \gamma$ center-of-mass system. The results are based on a 223 fb^{-1} data sample collected with the Belle detector at the KEKB e^+e^- collider. Clear peaks due to the $a_0(980)$ and $a_2(1320)$ are visible. The differential cross sections are fitted in the energy region 0.9 GeV $< W <$ 1.46 GeV to obtain the parameters of the $a_0(980)$. The energy and angular dependences above 3.1 GeV are compared with those measured in the π^0 π^0 channel. The measured cross section ratio is consistent with QCD predictions. The W^{-n} dependence of the integrated cross section has also been measured.

We also report a measurement of the exclusive cross section for $e^+e^- \to D^0D^{*-}\pi^+$ as a function of center-of-mass energy from the $D^0D^{*-}\pi^+$ threshold to 5.2 GeV with initial-state radiation. The analysis is based on a data sample collected with the Belle detector at the $\Upsilon(4S)$ resonance and nearby continuum with an integrated luminosity of 695 fb^{-1} at the KEKB asymmetric-energy e^+e^- collider.

The cross section s of the reactions $e^+e^- \to \phi\eta$, $\phi\eta'$, $\rho\eta$, $\rho\eta'$ have been measured using a data sample of 516 fb^{-1} collected with the Belle detector at the KEKB asymmetric-energy e^+e^- collider. The energy dependence of the cross sections is presented using Belle measurements together with those of CLEO and BaBar.

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Cross-section measurements in NOMAD

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We present new results on the neutrino-nucleon/nucleus
cross-sections using the high resolution NOMAD data.
The results include cross-section measurements of
(a) Inclusive NuMu-N charge current, (b) NuMu quasi elastic,
and (c) Coherent NuMu-Carbon neutral pion. Each measurement
is the most precise reported to date.

VI. QCD in Hadronic Physics / 440

Cross-sections of hadron production by 3-15 GeV/c beams of protons and charged pions.

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Precise measurements of hadron production on nuclear targets are vital for the design of a future neutrino factory and important for the tuning of hadron generators such as Geant4. The hadron yield must be known as a function of the energy and the production angle of the secondary particles. We report on HARP-CDP measurements of double-differential inclusive cross-sections of pion, proton and deuteron production on Beryllium, Copper and Tantalum targets, by beams of protons and charged pions in the momentum range between 3 and 15 GeV/c. Our studies show that cross-sections published by the "HARP Collaboration" are wrong by factors up to two.

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D* Mesons in Jets Analysis in proton-proton collisions at √s = 10 TeV using the ALICE detector at CERN-LHC.

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Charm and bottom quarks have been proposed as probes to study partonic matter produced in high-energy heavy-ion collisions. The detailed understanding of the production mechanisms in such collisions is of considerable interest. Measurements of the D*yield in jets probe the production processes in which the observed D* mesons are formed primarily from gluon splitting into c-cbar or b-bbar pairs. The charm content in jets is calculable in perturbative QCD, and the leading non-perturbative correction is expected to be significant at LHC energies. In this contribution we present latest results on performance studies of the reconstruction of charged D*mesons in jets in proton-proton collisions at √s = 10 TeV using the ALICE central detector. D*+ mesons are reconstructed through the decay sequence D*+ ⟶ D0 + π+ and D0 ⟶ K- + π+ (and its charge conjugate channel). The results are compared for different jet transverse momenta, and topological cut effects are discussed.

II. Flavour Physics / 880

D0-D0bar mixing at BABAR

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III. Higgs and New Physics / 764

Dark Matter from Lorentz Invariance and the LHC

Author: Giacomo Cacciapaglia[1]

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We discuss the unique 6 dimensional geometry where a stable Dark Matter candidate arises without imposing any extra discrete symmetry. The KK parity is part of the residual Lorentz symmetry of

the compact space due to the absence of fixed points. We will discuss the spectrum of the Standard Model on this 6D background and identify the candidate as a massive scalar photon. Finally, we will briefly sketch the phenomenology of this scenario, focusing on the peculiarities with respect to other models and possible extensions.

Plenary Session 2 / **948**

Dark matter theory

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Decays of Bs to Ds(*) Ds(*) and phi phi at CDF

presenter will be choesn

IV. Detectors (LHC and R&D) and Accelerators / **384**

Design process of the CMS Silicon Tracker for Super-LHC

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Following an expected increase of the LHC luminosity beyond its design value of 10^34 cm^-2s^-1 the CMS collaboration is planning for an upgrade of the experimental apparatus. In particular the silicon tracker should undergo a major rebuild to cope with the new ultimate luminosity of the upgraded collider (SLHC) which is foreseen to be a factor ten greater than the present limit. In these extreme conditions several hundred of interactions per beam crossing are expected and the large number of charged particles generated will correspondingly increase, requiring a new detector with a much higher granularity. This should be achieved keeping both the tracker power consumption and the material budget at levels which will not jeopardize the instrument operability and perfomance. Furthermore the radiation tolerance of the new silicon sensors should be much higher than the present one, requiring major developments on the detector technology side. Finally the new tracker should be able to provide data to contribute to the CMS first level trigger. Possible layouts of the new tracking system have to be simulated in detail to understand the behaviour of the apparatus in a very high pile-up condition and to define a new optimal design which could meet the SLHC requirements. The motivations for the upgrade together with the status of this design process and recent developments on the various R&D activities will be described.

Plenary Session 4 / **954**

Detectors R&D

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Determination of Strange Sea Distributions from $bm\nu N$ Deep Inelastic Scattering

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We present an analysis of the nucleon strange sea extracted from a global Parton Distribution Function fit including the neutrino and anti-neutrino dimuon data by the CCFR and NuTeV collaborations, the inclusive charged lepton-nucleon Deep Inelastic Scattering and Drell-Yan data. The (anti-)neutrino induced dimuon analysis is constrained by the semi-leptonic charmed-hadron branching ratio $B_\mu = (8.8 \pm 0.5)\%$, determined from the inclusive charmed hadron measurements performed by the FNAL-E531 and CHORUS neutrino emulsion experiments. Our analysis yields a strange sea suppression factor $\kappa(20\ \mathrm{GeV}^2) = 0.62 \pm 0.04(\mathrm{exp.}) \pm 0.03(\mathrm{QCD})$, the most precise value available, an x-distribution of total strange sea that is slightly softer than the non-strange sea, and an asymmetry between strange and anti-strange quark distributions consistent with zero (integrated over x it is equal to $S^-(20\ \mathrm{GeV}^2) = 0.0013 \pm 0.0009(\mathrm{exp.}) \pm 0.0002(\mathrm{QCD})$}).

I. Astroparticle Physics / 444

Determination of the Neutrino Flavor Ratio at the Astrophysical Source

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We discuss the reconstruction of neutrino flavor ratios at astrophysical sources from future neutrino-telescope measurements, given the knowledge of neutrino mixing angles obtained from terrestrial experiments. With a statistical analysis, we demonstrate that the pion source and the muon-damped source can be distinguished at the $3\,\sigma$ level provided the accuracies on measuring $R \equiv \phi(\nu_\mu)/\left(\phi(\nu_e) + \phi(\nu_\tau)\right)$ and $S \equiv \phi(\nu_e)/\phi(\nu_\tau)$ can both reach 10%. On the other hand, the above two sources are very difficult to distinguish by merely measuring R alone. We also discuss the effect of leptonic CP phase on such a flavor-ratio reconstruction.

V. QCD at Colliders / 989

Determination of the proton parton density functions at HERA

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Jet cross sections in deep inelastic ep scattering and photoproduction were measured with the ZEUS detector at HERA using an integrated luminosity of up to 500 pb-1. Measurements of differential cross sections are presented for dijet production and compared with perturbative QCD predictions. Regions of phase space where the cross sections are sensitive to the gluon content of the proton with small uncertainties were identified. These measurements have the potential to constrain
the gluon density in the proton when included as input to global QCD fits.

A NLO QCD analysis on ZEUS jet-production data and inclusive cross-section data, including data with polarised lepton beams, is presented. The analysis includes the most recent results on neutral current and charged current inclusive cross sections in e+p and e-p collisions extracted from the HERAII data, together with the NC cross sections measured at lower proton beam energy. The analysis is used to assess the impact of the most recent data on the parton distribution functions and their uncertainties.

A measurement of the inclusive deep-inelastic neutral current e+p scattering cross section is reported in the region of four-momentum transfer squared, 12 < Q^2 < 50 GeV^2, and Bjorken x, 2x10^-4 < x< =0.1. The results are based on data collected by the H1 Collaboration at the ep collider HERA at positron and proton beam energies of E_e=27.6 GeV and
E_p=920 GeV, respectively. The data are combined with previously published data, taken at E_p=820 GeV. The accuracy of the combined measurement is typically in the range of 1.3-2%. A QCD analysis at next-to-leading order is performed to determine the parton distributions in the proton based on H1 data.

V. QCD at Colliders / **51**

Determinations of alpha_s from hadronic event shapes and tests of analytic hadronization models using e+e- annihilation data

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QCD predictions of hadronic event shapes, in complete 3rd order (NNLO) and in resummed 3rd order (NNLO & NLLA) perturbation theory, are applied to e+e- annihilation data in the c.m. energy range of 14 to 200 GeV, in order to
precisely determine the running coupling alphas(Q). Moments of event shape distributions and respective predictions in NLO QCD are used to test different regions of phase space and various analytic models of hadronisation.

VII. Standard Model Electroweak Physics / **890**

Diboson Production at D0

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We present recent diboson production measurements from the D0 experiment at Fermilab's Tevatron collider. The production of ZZ has been observed using leptonic final states. Zgamma production has been observed and used to set the most stringent limits from a hadron collider on anomalous Zgammagamma and ZZgamma trilinear gauge couplings (TGCs). WW and WZ events with semi-leptonic final states are used to set limits on anomalous WWZ and WWgamma TGCs. Lastly, we present limits on anomalous WWZ and WWgamma TGCs obtained from a combination of the fully-leptonic Wgamma, WW, and WZ channels and the semi-leptonic WW and WZ channels, giving the most stringent limits from a hadron collider.

VII. Standard Model Electroweak Physics / 838

Diboson production (CDF)

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WW and WZ production in pbar p collisions at 1.96 TeV are studied in samples of ~3 fb-1 of data using leptons, jets and missing Et. Fully leptonic decays as well as semi-leptonic decays are measured. Diboson production is expected in the standard model, and predicted cross sections are confirmed. It is important to investigate various signatures as associated production of Higgs bosons is topologically similar.

V. QCD at Colliders / 993

Diffractive PDFs and factorisation tests at HERA

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Diffractive photoproduction of dijets was measured with the ZEUS detector at the ep collider HERA using an integrated luminosity of 77.2 pb-1. The measurements were made in the kinematic range Q2 < 1 GeV2 , 0.20 < y < 0.85 and xIP < 0.025, where Q2 is the photon virtuality, y is the inelasticity and xIP is the fraction of the proton momentum taken by the diffractive exchange. The two jets with the highest transverse energy, ETjet , were required to satisfy ETjet > 7.5 and 6.5 GeV, respectively, and to lie in the pseudorapidity range 1.5 <eta_jet < 1.5. Differential cross sections were compared to perturbative QCD calculations using available
parameterisations of diffractive parton distributions of the proton.

Measurements are presented of single and double-differential dijet cross sections in diffractive photoproduction ($Q2 < 0.01 GeV2$) based on 1999 and 2000 HERA data with an integrated luminosity of 54 pb^{-1}. The event topology is given by $epightarroweXY$, where the system X, containing at least two jets, is separated from a leading low-mass proton dissociative system Y by a large rapidity gap. The dijet cross sections are compared to leading order Monte Carlo models and to next-to-leading order QCD predictions, based on recent diffractive parton densities obtained by H1. The next-to-leading order calculations predict larger cross sections than observed. The suppression of

the data relative to the calculation is investigated as a function of various kinematic variables. Ratios of the diffractive to inclusive single-differential dijet cross sections are measured for the first time.

Differential dijet cross sections in diffractive deep-inelastic scattering are measured with the H1 detector at HERA using an integrated luminosity of 51.5 pb-1. The selected events are of the type ep −> eXY, where the system X contains at least two jets and is well separated in rapidity from the low mass proton dissociation system Y. The dijet data are compared with QCD predictions at next-to-leading order based on diffractive parton distribution functions previously extracted from measurements of inclusive diffractive deep-inelastic scattering. The prediction describes the dijet data well at low and intermediate zpom (the fraction of the momentum of the diffractive exchange carried by the parton entering the hard interaction) where the gluon density is well determined from the inclusive diffractive data, supporting QCD factorisation. A new set of diffractive parton distribution functions is obtained through a simultaneous fit to the diffractive inclusive and dijet cross sections. This allows for a precise determination of both the diffractive quark and gluon distributions in the range 0.05<0.9. In particular, the precision on the gluon density at high momentum fractions is improved compared to previous extractions.

ZEUS inclusive diffractive cross-sections data were used in a DGLAP next-to-leading-order QCD analysis to extract the diffractive parton distribution functions. Data on diffractive dijet production in deep inelastic scattering were also included in the fit to constrain the gluon density. Diffractive photoproduction dijet were used to test the extracted parton densities.

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Diffractive hadroproduction of electroweak bosons at the LHC

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Hard diffractive processes, such as the diffractive production of massive electroweak bosons, dijets or Higgs, allow to study the interplay of small and large distance dynamics in QCD. We present predictions for the cross sections for such processes at the LHC, using the diffractive parton distribution from the newest analysis of diffractive HERA data with higher twist. We calculate W and Z bosons production in single diffractive dissociation which occur by the existence of one large rapidity gap, represented by the pomeron exchange. We have shown that it is possible to obtain a reasonable overall description of hard diffractive production of massive electroweak bosons by the model based on Regge factorization supplemented by the gap survival factor.
The W bosons asymmetry is a particularly interesting observable since it is insensitive to the gap survival factor, which is the main source of uncertainty in diffractive hadroproduction. Thus, this asymmetry present an invaluable tool to study the mechanism of diffraction at the LHC. At the end we show new predictions for Higgs boson production in diffractive processes at the LHC.

V. QCD at Colliders / 731

Diffractive open charm production from the dipole model analysis

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The most promising QCD based approach to DIS diffraction is formulated in terms of dipole models. In this analysis, we consider two important parameterisations of the dipole scattering amplitude, called GBW and CGC in which parton saturation results are built in. We present a precise comparison of the results of the dipole models using these two parameterisations with the newest data from HERA. The comparison we performed prompt us to discuss some subtle points of the dipole models, mostly related to the qqg component, and connect them to the approach based on the diffractive parton distributions evolved with the Dokshitzer-Gribov-Lipatov-Altarelli-Parisi (DGLAP) equations. Within the latter approach, the diffractive open charm production, which is the main goal of this analysis, is particularly interesting since it is sensitive to a diffractive gluon distribution. Thus, we extracted the diffractive gluon distribution from the dipole model formulae to use it for the computation of the charm contribution to F2D. We found good agreement with the HERA data on the diffractive open charm production both for the the gluon distributions from the considered dipole models and the DGLAP fits to HERA data from our earlier analysis for diffractive parton distributions with higher twist.

V. QCD at Colliders / 155

Diffractive production of \chi_c(0,1,2) mesons at LHC, Tevatron and RHIC

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We calculate several differential distributions for exclusive double diffractive scalar $\chi_c(0^{++})$, axial-vector $\chi_c(1^{++})$ and tensor $\chi_c(2^{++})$ mesons production in the proton-antiproton collisions at Tevatron and in
proton-proton collisions at RHIC and LHC. We use the formalism of unintegrated gluon distributions (UGDFs) within the $k_\perp$-factorisation approach. The uncertainties of the Kaidalov-Khoze-Martin-Ryskin approach are discussed. The $g^*g^* \to \chi_c(0,1,2)$ transition vertices are calculated as functions
of gluon virtualities via the standard perturbative nonrelativistic QCD (pNRQCD) technique. Different models of UGDFs are used and the results are shown and discussed. The cross section for the diffractive component depends strongly on UGDFs.

The off-shell effects are discussed and quantified. We show that for the $\chi_c(1^{++})$ production the famous Landau-Yang theorem is not applicable in the case of off-shell gluons. The contribution of $\chi_c(1^{++})$ to the $J/\Psi + \gamma$ channel is smaller than that of the $\chi_c(0^{++})$ and $\chi_c(2^{++})$ decays, but not negligible and can be measured. The numerical value of the ratio of the these contributions is almost independent of UGDFs modeling.

We have also calculated differential cross sections for different spin polarizations of $\chi_c(1^{++})$ and $\chi_c(2^{++})$. The integrated cross section for spin polarizations $\lambda = \pm 1$ (for $\chi_c(1^{++})$) and $\lambda = \pm 2$ (for $\chi_c(2^{++})$) is approximately an order of magnitude greater than that for the $\lambda = 0$ polarization.

V. QCD at Colliders / **907**

Diffractive rho and phi production in DIS at HERA

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Exclusive rho^0 electroproduction at HERA has been studied with the ZEUS detector using 120 pb-1 of integrated luminosity collected during 1996-2000. The analysis was carried out in the kinematic range of photon virtuality 2 < Q2 < 160 GeV2, and gamma*p centre-of-mass energy 32 < W < 180 GeV. The results include the Q2 and W dependence of the gamma*p->rho^0 p cross section and the distribution of the squared-four-momentum transfer to the proton. The helicity analysis of the decay-matrix elements of the rho^0 was used to study the ratio of the gamma*p cross section for longitudinal and transverse photon as a function of Q2 and W. Finally, an effective Pomeron trajectory was extracted. The results are compared to various theoretical predictions.

An analysis of H1 data for rho and phi VM diffractive production, both in the elastic and proton dissociative channel is presented. The analysed data, which correspond to 51 pb-1, include a total of 12500 events in the transition region from low Q2 to the perturbative domain, $2.5 < Q2 < 60 GeV2, with data analysed in a consistent way, in particular for background estimates. The total, longitudinal and transverse cross sections are measured as a function of Q2, W and |t|. The polarisation efects are discussed in detail, in particular the Q2, |t| and (for rho mesons) M(pi,pi) dependences of the s-channel helicity conserving and violating amplitudes and phases. A consistent picture of VM production at intermediate and large Q2 thus emerges from H1 HERA-1 measurements, which can be interpreted in a QCD framework.

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Diffrative Scattering, QCD and TOTEM measurements at LHC

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Elastic scattering in the soft region poses a challenge to theoreists. TOTEM Colleboration plans to measure total and elastic scattering both in the soft and hard regions. A brief sketch of theory vs measurements is undertaken, specially with reference to QCD and eikonal picture.

V. QCD at Colliders / **50**

Dijet angular distributions at sqrt(s) = 14 TeV

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Jet production is the most dominant hard process in hadron collision experiments. While jets are background for many new physics searches, jets can also be used as a signal. Because of the rich abundance of jets, many jet studies can be performed with little integrated luminosity.

The dijet angular distribution between the two hardest jets in the event has shown to be a very useful measurement; at low integrated luminosity it is a good tool to probe QCD, while with more statistics, a search for new physics, such as effects coming from large extra dimensions, becomes possible.

We present a Monte Carlo study of dijet angular distributions at sqrt{s}=14 TeV. First we perform a next-to-leading order QCD study; we calculate the distributions in four different bins of dijet invariant mass (Mjj) using different Monte Carlo programs and different jet algorithms, and we also investigate the systematic uncertainties coming from the choice of the parton distribution functions and the renormalization and factorization scales.

In the second part, we present the effects on the distributions coming from a model including gravitational scattering and black hole formation in a world with large extra dimensions. We report a discovery potential for the mass bin 1 < Mjj < 2 TeV at 10 pb−1 integrated luminosity.

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Direct Measurement of the Mass Difference Between Top and Antitop Quarks with the D0 Detector

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We present a measurement of the difference between the masses of the top and antitop quarks in the lepton+jets final state. The analysis is based on the “matrix element” method. The purity of the data sample is enhanced by applying a neural-net-based b-tagging technique. The data for this measurement corresponds to 1 fb-1 of integrated luminosity acquired by the D0 experiment at the Fermilab Tevatron Collider. This represents the first direct measurement of a mass difference between a quark and its antiquark and represents a test of CPT invariance.

Plenary Session 1 / 945

Direct searches for Dark Matter

Joint EPS - EFCA meeting / 1022

Discussion

Joint EPS - EFCA meeting / 1020

Discussion

Joint EPS - EFCA meeting / 1016

Discussion

Joint EPS - EFCA meeting / 1018

Discussion

I. Neutrino Physics / 714

Double Chooz experiment

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Double Chooz will use two identical detectors at different distances from the Chooz nuclear power station to search for a non-vanishing value of θ_{13}, and, hopefully, to open the way to experiments aspiring to discover CP violation in the leptonic sector. The far detector is expected to be operative by the end of 2009. Installation of the near detector will occur in 2010.
Double Chooz has the capacity to exclude $sin^2(2\theta_{13}) < 0.03$ at 90% C.L. for $\Delta m^2_{31} = 2.5 \times 10^{-3} eV^2$ with three years of data running both near and far detectors.

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Double logarithmic term Ln^2(1/x) in the polarized non singlet structure function at small x in valon model

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We study the low x behavior of non-singlet spin structure Function, of the nucleon in the so-called the valon representation. We find the double logarithmic term Ln^2(1/x) in the polarized non singlet structure function at small x with using the valon model .The Structure of the valon itself develops through the perturbative dressing of a valence quark in QCD, which is independent of the hosting hadron. The results of non-singlet spin structure Function is in excellent agreement with the experimental data from HERMES collaborations for the entire measured range of x. It also provides an

acceptable agreement with the older data from SMC, E143 and E155 experiments. We have further compared our results with those from AA, BB, GRSV, and DNS global fits.

V. QCD at Colliders / **41**

Dynamical Parton Distributions at NNLO

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Utilizing recent DIS measurements and Drell-Yan data we determine at NNLO (3-loop) of QCD the dynamical parton distribution functions of the nucleon generated radiatively from valencelike positive input distributions at an optimally chosen low resolution scale. These are compared with standard" NNLO distributions generated from positive input distributions at some fixed and higher resolution scale. Although the NNLO corrections imply in both approaches an improved value of chi-square, present DIS data are still not sufficiently accurate to distinguish between NLO results and the minute NNLO effects of a few percent, despite of the fact that the dynamical NNLO uncertainties are somewhat smaller than the NLO ones and both are, as expected, smaller than those of theirstandard" counterparts. The dynamical predictions for the longitudinal structure function of the proton become perturbatively stable already at Q^2 = 2-3 GeV^2 where precision measurements could even delineate NNLO effects in the very small-x region. This is in contrast to the common "standard" approach but NNLO/NLO differences are here less distinguishable due to the much larger uncertainty bands.

III. Higgs and New Physics / **661**

Dynamical electroweak symmetry breaking by quasiconformal technicolour theories

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In technicolour theories the electroweak symmetry is broken by chiral symmetry breaking in an additional strongly interacting sector added to the standard model without elementary Higgs sector. Quasiconformal technicolour models with matter in higher representations of the technicolour gauge group are viable candidates for breaking the electroweak symmetry dynamically. They are not at odds with available electroweak precision data.
Here, we start with a brief introduction into dynamical electroweak symmetry breaking by technicolour theories. Subsequently, we discuss the phase diagram of strongly interacting theories in the Nc-Nf-plane and how to relate it to the task of finding candidates for quasiconformal technicolour models. Continuing from there, we select the prime candidates by using constraints from available electroweak precision data like, for example, bounds on flavour changing neutral currents, oblique parameters and the detectability of Nambu–Goldstone modes. The latter issue is also linked to the stability of the vacuum. We discuss the features of selected candidates in greater detail.

I. Astroparticle Physics / **553**

EDELWEISS-2 Dark Matter Search: recent results with new detectors

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The existence of dark matter (DM) has strong support today while its nature remains one of the big science quests. EDELWEISS-2 is a direct DM search experiment using cryogenic Germanium bolometers. The most promising DM candidate, a so-called weakly interacting massive particle, WIMP, is expected to scatter off the target nuclei thus depositing a tiny energy in the detectors. A powerful event selection and good background knowledge are of crucial importance in this case. The experiment is situated in the French-Italian Fréjus tunnel, in the Modane underground laboratory LSM with a shielding of 4800m.w.e. against cosmic rays. Since the end of 2007, EDELWEISS is taking data. The status of the experiment and the latest results will be presented. Special emphasis will be given on the performance of recently developed detectors. These detectors show a significantly improved beta/gamma rejection power and provide a promising base for next generation direct DM searches. In addition, the identification of muon-induced background events and special measurements of muon-induced neutrons will be discussed.

IV. Heavy Ions / **683**

EMC Effect in Heavy Ion Collision

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Recent data in heavy ion collisions show suppression at high transverse momenta, which might be identified as the EMC effect. The influence of nuclear parton distribution functions (nPDFs) on high-p_T hadron production in deuteron-gold dAu collisions at RHIC was investigated using a pQCD-improved parton model and several different parameterizations of nuclear PDFs, including the latest HKN and EPS09.
We study whether the EMC suppression of nuclear PDFs is responsible for the observed suppression of high-p_T π^0 and γ production in dAu collisions. We did a slope analysis Theoretical uncertainties in the nuclear modification factor, R_{dAu} resulting from uncertainties in the PDF fits and from pQCD scale uncertainties are evaluated uniquely.
We have also checked, the possibility that final-state energy loss of jets could also contribute to the observed suppression is evaluated using a simplistic implementation of the GLV energy loss model.

VI. QCD in Hadronic Physics / **773**

Early Physics with the LHCf detector at LHC

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The LHCf detector is ready to take data at the LHC accelerator at CERN. The whole detector has been installed at the beginning of 2008 on both side of LHC collision point 1 (IP1) and the commissioning phase is in a well advanced stage. Thanks to the excellent energy and position resolution of the two sampling calorimeters, LHCf will be able to measure the pion production cross section at a very small angle in p-p interactions up to 14 TeV in the center of mass system through the measurement of the photons produced in the neutral pion decay. It will also be able to identify neutrons and meausure their energy spectrum. LHCf will thus provide a good calibration of the various shower models that are widely used to estimate the primary energy of ultra-high-energy cosmic rays. Many of the experimental procedures used to derive the energy spectra of the incoming cosmic rays depend strongly on the nuclear interaction model used in the Monte Carlo codes of the air showers and several open questions in cosmic ray physics may profit from the accurate knowledge and calibration of Monte Carlo models provided by the LHCf experiment.

III. Higgs and New Physics / **822**

Early new physics searches with leptons at LHC

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Several models predict the existence of new particles leading to final states with high pT leptons. New heavy resonances may decay to dilepton or lepton with missing ET. Leptoquarks and Left-Right symmetric models lead to final states with leptons and jets. Models with substructure predict excited states of quarks and leptons leading to final states with lepton plus photon. The prospect for early discoveries, with integrated luminosity of about 100 pb-1, using ATLAS and CMS detectors, are discussed.

III. Higgs and New Physics / **846**

Early new physics searches with jets at the LHC

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Many proposed models of new physics predict yet undiscovered particles which decay with high branching fractions into quarks, such as extra gauge boson or fourth generation quarks. The high branching fractions to quarks make searches in channels with jets in the final state attractive for

investigations at low integrated luminosities or new phenomena with low production cross sections. The most challenging aspect of such analysis is the large background expected from standard model QCD processes.
The prospects of new discoveries in final states with jets at the Atlas and CMS experiment at the LHC will be presented.

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Effects of Universal Lűscher Term in Static Properties of Mesons.

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Nambu-Goto string predicts the long distance quark-antiquark potential to be :
$V(r) = \sigma r + \mu + \gamma/r + O(1/r2)$.
The coefficient $\gamma = -\pi(d-2)/24$ is the universal Lűscher term which depends on the space-time dimension 'd'. Recent lattice calculation of the force versus distance supports this potential for $r>0$ and $d=3$ & 4.
We use quantum mechanical Dalgerno's method to calculate the effect of Luscher term in quark-antiquark wave function and apply it to the mass and decay constants of heavy-light and heavy-heavy mesons.

IV. Detectors (LHC and R&D) and Accelerators / 967

Electromagnetic Calorimetry for the ILC

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The CALICE collaboration is developing calorimeters for use in the
Particle Flow approach (PFA) to jet energy measurement in future particle
accelerator experiments. A highly granular electromagnetic calorimeter
is central to this program and two prototypes , based on two different
technologies were consequently built. Both are sampling calorimeters:
Silicon-Tungsten and scintillator-Tungsten with MPPC read out, respectively.
They were tested extensively with particle beams, their performance
(linearity, resolution, uniformity) measured and found to be within
the PFA requirements. We will report on the measured performance of the prototypes, as well as on the planned future R&D developments.

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Electron Reconstruction and Identification with the ATLAS Detector

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The understanding of the reconstruction of electrons will be one of the key issues at the start-up of data-taking with the ATLAS experiment at the LHC in 2009. The first signals from prompt electrons are expected in direct J/psi and Upsilon production and in semi-leptonic decays of heavy flavour. They will be accompanied of course by W to enu and Z to ee decays, which will be used for a detailed and complete understanding of the performance of the trigger and offline algorithms once the accumulated statistics will be adequate.

The energy measurement of electrons is based on the electromagnetic calorimetry over most of the relevant energy range (10 GeV to a few TeV). The electromagnetic calorimeter cluster algorithm starting from electronically
calibrated calorimeter cells will be described. Local position and energy variations are corrected for. A refined calibration procedure, developed and validated over years of test-beam data-taking and analysis, strives to identify all sources of energy losses upstream of the calorimeter and outside the cluster and corrects for them one by one (using Monte-Carlo).

The construction tolerances and the calibration system ensure that the calorimeter response is locally uniform to ~ 0.5%.
Z to ee events, using the precisely known Z-boson mass as a constraint, will be used for in-situ calibration to achieve the desired global constant term of 0.7%. To achieve this the material in front of the calorimeter will have to be mapped out precisely using other methods.

The electron reconstruction relies on two algorithms, one which is calorimeter-seeded and the second one which is track-seeded. The former is optimised mostly for high-pT isolated electrons whereas the latter is optimised more for low-pT electrons, including those which are not isolated.

The electron identification is based on the shower shapes in the calorimeter and relies on the tracker and combined tracker/calo information to achieve the required rejection of 10^5 against QCD jets for a reasonably clean inclusive electron spectrum in the moderate pT region of 10 to 50 GeV. The required rejection factor is closer to a thousand per jet to cleanly extract the signal expected from di-electron resonances in the TeV mass range. The electron identification methods and their performance will be discussed. While the baseline identification will rely initially on simple cut-based analyses, powerful multivariate techniques, such as LogLikelihood and the H-matrix, have also been explored and the gain expected from them has been quantified.

Finally tag-and-probe methods, using Z to ee decays, have been developed in order to determine the efficiency of the electron trigger, reconstruction and identification from data alone. Good agreement was obtained in comparing the results of these methods with the estimations from Monte-Carlo truth. The large statistics expected in early data at low luminosity from J/psi and Upsilon to ee decays will extend the use of this method over the full pT range of interest for searches (Higgs-boson decays to electrons, electrons produced in cascade decays of SUSY particles, etc).

III. Higgs and New Physics / 47

Electroweak Effects and Cross Section for Higgs production in gluon fusion process

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We present results for the mixed QCD-electroweak correction to the Higgs boson production cross section in gluon fusion process arising from light quarks,

probing the factorization of QCD and electroweak corrections in this process. We show an updated theoretical prediction for the cross section based on this correction, the best current estimates for contributions from top and bottom quarks and the newest PDFs (MSTW2008).

VII. Standard Model Electroweak Physics / 209

Electroweak corrections to W+jet hadroproduction including leptonic W-boson decays

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We present the first calculation of the next-to-leading order electroweak corrections to W-boson + jet hadroproduction including leptonic W-boson decays. The W-boson resonance is treated consistently using the complex-mass scheme and all off-shell effects are taken into account. The corresponding next-to-leading order QCD corrections have also been recalculated. All the results have been implemented in a flexible Monte-Carlo code. Numerical results for cross sections and distributions of this standard model benchmark process are presented for the Tevatron and the LHC.

VII. Standard Model Electroweak Physics / 831

Electroweak physics from Belle

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We report a study of $\tau^- \to \pi^-\pi^+\pi^-\nu$, $\tau^- \to K^-\pi^+\pi^-\nu$, $\tau^- \to K^-K^+\pi^-\nu$ and $\tau^- \to K^-K^+K^-\nu$ decays using a 666 fb^{-1} data sample collected with the Belle detector at the KEKB asymmetric-energy e^+e^- collider. We present the branching fractions as well as the unfolded mass spectra of the total hadronic system for these four decay modes.

We also report the result of a search for a second class current (SCC) via $\tau \to \pi\eta^{(\prime)}\nu$ decays. Sensitivity at the 10^{-5} level can be achieved, while the branching fraction for a SCC is predicted to be at the $10^{-6} - 10^{-5}$ level in several phenomenological models.

III. Higgs and New Physics / 574

Evolution of the Universe to the present Inert phase

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We study 2HDM with an Z2 symmetry conserved both at the Lagrangian level and in states, assuming Model I for the Yukawa interaction. Such model can offer a candidate for a dark matter. We consider possible evolution of Universe after EWSB phase transition to the present Inert phase.

VI. QCD in Hadronic Physics / **716**

Exact beta function and glueball spectrum in large N Yang-Mills theory.

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In the pure large N Yang-Mills theory there is a quasi BPS sector that is exactly solvable at large N.
It follows an exact large N beta function and the glueball spectrum in this sector.
The main technical tool is localization of the loop equation for quasi BPS Wilson loops by homological deformations of the loop, somehow in analogy with Witten's cohomological localization by a coboundary deformation.

V. QCD at Colliders / **994**

Exclusive Photoproduction at HERA

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The exclusive photoproduction reaction gamma p -> Upsilon p has been studied with the ZEUS experiment in ep collisions at HERA using an integrated luminosity of 468 pb^-1. The measurement covers the kinematic range 60<W<220 GeV and Q^2<1 GeV^2, where W is the photon-proton centre-of-mass energy and Q^2 is the photon virtuality. These results, which represent the analysis of the full ZEUS data sample for this channel, are compared to predictions based on perturbative QCD.

The proton-dissociative diffractive photoproduction of J/psi mesons has been studied in ep collisions with the ZEUS detector at HERA using an integrated luminosity of 112 pb^{-1}. The cross section is presented as a function of the photon-proton centre-of-mass energy and of the squared four-momentum transfer at the proton vertex. The results are compared to perturbative QCD calculations.

The first measurement of diffractive scattering of quasi-real photons with large momentum transfer gamma p -> gamma Y, where Y is the proton dissociative system, is made using the H1 detector at HERA. The measurement is performed for initial photon virtualities Q^2 < 0.01 GeV^2. Cross sections are measured as a function of W, the incident photon-proton entre of mass energy, and t, the square of the four-momentum transferred at the proton vertex, in the range 175 < W < 247 GeV and 4<|t|<36 GeV^2. The W dependence is well described by a model based on perturbative QCD using a leading logarithmic approximation of the BFKL evolution. The measured |t| dependence is harder than that predicted by the model and those observed in exclusive vector meson production.

Based on data collected with the H1 detector at HERA in 2005, cross sections for elastic rho photoproduction have been measured at momentum transfer |t|<0.58 GeV^2 and photon-proton centre-of-mass energies 20<90GeV. This data has been combined with cross sections published previously by the Omega and ZEUS collaborations in a global fit to determine the pomeron trajectory alpha(t) in 13 bins of t from the W-dependence of the elastic rho production cross section.

II. Flavour Physics / **885**

Exclusive Semileptonic b -> c decays at BABAR and the determination of Vcb

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Exclusive leptonic and radiative B meson decays at BELLE

II. Flavour Physics / **922**

Exclusive leptonic and radiative B meson decays at Belle

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Measurement of the Differential Branching Fraction and Forward-Backward Asymmetry for $B \to K^{(*)}\ell^+\ell^-$

We study $B \to K^{(*)}\ell^+\ell^-$ decays based on a data sample of 657 million $B\bar{B}$ pairs collected with the Belle detector at the KEKB e^+e^- collider. We report the differential branching fraction, isospin asymmetry, K^* polarization, and the forward-backward asymmetry (A_{FB}) as functions of $q^2 = M^2_{\ell\ell}c^2$. The fitted A_{FB} spectrum tends to be higher than the Standard Model expectation in all q^2 bins. The measured branching fractions are $\mathcal{B}(B \to K^*\ell^+\ell^-) = (10.7^{+1.1}_{-1.0} \pm 0.9) \times 10^{-7}$ and $\mathcal{B}(B \to K\ell^+\ell^-) = (4.8^{+0.5}_{-0.4} \pm 0.3) \times 10^{-7}$, with the muon to electron ratios $R_{K^*} = 0.83 \pm 0.17 \pm 0.05$ and $R_K = 1.03 \pm 0.19 \pm 0.06$, respectively.

Search for purely leptonic decays $B^+ \to l^+\nu$

The purely leptonic decay $B^+ \to l^+\nu$ ($l = e, \mu$) is highly suppressed in the Standard Model due to lepton helicity mismatch but can be strongly enhanced in New Physics scenarios. We present a search for the decays $B^+ \to e^+\nu$ and $B^+ \to \mu^+\nu$ using a large data sample recorded by the Belle detector at the KEKB energy-asymmetric e^+e^- collider.

Evidence for $B \to K\eta'\gamma$

We report the results of a search for the radiative decay $B \to K\eta'\gamma$and find evidence for $B^+ \to K^+\eta'\gamma$. The results are obtained from a 605 fb^{-1} data sample collected at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric-energy e^+e^- collider.

Measurements of time-dependent CP violation and branching fractions in radiative $B \to \phi K\gamma$ and $B \to \omega K\gamma$ decays

We report measurements of time-dependent CP-violation parameters in radiative $B^0 \to \phi K^0_S\gamma$ and $B^0 \to \omega K^0_S\gamma$ decays using a large data sample collected at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB energy-asymmetric e^+e^- collider. These measurements are sensitive to right-handed currents from new physics. We also report updated measurements of branching fractions in $B \to \phi K^+(K^0_S)\gamma$ decays and new measurements of $B \to \omega K^+(K^0_S)\gamma$ decays.

VI. QCD in Hadronic Physics / 643

Exclusive pion cross section and asymmetry at HERMES

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Exclusive production of π^+ mesons was studied with the HERMES spectrometer at the DESY laboratory by scattering $27.6\,\mathrm{GeV}$ positrons and electrons off a transversely nuclear-polarised hydrogen target.
The spin-averaged cross section was measured for values of the virtuality of the exchanged photon $Q^2 > 1\,\mathrm{GeV}^2$ and the invariant mass of the photon-nucleon system $W^2 > 10\,\mathrm{GeV}^2$. The first measurement was carried out of the single-spin azimuthal asymmetry.
The precision of the results was limited by the lack of detection of the recoiling neutron in the process $ep \to en\pi^+$ and the infeasibility of taking data at different beam energies.
The leading contribution to the asymmetry was found to be consistent with zero and with a recent model calculation, while one subleading contribution was found to be large. The cross section results are compared to model calculations based on the Regge formalism and on generalised parton distributions. These distributions give a three-dimensional representation of the hadron structure at the partonic level.

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Exclusive scalar \mbox{\boldmath $f_0(1500)$} meson production

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We evaluate differential distributions for exclusive scalar
$f_0(1500)$ meson (glueball candidate) production for
$p\bar{p} \to N_1 N_2 f_0$ and $pp \to pp f_0$.
%Several mechanisms were considered, including gluonic diffractive,
Both gluon induced diffractive, pion-pion meson exchange current (MEC) components as well as
double-diffractive mechanism with intermediate pionic loop
are calculated for the first time in the literature.
The pion-pion component, which can be reliably calculated,
dominates close to the threshold
while the gluonic diffractive or double-diffractive with pionic triangle components
may take over only for larger energies.
At the moment only upper limit for the gluonic diffractive component
can be obtained.
The gluonic diffractive component is calculated based on
two-gluon impact factors as well as in the framework
of Khoze-Martin-Ryskin approach proposed for diffractive
Higgs boson production.
Different unintegrated gluon distribution functions (UGDFs) from
the literature are used.
Rather large cross sections due to pion-pion fusion are predicted
for PANDA energies, where the gluonic mechanism is shown
to be negligible.
The production of $f_0(1500)$ close to threshold
could limit the so-called πNN form factor in the region of
larger pion virtualities.
We discuss in detail the two-pion background to the production
of the $f_0(1500)$ meson.
We include both two-pion rescattering background
(ρ-reggeon exchange)
and double-diffractive two-pion background
(both pomeron and reggeon exchanges).
The amplitudes are calculated in the Regge approach.
Our calculation shows that imposing extra cuts
should allow to extract the signal of the glueball $f_0(1500)$
candidate at the highest PANDA energy.
We compare our results with the existing data of
the WA102 Collaboration.

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Exclusive semileptonic b -> c decays at BELLE

II. Flavour Physics / 921

Exclusive semileptonic b -> c decays at Belle

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Measurement of the decay $B^0 \to D^{*-} l^+ \nu$

We present measurements of the branching fraction and of the HQET form factors ρ^2, R_1 and R_2 for the decay $B^0 \to D^{*-} l^+ \nu$ using untagged $\Upsilon(4S) \to B\bar{B}$ events. The Cabibbo-Kobayashi-Maskawa

matrix element $|V_{cb}|$ is extracted and a test of the form factor parametrization is presented. The results are based on a large data sample recorded by the Belle detector at the KEKB e^+e^- collider.

Measurement of the decay $B^+ \to \bar{D}^{*0} l^+ \nu$

The measurement of the decay $B^+ \to \bar{D}^{*0} l^+ \nu$ does not rely on charged slow pion reconstruction and thus allows us to cross-check measurements of $B^0 \to D^{*-} l^+ \nu$. We present measurements of the branching fraction and of the HQET form factors ρ^2, R_1 and R_2 using $\Upsilon(4S) \to B\bar{B}$ events. The Cabibbo-Kobayashi-Maskawa matrix element $|V_{cb}|$ is extracted. The results are based on a data sample recorded by the Belle detector at the KEKB e^+e^- collider.

Measurement of $B \to D^{(*)}\tau\nu$ using hadronic tag

We present a measurement of $B \to D^*\tau\nu$ and $B \to D\tau\nu$ decays using a large data sample collected near the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric energy e^+e^- collider. Events are tagged by fully reconstructing one of the B mesons in hadronic modes. Constraints on theoretical models with a charged Higgs boson are discussed.

Studies of $B^+ \to \bar{D}^{(*)0}\tau^+\nu$ with inclusive
reconstruction of the accompanying B meson

We present studies of $B^+ \to \bar{D}^{*0}\tau^+\nu$ and $B^+ \to \bar{D}^0\tau^+\nu$ decays using a large data sample collected with the Belle detector at the KEKB asymmetric-energy e^+e^- collider. The events are tagged by inclusively reconstructing the accompanying B meson. Measurements of branching fractions and distributions characterizing signal decays are presented.

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Expectations for first pair-production of top-quarks in the semi-leptonic channel in CMS at sqrt(s) = 10 TeV

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The top quark will be a fundamental element of the early physics program at the Large Hadron Collider (LHC). Given the complex signature of this "most exotic" of all known SM particles, the pair production of top quarks will be a crucial instrument for the commissioning the LHC experiments' tools for physics analysis. Only when the first top-quark signal has been established will the experiments be able to use it to further probe the standard model, and to begin the search for new physics that the LHC is almost certain to deliver. We will discuss the plans and analysis strategies of CMS to pursue this physics program, and show the expected performance of the experiment with a focus on an early cross-section measurement in the channel where the W boson from one top quark decays into leptons, while the other decays into quarks.

VI. QCD in Hadronic Physics / 710

Experimental evidence for piK-atoms

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We present evidence for the first observation of electromagnetically bound pion-kaon pairs (piK-atoms) with the DIRAC-II experiment at the CERN-PS. The mean life of piK-atoms is related to the s-wave piK-scattering lengths, a measurement of which is relevant to low energy QCD, in particular chiral perturbation theories including the s-quarks. The atoms are produced by a 24 GeV/c proton beam in a thin Pt-target and the dissociated pions and kaons analyzed in a two-arm magnetic spectrometer. The observed enhancement at low relative momentum corresponds to the production of 173 +- 54 piK-atoms. From these first data we derive a lower limit for the mean life of 0.8 fs at the 90% confidence level.

III. Higgs and New Physics / **557**

Exploring Non-Supersymmetric New Physics in Polarized Moeller Scattering

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We study in an effective operator approach how the effects of new physics from various scenarios that contain an extra Z' neutral gauge boson or doubly charged scalars, can affect and thus be tested by the precision polarized M\o{}ller scattering experiments. We give Wilson coefficients for various classes of generic models, and we deduce constraints on the parameter space of the relevant coupling constants or mixing angles from the results of the SLAC E158 experiment where applicable. We give also constraints projected from the upcoming 1 ppb JLAB experiment. In the scenario where the extra Z' is light ($M_{Z'} \ll M_W$), we obtain further constraints on the parameter space using the BNL $g-2$ result where it is useful. We find that the BNL deviation from the Standard Model cannot be attributed to a light extra Z' neutral gauge boson.

IV. Heavy Ions / **782**

Exploring the QCD medium with the PHENIX experiment at RHIC

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High energy nucleus nucleus collisions produce extraordinarily hot and dense QCD matter which exhibits near-perfect fluid behavior and interacts strongly. This talk will present recent results from the PHENIX experiment at RHIC on the dynamical evolution of the medium and its response to high momentum probes. Their impact on our overall understanding of heavy-ion collisions will be discussed.

Extra Dimensions in Photon or Jet plus Missing Transverse Energy

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Recent studies of the CMS collaboration are presented on the sensitivity to searches for large (ADD) extra dimensions in channels with missing transverse energy (MET), ie the channels jets plus MET and photon plus MET. These studies are based on detailed detector simulation, including all Standard Model backgrounds. Particular emphasis is given to possible early discoveries, ie with 100 pb-1 or less. Projected 95\% CL exclusion limits as function of luminosity are presented as well.

III. Higgs and New Physics / 796

Extra dimensions and micro black holes at the LHC

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Models with extra dimensions have been proposed to solve outstanding problems of the Standard Model. In some of those models the strength of gravity is increased at TeV energies and unified with the electroweak interaction.
New studies are presented on the sensitivity to searches for new gauge bosons, such as W' and Z' bosons and other high mass resonances, as predicted e.g. by Randall-Sundrum models; to searches for large (ADD) extra dimensions in channels with missing transverse energy; to searches with di-photon final states; to searches for universal extra dimensions, and to searches for micro black hole production at the LHC.

III. Higgs and New Physics / 370

Extracting SUSY parameters from LHC measurements using Fittino

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With the advent of the LHC, low-energy Supersymmetry can be probed over the largest part of the theoretically motivated parameter space. Based on detailed experimental studies by the ATLAS and CMS collaborations, we investigate to what extent the parameters of the MSSM as well as of constrained models such as mSugra and GMSB can be measured as a function of the integrated luminosity ranging from 1 fb^-1 to 300 fb^-1.

Special emphasis is given to a careful evaluation of the stability of a global
chi^2 parameter estimation technique encoded in the Fittino package. This technique is based the simulated annealing algorithm for global function minimization with error determination from repeated Monte Carlo experiments (”toy fits”). The method is augmented by an efficient scan of the chi^2 hyper-surface in the multi-dimensional parameter space using a Markov-chain Monte Carlo approach.

Furthermore, we investigate the impact of additional constraints on the parameter space from low-energy measurements such as b -> s gamma
and (g-2)_\mu and cosmological constraints on the dark matter density in the Universe. Their impact is evaluated using the MasterCode and MircoMegas packages. Finally, the improvement possible with a future linear collider is also investigated.

III. Higgs and New Physics / 793

Extracting backgrounds to SUSY searches from LHC data

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Any discovery of new physics relies on detailed understanding of the Standard Model background. At the LHC, we expect to extract the backgrounds from the data itself, with minimum reliance on Monte Carlo simulations. We describe new developments in ATLAS and CMS on such data-driven techniques, and prospects for their application on first data.

II. Flavour Physics / 666

FCNC Processes in the LHT Model: a 2009 Look

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We update our 2006-2007 results for FCNC processes in the Littlest Higgs model with T-parity. The removal of the logarithmic UV cutoff dependence in our previous results through a new contribution to Z0 penguin diagram identified by Goto
et al. and Aquila et al., while making the deviations from the SM expectations
in the quark sector less spectacular, still allows for sizable new physics effects in
K -> pi nu \bar nu and KL -> pi0 l+ l− decays and in the CP asymmetry S_[psi phi] that remains unchanged. While li -> lj
decays are essentially unaffected by these modifications,
the branching ratios for decays with three leptons in the final state, like
mu -> 3e are lowered by almost an order of magnitude. In spite of this, the pattern
of lepton flavour violation in the LHT model can be distinguished from the
one in the supersymmetric models.

IV. Detectors (LHC and R&D) and Accelerators / 546

First Alignment of the CMS Tracker and Implications for the First Collision Data

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We present the first results of the full CMS Silicon Tracker alignment based on several million reconstructed tracks from the cosmic data taken during the commissioning runs with the detector in its final position. Implication for CMS physics performance is discussed. The all-silicon design of the tracking system of the CMS experiment is expected to provide 1-2% resolution for 100 GeV tracks and an efficient tagging of b-jets. To achieve optimal performance the position and orientation of each of the 15148 silicon strip and 1440 silicon pixel modules need to be determined with a precision of several micrometers. For the modules well illuminated by cosmic ray particles, the ultimate precision has been achieved with data from the silicon modules traversed in-situ by charged muons used in combination with survey measurements. The achieved resolution in all five track parameters is controlled with data-driven validation of the track parameter measurements near the interaction region, and tested against prediction with detailed detector simulation. Outlook for expected tracking and physics performance with the first collisions is given.

VI. QCD in Hadronic Physics / **487**

First Observation of Hadronic Final State Charge Asymmetry in High Q^2 Deep-Inelastic Scattering at HERA

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A first measurement of the charge asymmetry in the scattered hadronic final state in high Q^2 deep-inelastic ep neutral current scattering at HERA has been made. The difference between the normalised distribution of the scaled momentum, xp, for positive and negative particles, measured in the current region of the Breit frame, has been studied together with its evolution as a function of Q^2. The results are compared to Monte Carlo models at the hadron and parton level.

IV. Heavy Ions / **81**

First measurements with the ALICE detector at LHC

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The ALICE experiment is designed to measure the properties of strongly interacting matter created in heavy-ion collisions at LHC. The apparatus has several features, such as low p_T acceptance and powerful tracking over a broad momentum range, that make ALICE also an important contributor to the first proton-proton physics. In this respect the ALICE physics program aims both at setting the baseline for the understanding of the heavy-ion data and exploring the new energy domain.
\\

The charged-particle multiplicity and pseudorapidity density distributions will be the first measurements that ALICE will perform, both in p-p and in Pb-Pb collisions.
As those observables correspond to basic properties of the collisions in the new energy domain at LHC, their knowledge will allow to constrain the hadroproduction models and correctly configure the Monte Carlo generators.
Moreover, the measurement of the charged-particle pseudorapidity density in the central rapidity region will extend the existing energy dependence pattern and provide an estimate of the energy density attained in the early phase of the collision. Besides these very first measurements, p_T spectra of both all charged and identified particles, baryon number transport and strangeness production analyses will also be carried out within the p-p first physics programme.
\\
Since it will follow the first p-p run, the early heavy-ion data taking is expected to be carried out with a fully commissioned detector: in particular alignment and calibrations will be available from the previously collected cosmics and p-p samples. Data quality and statistics should allow, already with this pilot run, to explore quite a rich physics spectrum. The first few 10^4 events (both minimum bias and central collisions) will provide information about global event properties such us multiplicity, pseudorapidity density and elliptical flow. With a statistics of 10^5 to 10^6 events particle spectra, resonances, differential flow and interferometry analyses will be accessible.
\\
After an introductory description of the status of the experiment, this contribution
deals with the ALICE physics potential in particular discussing the early p-p and Pb-Pb running scenarios and the corresponding physics programmes. Details on the very first measurements of the charged-particle pseudorapidity distributions will be also presented.

I. Astroparticle Physics / **669**

First measurements with the ANTARES detector

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The present status of the ANTARES detector is given. The experience of building and running a deep sea neutrino detector in the Mediterranean sea is reviewed. The first neutrino flux limits from astrophysical sources determined by ANTARES are presented. These limits are the most stringent limits to date for the sources in the southern sky, despite being determined in less than half a year data taking with a detector consisting of only five of the final twelve detector lines. The measured downward going muon flux agrees well with previously published experimental data. Finally a look at the first data from the full detector will be given.

Plenary Session 2 / **959**

Flavour physics at other machines (B-factories)

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Plenary Session 1 / **958**

Flavour physics at the Tevatron

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Plenary Session 2 / **960**

Flavour theory

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III. Higgs and New Physics / **454**

Flavour violating squark and gluino decays

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We consider scenarios with large flavour violating
entries in the squark mass matrices focusing on the mixing between
second and third generation squarks. These entries govern both,
flavour violating low energy observables on the one hand and
squark and gluino decays on the other hand.
We first discuss the constraints on the parameter space due to the
recent data on B mesons from the B factories and Tevatron. We then
consider flavour violating squark and gluino decays and show that they
can still be typically of order 10\% despite the stringent
constraints from low energy data. Finally we briefly comment on the
impact for searches and parameter determinations at future collider
experiments such as the upcoming LHC or a future International Linear
Collider.

IV. Heavy Ions / **158**

Flow, spectra and HBT radii in Heavy-Ion collisions

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Recent 3+1D hydrodynamic calculations modeling the expansion of the dense matter created in Heavy-Ion collisions at RHIC energies are presented. Assuming a relatively early start up time of the collective expansion and a hard equation of state, we are able to reproduce particle spectra at different centralities and rapidities, elliptic flow as function pseudorapidity, HBT radii and directed flow as function of pseudorapidity. The quantitative description of all 3 HBT radii caused difficulties for some of the previous calculations. The directed flow at these energies, including its scaling with the size of the colliding system, is described for the first time in a dynamic model.
P. Bozek and I. Wyskiel, Phys. Rev. C 79, 044916 (2009)
P. Bozek and I. Wyskiel, arXiv:0903.3129 [nucl-th]

IV. Heavy Ions / **573**

Full jet reconstruction in 200 GeV p+p, d+Au and Au+Au collisions by STAR

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Full jet reconstruction in heavy-ion collisions is a promising tool for the quantitative study of properties of the dense medium produced at RHIC. Measurements of d+Au collisions are important to disentangle initial state nuclear effects from medium-induced k_{T} broadening and jet quenching. Study of jet production and properties in d+Au in combination with similar studies in p+p is an important baseline measurement needed to better understand heavy-ion results~[1,2].
The large acceptance of the Time Projection Chamber (TPC) and the Barrel Electromagnetic Calorimeter (BEMC) detectors makes the STAR experiment well suited for full jet reconstruction. Utilizing the high luminosity delivered by RHIC in run 8, a large data sample of 200 GeV d+Au collisions was collected. In addition to the minimally biased trigger, several fast online BEMC triggers were used to enrich the rate of recorded jets.
We report measurements of the inclusive jet spectrum and di-jet correlations in d+Au that are sensitive to initial state nuclear effects and compare to similar measurements in p+p collisions. To control detector and trigger related systematic uncertainties we use p+p reference data taken with the same BEMC triggers and the same detector geometry (run 8). In order to estimate the systematic uncertainties in jet reconstruction we apply several modern jet reconstruction algorithms~[3,4].

[1] S.~Salur (for the STAR Collaboration), arXiv:0809.1609.
[2] J.~Putschke (for the STAR Collaboration), arXiv:0809.1419.
[3] M.~Cacciari and G.~Salam, Phys.\ Lett.\ {\bf B641}, (2006) 57-61.
[4] M.~Cacciari, G.~Salam and G.~Soyez, JHEP {\bf 0804}, (2008) 063.

IV. Detectors (LHC and R&D) and Accelerators / **690**

Future neutrino oscillation facilities

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The EUROnu FP7 Design Study has recently begun to investigate possible future high intensity neutrino oscillation facilities that could be located in Europe and elsewhere. This talk will describe the major challenges of these facilities and the accelerator R&D work that is being undertaken, particularly by EUROnu, to meet them.

V. QCD at Colliders / **8**

GPDs at HERA and perspectives at COMPASS

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Standard parton distribution functions contain neither information on the correlations between partons nor on their transverse motion, then a vital knowledge about the three dimensional structure of the nucleon is lost. Hard exclusive processes, in particular DVCS, are essential reactions to go beyond this standard picture. In the following, we examine the most recent data in this context and we focus on the small and intermediate x domain from HERA. Then, we discuss some perspectives accessible in a future program at COMPASS.

III. Higgs and New Physics / **472**

General Search for New Phenomena at HERA

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A model–independent search for deviations from the Standard Model prediction is performed using the full $e^{\pm}p$ data sample collected by the H1 experiment at HERA. All event topologies involving isolated electrons, photons, muons, neutrinos and jets with transverse momenta above 20 GeV are investigated in a single analysis. Events are assigned to exclusive classes according to their final state. A dedicated algorithm is used to search for deviations from the Standard Model in the distributions of the scalar sum of transverse momenta or the invariant mass of final state particles and to quantify their significance. Variables related to angular distributions and energy sharing between final state particles are also introduced to study the final state topologies. No significant deviation from the Standard Model expectation is observed in the phase space covered by this analysis.

III. Higgs and New Physics / **393**

Generic Search for Deviations from Standard Model Predictions in CMS

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We present a model independent analysis approach, systematically scanning the data for deviations from the Standard Model Monte Carlo expectation. Such an analysis can contribute to the understanding of the CMS detector and the tuning of event generators. Furthermore, this approach is sensitive to a variety of models of new physics, including those not yet thought of. Events are classified into event classes according to their particle content (muons, electrons, photons, jets and missing transverse energy). A scan of various distributions is performed, identifying significant deviations from the Monte Carlo simulation. Systematic uncertainties are taken into account rigorously within the algorithm. Possible detector effects and generator issues, as well as models involving supersymmetry and new heavy gauge bosons have been used to test the search algorithm.

I. Astroparticle Physics / **544**

GeoSynchrotron Radiation from Earth Skimming Tau Neutrino Shower

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The origins of the ultra-high energy cosmic rays remain a fundamental and unsolved problem in astroparticle physics. Promising clues could be provided by the associated high energy neutrinos since they would neither interact with intergalactic or interstellar media nor be deflected by the magnetic fields. Various detectors have been proposed for detecting high energy neutrinos. Some of them rely on measuring the air shower by the so-called earth-skimming ν_τ, for which horizontal showers are generated by the ensuing τ decay. Using CORSIKA to simulate the tau decay induced air shower, we extract universal particle energy and lateral distribution. We then calculate the synchrotron radiation from tau decay showers of $10^{16.5}$ eV $\sim$ $10^{18.5}$ eV energies by adapting the "Coherent Geosynchrotron Radiation" model proposed by Huege and Falcke 2003. Taking into account in detail the conversion from tau neutrinos to tau leptons and the detection efficiency of the designed antennae, we estimate the expected tau neutrino event rate for an integrated tau neutrino flux $\phi_{\nu_\tau} \sim 10^{-17}\mathrm{cm}^{-2}\mathrm{s}^{-1}\mathrm{sr}^{-1}$ above $10^{18}\,\mathrm{eV}$.

VII. Unified Theories, Strings, Non-perturbative QFT / 873

Getting 4d physics from open string wavefunctions

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We briefly review the different approaches to model building within type IIB string theory and show the utility of open string wavefuntions for computing 4D physical couplings, such as Yukawa couplings. In the second part of the talk we report on some of the recent developments in extending these techniques to compactifications with closed string fluxes or with non-diagonal magetization.

III. Higgs and New Physics / 811

Global searches at the Tevatron

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Model-independent global searches for new physics have been performed at the CDF and D0 experiments. Using 2 fb-1 of data, at CDF nearly 400 final states are examined, looking for discrepancies between the observed data and the standard model expectation in populations, kinematic shapes, and the tails of the summed transverse momentum distribution. A significant improvement to the sensitivity is achieved searching also in approximately 5000 mass variables looking for 'bumps' that might indicate resonant production of new particles. At D0, global and model-independent searches are performed in final states involving leptons using 1 fb-1 of data.

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GlueX a new facility to search for gluonic degrees of freedom in mesons.

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While gluonic degrees of freedom in nucleons are well established its counter part in mesons has not been confirmed. The properties of the of mesons are attributed to quark degrees of freedom only.

The GlueX detector facility in Hall-D at Jefferson lab in Newport News is part of the 12GeV upgrade and dedicated to the search for gluonic degrees of freedom in mesons by scattering high energy linearly polarized real photons of up to 9GeV from nucleon targets.
To provide the necessary good detection coverage over 4pi, part of the detector resides within a large solenoid magnet surrounding the target. In the bore of the magnet a straw tube cylindrical drift chamber around the target and a series of cathode-strip wire chambers downstream of the target are used for particle tracking. Two electromagnetic calorimeters, one cylindrical shaped inside the magnet (BCAL) and one downstream (FCAL) of the magnet provide the necessary detection capabilities of photons from neutral meson decays.
The former is based on a lead scintillation fiber matrix the latter on lead glass. The optical readout of the BCAL is based on silicon photo multipliers that are insensitive to the high magnetic field of the solenoid.
A cylindrical plastic scintillator hodoscope around the target and two hodoscope planes downstream of the solenoid in front of the FCAL electromagnetic calorimeter complement the detector by providing timing information.
To handle the large data rate, custom electronics for digitization, trigger and readout has been developed and built at Jefferson Lab. The flash analog to digital converters run at 250MHz sampling the analog signal every 4ns and forming energy sums at the same rate. This information is shipped via optical link at the same 250MHz rate to a trigger decision logic. Data readout rates of up to 300MB/s are expected to be written to disk at high luminosity running. The level 1 trigger electronics uses VXS, a VME based system with a high-speed switch-fabric on the back plane.
Detector construction is starting now and the facility is expected to start operation in April 2014.

Plenary Session 3 / 951

Gravitational waves

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I. Cosmology and Gravitational Waves / 447

Gravitino dark matter and high reheating temperature

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Supersymmetry breaking mediated by gauge interactions is regarded an attractive option due to the lack of new sources of flavor changing neutral currents other than those already present in the Standard Model. In models with gauge mediated supersymmetry breaking (GMSB), the dark matter particle is the gravitino. It is produced both thermally in scatterings in the hot plasma and non-thermally from decays of the next to lightest supersymmetric particle (NLSP). If the NLSP is sufficiently abundant during Big Bang Nucleosynthesis (BBN), these decays can alter the abundances of light elements. This, in turn, gives constraints on the gravitino mass and, for the observed dark matter abundance, on the reheating temperature of the Universe. Since sufficiently high reheating temperature is crucial for thermal leptogenesis, one obtains constraints on viable models with GMSB, consistent with thermal leptogenesis.

We study the interplay of these constraints within a recently introduced and interesting class of models with GMSB, known as models with general gauge mediation (GGM). We study the possibility that the NLSP is a stau or a sneutrino in these models. We determine whether it is possible to achieve 'compressed' spectra of supersymmetric particles in which gluino is not much heavier than the NLSP, which alleviates the constraints imposed by requiring successful thermal leptogenesis. We study regions of the parameter space of models with GGM and identify regions in which one achieves radiative breaking of electroweak symmetry, satisfies the higgs mass bounds, gravitinos make up the observed amount of dark matter and the reheating temperature is high enough for leptogenesis.

V. QCD at Colliders / 929

HERA DVCS Results

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Deeply Virtual Compton Scattering is the simplest interaction that allows access to Generalised Parton Distributions, a theoretical framework that can be used to describe the nucleon structure. The strong interest in GPDs results from the fact that they offer access to the total angular momentum of quarks inside the nucleon and to a 3-dimensional picture of nucleon structure. The measurement of the DVCS process is complicated by a competing interaction known as Bethe Heitler which has the same final state. GPDs sensitive to asymmetries from the interference term of these two processes are accessed.

A measurement of elastic DVCS collision data recorded with the H1 detector since 2003 is presented. The cross section is measured as a function of the virtuality of the exchanged photon and the centre-of-mass energy W of the γ*p system in the kinematic domain 6.5 < Q2 < 80 GeV2 30 < W <
140 GeV and |t| < 1 GeV2 where t denotes the squared momentum transfer at the proton vertex. A beam charge asymmetry is extracted for the first time in the low x ≈ Q2/ W2 kinematic domain.

Released results from HEMRES of beam charge, beam spin and target asymmetries on both unpolarised and polarised hydrogen and deuterium targets are presented. The extracted asymmetries are presented over the range of HERMES kinematic acceptance, the dependence on kinematic variables t , xB and Q2 is also shown. The results are compared with asymmetries from a phenomenological model of GPDs based on double distributions from Vanderhaeghen, Guidal and Guichon.

DVCS, have also been measured with the ZEUS detector. Cross sections are
presented as a function of Q2 and W, for a wide region of the phase space, Q2 > 1.5 GeV2 and 40 < W

< 170 GeV. A subsample of events in which the scattered proton is measured in the leading proton spectrometer is used for the first direct measurement of the differential cross section as a function of t.

VI. QCD in Hadronic Physics / **93**

Hadron mass generation and the strong interaction

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Assuming a Lagrangian of the strong interaction slightly different from quantum chromodynamics - by replacing the non-Abelian Yang-Mills term by the coupling of two gluons to J(pi)=0+ (the quantum numbers of the vacuum) with subsequent creation of quarks and/or antiquarks - the confinement of quarks is well understood. Further, hadron masses are generated by requiring "massless" quarks, which indicates that the vacuum of the strong interaction is close to the absolute vacuum. Consequently, new (Higgs) fields are not needed to explain quark masses.

Using self-consistency requirements, two-gluon and corresponding quark-antiquark densities have been deduced. There are only two self-consistent solutions, one which corresponds to mesons, the other which can be identified with baryons. For fundamental mesonic states this yields a predominant q-qbar structure, whereas for baryons a strongly mixed 3q and 5q structure is obtained, with a nucleon density, which yields a good understanding of the hard electromagnetic form factors found experimentally.

The hadron masses are given by bound state energies in the q-q potential and for excited states additionally by the binding in the self-induced 2-gluon binding potential, which corresponds to the confinement potential. This has a form for the nucleon, which explains that this system has the highest stability of hadrons.

In conclusion, a non-Abelian gluon-gluon coupling coupling has been assumed, which avoids the difficulties of quantum chromodynamics to explain the strong scalar fields found in hadrons and the coupling to the absolute vacuum. In the new Lagrangian chiral symmetry is not present, leading naturally to the sequence of hadronic states observed experimentally. Further, the dominance of the scalar part of hadron-nucleon potentials (given by Pomeron-exchange at high energy) is well understood.
Details as well as the resulting structure of the theory, which deviates appreciably from the present standard model, will be discussed.

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Hadronic b -> c decays at BELLE

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II. Flavour Physics / **969**

Hadronic b -> c decays at BaBar

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First, we report a study of ten Cabibbo-favored B decays to final states of the form B0bar,B- –> D() *p pbar n pi, n=0,1,2. We measure the branching fractions and present their kinematic distributions using a data sample of 455 million B Bbar pairs collected with the BaBar detector at the PEP-II asymmetric-energy B Factory at SLAC. Second, we report the Dalitz plot analysis of B- –> D+ pi- pi- using a data sample of 383 million B Bbar pairs. The branching fraction of the B decay as well as the masses and widths of D^{0}_2* and D^{*0}_0, the 2+ and 0+ c ubar P-wave states to D+ pi- final states, resp., are measured.

II. Flavour Physics / 920

Hadronic b -> c decays at Belle

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Study of $B \to D_s^* h$ decays

We report a measurement of the branching fractions for $B^0 \to D_s^* h$ decays using a large sample of $B\bar{B}$ decays collected with the Belle detector at the KEKB asymmetric energy e^+e^- collider.

Improved measurements of $B \to D_s K$ and $B \to D_s \pi$ branching fractions

We report improved measurements of the $B \to D_s K$ and $B \to D_s \pi$ branching fractions. The results are based on a large data sample recorded at the Υ(4S) resonance by the Belle experiment at the KEKB asymmetric energy e^+e^- collider.

Measurement of $B \to D_s^{(*)} K\pi$ branching fractions

We report a measurement of the exclusive B^+ meson decay to the $D_s^{(*)-} K^+\pi^+$ final state using $657\times10^6 B\bar{B}$ pairs collected at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric-energy e^+e^- collider. We use $D_s^{*-} \to D_s^-\gamma$ and the $D_s^- \to \phi\pi^-$, $\bar{K}^*(892)^0 K^-$ and $K_S^0 K^-$ decay modes for $D_s^{(*)}$ reconstruction to measure the following branching fractions: $calB(B^+ \to D_s^- K^+\pi^+)$ and $calB(B^+ \to D_s^{*-} K^+\pi^+)$.

Measurement of $B \to D_s K_s^0\pi$ and $B \to D_s KK$ branching fractions

We report a measurement of the exclusive B meson decay to the $D_s K_s^0\pi$ and $D_s KK$ final states using $657 \times 10^6 B\bar{B}$ pairs collected at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric-energy e^+e^- collider.

II. Flavour Physics / 883

Hadronic decays of D mesons at CLEO

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Hadronic decays related to gamma at BABAR

II. Flavour Physics / 863

Hadronic decays related to gamma at BABAR

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Hadroproduction at SPS Energies

Author: Andrzej Rybicki[1]

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At the Super Proton Synchrotron, measurements of final state hadron production in p-p, n-p, pion-p, p-nucleus and pion-nucleus reactions have been performed at a c.m. energy of sqrt(s)=17.3 GeV. The experimental data are characterized by an unprecedented coverage of available phase space. This includes the area 0<x_F^*<0.85 and 0<p_T<2 GeV/c, covered in a dense two-dimensional grid of double differential cross sections for inclusive, identified particle production.

What results is the possibility of an unprecedently detailed analysis of the soft hadroproduction process in the non-perturbative area of Quantum Chromodynamics (QCD). Several aspects of this analysis will be reviewed in this talk, including in particular (1) the dependence of particle production on the valence structure of the incoming projectile hadron, (2) the transport of baryon number from the initial incoming proton down into the final state baryon at low x_F, and (3) the influence of the nuclear medium induced by the non-elementary target.

As an addition to the above, the possibility of obtaining novel information on the hadron formation time on the basis of new electromagnetic probes will be discussed.

V. QCD at Colliders / 997

Heavy Flavour photoproduction at HERA

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Charm and beauty photoproduction has been studied in ep collisions at HERA with the ZEUS and H1 detectors. Heavy quarks were identified using different experimental techniques. Charm was identified via the reconstruction of D* mesons, while beauty was tagged via its semi-leptonic decay into leptons or using lifetime tagging techniques. Differential cross sections were measured and compared to leading order Monte Carlo programs and next-to-leading order QCD predictions.

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Heavy Flavour production in ATLAS

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ATLAS prepared a program for measurements of production cross sections both of b-hadrons and Onia in central proton-proton collisions at new energy 14 TeV of LHC. Dedicated triggers based on muon, di-muon or electron signatures are designed to accommodate large statistics with already first several months. Starting from semi-inclusive measurements for very early stage exclusive channels will soon dominate measurements, allowing tests of QCD in Heavy Flavour sector already with 10 pb-1. With larger statistics production polarization measurements are being prepared for J/ψ and Λb. It is expected that 30 fb-1 collected at 1033cm-2 s-1 will allow specific measurements not accessible with limited statistics of Tevatron. In particular Λb polarization measurement can be achieved using $\Lambda b \longrightarrow J/\psi\ \Lambda$ decay. In J/ψ a polarization measurement will allow to confirm or exclude model predictions within large interval of transverse momenta.

IV. Heavy Ions / 803

Heavy Ion Physics with the ATLAS Detector at the LHC

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The heavy-ion program at LHC will be pursued by three experiments including ATLAS, a multipurpose detector to study p+p collisions. A report on the potential of the ATLAS detector to uncover new physics in Pb+Pb collisions at energies thirty times larger than energy available at RHIC will be presented. Key aspects of the heavy-ion program of the ATLAS experiment, implied by measurements at RHIC, will be discussed. They include measurement capability of high-pT hadronic and electromagnetic probes, quarkonia as well as elliptic flow and other bulk phenomena. Measurements by the ATLAS experiment will provide crucial information about the formation of a quark-gluon plasma at the new energy scale accessible at the LHC.

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Heavy Ion Physics with the ATLAS Detector at the LHC

Author: Di Ciaccio Anna[1]

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The heavy-ion program at LHC will be pursued by three experiments including ATLAS, a multipurpose detector to study p+p collisions. A report on the potential of the ATLAS detector to uncover new physics in Pb+Pb collisions at energies thirty times larger than energy available at RHIC will be presented. Key aspects of the heavy-ion program of the ATLAS experiment, implied by measurements at RHIC, will be discussed. They include measurement capability of high-pT hadronic

and electromagnetic probes, quarkonia as well as elliptic flow and other bulk phenomena. Measurements by ATLAS experiment will provide crucial information about the formation of a quark-gluon plasma at the new energy scale accessible at the LHC.

V. QCD at Colliders / **986**

Heavy flavour production at LHC

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The Large Hadron Collider (LHC) will open up a new era in high energy physics. The expected large cross sections for heavy-flavour production in proton-proton collisions at √s = 14 TeV will allow detailed studies of production mechanisms and an extensive test of QCD. Since charm and beauty has been proposed as a good probe to study hot QCD matter (the so-called Quark-Gluon Plasma), the understanding of the production mechanisms in elementary proton-proton collisions is of primary importance as reference for studies in heavy-ion collisions. In this talk, the heavy-flavour physics program of the ALICE, ATLAS and CMS experiments will be reviewed.

V. QCD at Colliders / **991**

Heavy flavours in DIS using muon tags at HERA

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The production of charm and beauty quarks in ep interactions has been measured with the ZEUS detector at HERA for squared four-momentum exchange Q^2>20 GeV^2, using an integrated luminosity of 126 pb^-1. Charm and beauty quarks were identified through their decays into muons. Differential cross sections were measured for muon transverse momenta p_T^{mu}>1.5 GeV and pseudorapidities -1.6<eta^{mu}<2.3, as a function of p_T^{mu}, eta^{mu}, Q^2 and Bjorken x. The charm and beauty contributions to the proton structure function F_2 were also extracted. The results agree with previous measurements based on independent techniques and are well described by QCD predictions.

VI. QCD in Hadronic Physics / **695**

Heavy hadron spectroscopy in a Salpeter model with AdS/QCD inspired potential

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The quark-antiquark potential obtained in a gauge/gravity (AdS/QCD) approach is inserted in a Salpeter equation to determine heavy hadron masses. The parameters of the model are fixed fitting the known spectrum of the S-wave mesons in the sector of heavy-light quarks, charmonium and bottomonium. The predicted mass of η_b is in agreement with the subsequent observation by BaBar Collaboration. A discussion of heavy tetraquark masses is also presented, motivated by the possibility of a diquark-antidiquark structure for some states. The decay constants of charmonium and bottomonium are determined: they control the processes $\eta(nS)_{c/b} \to \gamma\gamma$ and
$\psi(nS)/\Upsilon(nS) \to \ell\bar{\ell}$.
Finally, the masses of baryons comprising two heavy quarks are computed in the same model, assuming a quark-diquark scheme; these states are predicted to exist by the quark model, but so far there is only one experimental candidate, Ξ_{cc}, observed by the Selex Collaboration.

based on:
Eur.\ Phys.\ J.\ C {\bf 57}, 569 (2008)
Phys.\ Rev.\ D {\bf 78}, 117501 (2008)
arXiv:0902.4624 [hep-ph], to appear on Phys.\ Rev.\ D {\bf 79}, 094002 (2009)

VI. QCD in Hadronic Physics / 646

Heavy quark meson spectroscopy at CDF

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With growing datasets collected by the CDF II experiment, studies of the spectroscopy of mesons containing heavy quarks becomes more exciting. The CDF experiment has good capabilities in both charm and bottom sector. This capability allowed also to contribute to the study of the Zoo of states called X,Y,Z. In this area we present a recent update of the mass measurement of X(3872). The result m(X(3872)) = 3871.61 +- 0.16 +- 0.19 MeV/c^2 is currently the most precise measurement in the world. In addition, we report evidence for a new narrow resonance, Y(4140), the first to be seen in the J/psi phi decay mode, using 2.7 fb-1 of exclusive B+->J/psiphiK decays.

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Higgs search in H->WW decay channels with the CMS detector

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The prospects for the search of the Standard Model Higgs boson in the decay channel H -> WW* -> l nu l' nu' (l or l' = e or mu) with the CMS experiment at the LHC is presented. The analysis

relies on a full simulation of the detector response and emphasis is put on explicit strategies for the measurement of experimental and background systematics from data. The discovery reach is presented as a function of the Higgs mass. A new complete strategy is presented for the early searches and for the control of systematics at very low luminosities of O(1 fb-1)

Plenary Session 2 / **937**

Higgs searches

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VII. Standard Model Electroweak Physics / **903**

High Q2 Neutral current and Charged current analyses using the complete HERA data

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Measurements of Neutral Current (NC) ep -> e X and Charged Current (CC) ep -> nu X cross sections by the H1 and ZEUS collaborations are presented using HERA data recorded during the years 1994-2007. The cross sections are measured in the region of large negative four-momentum transfer squared Q2 >200 GeV^2. Single differential and double-differential cross-sections are extracted and and compared to predictions of the Standard Model. The dependence on the lepton beam polarisation is also investigated. Using the ZEUS data on NC, CC and jet production, a NLO QCD analysis is performed, to assess the impact of the most recent data on the parton distribution functions and their uncertainties.

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High density and/or high temperature nuclear matter may be a source of high energy cosmic particles.

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The present paper focuses on one of the possible sources of high energy cosmic particles.
In system where the temperature and density is near the QCD critical ones there is some probability that the energies of group of partons will transfer to one or to several partons as a result of nucleon collective effects (as a result of nucleons percolation for example [H.Satz. arXiv:hep-ph/0212046 v1; Janusz Brzychczy.arXiv:nucl-th/0407008 v1; C. Pajares.arXiv:hep-ph/0501125 v1]). It follows from

that about 25 years ago by the European Muon Collaboration (EMC) at CERN in deep-inelastic muon-nucleus scattering [J.J. Aubert et al., Phys. Lett. 123B, 275 (1983)] it was observed that the structure function F2 and hence the quark and gluon distributions of a nucleon bound in a nucleus differ from those of a free nucleon. Some early experiments in JINR Dubna showed that at energy around several GeV the particle production in nuclear collisions is set up in the asymptotic regime [A.M. Baldin et al. Sov.J. Nucl.Phys.18,41 (1973)]. This means that the achievement of invariability of the physical picture of the secondary particle production in nuclear fragmentation with increasing collision energy or the achievement of the so-called limiting fragmentation of nuclei. A remarkable peculiarity of the phenomena is the spreading of these properties also to particles produced behind the kinematic limit of free nucleon collisions. In the language of the parton model, this fact points out that nuclei contain multiquark states.
The parton (or partons) which have had high energy could leave the hot and/or density system with minimum energy loses and transform to hadrons. The values of Feynman x of these particles as well as its energies could be limited by values of the total energy of the collected nucleons system only.
It is expected that some medium with high density close to the QCD critical one can be formed in the center of some massive starts (for example of neutron stars [A. G. Lyne and F. G. Smith. Pulsar Astronomy. Cambridge University Press, 1990.]) due to high density of matter the deconfinement (and parton structure) could appear in these mediums. The same structure could also be formed during the mixed phase formation in heavy ion collisions at relativistic and ultrarelativistic energies [A.N. Sissakian, A.S. Sorin, M.K. Suleymanov, V.D. Toneev , G.M. Zinovjev. Properties of strongly interacting matter and search for a mixed phase at the JINR Nuclotron. Phys. Part.Nucl.Lett.5:1-6,2008]. The parton (or partons) with long values of x (or E) could be formed in this system, to transform to hadrons and appear as high energy cosmic particles.

III. Higgs and New Physics / **794**

High-mass Higgs search and combined discovery prospects at the LHC

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We present the discovery potential of the ATLAS and CMS detectors at the LHC for a neutral Higgs boson decaying to ZZ*() -> 4 leptons (electrons or muons) or to WW()* -> l nu l' nu' (l or l' = e or mu).
The analysis relies on a full simulation of the detector response and emphasis is put on explicit strategies for the measurement of experimental and background systematics from data.
We also present an evaluation of expected 95\% C.L. exclusion limits in early Higgs boson searches. We show that these two channels alone should allow for excluding the Standard Model Higgs boson in the mass range of 140-230 GeV by the time when CMS or ATLAS collect 1~fb^{-1} of data at a center-of-mass energy of 14 TeV. We also give an estimate of how the change of the LHC center-of-mass collision energy from 14 to 10 TeV would impact the Higgs boson exclusion limits.

III. Higgs and New Physics / **809**

High-mass resonances in dilepton, dijet and diboson final states at the Tevatron

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At hadron colliders, new massive particles can be searched for by the observation
of high tranverse momentum objects forming high-mass resonances. Searches for additional massive vector bosons (W',Z'), Randall-Sundrum gravitons and sneutrinos in R-parity violating scenarios are performed in dilepton, dijets and diboson final states. The most recent results from the CDF and D0 experiments at the Tevatron are presented.

V. QCD at Colliders / **672**

Higher-order QCD corrections to vector boson production at hadron colliders.

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We consider QCD radiative corrections and their to the production of vector bosons in hadron collisions.

We present a fully exclusive calculation up to next-to-next-to-leading order (NNLO) in QCD perturbation theory. Our calculation is implemented in a parton level Monte Carlo program which allows the user to apply
arbitrary kinematical cuts on the final-states and to compute the corresponding distributions in the form of bin histograms. We show selected numerical results at the Tevatron and the LHC.

We discuss the resummation of logarithmic-enhanced QCD corrections at small values of qT and the matching procedure to consistently combine resummation with the fixed order perturbative result at intermediate and large qT. We present a study of the scale dependence and of the perturbative uncertainty of our results. We compare numerical results for e+e- pairs from the decay of Z bosons with the available Tevatron data.

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Hot and dense nuclear matter in an extended mean field approach

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We investigate the equation of state of hadronic and quark-gluon matter at finite temperature and baryon density considering the possible formation of mixed phase in relativistic heavy ion collisions. The analysis is performed by requiring the Gibbs conditions on the global conservation of baryon number, electric
charge and strangeness number. For hadronic phase, we study an extended relativistic mean-field theoretical model with the inclusion of Delta-isobar, hyperons and kaons degrees of freedom. For the quark sector, we employ a MIT-Bag model with lowest order perturbative corrections. In this context, the behavior of the strangeness chemical potential and the possibility of strangeness-antistrangeness separation in the hadronic-quark-gluon mixed phase are analyzed.

VI. QCD in Hadronic Physics / 460

Inclusive Photoproduction of rho^0, K^{*0} and phi Mesons at HERA

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Inclusive non-diffractive photoproduction of rho(770)^0, K^*(892)^0 and phi(1020) mesons is investigated with the H1 detector in ep collisions at HERA. The corresponding average \gamma p centre-of-mass energy is 210 GeV. The mesons are measured in the transverse momentum range 0.5<p_T<7 GeV and the rapidity range |y_{lab}|<1. Differential cross sections are presented as a function of transverse momentum and rapidity, and are compared to the predictions of hadroproduction models.

II. Flavour Physics / 887

Inclusive Semileptonic B Decays at BABAR

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presenter will be chousen

II. Flavour Physics / 886

Inclusive b -> u decays and determination of Vub at BELLE

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Inclusive radiative B meson decays at BELLE

II. Flavour Physics / 923

Inclusive radiative B meson decays at Belle

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Improved measurement of inclusive radiative B-meson decays

We report a fully inclusive measurement of the flavor changing neutral current decay $B \to X_s\gamma$ in the energy range $1.7\,\mathrm{GeV} \leq E_\gamma^{\mathrm{c.m.s.}} \leq 2.8\,\mathrm{GeV}$, covering 97\% of the total spectrum, where c.m.s. is the center of mass system. Using 605 fb^{-1} of data we obtain measurements of the partial branching fraction and first and second moments of the photon energy spectrum for lower energy thresholds including and above $1.7\,\mathrm{GeV}$.

Improved Measurement of the Electroweak Penguin Process $B \to X_s\ell^+\ell^-$

We present a measurement of the branching fraction for the electroweak penguin process $B \to X_s\ell^+\ell^-$, where ℓ is an electron or a muon and X_s is a hadronic system containing an s-quark. The X_s hadronic system is reconstructed with one $K^\pm$ or K_s^0 and up to four pions, where at most one pion can be neutral. The measurement is based on a data sample four times larger than used in the previous analysis, accumulated at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB e^+e^- asymmetric-energy collider.

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Indirect luminosity measurements with LHCb

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We report on studies of indirect luminosity measurements, using events containing muon final states, in LHCb. The first method exploits elastic two photon dimuon production in LHCb. The process has a theoretical uncertainty of less than 1%, making it an ideal choice for use in performing an indirect luminosity measurement. Strategies for triggering, selection and background rejection are discussed. Our studies indicate that a measurement precision of 1.5% can be obtained with 2 fb-1 of data. Prospects for further reducing the uncertainty (which is dominated by the rate of dimuons produced from double pomeron exchange), by examining the rate of exclusive dilepton, diphoton and dijet events in data, will be discussed. These results are compared to measurements which can be obtained using electroweak bosons.

VI. QCD in Hadronic Physics / 977

Inelastic J/psi production at HERA

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Inelastic Photo-production of J/Psi mesons is studied in ep-scattering at HERA. The J/psi decay angular distributions have been measured with the ZEUS detector, using an integrated luminosity of 468 pb^-1. The range in photon-proton centre-of-mass energy, W, was 50<W<180 GeV. The polar and azimuthal angles of the mu+ were measured in the J/psi rest frame and compared to theoretical predictions at leading and next-to-leading order in QCD.
Single differential and double differential cross sections are measured with the H1 detector, using the data taken in the years 2006 and 2007 and corresponding to an integrated luminosity of approximately 166 pb^-1. Precision and purity are increased compared to previous analyses. The results are compared to theoretical predictions.

I. Cosmology and Gravitational Waves / 324

Inflation and preheating in supergravity - the role of flat directions

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In order to properly describe inflation and particle production one has to consider the underlying theory of particles and interactions. Supersymmetry is one of the most promising extensions of the Standard Model (SM). One of the typical features of supersymmetric extensions of the SM is the presence of flat directions - directions in field space, along which the scalar potential identically vanishes in the limit of unbroken global supersymmetry. Due to large quantum fluctuations or the classical evolution of fields during inflation flat directions can easily acquire large vacuum expectation values (VEVs). Therefore, there is a natural question about the role of such large VEVs in the process of particle production. It was postulated in literature that large flat direction VEVs influence the process of particle production by blocking preheating from the inflaton - the phase of rapid, non-perturbative inflaton decay.

Motivated by a recent discussion about the role of flat directions in the early universe a consistent model of inflation and preheating in supergravity with MSSM fields is built. It is based on a model proposed by M. Kawasaki, M. Yamaguchi and T. Yanagida. In the inflationary stage, the flat directions acquire large VEVs without spoiling the background of slow-roll, high-scale inflation consistent with the latest WMAP5 observational data. In the stage of particle production, naturally following inflation, the role of flat direction large VEVs depends strongly on effects connected with the supergravity framework and non-renormalizable terms in the superpotential, which have been neglected so far in the literature. Such effects turn out to be very important, changing the previous picture of preheating in the presence of large flat direction VEVs by allowing for efficient preheating from the inflaton.

VII. Unified Theories, Strings, Non-perturbative QFT / 114

Intermediate mass scales in the non-supersymmetric SO(10) grand unification: a reappraisal

Authors: Luca di Luzio[1] ; Michal Malinsky[2] ; Stefano Bertolini[1]

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The current status of the non-supersymmetric SO(10) GUTs is discussed from the point of view of the high scale unification of the running gauge couplings. The new refined analysis shows that, on the contrary to the common lore, several breaking chains are still perfectly compatible with the current phenomenological constraints imposed namely by the absolute neutrino mass scale and the proton decay rate.

Joint EPS - EFCA meeting / 1014

Introduction

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VI. QCD in Hadronic Physics / 691

Is the X(3872) molecular hypothesis compatible with CDF data?

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Assuming that the X(3872) is a D0- \bar D0* molecule, we estimate its prompt production cross section at Tevatron and compare our results with the CDF data. We use different hadronization models, namely
the ones implemented in Pythia and in Herwig, in order to have an estimate of the associated uncertainties.
We give an upper bound for the theoretical cross section
and a lower bound for the experimental one. According to our preliminary results, S-wave resonant scattering seems to be unlikely to allow the formation of a loosely bound molecule in high energy hadronic collisions. Some alternative mechanisms are discussed

VII. Standard Model Electroweak Physics / 902

Isolated Lepton and Multi-Lepton production at HERA

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Measurements of the production of events containing isolated high energy leptons (electrons, muons or taus) and missing transverse momentum produced in ep collisions have been performed with the H1 and ZEUS detectors at HERA in the period 1994-2007. In addition, topologies with more than one high energy isolated lepton (electron or muon) are analyzed. The data samples corresponds to an integrated luminosity of 0.5 fb^{-1} per experiment. The observed event yields are compared to the predictions from the Standard Model. In general good agreement is found, where the SM prediction is dominated by W production for the case of isolated high energy leptons with missing transverse momentum and by gamma-gamma collisions for the multilepton topologies. Total and differential cross sections of these processes are measured. The H1 and ZEUS data are also combined

in a common phase space, in order to make best use of the full HERA data samples and measure these rare processes with good precision.

V. QCD at Colliders / **48**

Jet-gap-jet events at Tevatron and LHC

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Double diffractive events are a direct test of BFKL resummations at Tevatron and LHC. In this new study, we compute for the first time the BFKL NLL cross section for two jet events with a large rapidity gap between jets. The BFKL NLL formalism leads to a good description of D0 data, and we provide in addition some predictions for LHC.

V. QCD at Colliders / **987**

Jets and alpha_s at HERA

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Jet cross sections in deep inelastic ep scattering (DIS) and photoproduction were measured with the H1 and ZEUS detectors at HERA using data collected in the years 1999-2007 and corresponding to an integrated luminosity of up to 500 pb-1. Measurements of differential cross sections for inclusive-jet production in DIS and photoproduction are presented together with the tri-jet to di-jet ratio in DIS. Inclusive jet, di-jet and tri-jet cross sections, normalised to the neutral current DIS cross sections, are also measured and presented as functions of Q^2, jet transverse momentum and proton momentum fraction. All the measurements are well described by perturbative QCD calculations at next-to-leading order corrected for hadronisation effects. QCD analyses of the measured observables were used to extract precise values of the strong coupling constant and test its energy-scale dependence.

II. Flavour Physics / **38**

K and B Physics in a Warped Extra Dimension with Custodial Protection

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I briefly introduce the theoretical basics of a warped extra dimension with custodial protection, paying particular attention to the flavour structure of this type of models.
Then I discuss the implications for particle-antiparticle mixing that is affected by tree level exchanges of KK gauge boson in an important manner. I show that although generically the experimental constraint from epsilon_K requires a KK scale of at least 20 TeV, even with KK modes in the reach of the LHC this constraint can be fulfilled without significant fine-tuning of the fundamental 5D Yukawa couplings. Simultaneously the CP-asymmetries S_{psi phi} and A^s_SL, related to B_s mixing, can be significantly enhanced over their SM predictions.
After that I turn to the predictions for rare K and B decays in that scenario, that turn out to be dominantly affected by tree level flavour changing Z couplings to right-handed down-type quarks. It turns out then that while rare K decays can receive large corrections with respect to their SM predictions, the effects in B decays are small and challenging for future experiments. Interesting correlations between various observables occur, that allow in principle to distinguish this models from other new physics scenarios, such as models with Minimal Flavour Violation or the Littlest Higgs model with T-parity.

I. Neutrino Physics / **78**

KATRIN: an experiment to determine the neutrino mass

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The KArlsruhe TRItium Neutrino (KATRIN) experiment is a next generation, model independent, large scale tritium-beta-decay experiment to determine the mass of the electron anti-neutrino by investigating the kinematics of tritium beta decay with a sensitivity of 0.2 eV/c². The measurement setup consists of a high luminosity windowless gaseous molecular tritium source (WGTS), a differential and cryogenic pumped electron transport and tritium retention section, a tandem spectrometer section (Pre-Spectrometer and Main Spectrometer) for energy analysis, followed by a detector system for counting transmitted beta decay electrons.

To achieve the desired sensitivity the WGTS, in which tritium decays with an activity of 10e11 Bq, needs to be stable on the 0.1% level in injection pressure and temperature at an absolute value of 27K. With the capability to create an axial magnetic field of 3.6T the WGTS is going to be one of the world's most complex superconducting magnet & cryostat systems.

The Main Spectrometer (length 24m, diameter 10m), which works as a retarding electrostatic spectrometer, will have an energy resolution of 0.93eV at 18.6keV. The retarding potential of -18.6kV needs to be stable at the 1ppm level. In order to reach the background level needed to achieve the sensitivity, it will be operated at a pressure of 10e-11mbar.

The talk will give an overview of the actual status of the project.

VII. Standard Model Electroweak Physics / **56**

KLOE Measurement of the sigma(pi+pi-(gamma)) cross section and the pi-pi contribution to the muon anomaly

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The KLOE experiment, operating at the Frascati phi-factory DAPHNE, has measured the differential cross section for the process e+ e- –> pi+ pi- gamma as a function of the pi+pi- invariant mass, M(pipi).

From the measured differential $M(pipi) spectrum inclusive of final state radiation, the total sigma(pi+pi-(gamma)) cross section is determined using the QED radiator function.

The final result of the analysis of events with Initial State Radiation (ISR) photons emitted at small angle is presented, from a sample corresponding to an integrated luminosity of 240 pb-1 of data taken on peak of the phi meson.

From the sigma(pi+pi-(gamma)) cross section, the pi-pi contribution to the muon magnetic anomaly is obtained in the mass range (0.592 < M(pipi) < 0.975) GeV with a statistical error of 0.1%, an experimental systematic error of 0.6% and a theoretical systematic error
of 0.6%.

Preliminary results from an independent analysis of events with an ISR photon detected at large angle are presented, from a sample corresponding to an integrated luminosity of 230 pb-1 of data taken off the phi peak. This selection allows to reach the pipi threshold with suppressed background from phi decays.

II. Flavour Physics / **856**

KLOE measurements of KL lifetime and absolute branching ratio of K+ -> pi+pi-pi+

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We are presently finalizing a new determination of the KL lifetime using the whole KLOE data set, consisting of more than 10^9 phi -> KSKL decays (the previous KLOE measurement is reported in PLB 626, 2005). The KL lifetime will be extracted from the proper time distribution of KL -> 3pi0 decays, tagged by KS -> pi+pi- decays on the opposite hemisphere of the apparatus.

The measurement of the BR for the decay K+ -> 3 charged pions completes the KLOE program of precise and fully inclusive measurements of the kaon dominant BR's. We are currently finalizing this measurement, which is based on the analysis of phi -> K+K- events in which one of the two kaons undergoes a two-body decay, either mu nu or pi pi0 (tagging kaon). Given a tag, the opposite charged kaon decaying to 3 charged pions is easily and unambiguously identified.

VI. QCD in Hadronic Physics / **55**

KLOE results on light meson properties

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The KLOE experiment has collected 2.5 fb-1 at the peak of the phi resonance at the e+e- collider DAPHNE in Frascati. The whole data set includes 100 million eta's produced through the radiative decay phi −> eta gamma and tagged by means of the monochromatic recoil photon. With this sample, we are studying eta rare decays. We have a final result for the BR
measurement of the eta −> pi+pi-e+e- decay, with a sample of 1600 signal events, 100 times larger than previous best measurement. These events are also used to measure the asymmetry between the pi+pi- and the e+e- decay planes in the eta rest frame, whose observation could test unexpected mechanism of CP violation, thus providing an hint of new physics beyond the Standard Model. The same four track final state is also under study to observe for the first time the eta −> e+ e- e+ e- decay channel.

Using a sample of 600 pb-1 collected at center of mass energy between 1000 and 1030 MeV, we have measured the cross section parameters for the two processes e+ e- −> pi+ pi- pi0 pi0 and e+ e- −> pi0 pi0 gamma, which proceed through the omega pi0 intemediate state. The ratio
Gamma(omega−>pi0gamma)/Gamma(omega−>pi+pi-pi0) is extracted with an accuracy of 1.8%. This measurement substantially improves the accuracy of the two corresponding branching fractions, giving a value for BR(omega−>pi0gamma) which is three standard deviation lower than the PDG fit. Moreover, the observed interference pattern at the phi peak is
used to extract the most precise measurement to date of the BR for the OZI and G-parity violating phi −> omega pio decay.

We have also new results in the scalar meson sector. We have the final measurement for the search of the phi −> K0 K0bar gamma decay, which proceeds through f0(980)/a0(980) gamma. No previous measurement of this decay mode exists. Theoretical predictions for the branching fraction are spread in the 10^(-7)−10^(-9) range. KLOE looks for Ks Ks gamma final state events, with both Ks decaying in pi+pi-. Results for the upper limit on the branching ratio are presented with the full KLOE statistics, which allows to test most of the available theory models. Moreover we have the final measurement of the high statistics results on the phi −> a0(980) gamma decay, with a0 in eta pi0 for two different eta final states, which provide the BR measurement and also the determination of the a0(980) coupling to eta pi and KK. The unfolded M(etapi) spectrum has been also extracted.

Finally, we have updated our measurement of the gluonium content of the eta' that indicated a 3 sigma's evidence. Other SU(3) relations were added in the fit of the vector to pseudoscalar gamma, pseudoscalar to vector gamma and pseudoscalar to gamma gamma transitions, thus allowing the extraction of other parameters, such as the vector mixing angle and the SU(3) breaking parameter 2*ms/(mu+md). The effect of including the pseudoscalar to two gammas
decay amplitudes on the fit result is also discussed.

Plenary Session 3 / **939**

LHC machine

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Plenary Session 3 / **961**

LHCb

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IV. Detectors (LHC and R&D) and Accelerators / **745**

LHeC and eRHIC

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This talk is focused on possible designs and predicted performance if two proposed high-energy, high-luminosity electron-hadron colliders: eRHIC at BL and and LHeC at CERN. Both the eRHIC and the LHeC will add polarized electrons to the list of colliding species in these versatile hadron colliders: 10-20 GeV electrons to 250 GeV RHIC and 50-100 to 7 TeV LHC. Both colliders plan to operate in electron-proton (in RHIC case protons are polarized as well) and electron-ion collider modes. These two colliders are complimentary both in the energy range and in the physics goals.
I will discuss possible choices of the accelerator technology for the electron part of the collider for both eRHIC and LHeC, and will present predicted performance for the colliders. In addition, possible staging scenarios for these collider will be discussed.

I. Neutrino Physics / 825

Last Borexino Result

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Borexino is a large-volume liquid scintillator detector placed in the underground halls of the Laboratori Nazionali del Gran Sasso in Italy. It is able to detect in real time neutrino interactions below 2 MeV, due to the very high radio-purity reached by the detector. The interaction rate of the 0.862 MeV 7Be neutrinos is 49±3stat±4syst counts/(day•100 ton) , in agreement with the oscillation hypothesis in the MSW Large Mixing Angle scenario. Our result is the first direct measurement of the survival probability for solar νe in the transition region between matter-enhanced and vacuum-driven oscillations.

I. Astroparticle Physics / 787

Latest results from the Pamela experiment

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The PAMELA apparatus has been launched in space on June 15, 2006 on the
Russian Resurs DK1 satellite, and is continuously taking data since July
2006. The experiment is devoted to the precise and extensive measurements of
cosmic ray in space, with main focus on the antiprotons and positrons in the
100 MeV/200 GeV energy range. Primary protons, electrons and light nuclei spectra are also precisely measured, and many solar physics and geomagnetic related aspects can be investigated with high statistics and long time exposure.
This talk will present the latest analysis of the PAMELA data,
with particular emphasis on the antiproton/proton and positron/electron ratio.

V. QCD at Colliders / **906**

Leading Baryon Production at HERA

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The production of highly energetic forward neutrons has been studied in deep-inelastic scattering. The data were taken with the H1 detector at HERA in the years 2006-2007 and correspond to an integrated luminosity of 117 pb^-1. Semi-inclusive cross sections have been measured in the kinematic region 4 < Q^2 < 100 GeV^2, 0.7*10^-4 < x < 0.3*10^-1 and the fractional momentum of the neutron 0.3 < X_L < 1.0. The data are used to estimate the structure of the pion. Furthermore, the cross sections are measured differentially in neutron energy and p_T and compared to the predictions of models of leading neutron production.

Differential cross sections for dijet photoproduction and in association with a leading neutron have been measured in the reaction e+ p -> e+ jet jet X n with the ZEUS detector at HERA using an integrated luminosity of 40pb-1. The data are consistent with a simple pion exchange model. The ratio of the neutron-tagged and dijet cross sections show violations of factorization of the lepton and photon vertices which can be explained by kinematic effects constraining the phase space for neutron production. Normalised double-differential leading-neutron cross sections have been measured in dijet photoproduction for the first time. The distributions can be fully characterised by only two energy dependent parameters
extracted from fits to the data. Absorption effects were studied by comparing the dijet photoproduction measurements and similar results in deep inelastic scattering. No clear effect, not related to kinematics, was observed. In a resolved-enriched dijet photoproduction sample, significantly fewer neutrons were seen than for direct. This depletion can also be accounted for by kinematic constraints.
The semi-inclusive reaction e+p -> e+Xp was studied with the ZEUS detector at HERA using an integrated luminosity of 12.8 pb-1. The final state proton, which was detected with the ZEUS leading proton spectrometer, carried a large fraction of the incoming proton energy, x_L > 0.32, and its transverse momentum squared satisfied p_T2 < 0.5 GeV2; the exchanged photon virtuality, Q2, was greater than 3 GeV2 and the range of the masses of the photon-proton system was 45 < W < 225 GeV. The leading-proton production cross section and rates are presented as a function of x_L, p_T2, Q2 and the Bjorken scaling variable, x.

I. Neutrino Physics / **564**

Lepton Flavour Violation in Models with A4 Flavour Symmetry.

Authors: Claudia Hagedorn[1] ; Ferruccio Feruglio[2] ; Luca Merlo[2] ; Yin Lin[2]

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I discuss lepton flavour violating transitions, leptonic magnetic dipole moments (MDMs) and electric dipole moments (EDMs) in a class of models characterized by the flavour symmetry A4 x Z3 x U(1)*{FN}. I present the relevant low-energy effective Lagrangian where these effects are dominated by dimension six operators, suppressed by the scale M of new physics. All the flavour breaking effects are universally described by the vacuum expectation values of a set of spurions. I separately analyze both a supersymmetric and a general case. While the observed discrepancy delta a_mu in the anomalous MDM*

of the muon suggests M of order of a few TeV, several data require M above 10 TeV, in particular the limit on EDM of the electron. In the general case also the present limit on BR(mu -> e gamma) requires M >10 TeV, at least. The branching ratios for mu -> e gamma, tau -> mu gamma and tau -> e gamma are all expected to be of the same order. In the supersymmetric case the constraint from mu -> e gamma is softened and it can be satisfied by a smaller scale M. In this case both the observed delta a_mu and the current bound on BR(mu -> e gamma) can be satisfied, at the price of a rather small value for ||, of the order of a few percents, that reflects on a similar value for theta{13}.

VI. QCD in Hadronic Physics / 833

Light particle searches at Belle

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We report on a search for the $X(1812)$ state in the decay $B^{\pm} \to K^{\pm}\omega\phi$ with a data sample of 657×10^6 $B\bar{B}$ pairs collected with the Belle detector at the KEKB e^+e^- collider. No significant signal is observed. An upper limit $calB(B^{\pm} \to K^{\pm}X(1812), X(1812) \to \omega\phi) < 3.2 \times 10^{-7}$ (90\% C.L.) is determined. We also constrain the three-body decay branching fraction to be $calB(B^{\pm} \to K^{\pm}\omega\phi) < 1.9 \times 10^{-6}$ (90\% C.L.).

We also report on a search for a low mass particle with a mass of 214.3 MeV/c^2 reported by the HyperCP experiment at Fermilab. For this search we use the following decay modes: $B^0 \to K^-\pi^+X^0$, $X^0 \to \mu^+\mu^-$; $B^0 \to \pi^-\pi^+X^0$, $X^0 \to \mu^+\mu^-$; $B^0 \to K^{*0}X^0$, $K^{*0} \to K^+\pi^-$, $X^0 \to \mu^+\mu^-$; and $B^0 \to \rho^0X^0$, $\rho^0 \to \pi^+\pi^-$, $X^0 \to \mu^+\mu^-$, where X^0 is a pseudo-scalar particle with mass of 214.3 MeV/c^2.

We finally report a search for the $X(1835)$ state via $e^+e^- \to J/\psi X(1835)$ process with a data sample of 673 fb^{-1} collected on and off $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric-energy e^+e^- collider. As no significant signal is found for $e^+e^- \to J/\psi X(1835)$ production, we measure an upper limit on its cross-section $\sigma_{Born}[e^+e^- \to J/\psi X(1835)] \times [Br(X(1835) \to > 2charged)]$.

I. Astroparticle Physics / 40

Limits on Low-Mass WIMP Dark Matter with an Ultra-Low-Energy Germanium Detector at 220 eV Threshold

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An energy threshold of (220+-10) eV was achieved at an efficiency of 50% with a four-channel ultra-low-energy germanium detector [1] with a total active mass of 20 g. This provides a unique probe to WIMP dark matter with mass below 10 GeV. With low background data taken at the Kuo-Sheng Laboratory, limits on WIMPs in the galactic halo were derived for both spin-independent and spin-independent couplings down to WIMP mass of 3 GeV [2]. This detector technique makes the unexplored sub-keV energy window accessible for new neutrino and dark matter experiments [1]. Status on data taking and analysis on a 500-g point-contact germanium detector will be reported.

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1.H.T. Wong, Mod. Phys. Lett. A 23, 1431 (2008).
2.S.T. Lin et al., Phys. Rev. D 76, 061101(R) (2009) .

III. Higgs and New Physics / 778

Low mass Higgs and Higgs properties at the LHC

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We present recent MC results and search strategies for low mass Higgs and discuss about measurements of Higgs properties at the LHC. We focus on analysis of H->gamgam, VBF H->tautau, H->bbbar/WW produced with ttbar and vector boson.

VI. QCD in Hadronic Physics / 29

Measurement of Bc mass and lifetime at LHCb

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The Bc mass and lifetime measurements using the exclusive decay Bc -> Jpsi pi at the LHCb experiment were studied. About 300 signal events are expected for a data set which corresponds to an integrated luminosity of 1 fb-1, with a B/S ratio around 2. Based on these data, the Bc mass and lifetime can be measured with expected statistical errors below 2 MeV/c^2 and 30 fs, respectively

VII. Standard Model Electroweak Physics / 830

Measurement of Di-Boson production at LHC

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Di-Gauge Boson in the LHC will be discussed. The measurements of cross sections and triple gauge couplings(TGC) at early stage of data taking will be described as well as di-boson polarization and TGC at high luminosity. The selection for the cross section measurements will be shown as well as the transverse mass variable used for the WW TGC measurement. A comparison between LHC limits and limits obtained from the Tevatron and LEP2 will be shown. For the case of the ZZ and WZ polarization measurements the reconstruction of the decay angle used for extracting the polarization will be discussed and the lonigitudinal polarization will be shown as a function of the centre of mass energy. All results were achieved by using the full detectors simulation program.

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Measurement of Differential Z/gamma+jet+X Cross Sections with the D0 Detector

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We present measurements of differential cross sections in inclusive Z/gamma plus jet production in a data sample of 1fb-1 collected with the D0 detector in proton antiproton collisions at sqrt(s)=1.96TeV. Measured variables include the Z/gamma transverse momentum (pT-Z), and rapidity (y-Z), the leading jet pT (pT-jet), and rapidity (y-jet), as well as various angles of the Z+jet system. We compare the results to different Monte Carlo event generators and to next-to-leading order perturbative QCD (NLO pQCD) predictions, with non-perturbative corrections applied.

V. QCD at Colliders / **998**

Measurement of Z/gamma+jet+X and photon+b/c +X Cross Sections with the D0 Detector

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We present measurements of differential cross sections for the inclusive Z/gamma plus jet production and for the inclusive photon plus heavy flavor production in a data sample of 1fb-1 collected with the D0 detector in proton antiproton collisions at sqrt(s)=1.96TeV.
In the first measurement, we compare kinematic distributions of the Z/gamma and the jet as well as of the various angles of the Z+jet system, with different Monte Carlo event generators and next-to-leading order perturbative QCD (NLO pQCD) predictions with non-perturbative corrections applied.
In the second measurement, we compare the results with next-to-leading order perturbative predictions, covering photon transverse momenta 30-150 GeV, photon rapidities |y_gamma| < 1.0, jet rapidities |y_jet| < 0.8, and jet transverse momenta pT_jet > 15 GeV.

VI. QCD in Hadronic Physics / **424**

Measurement of charged particle spectra in pp collisions at CMS

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We present the plans of the CMS collaboration to measure cross sections and differential yields of charged particles (unidentified or identified pions, kaons and protons) produced in inelastic proton-proton collisions at center-of-mass energy of 14 TeV. The measurements of these basic observables could also serve as an important tool for calibrating and understanding the CMS detector at start-up. The tracking of very low transverse momentum charged particles will be possible down to about 100 MeV/c, with good efficiency and negligible fake rate. Charged hadrons can be identified down to 0.8 and 1.5 GeV/c total momentum for kaons and protons, respectively. Comparisons of the results to various theoretical models are also discussed.

V. QCD at Colliders / 859

Measurement of charm and beauty in DIS using the H1 Vertex Detector and Combination of F_2{cc}

Author: Katerina Lipka[1]

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The inclusive charm and beauty cross sections as well as the charm and beauty jet cross sections are measured in e^-p and e^+p collisions at HERA II in deep inelastic scattering. The data were collected with the H1 detector in 2006 and 2007 corresponding to an integrated luminosity of 189 pb^-1. The amount of charm and beauty events is determined using variables reconstructed by the H1 vertex detector including the impact parameter of tracks to the primary vertex and the position of the secondary vertex. The measurements are compared with QCD predictions.

A combination of recent results from HERA on the charm contribution, F_2^{cc}, to the inclusive proton structure function F_2 is presented. The charm quarks are identified by reconstructed D mesons, by muons from semi-leptonic charm decays, or by the long lifetime and large mass of charmed hadrons. The combination procedure accounts for correlations of the experimental systematic uncertainties of the measurements as well as theory uncertainties which leads to an improved precision.

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Measurement of photon+b+X and photon+c+X Production Cross Sections with the D0 Detector

Authors: Aurelio Juste[1] ; Stefan Soldner-Rembold[2]

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First measurements of the differential cross sections for the inclusive production of a photon in association with a heavy quark (c, b) jet are presented, covering photon transverse momenta 30-150 GeV, photon rapidities | y_gamma| < 1.0, jet rapidities |y_jet| < 0.8, and jet transverse momenta pT_jet > 15 GeV. The results are based on an integrated luminosity of 1 fb-1 in ppbar collisions at sqrt(s)=1.96 TeV recorded with the D0 detector at the Fermilab Tevatron Collider. The results are compared with next-to-leading order perturbative QCD predictions.

VII. Unified Theories, Strings, Non-perturbative QFT / **43**

Measurement of the $D^0 \to \phi\eta$, $D^0 \to \omega\eta$ and $D^0 \to K^*\eta$ Branching Fractions

Author: Amir Rahimi[1]

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We present updates on the searches for three $D^0 \to V\eta$ decays, where the D^0 comes from the decay $D^{*+} \to D^0\pi^+$ and V is a ϕ, ω or K^* vector meson. These results use a 467~fb^{-1} data sample collected with the {\sl B{\scriptsize A}B{\scriptsize AR}} detector at SLAC.

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Measurement of the FCNC Decays K+- -> pi+- l+ l-

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We report on measurements of the rare decays K+- -> pi+- e+ e- and K+- -> pi+- mu+ mu-. The full NA48/2 data set was analyzed, leading to more than 7200 reconstructed events in the electronic and more than 3000 events in the muonic channel, the latter exceeding the total existing statistics by a factor of five. For both channels the selected events are almost background-free. From these events, we have determined the branching fraction and form factors of K+- -> pi+- e+ e- using different theoretical models. Our results improve the existing world averages significantly. In addition, we measured the CP violating asymmetry between K+ and K- in this channel to be less than a few percent.

V. QCD at Colliders / **854**

Measurement of the Inclusive ep Scattering Cross Section at Low and Medium Q^2 at HERA

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Measurements of the inclusive ep scattering cross section are presented in the region of low to medium momentum transfers, 0.2 GeV^2 < Q^2 < 150 GeV^2, and Bjorken x, 5x10^-6 < x < 0.1. The results are based on data sets collected by the H1 Collaboration at HERA at positron beam energies of 27.6 GeV and proton beam energies of 820 or 920 GeV. A combination with data previously published by H1 leads to a cross section measurement of a few percent accuracy at low Q^2 and 1.3-2% at medium Q^2. A kinematic reconstruction method exploiting radiative ep events extends the measurement to lower Q^2 and larger x. The low Q^2 data are compared with theoretical models which apply to the transition region from photoproduction to deep inelastic scattering. A next-to-leading order QCD analysis is performed on the data with sufficiently high Q^2 to determine the parton distributions in the proton.

II. Flavour Physics / 800

Measurement of the KS lifetimes and CPT symmetry tests in the neutral kaon system with quantum interferometry at KLOE

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A phi-factory offers the possibility to select pure kaon beams: neutral kaons from phi ⟶ KSKL are in fact produced in a well defined state (JPC=1−) and the detection of a kaon at large (small) times tags a KS (KL). This allow to perform precise measurement of kaon properties, as for example lifetime, and to study time evolution of neutral kaon system. In particular, studying the distribution of Δt, the difference between the two neutral kaon decay times, where both kaons decay into π+π− pair, provides unique opportunities for testing quantum mechanics and CPT symmetry.
Using the full 2004-2005 data sample (L=1.5 fb-1) collected with the KLOE detector at the Frascati-DAΦNE e+e− collider,
we discuss very recent update of the results testing the validity of quantum mechanics and CPT invariance.
Then, we are presently finalizing the determination KS lifetimes using ~1/3 the whole KLOE data set, where the proper time distribution of KS ⟶ π+π− provides a competitive measurement of lifetime.

VII. Standard Model Electroweak Physics / 146

Measurement of the W Boson Mass and Width with 1 fb-1 of D0 Run II Data

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We present the most precise single measurement of the W boson mass and and a measurement of the W width using data collected with the D0 experiment. An integrated luminosity of

1 fb-1 yields 499,830 W->evcandidates. The mass is measured with an uncertainty of less than 45 MeV while the width uncertainty is less than 75 MeV.

VII. Standard Model Electroweak Physics / 575

Measurement of the W-boson mass at the LHC: Shortcuts revisited.

Authors: Andrzej Siodmok[1] ; Florent Fayette[2] ; Mieczysław Witold Krasny[2] ; Wiesław Płaczek[3]

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The claim that the W mass will be measured at the LHC with a precision of O(10) MeV is critically reviewed. It is argued that such a precision cannot be achieved, unless a dedicated measurement programme, specific to the LHC collider is pursued. We propose such a programme. Its main target is to significantly improve the experimental control of the relative polarization of the W+, W- and Z bosons. We want to achieve this goal either in dedicated LHC collider runs with the isoscalar beams, or, by running, in parallel to the standard pp collision program, a dedicated muon scattering "LHC-support-experiment" at the CERN SPS. One of these auxiliary measurements is necessary for the "precision measurement programme" at the LHC, but not sufficient. It must be followed by dedicated measurement strategies which are robust with respect to both the systematic measurement uncertainties and to the perturbative and nonperturbative QCD effects. We propose such strategies and evaluate their precision.

At the LHC, contrary to the Tevatron case, both the masses of the W+ and of the W- bosons must be measured with high precision. We propose two contributions to this conference. The first one, by Florent Fayette, proposes and evaluates the LHC dedicated strategies to measure the difference of the masses of the W+ and W- bosons. The second one, by Andrzej Siodmok, proposes the strategy to measure the W boson mass under the assumption that both masses are equal. We shall show in these presentations how one can overcome (circumvent) the obstacles in measuring the masses of W+ and W- to a precision of 10 MeV. We shall present a detailed evaluation of the precision of the proposed methods based on the studies of a large, O(10^11) sample of simulated W and Z production events.

V. QCD at Colliders / 992

Measurement of the charm fragmentation into D* mesons at HERA

Authors: Monica Turcato ZEUS Collaboration[1] ; Shuangshi Fang[2]

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The charm fragmentation function has been measured in D*photoproduction with the ZEUS detector at HERA using an integrated luminosity of 120 pb-1. The fragmentation function is measured versus z, the ratio of E+p_parallel for the D* meson and that for the associated jet, where E is the energy and p_parallel the longitudinal momentum relative to the jet axis. Jets were reconstructed

using the k_T clustering algorithm and required to have transverse energy greater than 9 GeV. The D* meson associated with the jet was required to have a transverse momentum greater than 2 GeV. The measured function is compared to different fragmentation models incorporated in leading-logarithm Monte Carlo simulations and a next-to-leading-order calculation. The results are similar to those from e+e- experiments.

The process of charm quark fragmentation is studied using $D^{*\pm}$ meson production in deep-inelastic scattering as measured by the H1 detector at HERA. Two different regions of phase space are investigated defined by the presence or absence of a jet containing the $D^{*\pm}$ meson in the event. The parameters of fragmentation functions are extracted for QCD models based on leading order matrix elements and DGLAP or CCFM evolution of partons together with string fragmentation and particle decays. Additionally, they are determined for a next-to-leading order QCD calculation in the fixed flavour number scheme using the independent fragmentation of charm quarks to $D^{*\pm}$ mesons.

I. Astroparticle Physics / **430**

Measurement of the cosmic muon charge asymmetry

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In late 2008, CMS collected 300 million events from atmospheric cosmic ray muons in a dedicated long run, with the full detector operational, assembled in the P5 experimental area at LHC. Using these data, CMS has measured the charge asymmetry of cosmic muons, as a function of the muon momentum, from 10 GeV/c up to the Tev/c scale. While the analysis of cosmic muons is not part of the physics program of CMS, it provides high quality measurements that assess the expected performance of the CMS detector, from the data taking to the reconstruction and analysis software. This is the first physics result of the CMS experiment.

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Measurement of the front back asymmetry in top-antitop quark pairs at CDF

Author: Collaboration CDF[1]

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A method of reconstructing t-tbar events in the lepton plus jets mode is applied to a measurement of the forward backward asymmetry in t- tbar pair production at CDF. The measurement is a test of discrete symmetries in t-tbar production and strong interactions at large Q^2. In the present data set it is potentially sensitive to the presence of parity-violating production channels such as a massive Z'- like boson or new physics within strong interactions. We present a measurement of the top quark forward-backward asymmetry in two complimentary rest frames: the proton anti-proton frame and the top anti-top frame.

II. Flavour Physics / **867**

Measurements of CP violation and CKM matrix at LHCb

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I. Neutrino Physics / **39**

Measurements of Neutrino-Electron Scattering Cross-Section and the Electroweak Parameters at the Kuo-Sheng Reactor Neutrino Laboratory

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The TEXONO Collaboration has been pursuing a research program on low energy neutrino physics[1] at the Kuo Sheng Reactor Neutrino Laboratory in Taiwan, where sensitive searches on neutrino magnetic moments, reactor axions and WIMP dark matter have been performed. We report our final results on the measurement of neutrino-electron scattering cross-section using a CsI(Tl) scintillating crystal array with a total mass of 200 kg [2]. This interaction channel is unique among the Standard Model processes, having both the neutral- and charged-current components, as well as their interference term. The various electroweak parameters were derived. Limits are placed for possible neutrino electromagnetic processes. This measurement provides a probe to the Standard Model at the MeV region, complementary to the precision data at accelerators at higher energies.

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II. Flavour Physics / **864**

Measurements of charmless B decays related to alpha at BABAR

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V. QCD at Colliders / **990**

Measurements of the longitudinal proton structure function at HERA

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The reduced cross sections for ep deep inelastic scattering have been measured with the ZEUS and H1 detectors at HERA at three different centre-of-mass energies, 318, 251 and 225 GeV. From the cross sections, measured double differentially in Bjorken x and the virtuality, Q2, the proton structure
functions F_L and F_2 have been extracted in a wide kinematic region. The measurements are compared with NLO QCD predictions.

III. Higgs and New Physics / **102**

Measuring Lepton Flavour Violation at LHC with Long-Lived Slepton in the Coannihilation Region

Author: Takashi Shimomura[1]

Co-authors: Hiroki Saito [2] ; Joe Sato [3] ; Masato Yamanaka [4] ; Oscar Vives [1] ; Satoru Kaneko [5]

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When the mass difference between the lightest slepton, the NLSP, and the lightest neutralino, the LSP, is smaller than the tau mass, the lifetime of the lightest slepton increases in many orders of magnitude with respect to typical lifetimes of other supersymmetric particles. In a general gravity-mediated MSSM, where the LSP is the neutralino, the lifetime of the lightest slepton is inversely proportional to the square of the intergenerational mixing in the slepton mass matrices. Such a long-lived slepton would produce a distinctive signature at LHC and a measurement of its lifetime would be relatively simple. Therefore, the long-lived slepton scenario offers an excellent opportunity to study lepton flavour violation at ATLAS and CMS detectors in the LHC and an improvement of the leptonic mass insertion bounds by more than five orders of magnitude would bepossible. In my talk, I will explain how the slepton lifetime are sensitive to LFV couplings and discuss a possibilities on measuring the lifetime at the LHC experiment. I also show that measurment of the slepton lifetime cand determine branching ratios of LFV tau decays in SUSY Type I Seesaw model.

VI. QCD in Hadronic Physics / **908**

Meson Spectroscopy at COMPASS

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on behalf of the COMPASS collaboration

In addition to constituent qq(bar) pair configurations, four quark states or
gluonic excitations like hybrids or glueballs are also expected to contribute to the mesonic spectrum. The most promising way to identify such states allowed by QCD is the search for
J^PC quantum number combinations which are forbidden in the constituent
quark model. The fixed target COMPASS experiment at CERN offers the opportunity to search for such states in the light quark sector with an unprecedented statistics.

First studies of diffractive reactions of 190 GeV/c pions were carried out by COMPASS during a pilot run in 2004.
In a first analysis, the three charged pion final state was studied.
A Partial Wave Analysis (PWA) with 42 waves including
acceptance corrections through a phase-space Monte Carlo
simulation of the spectrometer was performed.
The exotic pi1 (1600) meson with quantum numbers J^PC = 1-+ has been clearly established in the rho-pi decay channel
with a mass of 1660 +/-0.010(stat) MeV and a width of 0.269 +/-0.021(stat) MeV.
The final state with 5 charged pions was also investigated.
Results from that study will also be presented.

The improved detectors performance in 2008 allows us to study besides these channels further diffractively and centrally produced resonances, neutral ones as well as charged ones. First results of the ongoing analysis of the 2008
data taking period, using a 190 GeV/c pion beam on a
hydrogen target will be given.

V. QCD at Colliders / **889**

Mini experimental review of low-x at LHC

Author: Silvia Ochesanu[1]

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Feasibility studies are presented on forward jet production at the LHC with the CMS detector, assuming the integrated luminosity 1 pb-1, together with studies of inclusive Z and W production, as well as low-mass Drell Yan with the LHCb detector. The potential sensitivity of the CMS and the LHCb experiments to the proton PDFs at low x_Bj is discussed. The feasibility of observing hard diffraction at the LHC with the first 10-100 1 pb-1 collected by the CMS detector are also summarized. Studies of single-diffractive di-jet production, single-diffractive W boson production, Y photoproduction and di-jet production with a large rapidity gap between jets in pp collisions are presented.

V. QCD at Colliders / **874**

Mini review, hard diffraction and CEP at LHC.

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The LHC experiments provide an unprecedented coverage in pseudo-rapidity. This advantage and high LHC luminosity allows for interesting studies of exclusive diffractive production, probing gluon physics and testing pQCD, and which can eventually lead to discovery physics. The talk is focused on the CMS program, the ATLAS is also mentioned briefly, and includes discussion of the exclusive production of upsilon and chi_b mesons, and of dijets.

I. Neutrino Physics / **768**

MiniBooNE experiment: recent results and future plans

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MiniBooNE is the neutrino oscillation experiment located at Fermi National Accelerator Laboratory in Batavia, USA. The main goal of this experiment is to confirm or reject the evidence for muon to electron anti-neutrino oscillations seen by LSND experiment at LANL.
First neutrino events were detected in 2002 and since then MiniBooNE obtained many interesting results including the low-energy excess of electron neutrinos over the background which is still not understood.
My talk will describe production and detection of neutrinos at MiniBooNE as well as event selection and analysis techniques. I will then present recent cross-section and oscillation results and briefly go over the future plans.

I. Neutrino Physics / 673

Minimal flavour seesaw models

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We explore realizations of minimal
flavour violation (MFV)within the lepton sector. We find that it can be realized within those seesaw models where a separation of the lepton number and lepton fl
avour violating scales can be achieved, such as type II and inverse seesaw models. We present in particular a simple possibility that results in a different implementation of the MFV hypothesis than has been discussed before. Corresponding experimentally reachable predictions for rare lepton processes are given.

V. QCD at Colliders / 891

Minimum Bias and Hadronic Event Shapes at LHC

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The large uncertainties in the extrapolation at the LHC energies of the current phenomenological models for the track multiplicity and pt spectra in minimum bias events will require a direct measurement with the first data. The strategies developed by ATLAS and CMS are reviewed, with particular emphasis to the minimum bias trigger and low pt tracking efficiency. The ability of the experiment to disentangle between different models will be discussed. The study of the hadronic event shapes in QCD events will be also reviewed. The hadronic event shapes are robust against jet energy scale variations and resolution effects. This makes them appealing for the tuning of the Monte Carlo models with the first data.

I. Cosmology and Gravitational Waves / 659

Models of Inflation in Supergravity

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In supergravity, the construction of viable models of inflation is challenging due to the so-called η-problem, which states that the flatness of the inflaton potential is typically spoiled by supergravity corrections. We discuss strategies to overcome this problem and how they can be applied to classes of inflationary models. In this context, we also propose a new class of models, referred to as tribrid inflation, which is particularly suitable for solving the η-problem using either a Heisenberg symmetry or a shift symmetry of the Kaehler potential.

VII. Standard Model Electroweak Physics / 850

Multi-jet processes at NLO

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In this talk, we report on a recent next-to-leading order QCD calculation of the production of a W boson in association with three jets at hadron colliders. The computation is performed by combining two programs, BlackHat for the computation of the virtual one-loop matrix elements and Sherpa for the real emission part.

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Multiplicity fluctuations in high-energy nuclear collisions as signature of the temperature fluctuations

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Recently experiments in high-energy nuclear collisions have observed fluctuations of multiplicity which exhibit spectacular and unexpected features as functions of the number of participants (in particular they show that the scaled variance of the multiplicity distribution, Var(N)/, increases when proceeding from the central towards peripheral collisions, i.e., when the number of participants decreases. None of the present models can account for the experimental results. In [1] we have described the observed behavior without resorting to any specific dynamical picture but, instead, by attributing it to some nonstatistical,intrinsic fluctuations existing in a hadronizing system

produced in high energy heavy ion collisions. To account for such fluctuations we propose
to use a special version of statistical model based on nonextensive Tsallis statistics in which fluctuations of the temperature are known to be directly connected with the nonextensivity parameter q, with |q-1| being a direct measure of fluctuations, namely q = 1 + Var(1/T)/<1/T>^2 (in the limit of vanishing fluctuationsfor, q -> 1, one recovers the usual Boltzmann-Gibbs
statistical approach). We evaluate the nonextensivity parameter q and its dependence on the hadronizing system size from the experimentally observed collision centrality dependence of the mean multiplicity, , and its variance,
Var(N). We attribute the observed system size dependence of q to the finiteness of the hadronizing source with q = 1 corresponding to an infinite, thermalized source with a fixedtemperature, and with q > 1 (which is observed)
corresponding to a finite source in which both the temperature and energy fluctuate.

[1] G.Wilk and Z.Wlodarczyk, arXiv:0902.3922[hep-ph] (to be published in Phys. Rev. C).

IV. Detectors (LHC and R&D) and Accelerators / **799**

Muon Reconstruction and Identification in CMS

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Muonic final states will provide clean signatures for many physics processes at the LHC. One of the main goals of the Compact Muon Solenoid (CMS) design is thus to ensure efficient and accurate identification and reconstruction of muons. A sophisticated muon system is used for muon identification and stand-alone reconstruction and the inner silicon tracker exploits the high magnetic field to ensure a very precise transverse momentum resolution. The global reconstruction algorithms combine muons reconstructed in the dedicated spectrometer with tracks reconstructed in the inner detector. The CMS reconstruction software is well suited for both offline reconstruction and online event selection (HLT) and its performance has been studied in detail using Monte Carlo simulations. The muon reconstruction has also been employed successfully to reconstruct cosmic muons traversing the CMS detector. The design of the CMS muon identification and reconstruction is presented, as well as its performance on simulated and cosmic data.

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Muon identification algorithms in ATLAS

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In the midst of the intense activity that will arise from the proton-proton collisions at the LHC, muons will be very useful to spot rare events of interest. The good resolution expected for their momentum measurement shall also make them powerful tools in event reconstruction. Muon identification will thus be a crucial issue in the ATLAS experiment at the LHC. Their charged tracks can be reconstructed in the external spectrometer only, but the combination of such “stand-alone” tracks with tracks from the inner detector shall increase the precision and reliablilty of the reconstructed muon. This is particularly true in the lower part of the pT spectrum, where the inner detector is more performant. We will present here the various strategies for combined muon identification in the ATLAS experiment. The main algorithms, called Staco and Muid, perform the
combination of existing tracks in the inner detector and in the muon spectrometer,allowing the best

identification of muon tracks. Their efficiency is completed by muon tagging algorithms, which identify inner tracks as muons using raw information from the outer spectrometer; they are very useful for regions with limited detector coverage and for low energy muons. Finally, calorimeter tagging algorithms extract additional muon candidates from their minimum ionization deposits in the calorimeter cells. The performance of all those algorithms both on collisions simulation and cosmic data will be detailed, along with their latest developments aiming at first data at the end of 2009.

IV. Detectors (LHC and R&D) and Accelerators / **718**

NEXT: A Neutrinoless Double Beta Decay Experiment with a Gaseous Xenon TPC

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NEXT (Neutrino Experiment with a Xenon TPC) is a double beta experiment aiming to explore the degenerated hierarchy, with a sensitivity better than 100 meV. To do this the NEXT collaboration is planning to build a high pressure xenon TPC of about 100 kg, operated in the underground lab Canfranc. The advantage of a gaseous TPC is that it provides not only a good energy resolution but measuring in addition the event topology provides additional background suppression. The baseline design foresees to operate the detector with an electroluminescence readout which provides the best energy resolution achievable in pure xenon at high pressures. While the energy measurement is planned to be done with a few hundred PMTs, one of the challenges is to develop a UV light readout system for the tracking.
In the presentation the detector concept and the R&D status will be presented.

VII. Standard Model Electroweak Physics / **844**

NLO QCD calculations with the OPP method

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We report on recent progress on NLO QCD calculations using the
OPP method. The method gives a complete description of the one-loop matrix element.
We will also discuss the development of the programmes, HELAC-1L and HELAC-DIPOLES that allow for a fully numerical evaluation of NLO QCD corrections.

VII. Standard Model Electroweak Physics / **378**

NNLL Electroweak Corrections to Gauge Boson Pair Production at LHC

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The high energy behaviour of electroweak corrections to gauge boson pair production at LHC is presented. Using the evolution equation approach, the logarithmically enhanced contributions up to NNLL to all order in perturbation theory are derived. On the basis of this result the two-loop NNLL for partonic and hadronic cross section are obtained. Explicit results for W-pair production are presented.

VII. Unified Theories, Strings, Non-perturbative QFT / 449

Neutralino Dark Matter and Collider Signal in an SO(10) model with Two-step Intermediate Scale Symmetry Breaking

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We investigate phenomenology of an SO(10) model which features two-step intermediate scale symmetry breaking, $SO(10) \to SU(4)_C \times SU(2)_L \times SU(2)_R \to SU(3)_C \times U(1)_{B-L} \times SU(2)_L \times SU(2)_R \to SU(3)_C \times SU(2)_L \times U(1)_Y$. We compare the low energy phenomenology of our model to mSUGRA with scalar masses, gaugino masses and trilinear couplings, which are assumed to be universal at the GUT scale. And finally, we show the direct and indirect detection rates for neutralino dark matter in our model, as well as collider signals at LHC.

Plenary Session 4 / 964

Neutrino physics

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VI. QCD in Hadronic Physics / 781

New Hadroproduction results from the HARP/PS214 experiment at CERN PS

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(HARP Collaboration)

Measurements of the double differential charged pion cross sections from incident pions, protons in the momentum range 3-12 GeV/c on thin nuclear targets (Be, N2, O2, Al, Cu, Sn, Ta, Pb) are presented. Results are compared with the GEANT4 and MARS MonteCarlo generators.

Plenary Session 2 / **938**

New Physics searches

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New data for the comprehension of the LSND anomaly

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The so-called 'LSND anomaly', a 3.8 \sigma excess of \nuebar events, resulted in many theoretical speculations. The interpretation by the LSND authors that the anomaly originates from \numubar->\nuebar oscillation, is inconsistent with the recent findings of the MiniBooNE Collaboration. We present a critical assessment of the prediction of the neutrino fluxes that were used in the analysis of the LSND experimental data, which possibly can shed light on the anomaly. Our appraisal is based on the pion spectra measured with the HARP large-angle spectrometer under conditions that closely reproduce the LSND situation: a proton beam with 800 MeV kinetic energy bombarding water and copper targets.

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New developments in data-driven background determinations for SUSY searches in ATLAS

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Any discovery of new physics relies on detailed understanding of the Standard Model background. At the LHC, we expect to extract the backgrounds from the data itself, with minimum reliance on Monte Carlo simulations. We describe new developments in ATLAS on such data-driven techniques, and prospects for their application on first data.

II. Flavour Physics / **478**

New physics sensitivity of the rare decay mode $B \to K^0 \ell^- \; ell^+$

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We design new observables available from the angular distributions of the decay $B \to K^0 ell^- ell^+$ with high sensitivity to specific new phsyics operators.
We present a NLO analysis of all observables based on the QCD factorization approach in the low-dilepton mass region and make the uncertaintities due to the Λ/m_b corrections manifest and finally analyse the sensitivity of the new observables to new physics.
We explore the experimental sensitivities at LHCb and SuperLHCb based on a full-angular fit method. We also show that the previously discussed transversity amplitude AT_1 cannot be measured at the LHCb experiment or at future B factory experiments as it requires a measurement of the spin of the final state particles.
We also analyse CP violating observables in this decay mode and critically discuss their sensitivity to new physics.

VI. QCD in Hadronic Physics / 802

New results on quark helicity distributions and gluon polarization from the COMPASS experiment at CERN

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The new results on quark helicity distributions and on gluon polarization Delta_G/G from the COMPASS experiment will be presented. COMPASS is polarized DIS experiment using polarized muons with an energy of 160 GeV scattered off a polarised deuteron and proton targets. Quark helicity distributions are obtained from inclusive and semi-inclusive reactions from 2002-2004 and 2006 deuteron data and from 2007 proton data. The gluon polarisation Delta_G/G is determined from photon-gluon fusion (PGF)events. Two methods based on LO QCD approximation are used to extract PGF events: the selection of open-charm events via observation of D0 and D* mesons or a pairs of high-pT hadrons. The open-charm result is obtained from the data collected in 2002-2006 and it is updated with additional charm contributions. For these contributions a new method of the signal strength parameterization based on a neural network classification is used. The high-pT hadron pair result is obtained from 2002-2004 data using a new method of accounting for background processes.

Plenary Session 4 / 943

New theories for the Fermi scale

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Plenary Session 1 / 957

Non-perturbative Field Theory

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II. Flavour Physics / 542

Nonleptonic charmless B_c decays and their search at LHCb

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We discuss the decay of B_c mesons into two light (pseudoscalar and vector) mesons. All these decay channels come from a single type of diagram, namely tree annihilation which allows us to derive simple relations among these processes. The size of annihilation contributions is an important issue in B physics, and we provide two different estimates in the case of non-leptonic charmless B_c decays, either a comparison with annihilation decays of heavy-light mesons or a perturbative model inspired by QCD factorisation. We finally discuss a possible search for these channels at LHCb.

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Nonphotonic electrons at RHIC within the kt-factorization approach

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Recently the PHENIX and STAR collaborations at RHIC have measured transverse momentum distribution of so-called nonphotonic electrons.
They have measured the total charm and bottom production cross-section for p+p and Au+Au collisions at 200 GeV. The dominant contribution to the nonphotonic electrons/positrons comes from the semileptonic decays of charm and beauty mesons.
In the first step of our approach the single particle spectra of heavy quarks and antiquarks are obtained assuming gluon-gluon fusion and quark-antiquark annihilation in the k_t-factorization approach. To obtain the single particle spectra of mesons from those of quarks/antiquarks a standard hadronization procedure with Peterson and Braaten et al. fragmentation functions are applied.
We find the semileptonic decay functions by fitting to recent data of the CLEO and BABAR collaborations. We have calculated inclusive spectra of nonphotonic electrons/positrons for RHIC energy.We have concentrated on the dominant gluon-gluon fusion mechanism and used two recent

unintegrated gluon distribution functions from the literature. Special emphasis was devoted to the Kwieciński unintegrated gluon (parton) distributions. In this formalism, using unintegrated quark and antiquark distributions, one can calculate in addition the quark-antiquark annihilation including transverse momenta of initial partons (quarks/antiquarks). In addition, we have used unintegrated gluon distributions constructed by Ivanov and Nikolaev to describe deep-inelastic data measured at HERA. We have compared results obtained in our approach with experimental data measured recently by the PHENIX
collaboration at RHIC. We get a reasonable description of the data at large transverse momenta of electrons/positrons. In the next step of our analysis, we have calculated the kinematic correlations between charged leptons from semileptonic decays as well as for the Drell-Yan process based on unintegrated parton distributions. This includes correlation in azimuthal angle between charged leptons and correlations in transverse momenta of the leptons.

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Normal galaxies... in the infrared: AKARI Deep Field South data identifications and spectral energy distributions.

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AKARI is the first satellite dedicated to survey the entire sky in near-, mid- and far- infrared wavelenghts at the same time with un unpecedented agular resolution to investigate the evolution of star-forming galaxies, the large-scale structure of the Universe, and the cosmic infrared background radiation.

Our main goal is to identify the detected sources from the AKARI Deep Field South (one of the deep fields close to the Ecliptic Pole) in all available wavelengths to build a catalog and to construct spectral energy distributions (SEDs). The unique property of the ADFS is that the cirrus emission density is the lowest in the whole sky, i.e., the field is the most ideal sky area for far-infrared (FIR) extragalactic observations.

To find counterparts of AKARI sources we searched public databases (NED, SIMBAD and others). Checking 480 sources brighter than 500 Jy in the Wide-S band (90 um), we found 114 sources with possible counterparts, among which 78 were known galaxies. We present these sources as well as our first attempt to construct SEDs for the most secure and most interesting sources among them, including all the known data together with the AKARI measurements in four bands.

VII. Standard Model Electroweak Physics / 172

Observation of Single Top Quark Production with the D0 Detector

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We report first observation of the electroweak production of single top quarks in ppbar collisions at sqrt(s) = 1.96 TeV based on 2.3 fb^-1 of data collected by the D0 detector at the Fermilab Tevatron Collider. Using events containing an isolated electron or muon and missing transverse energy, together with jets originating from the fragmentation of b quarks, we measure a cross section of sigma(ppbar -> tb + X, tqb + X) = 3.94 +- 0.88 pb. The probability to measure a cross section at this value or higher in the absence of signal is 2.5 x 10^-7, corresponding to a 5.0 standard deviation significance for the observation.

VII. Standard Model Electroweak Physics / **829**

Observation of single top at CDF

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We present observation of electroweak single top quark production using 3.2 fb-1 of data collected by the CDF experiment. Candidate events are selected for further classification by five parallel analysis techniques: one using a likelihood discriminant, one using a matrix-element discriminant, one using decision trees, one using a neural network, and one using a complementary dataset. The results of these analyses are combined in order to improve the expected sensitivity. The signicance of the observed data is 5.0 standard deviations, and the expected sensitivity is in excess of 5.9 standard deviations. We also present the most current value of the CKM matrix
element Vtb. Finally we present the most precise results on a separate search for s-channel and t-channel single top quark production at CDF.

II. Flavour Physics / **145**

Observation of the Doubly Strange b Baryon Omega-_b with the D0 Detector

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We report the first observation of the doubly strange b baryon Omega-_b in the decay channel Omega-_b to J/psi Omega-, with J/psi to mu+ mu- and Omega- to Lambda K- to (p pi-)K- in ppbar collisions at sqrt{s} = 1.96 TeV. Using approximately 1.3 fb-1 of data collected with the D0 detector at the Fermilab Tevatron Collider, we observe a signal with 5.4 sigma.

I. Astroparticle Physics / **852**

Observations of High Energy Cosmic Ray Electrons by the ATIC Balloon Experiment

Authors: Jin Chang[1] ; Wu J.[1]

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Recently the Advanced Thin Ionization Calorimeter (ATIC) balloon experiment reported observations of high energy cosmic ray electrons over the energy range 300 to 800 GeV, indicating a feature in the otherwise smoothly decreasing energy spectrum. ATIC has had three successful high altitude flights over the continent of Antarctica 2000-2001, 2002-2003 and 2007-2008. During this talk we will discuss the ATIC experiment, the electron observations (including preliminary results from the most recent ATIC flight), examine the merits of the various source models and compare the ATIC observations with other recent measurements.

Plenary Session 1 / **946**

Observing signatures of Cosmic Rays using high-energy gamma-ray telescopes

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V. QCD at Colliders / **100**

On qualitative aspects of the choice of factorization schemes at NLO

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Although the choice of a factorization scheme is as important as the choice of a factorization scale, the dependence of theoretical predictions (at finite order) on the choice of a factorization scheme has been little investigated. This is due to the fact that the freedom in the choice of a factorization scheme is enormous, even at NLO. Every factorization scheme can be unambiguously specified by the corresponding higher order splitting functions, which can be chosen at will. However, in practice not all possible choices provide reasonable predictions at NLO. The NLO splitting functions that correspond to an applicable factorization scheme should satisfy some nontrivial conditions, which can be easily formulated in the space of Mellin moments. If these conditions are not satisfied, then the corresponding parton distribution functions diverge for low x as x^xi with xi=-4.63 for nf=3 and xi=-3.85 for nf=4 where nf is the number of active flavours. This occurs even if the NLO splitting functions have better low x behaviour than the LO ones. The NLO hard scattering cross-sections

behave for low x in a similar way as the parton distributions. It is likely that in such a factorization scheme the cancellation between large negative and positive numbers in expressions for physical quantities is incomplete at NLO and the obtained results are thus unreasonable. An example of a factorization scheme which appears at first sight as applicable but which does not satisfy the conditions is the factorization scheme in which all NLO splitting functions vanish and which would thus be otherwise optimal for generating NLO initial state parton showers, because in this scheme the NLO initial state parton showers are formally identical to the LO ones. It is worth mentioning that the conditions give no restriction on non-singlet splitting functions.

I. Neutrino Physics / 559

On the Interplay Between the 'Low' and 'High' Energy CP-Violation in Leptogenesis.

Authors: Emiliano Molinaro[1] ; Serguey Petcov[1]

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We analyse within the "flavoured" leptogenesis scenario of baryon asymmetry generation, the interplay of the "low energy" CP-violation, originating from the PMNS neutrino mixing matrix U, and the "high energy" CP-violation which can be present in the matrix of neutrino Yukawa couplings, λ, and can manifest itself only in "high" energy scale processes. The type I see-saw model with three heavy right-handed Majorana neutrinos having hierarchical spectrum is considered. The "orthogonal" parametrisation of the matrix of neutrino Yukawa couplings, which involves a complex orthogonal matrix R, is employed. In this approach the matrix R is the source of "high energy" CP-violation. Results for normal hierarchical (NH) and inverted hierarchical (IH) light neutrino mass spectrum are derived in the case of decoupling of the heaviest RH Majorana neutrino. It is shown that taking into account the contribution to Y_B due to the CP-violating phases in the neutrino mixing matrix U can change drastically the predictions for Y_B, obtained assuming only "high energy" CP-violation from the R-matrix is operative in leptogenesis. In the case of IH spectrum, in particular, there exist significant regions in the corresponding parameter space where the purely "high energy" contribution in Y_B plays a subdominant role in the production of baryon asymmetry compatible with the observations.

Plenary Session 1 / 1011

Opening

chair man: Per Osland

Joint EPS - EFCA meeting / 1023

Overall discussion and concluding remarks

I. Astroparticle Physics / 757

PAMELA and Fermi-LAT data as backgrounds for future dark matter searches

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The recent data from PAMELA and Fermi-LAT can be interpreted as evidence of new astrophysical sources of high energy positrons. In that case, such astrophysical positrons constitute an additional background against the positrons from dark matter annihilation. In this paper, we study the effect of that background on the prospects for the detection of a positron dark matter signal in future experiments. In particular, we determine the new regions in the (mass, sigmav) plane that are detectable by the AMS-02 experiment for several dark matter models. In spite of the larger background, we find that these regions are not that different from those obtained for the conventional background model. That is, an astrophysical explanation of the present data by PAMELA and Fermi-LAT implies that the detection of positrons from dark matter annihilation is only slightly more challenging than previously believed.

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Pade approximation and non-singlet structure function up to N^3LO

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We present the results of our QCD analysis for nonsinglet unpolarized quark distributions and structure function F_2(x,Q^2) up to NNNLO using the Pade approximation. New parameterizations are derived for the nonsinglet quark distributions for the kinematic wide range of x and Q^2. The analysis is based on the Jacobi polynomials expansion of the structure function. The higher twist contributions of proton and deuteron structure function are obtained in the large x region. Our calculations for nonsinglet unpolarized quark distribution functions based on the Jacobi polynomials method are in good agreement with the other theoretical models. The values of Lambda_{QCD} and \alpha_s(M_z^2) are determined.

VI. QCD in Hadronic Physics / 975

Particle spectra at ZEUS

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The charged multiplicity distributions and the mean charged multiplicity have been investigated in inclusive neutral current deep inelastic ep scattering with the ZEUS detector at HERA using an integrated luminosity of 38.6 pb-1. The measurements were performed in the current region of the Breit frame, as well as in the current fragmentation region of the hadronic centre-of-mass frame. The KNO-scaling properties of the data were investigated and the energy dependence was studied using different energy scales. The data are compared to results obtained in e+e- collisions and to previous DIS measurements as well as to leading-logarithm parton-shower Monte Carlo predictions.

The scaled momentum distributions of charged particles in jets have been measured for dijet photoproduction with the ZEUS detector at HERA using an integrated luminosity of 359 pb-1. The distributions are compared to predictions based on perturbative QCD carried out in the framework of the modified leading-logarithmic approximation (MLLA) and assuming local parton-hadron duality (LPHD). The universal MLLA scale, Lambda_eff , and the LPHD parameter, k^ch , are extracted.

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Parton transversity distribution in the pion from chiral quarks

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Parton transversity distribution in the pion is calculated in the framework of chiral quark models. The results for the corresponding form factors are compared to the recent data from lattice QCD and agreement is found. It shows, together with the previous predictions of these models for such quantities as the parton distribution function, distribution amplitudes, generalized parton distributions, etc., that the chiral dynamics can be reliably used to provide a link between the low- and high-energy processes.

VII. Unified Theories, Strings, Non-perturbative QFT / 64

Patterns of High energy Massive String Scatterings in the Regge Regime

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We calculate high energy massive string scattering amplitudes of open bosonic string in the Regge regime (RR). We found that the number of high energy amplitudes for each fixed mass level in the RR is much more numerous than that of Gross regime (GR) calculated previously. Moreover, we discover that the leading order amplitudes in the RR can be expressed in terms of the Kummer function of the second kind. In particular, based on a summation algorithm for Stirling number identities developed recently, we discover that the ratios calculated previously among scattering

amplitudes in the GR can be extracted from this Kummer function in the RR. We conjecture and give evidences that the existence of these GR ratios in the RR persists to subleading orders in the Regge expansion of all string scattering amplitudes. Finally, we demonstrate the universal power-law behavior for all massive string scattering amplitudes in the RR.

IV. Detectors (LHC and R&D) and Accelerators / 693

Perforamnce of the ALIBAVA portable readout system with irradiated and non-irradiated microstrip silicon sensors

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A readout system for microstrip silicon sensors has been developed as a result of collaboration among the University of Liverpool, the CNM of Barcelona and the IFIC of Valencia. The name of this collaboration is ALIBAVA and it is integrated in the RD50 Collaboration. This system is able to measure the collected charge in one or two microstrip silicon sensors by reading out all the channels of the sensor(s), up to 256, as an analogue measurement. The system uses two Beetle chips to read out the detector(s). The Beetle chip is an analogue pipelined readout chip used in the LHCb experiment. The system can operate either with non-irradiated and irradiated sensors as well as with n-type and p-type microstrip silicon sensors. Heavily irradiated sensors will be used at the SLHC, so this system is being to research the performance of microstrip silicon sensors in conditions as similar as possible to the SLHC operating conditions.

The system has two main parts: a hardware part and a software part. The hardware part acquires the sensor signals either from external trigger inputs, in case of a radioactive source setup is used, or from a synchronised trigger output generated by the system, if a laser setup is used. This acquired data is sent by USB to be stored in a PC for a further processing. The hardware is a dual board based system. The daughterboard is a small board intended for containing two Beetle readout chips as well as fan-ins and detector support to interface the sensors. The motherboard is intended to process the data, to control the whole hardware and to communicate with the software by USB. The software controls the system and processes the data acquired from the sensors in order to store it in an adequate format file.

The main characteristics of the system will be described. Results of measurements acquired with n-type and p-type irradiated and non-irradiated detectors using both the laser and the radioactive source setup will be also presented and discussed.

IV. Detectors (LHC and R&D) and Accelerators / 1004

Performance of The ATLAS Muon Spectrometer During the Commissioning

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The ATLAS detector has been operated for several months.
Its very large Muon Spectrometer includes four different technology chamber types. It should provide muon trigger up to pseudo-rapidity of 2.4 and track reconstruction with a nominal standalone momentum resolution around 10% for particles of 1 TeV.

The Muon system, while still in completion, has undergone an intense program of commissioning, ranging from understanding the status of each single chamber to study the performance of the whole system. The data source, besides a few days with LHC single beam, mainly relied on cosmic rays. Several preliminary results relevant to the muon trigger and reconstruction performance will be analyzed.

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Performance of the missing transverse energy measurement with the ATLAS detector in commissioning data

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The measurement of the missing transverse momentum in events produced in proton- proton collisions is an important ingredient in the physics program of LHC. In 2008 the Atlas detector has been operated to commission and integrate the individual sub-detectors and a large data-set of millions of events has been recorded. It has been shown that the noise in more than 200000 cells in the ATLAS calorimeter does not introduce a significant bias in the measurement of the scalar and vectorial transverse energy. Moreover, the noise in the Atlas liquid argon calorimeter is compatible with the expectation for uncorrelated Gaussian noise. Also large energy deposits of several TeV in the Atlas calorimeters have been analyzed. It is shown that the transverse momentum spectrum of these high energy depositions can be explained by photons radiated from high energetic muons produced in cosmic rays. Furthermore it is investigated how energy depositions induced by cosmic rays can be rejected based on jet properties. This study shows that ATLAS is well prepared to analyze first collision expected in autumn of 2009.

III. Higgs and New Physics / 52

Phenomenology of the minimal B-L extension of the Standard model

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We present the Large Hadron Collider (LHC) discovery potential in the Z' and heavy neutrino sectors of a $U(1)_{B-L}$ enlarged Standard Model also encompassing three heavy Majorana neutrinos. This model exhibits novel signatures at the LHC, the most interesting arising from a Z' decay chain involving heavy neutrinos, eventually decaying into leptons and jets. In particular, this signature allows one to measure the Z' and heavy neutrino masses involved. In addition, over a large region of parameter space, the heavy neutrinos are rather long-lived particles producing distinctive displaced vertices that can be seen in the detectors. Lastly, the simultaneous measurement of both the heavy neutrino mass and decay length enables an estimate of the absolute mass of the parent light neutrino. For completeness, we will also compare the LHC and future LCs discovery potentials.

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Photon Reconstruction and Identification with the ATLAS Detector

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The understanding of the reconstruction of photons will be one of the key issues at the start-up of data-taking with the ATLAS experiment at the LHC in 2009. Large statistics of photons produced in association with jets are expected over a wide range of ET, from 20 GeV to several hundred GeV. These will be used as an important in situ calibration tool for the jet energy scale.

The energy measurement of unconverted photons is based on the electromagnetic calorimetry over the full relevant energy range (10 GeV to a few TeV). The electromagnetic calorimeter cluster algorithm starting from electronically calibrated calorimeter cells will be described. Local position and energy variations are corrected for. A refined calibration procedure, developed and validated over years of test-beam data-taking and analysis, strives to identify all sources of energy losses upstream of the calorimeter and outside the cluster and corrects for them one by one (using Monte-Carlo). Unconverted photons require a specific calibration depending on the conversion radius to reach the optimal linearity and resolution.

The construction tolerances and the calibration system ensure that the calorimeter response is locally uniform to ~ 0.5%.
Z to ee events, using the precisely known Z-boson mass as a constraint, will be used for in-situ calibration to achieve the desired global constant term of 0.7%. To achieve this the material in front of the calorimeter will have to be mapped out precisely using other methods, one of which involves low-energy photon conversions.

The photon reconstruction is based on a calorimeter-seeded algorithm which classifies as photons those candidates which have no matching prompt track. These are subdivided into unconverted photon candidates without any matching conversion candidate and converted photon candidates, which contain one or more matching conversion candidates.
The reconstruction of converted photons will be described and the expected efficiency versus conversion radius will be presented. Converted photons can provide further discrimination against the residual background from hadronic jets which consists mostly of isolated pi0's.

The photon identification is based almost exclusively on the shower shapes in the calorimeter. The goal is to achieve the required rejection of $10^3 - 10^4$ against QCD jets in the moderate pT region of 20 to 100 GeV, which is the relevant one for Higgs to gamma-gamma searches. The photon identification methods and their performance will be discussed. While the baseline identification will rely initially on simple cut-based analyses, powerful multivariate techniques, such as LogLikelihood and the H-matrix, have also been explored and the gain expected from them has been quantified.

VI. QCD in Hadronic Physics / 681

Physics with the KLOE2 experiment at the phi factory

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We report on the most debated issues which experimentation at the phi factory can really shed light on with a short-term program of measurements.

Recent, very promising improvements in the lattice-QCD calculations call for new precision measurements in the Kaon sector to obtain more stringent results on CKM Unitarity and Lepton Flavour Universality.
Neutral Kaon Interferometry can probe Discrete Symmetries, but also Quantum Mechanics at the Planck scale. Current limits obtained by KLOE can be overcome by both, the increase in statistics, and the upgrade of the tracking system with an inner GEM chamber for improving vertex resolution near the beam interaction region.
One possible solution to the Dark Mass problem, allowing also to interpret the positron excess measured by the satellite Payload experiment PAMELA, suggests a "dark" sector that can really be constrained by the experiments at the Kaon and B-Factories.
Low energy QCD phenomenology can receive an important contribution from the
new measurements of radiative and non-leptonic decays of K, eta and eta' mesons.
Finally, important results on the physics in the continuum can be achieved by new measurements of the hadronic cross section and the study of gamma-gamma processes. Improvements on hadronic cross section at low energy are needed to understand the 3-sigma effect on (g-2)*{mu} and for precision determination of alpha*{em} at the TeV scale while the analysis of the gamma-gamma sample impacts scalar spectroscopy and the underlying physics but also the light-by-light
hadronic contribution to (g-2)_{mu}.

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Pion Production Measurement in NA61/SHINE Experiment for High Precision Neutrino Oscillation Experiments

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Tomasz Jan Palczewski, for the NA61 Collaboration:

In this talk I will present preliminary results from a fixed target experiment NA61/SHINE at the CERN SPS. One of physics goals of the NA61 experiment is a measurement of hadron production cross sections from proton-Carbon interactions at 31GeV/c for the T2K experiment at J-PARC. A better knowledge of differential cross sections for pion and kaon production is of importance for improving the accuracy of neutrino flux simulations. The performance of the NA61 detector will be discussed. It will be shown that our detector has a large acceptance, good particle identification, and full coverage of the T2K phase space region. The event reconstruction efficiency, acceptance corrections, and identification methods used will be discussed. Finally, preliminary NA61 differential cross section d2 sigma / dp dTheta for pions production from proton interactions on a thin carbon target will be presented.

V. QCD at Colliders / 563

Pomeron Odderon interference in production of pi-pi pairs at LHC

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The experimental evidence for Odderon exchange processes is still weak.
In this talk, we will show that the Odderon could be observed by
interference effects with the Pomeron in charge asymmetries in the production of two pion pairs.
After discussing the theoretical framework for our calculation
based on high energy factorization and the necessary phenomenological input,
the calculation of the charge asymmetry and its result will be presented.
We will conclude with a discussion of experimental rates to be expected in
ultra-peripheral collisions at the LHC

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Precision Measurement of Photon Emission in K+- -> pi+- pi0 gamma Decays

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We report our final result on the measurement of direct photon emission
(DE) in the decay K+- -> pi+- pi0 gamma and its interference (INT) with
the inner bremsstrahlung amplitude. For this measurement the full NA48/2
data set with about 600k reconstructed K+- -> pi+- pi0 gamma decays was
analyzed, which is factor of 30 larger than for previous experiments and
a factor of three w.r.t. our preliminary result.
From this, the sizes of both the DE and the INT amplitudes have been
measured with high precision, with the INT amplitude being observed for
the first time. In addition, the CP violating asymmetry between K+ and K- has been
obtained to be less than 10^3 in this channel.

II. Flavour Physics / 763

Precision measurements of rare kaon decays

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We report the latest results on rare kaon decays from NA48/2 experiment. Samples of 7200 reconstructed K+- -> pi+- e+ e-, and more than 3000 K+- -> pi+- mu+ mu- events, with very small background contamination, have been collected. The latter is exceeding the total existing statistics by a factor of five. A precise measurement of the branching fractions and the form factors of the rare decays K+- -> pi+- l+ l- has been performed using different theoretical models.
The precise measurement of direct photon emission (DE) in the decay K+- -> pi+- pi0 gamma and its interference (INT), with the INT amplitude being observed for the first time, has been finalized. This study is based on the full NA48/2 data set with about 600k reconstructed K+- -> pi+- pi0 gamma decays which is factor of 30 larger than for previous experiments. We report the results on the CP violating asymmetry between K+ and K- obtained from rare kaon decays.

V. QCD at Colliders / **935**

Preliminary Results on Multiple Parton Interactions from HERA and TEVATRON

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Photoproduction data of HERA are analyzed by requiring dijets with transverse momenta of at least 5 GeV. The two jets define in azimuth a towards region (leading jet) and an away region (2nd jet) and transverse regions between them. The charged particle multiplicity is measured in these regions as a function of the variables x_{gamma} and pT_{leading jet}. Models which include contributions of multiparton interactions are able to describe the measurement, whereas predictions without them lie below the measurements, especially at low x_{gamma}, the region of enhanced contributions from the resolved photon.
Double parton (DP) interactions in “gamma + 3 jet” events in p-pbar collisions at sqrt{s}=1.96TeV are studied basing on the sample of “gamma + 3jet” events collected in the D0 experiment with an integrated luminosity of 1fb^{-1}. The fraction f{DP} of the events with double parton scattering is determined. The events are selected with photon candidate transverse momentum 60 < pT^{gamma} < 80 GeV. The leading jet pT ^{jet} > 25 GeV and two additional jets with pT > 15 GeV. The values of f{DP} are measured in three intervals of the transverse momentum pT^{jet2} of the second jet which spans the range of 15 - 30 GeV. It is found that the f{DP}fractions drop with increasing of pT^{jet2}. The effective cross section sigma_{eff} (a process-independent parameter which contains an information about the parton density inside the proton and about the parton correlations) is calculated in the same three pT^{jet2} intervals. The average value over these three pT^{jet2} intervals is sigma_{eff}^{aver} = 15.1 +/- 1.9 mb.

Plenary Session 1 / **1012**

Prize Ceremony

Plenary Session 1 / **1013**

Prize Winners

II. Flavour Physics / **94**

Probing New Physics in exclusive b -> s l+ l- and b -> s nu anti-nu decays

Authors: Andrzej Buras[1] ; Aoife Bharucha[2] ; David Straub[1] ; Michael Wick[1] ; Patricia Ball[2] ; Wolfgang Altmannshofer[1]

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The rare decay B -> K*l+ l- gives access to many angular observables that offer new important tests of the Standard Model and its extensions. We present a detailed study of these observables and point out a number of correlations which will allow a clear distinction between different New Physics scenarios. Furthermore, we discuss the decays B -> K* nu anti-nu, B -> K nu anti-nu and B -> X(s) nu anti-nu, which allow a transparent study of Z penguin physics. We study all observables accessible in these decays in the context of the Standard Model and various New Physics models.

IV. Heavy Ions / **42**

Probing charm production in high-energy nuclear collisions

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Lattice QCD predicts that, above a certain critical energy density or temperature, strongly interacting matter undergoes a phase transition from the hadronic world to a quark-gluon plasma state, where the colored quarks and gluons are no longer bound to colorless hadrons.
The suppression of quarkonium production in high-energy nuclear collisions is one of the most interesting signatures of QGP formation, for two reasons: due to their large masses, charm and beauty quarks are created only in the initial hard scattering processes, before the QGP is formed; and the Q-Qbar binding potential should be screened in the deconfined color medium.
Until the LHC starts colliding Pb nuclei, charm is the heaviest quark that can check the validity of the finite temperature QCD predictions, given the much smaller beauty production cross sections. However, the interpretation of the presently available results on charmonium suppression, obtained at the SPS and RHIC, is hampered by a multitude of other "nuclear effects".
Measurements of the D meson production yield and its dependency on collision centrality and energy are very valuable in this context. In particular, the ratio between the J/psi and the DDbar production yields is insensitive to initial state effects, such as the very badly known nuclear modifications of the gluon distribution functions and the energy loss of the partons which interact to produce the c-cbar pair.
However, it is exceedingly difficult to reconstruct the hadronic decays of the D mesons in the high-density track environment of a high-energy nuclear collision. This explains why almost all available experimental data on charm production in heavy-ion collisions comes from studies of correlated semi-leptonic decays of pairs of charmed mesons.
This talk will review the available SPS and RHIC open charm measurements, expose the respective puzzles, and discuss some paths towards their solution.

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Probing low x with LHCb data

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We report on studies of low invariant mass Drell-Yan production in the LHCb experiment. Measurements of the Drell-Yan differential cross- section can probe values of x down to 10^-5. Strategies for triggering, selection, and background reduction are discussed. Estimated statistical and systematic errors are given as a function of Drell-Yan invariant mass. The sensitivity to uncertainties in parton density functions is discussed.

II. Flavour Physics / 450

Probing the MSSM flavor structure with low energy CP violation

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We present a systematic study of the low energy phenomenology of CP violation in b->s transitions within the MSSM. Allowing for the presence of new sources of CP violation, we discuss the Minimal Flavor Violation framework, scenarios with generic new flavor structures in the soft SUSY breaking sector and also setups where the quark and squark masses are determined by underlying flavor models. In particular, we address the question how large the New Physics contribution to CP violation in Bs mixing can be and we outline strategies to disentangle among the different SUSY scenarios by means of a correlated analysis of both DeltaF=1 and DeltaF=2 low energy observables.

I. Astroparticle Physics / 755

Probing the eV-mass range for solar axions with the CAST experiment

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The CERN Axion Solar Telescope (CAST) is searching for solar axions, which could be produced in the core of the Sun via the so-called Primakoff effect. For this purpose, CAST uses a decommissioned LHC prototype magnet. In its magnetic field of 9 Tesla axions could be reconverted into X-ray photons. The magnet is mounted on a structure built to follow the Sun during sunrise and sunset for a total of about 3 hours per day.
The analysis of the data acquired during the first phase of the experiment with vacuum in the magnetic field region yielded the most restrictive experimental upper limit on the axion-to-photon coupling constant for axion masses up to about 0.02 eV. In order to extend the sensitivity of the experiment to a wider mass range, the CAST experiment continued its search for axions with helium in the magnet bores. In this way it is possible to restore coherence for larger masses. Changing the pressure of the helium gas enables the experiment to scan different axion masses. In the first part of this second phase of CAST, helium-4 has been used and the axion mass region was extended up to 0.4 eV. Therefore the experiment enters the regions favored by axion models. In CAST's ongoing helium-3 phase the studied mass range is now further extended.
We will present the final results of CAST's helium-4 phase. Furthermore the latest upgrades of the experiments will be shown and an outlook on CAST's status and prospects will be given.

V. QCD at Colliders / 861

Prompt Photon Production in Deep Inelastic Scattering and Photoproduction at HERA

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Prompt-photon cross sections in deep inelastic ep scattering were measured with the ZEUS detector at HERA using an integrated luminosity of 320 pb-1. A clear signal for isolated photons in the photon transverse-energy and rapidity ranges 4 < E_T^gamma < 15 GeV and -0.7 < eta^gamma < 0.9 was observed for virtualities of the exchanged photon of Q^2 > 10 GeV^2. Measurements of differential cross sections are presented for inclusive prompt-photon production as a function of Q^2, x_Bj, E_T^gamma and eta^gamma. Perturbative QCD predictions are compared to the measurements.

The production of isolated photons in deep-inelastic scattering $ep \to e\gamma X$ is measured with the H1 detector at HERA. The measurement is performed in the kinematic range of negative four-momentum transfer squared 450 GeV. The
analysis is based on a total integrated luminosity of 227 pb^-1. The production cross section of isolated photons with a transverse energy in the range 3 < E_T^\gamma < 10 GeV and pseudorapidity range -1.2 < \eta^\gamma < 1.8 is measured as a function of E_T^\gamma, \eta^\gamma and Q^2. Isolated photon cross sections are also measured for events with no jets or at least one hadronic jet.
The measurements are compared with predictions from Monte Carlo generators modelling the photon radiation from the quark and the electron lines, as well as with calculations at leading and next to leading order in the strong coupling. The predictions significantly underestimate the measured cross sections.

A measurement of the production of prompt photons in photoproduction by the H1 experiment at HERA is presented. The analysis is based on the data taken in the years 2004-2007, with a total integrated luminosity of 340 pb^-1. Prompt photon cross sections are measured for photons with a transverse energy in the range 6 < E_T^gamma < 15 GeV and in the pseudorapidity range -1 < eta^gamma < 2.4. Cross sections for prompt photon events with an additional hadronic jet are measured as a function of the transverse energy and pseudorapidity of the jet and of the momentum fractions x_gamma and x_proton of the incident photon and proton, respectively, carried by the constituents participating in the hard scattering process. Additionally, the transverse correlation between the photon and the jet is studied. The results are compared with predictions of a next-to-leading order calculation and a calculation based on the k_T factorisation approach.

II. Flavour Physics / 900

Properties of heavy-flavoured baryons at CDF

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Presenter will be chousen

II. Flavour Physics / 820

Properties of heavy-flavoured hadrons at CDF

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We present recent CDF results on the properties of hadrons containing heavy quarks. These include a new measurement of the Bc production rate and updated measurement of B-hadron lifetimes.

IV. Heavy Ions / 195

Properties of the matter created in heavy ion collisions – results from the PHOBOS experiment

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In the collisions of ultrarelativistic heavy ions the energy of the nuclei is released in a small volume leading to the creation of a hot and dense nuclear matter. The study of the particles produced from it gives the information on the conditions in the early stage of the collision and the evolution of the system. The PHOBOS experiment provides unique data on the particle production in the almost full phase space and down to very small transverse momenta.

The talk will present an overview of recent results from the PHOBOS experiment. The extensive studies of charged particles production are based on the multiplicity measurements in a very wide pseudorapidity range and reveal strong short and long range correlations. Their dependence on the collision centrality for the two colliding systems: Au+Au and Cu+Cu is analyzed. In addition both the high and very low pT distributions, the particle ratios and elliptic flow results will be shortly presented.

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Properties of the top quark

Author: Collaboration CDF[1]

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More than a decade after its discovery we are still trying to find out more about the nature of the top quark. The current statistics of the Tevatron allow us to make stringent tests. In this talk we will present state of the art measurements of top quark properties. By studying rates and distributions sensitive to the production and decay mechanisms of top quarks, we can search for contamination from non-standard model particles, or subtle differences in the electroweak or strong interactions that govern top quark interactions. We will present the most recent and precise measurements of the properties of the top quark such charge, lifetime, width, and more done by the CDF experiment at Fermilab.

III. Higgs and New Physics / 789

Prospects for R-Parity Conserving SUSY searches at the LHC

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The talk will review the current strategies to search for generic SUSY models with R-parity conservation in the ATLAS and CMS detectors at the LHC. The discovery reach in early data will be presented for the different search channels based on missing transverse momentum from undetected neutralinos and multiple jets. The talk will also describe the search for models of gauge-mediated supersymmetry breaking for which the NLSP is a neutralino decaying to a photon and a gravitino. In this scenario, the search strategy exploits the distinct signature of a non-pointing photon. Finally, we will present recent work on techniques used to reconstruct the decays of SUSY particles at the LHC in early data, based on the selection of final-state exclusive decay chains.

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Prospects for SUSY discovery based on inclusive searches with the ATLAS detector at the LHC

Author: Di Ciaccio Anna[1]

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We present searches for generic SUSY models with R-parity conservation in the ATLAS detector at the LHC, based on signatures including missing transverse momentum from undetected neutralinos, multiple jets and leptons or b and tau jets. We show the corresponding discovery reach for early ATLAS data, including the effect of systematic uncertainties on the background estimate.

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Prospects for early discoveries at the LHC with dileptons, jets and no missing energy

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Final states with high pT leptons and jets, without missing energy, are predicted by several BSM models at the LHC, including LR symmetric models and Leptoquarks.
The prospects for an early discovery of particles predicted by these models, using the ATLAS experiment, are discussed. These particles include in particular first and second generation leptoquarks, right-handed W and heavy neutrinos.

Plenary Session 1 / 956

QCD - experiment

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V. QCD at Colliders / **780**

QCD Studies with W and Z Measurements at LHC

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Events containing W or Z bosons, with subsequent leptonic decays, are important channels to test the Standard Model. They will be copiously produced at the Large Hadron Collider (LHC). Identification of these events will probe QCD predictions for the associated production of W or Z bosons with one or more jets and will constrain the parton distribution functions of the proton through measurements such as the W charge asymmetry and the Z/gamma* rapidity distribution. Studies of the prospects for these measurements using the ATLAS and CMS detectors will be presented, with emphasis on the potential for the first years of LHC operation.

VI. QCD in Hadronic Physics / **561**

QCD factorization beyond leading twist in exclusive processes: rhoT-meson production

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Exclusive processes in hard electroproduction with asymptotic gamma*p center of mass energy is one of the best place for understanding QCD in the perturbative Regge limit.*
The HERA experiment recently provided precise data for rho electroproduction, including all spin density matrix elements. From QCD, it is expected that such a process should factorize between a hard (calculable) coefficient function, and hadronic (P and rho) matrix elements. Such a factorization is up to now only proven for a longitudinaly polarized rho. Within the kt-factorization approach (valid at large s_gamma p), we evaluate the impact factor of the transition gamma* -> rhoT taking into account the twist 3 contributions. We show that a gauge invariant expression is obtained with the help of QCD equations of motion.

More generally, relying on these equations and on the gauge invariance of the factorized amplitude, the non-perturbative Distribution Amplitudes can be reduced to a minimal set.
This opens the way to a consistent treatment of factorization for exclusive processes with a transversally polarized vector meson.

V. QCD at Colliders / **839**

QCD jets at LHC

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Jet production is the dominant process at the LHC. Studies of jet final states, over the full range of transverse momenta, are of great importance as they can serve to confront perturbative QCD calculations, test the extent to which partons are elementary, and investigate many interesting physics processes within and beyond the standard model. In this talk, we present the plans and prospects for QCD measurements at the ATLAS and CMS experiments. The kinematic reach and the expected statistical and systematic uncertainties for the early data will also be discussed.

VI. QCD in Hadronic Physics / **823**

QCD tests at NA48

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The NA48/2 experiment was originally constructed to measure CP violation in charged kaon sector, using simultaneous positive and negative kaon beams. Several charged kaon decay modes have been collected during two years of data taking. The kaon system is a unique laboratory in which study the dynamics of the QCD in low energy regime, with high statistics and precision. The pi-pi scattering close the threshold has been studied with unprecedented statistics, using more than one million K+- –> Pi+ Pi- e+- nu (Ke4) and the cusp structure in more than 60 million K+- –> pi+- pi0 pi0.
The S-wave scattering lengths a0 and a2 have been measured independently in these two modes allowing accurate tests of Chiral Perturbation Theory.
We also report on the measurement of the branching fraction of the decay K+- -> pi+- gamma gamma using more than 1000 reconstructed decays from the 2003 NA48/2 data set. The data statistics are about a factor of 30 larger than for any previous measurement. The spectrum of invariant gamma gamma mass shows the expected behaviour, being compatible with a decay parameter c^ of the order of 2.
In addition we report on the first measurement of the related decay K+- -> pi+- e+ e- gamma (with internal gamma conversion) branching fraction and the decay distribution, using 120 reconstructed K+- -> pi+- e+ e- gamma events from the complete NA48/2 data set.
Both measurements are in good agreement with the theoretical expectations from Chiral Perturbation Theory.

V. QCD at Colliders / **748**

QCD vs. MC: Drell-Yan pT distribution

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The parton shower algorithms sums up large logarithms. In general we can say that they are able to sum up the leading logarithmic contributions almost for all important quantities but we have less confidence when we want to say something about the next-to-leading logarithmic contributions. In this talk I will discuss a strategy how to validate parton shower algorithms against some know analytic result. I will focus on the Drell-Yan pT distribution since this is one of the most important non-trivial observable what can test the initial state shower in the Monte Carlo programs and it can provide some guidelines how to define modified leading order parton distribution functions for general purpose event generation.

II. Flavour Physics / 633

Quantum-correlated D Decays at CLEO-c

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The 818 fb-1 dataset collected at the psi(3770) resonance in the CLEO-c detector offers unique possibilities for measuring strong phase differences in neutral D decays. The measurements require that both D mesons in the event are fully reconstructed, usually with one decaying to the signal mode of interest, and the other to a CP eigenstate. The strong phase differences extracted from these decays are important inputs to measurements of D-mixing parameters and the determination of the CKM angle gamma in B –> DK decays. Results will be present from a variety of D decays including KSpipi, KSKK and other 3- and 4-body modes. The impact of these results on the measurement of the CKM angle gamma/phi3 will be discussed.

II. Flavour Physics / 562

Quark masses from low-energy moments of heavy-quark current correlators

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We present new results for the low-energy moments of heavy-quark current correlators. These new results can be used to improve the determination of the charm- and bottom-quark masses from experimental data of
R(s) or in case of the charm quark from comparison with lattice calculations. For the bottom quark we discuss the impact of new data from the Babar experiment.

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Quark-pair production in strong non-Abelian field

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We have investigated quark-pair production in the early stage of heavy ion collisions, especially the massive strange and charm quark-pair production. Our kinetic model is based on a Wigner function method for fermion-pair production in strong non-Abelian fields. To describe the overlap of two colliding heavy ions we have applied the time-dependent color field with a pulse-like shape. The calculations have been performed in an SU(2)-color model with finite current quark masses. For strange quark-pair production the obtained results are close to the Schwinger limit, as we expected. For charm quark the large inverse temporal width of the field pulse, instead of the large charm quark mass, determines the efficiency of the quark-pair production. Thus we do not observe the expected suppression of charm quark-pair production connecting to the usual Schwinger-formalism, but our calculation results in a relatively large charm quark yield. This effect appears in Abelian models as well, demonstrating that particle-pair production for fast varying non-Abelian gluon field strongly deviates from the Schwinger limit for very heavy quarks. We display our results on number densities for light, strange, charm quark-pairs, and different suppression factors as the function of characteristic time of acting chromo-electric field.

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R&D perspectives for new neutrino beams at accelerators

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This talk will review the current R&D effort towards new neutrino beams at accelerators, both superbeams and neutrino factory.
After a brief introduction on the physics reach, as compared to other ongoing projects, the critical R&D issues of targetry and muon cooling will be discussed.

IV. Detectors (LHC and R&D) and Accelerators / 119

Radiation-hard ASICS for sLHC optical data transmission

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High-speed data transmission in a high radiation environment poses an immense challenge in the detector design. We investigate the feasibility of using optical links for the silicon trackers of the ATLAS experiment for the planned upgrade of the LHC. The planned upgrade with ten times higher

collision rate will produce a similar increase in the radiation. One possibility for the optical transmission is to use VCSEL arrays operating at 850 nm to transmit optical signals while using PIN arrays to convert the optical signals into electrical signals.

We have designed a prototype chip containing building blocks for future SLHC optical links using a 130 nm CMOS 8RF process. The chip contains four main blocks; a VCSEL driver optimized for operation at 640 Mb/s, a VCSEL driver optimized for 3.2 Gb/s, a PIN receiver with a clock/data recovery circuit for operation at 40, 160, and 320 Mb/s, and two clock multipliers designed to operate at 640 Mb/s. The clock multiplier is designed to produce the high speed clock to serialize the data for transmission. All circuitry was designed following test results and guidelines from CERN on radiation tolerant design for the process.

We have irradiated the chips with 24 GeV protons at CERN. For the VDC, the duty cycle of the output signal and the current consumption of the LVDS receiver remained constant during the irradiation. However, we observed significant decreases in the current consumption of the VCSEL driver circuit and the output drive current. This indicated that the think oxide layout used in the VCSEL driver portion of the chip might not be as radiation-hard and the circuit had been redesigned to minimize this sensitivity. For the PIN receiver, we found that the radiation produced no significant degradation, including the single event upset rate. The upset rate decreased with larger PIN current and was higher for a chip coupled to a PIN diode as expected. For the clock multipliers, we observed that the clocks of some chips lost lock during the irradiation and power cycling was needed to resume operation at 640 MHz. We will present the results from the detailed characterization of the irradiated chips.

II. Flavour Physics / 875

Rare B meson decays involving leptons at BABAR

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presenters will be chousen

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Real time physics analysis with the ATLAs tau trigger system

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The scope of the ATLAS tau trigger system at the LHC is most ambitious. It aims at reconstructing in real time, a matter of seconds, a detailed picture of the high energy proton proton collisions at the LHC. Such system is mandatory in order to select efficiently data needed for discovery of new physics in a proton proton collision environment where the rates of jets observed in the detector are high and the tau identification is difficult. New physics scenarios targeted specifically by the the ATLAS tau trigger system are Standard Model or SuperSymmetric Higgs production, and production of new exotic resonances.

This contribution will detail how the analysis techniques developed offline for efficient data analysis have been implemented in the algorithms which run online at the trigger. In particular, the focus will be

on how to satisfy the requirements imposed by the physics goals while addressing the limitations from the overall event rate and latency allowed. The prospects for early running during the first LHC collisions and trigger evolution from first collisions to stable running will be also summarized, following change of trigger goals from commissioning of detector to measurement of Standard Model physics and discoveries.

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Realistic cross sections for exclusive rho^0 rho^0 production in ultrarelativistic heavy-ion collisions.

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Relativistic heavy-ion collisions at RHIC and LHC represent an intense source for photon induced processes. We present, calculated for the first time, realistic cross section for exclusive electromagnetic production of two neutral rho mesons in coherent photon-photon processes. We consider the process [A A ⟶ A rho^0 rho^0 A] in Au-Au collisions at sqrt(s_{NN})=200 GeV and Pb-Pb collisions at sqrt(s_{NN})=5500 GeV. For low-energy part of the elementary [gamma gamma ⟶ rho^0 rho^0] process, we use experimental data which were measured by several group at e^+ e^+ colliders, while for higher energy, we include a vector-dominance-model (VDM)-Regge contribution. The suggested model well describes the experimental data for W>~2.5 GeV.
To illustrate the sensitivity of our calculations on details of the nuclear form factor, we also compare realistic charge density with monopole and point-like form factors. The cross section is calculated in the equivalent photon approximation. We consider peripheral collisions so the impact parameter of the beam particles is larger than the sum of their nuclear radii. Our estimates include the presence of the absorption effects. Finally, large cross section, of the order of fraction of milibarn, have been found. The bulk of the cross section is concentrated in low rho^0 rho^0 invariant masses.
The rho^0 mesons, decaying into pi^+ pi^-, could be measured by the STAR Collaboration at RHIC and ALICE Collaboration at LHC.

I. Astroparticle Physics / 656

Recent Results from WIMP-search analysis of CDMS-II data

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[2] _

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The Cryogenic Dark Matter Search experiment (CDMS-II), operated at Soudan Underground Laboratory, employs an array of germanium and silicon low-temperature particle detectors to identify nuclear recoils from elastic scattering of Weakly Interacting Massive Particles (WIMPs). These detectors record the phonon and ionization depositions of each particle impact, data which are used to discriminate WIMP candidates from electromagnetic background. CDMS-II has been operating with its full complement of detectors since October 2006, and has already published a world-leading limit on WIMP interactions from the first portion of this data set. I will present the current results of this search, including the status of our newest blind analysis of data acquired from July 2007 through September 2008.

II. Flavour Physics / 446

Recent Results from the KEDR Detector

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We present results of precise measurements in the psi family energy range based on the data collected with the KEDR detector at the VEPP-4M e+e- collider in Novosibirsk. They include: final results on the high-precision measurements of the J/psi and psi(2S) masses, leptonic widths of the J/psi meson, D+ and D0 meson masses.

I. Neutrino Physics / 671

Recent Results from the MINOS Experiment

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The MINOS experiment utilizes the NuMI beam of muon neutrinos to study the phenomenon of neutrino oscillations. Neutrinos are sent over a baseline of 735 km, with a detector near the production point at Fermilab and one at the Soudan underground laboratory in northern Minnesota. By measuring the disappearance characteristic of oscillations, MINOS has made the best measurement of the atmospheric neutrino mass splitting to date. By looking for electron neutrino appearance, a limit has been placed on the the mixing angle sin^2(2*theta_13) of < 0.29 at 90% c.l. (for delta_CP = 0 and normal mass hierarchy). A study of neutral current interactions has allowed limits to be placed on the existence of additional, sterile neutrino flavours beyond the three of the standard oscillation model. Using the 7% muon antineutrino component of the beam, the first direct observation of muon antineutrinos in a long baseline experiment has been made, along with direct limits on the antineutrino oscillation parameters. In September 2009, the current in the NuMI focusing horns will be reversed to begin running with a dedicated antineutrino beam. This will allow the first precision measurements of the atmospheric-regime antineutrino oscillation parameters, an important test of CPT-invariance in the neutrino sector.

VI. QCD in Hadronic Physics / 578

Recent results and prospects on exploring the helicity structure of the proton at RHIC in high-energy polarized proton-proton collisions

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One of the primary goals of the high-energy spin physics program at RHIC is to determine the polarized gluon contribution, ΔG, to proton spin.
The most recent STAR measurements of the longitudinal double-spin asymmetries, A_{LL}, for the inclusive production of jets, neutral and charged pions at mid-rapidity from collisions at a center of mass energy of $\sqrt{s} = 200$ GeV will be presented.
STAR has also begun measurements of di-jet production, and is preparing for future measurements of gamma+jet production. At leading order, both processes provide access to the initial parton kinematics, allowing a direct determination of the parton momentum dependence of $\Delta g(x)$.

The production of $W^{-(+)}$ bosons provides an ideal tool to study the spin-flavor structure of the proton, in particular contribution from the sea anti-quarks. $W^{-(+)}$ bosons are produced in $\bar{u} + d\,(\bar{d} + u)$ collisions and can be detected through their leptonic decays, $e^- + \bar{\nu}_e\,(e^+ + \nu_e)$, where only the respective charged lepton is measured. The suppression of QCD background over W boson signal events by several orders of magnitude is accomplished by using the highly segmented STAR Electromagnetic Calorimeter (EMC) allowing for hadron suppression based on shower shape analysis, requiring an isolation criteria suppressing jet events, and vetoing di-jet events based on the measured away side energy.
Results of full scale simulations and reconstruction of expected W and QCD background yields will be shown. The STAR experiment has recently completed collecting data for exploratory run 9 with longitudinaly polarized p+p collisions at $\sqrt{s} = 500\,\text{GeV}$.
The current analysis status and plans for future STAR measurements at $\sqrt{s} = 500\,\text{GeV}$ in polarized proton-proton collisions will be presented.

IV. Heavy Ions / **569**

Recent results from the CERN NA60 experiment

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NA60 has measured dimuon production in In-In collisions at the CERN SPS at 158 GeV/nucleon, and in p-A at 158 and 400 GeV. Highlights from the results of NA60 include the first measurement of the rho spectral function in nuclear collision, the production of thermal muon pairs in the invariant mass region between the ϕ and the J/ψ, and the study of the J/ψ suppression. In this talk we will concentrate on recent results, such as the polarization of the continuum excess, the comparison of phi->mumu and phi->KK results (the phi puzzle) and in particular on the first measurement of cold nuclear matter effects on J/ψ production at 158 GeV and on the consequences for our understanding of the anomalous J/ψ suppression in nuclear collisions.

VI. QCD in Hadronic Physics / **507**

Recent results on two-photon physics at BABAR

Authors: Owen Long[1] ; Vladimir DRUZHININ[2]

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Two-photon processes produced at e+e- colliders via the reaction e+ e- –> e+ e- gamma gamma*() –> e+ e- X, provide important experimental data for the study of hadronic spectra and testing QCD predictions. We report here on recent results in a number of these channels that are obtained at the PEP-II collider with the BABAR detector. The gamma gamma –> pi0pi0, pi0eta, and etaeta cross sections are measured in the two photon invariant mass range from 2 GeV to 5 GeV using both single tag and no tag techniques. We also present measurements of the photon-meson transition form factors using the single tag technique. The gamma gamma* -> pi0 transition form factor for the momentum transfer range Q2=4-40 GeV2 and the gamma gamma* -> eta_c transition form factor for the range Q2=2-50 GeV2 will be presented.

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Reconstruction and Identification of Hadronic Decays of Taus using the CMS Detector

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Taus provide an excellent probe of possible new physics beyond the Standard Model and their identification at the LHC is an important part of the CMS physics program. This talk reports on the strategies to trigger, reconstruct, and identify hadronic decays of taus during the early running of the LHC (tens of inverse picobarns of data), preparing the way for searches involving taus at a few inverse femtobarns of collected data. Several recent advances will be presented including the optimization of tau triggers for low luminosity running and the use of particle flow reconstruction techniques.

VII. Unified Theories, Strings, Non-perturbative QFT / 966

Reconstruction of the primordial power spectrum using multiple data sets

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The primordial power spectrum is important both for cosmological parameter estimation and for distinguishing between models of inflation. Many cosmological observables which probe inhomogenities are related to the power spectrum by a convolution with a transfer function. We show how two different deconvolution techniques, Tikhonov regularisation and the Backus-Gilbert method, can be used to obtain high resolution reconstructions of the power spectrum with well-defined error estimates from multiple noisy data sets. We apply both methods to a number of data sets including the WMAP temperature and polarisation data and demonstrate they give consistent results. The recovered power spectrum exhibits interesting features on large scales.

VI. QCD in Hadronic Physics / 530

Renormalization of B-meson distribution amplitudes

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We study some properties of light-cone distribution amplitudes of B-mesons, which are a key ingredient for factorisation approaches for B-meson decays. We determine how two-parton distribution amplitudes mix with three-parton ones at one loop: \phi_+ is shown to mix only into itself, whereas \phi_- mixes with the difference of three-parton distribution amplitudes \Psi_A-\Psi_V. We determine the corresponding anomalous dimension and confirm some constraints on \phi_+ and \phi_- derived from the light-quark equation of motion. Finally, we comment on some implications of our result for phenomenological models of these distribution amplitudes.

II. Flavour Physics / 97

Resolution of the B -> pi pi, pi K puzzles

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We show that there exist uncanceled soft divergences in the k_T factorization for nonfactorizable amplitudes of two-body nonleptonic B meson decays, similar to those identified in hadron-hadron collisions. Viewing the special role of the pion as a q-qbar bound state and as a pseudo Nambu-Goldstone boson, we associate a soft factor with it in the perturbative QCD formalism. This soft factor enhances the nonfactorizable color-suppressed tree amplitudes, such that the branching ratios B(B->pi^0 pi^0) and B(B->pi^0 rho^0) are increased under the constraint of the B(B->rho^0 rho^0) data, the difference between the direct CP asymmetries A_{CP}(B->pi^\mp K^\pm) and A_{CP}(B->pi^0 K^\pm) is enlarged, and the mixing-induced CP asymmetry S_{pi^0 K_S} is reduced. That is, the known B->pi pi and B->pi K puzzles can be resolved simultaneously.

I. Astroparticle Physics / 974

Results from IceCube

Author: Christian Spiering[1]

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The cubic kilometer neutrino telescope IceCube at South Pole has begun the 3rd season of data-taking with meanwhile almost 0.75 cubic kilometers of instrumented ice volume. The cubic kilometer neutrino telescope IceCube at South Pole has begun the 3rd season of data-taking with meanwhile almost 0.75 cubic kilometers of instrumented ice volume. The talk sketches the project status and gives examples of recent results: The search for astrophysical neutrinos and for neutrinos from dark matter annihilation, the study of cosmic rays, and particle physics results from a study of neutrinos generated in the Earth atmosphere. talk sketches the project status and
gives examples of recent results: The search for astrophysical neutrinos and for neutrinos from dark matter annihilation, the study of cosmic rays, and particle physics results from a study of neutrinos generated in the Earth atmosphere.

I. Astroparticle Physics / **379**

Results from the ARGO-YBJ experiment

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The ARGO-YBJ detector at the YangBaJing Cosmic Ray Laboratory (4300 m a.s.l., Tibet, P.R. China) has been put into operation since November of 2008.
It is the first EAS detector combining a very high mountain altitude with a full coverage detection surface.
The high time-space granularity combined with the full coverage make ARGO-YBJ a unique device to study the EAS characteristics.
In this paper we report a few selected results in Gamma-Ray Astronomy and Cosmic Ray Physics.

II. Flavour Physics / **65**

Review of NA48 CP violation measurements with neutral and charged kaons

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The NA48 experiment at the SPS was designed in the early nineties to solve the issue of the existence of direct CP violation, and to measure it with high precision.
The developement of an intense beam, an ensemble of detectors providing state-of-the art resolution, and a performant data acquisition system, allowed to perform several other CP violation measurements to be performed.
After the completion of the above program, the switch to a unique configuration with twin charged kaon beams allowed accurate searches for further CP violation effects, exploiting unprecedented statistics and systematic control thanks to a highly CP-symmetric design.
The CP violation measurements obtained from almost a decade of data collection will be reviewed.

VII. Standard Model Electroweak Physics / 848

Review of electroweak fits of the SM and beyond with Gfitter

Author: Andreas Hoecker[1]

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Results from the global Standard Model (SM) fit to electroweak precision data, including newest Tevatron measurements, are reviewed and discussed. The constraint on the Higgs boson mass obtained from the fit is convolved with the high-scale behaviour of the Higgs quartic coupling to derive likelihoods for stability, metastability or instability scenarios of the SM. Information from the electroweak fit on loop contributions from beyond-SM models is obtained through an analysis of the so-called oblique parameters. Various models are discussed. Finally, an update of the constraints on a generic Two-Higgs-Doublet Model is presented.

VI. QCD in Hadronic Physics / 699

SDMEs in exclusive rho^0 electroproduction

Author: Alexander Borissov[1]

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Spin Density Matrix Elements (SDMEs) describing the angular distribution of exclusive rho^0 electroproduction and decay are determined in the HERMES experiment with 27.6 GeV beam energy on unpolarized hydrogen and deuterium targets, and on transversely polarized hydrogen target. Those are extracted in the kinematic region 1 < Q^2 < 7 GeV^2, 3 < W < 6.3 GeV, and -t < 0.4 GeV^2. Within the given experimental uncertainties, a hierarchy of relative sizes of helicity amplitudes is observed. A small but statistically significant deviation from the hypothesis of s-channel helicity conservation is observed. An indication is seen of a contribution of unnatural-parity-exchange amplitudes; these amplitudes are naturally generated with a quark-exchange mechanism.

Plenary Session 4 / 942

SM theory for collider physics

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II. Flavour Physics / 481

SU(3) Flavour Symmetries and CP Violation

Author: Joel Jones Perez[1]

Co-authors: Antonio Masiero [2] ; Jae-hyeon Park [2] ; Lorenzo Calibbi [3] ; Oscar Vives [1] ; Werner Porod [4]

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In order to satisfy current FCNC and CP violation bounds, SUSY flavour structures cannot be generic. An interesting solution to these SUSY Flavour and CP Problems lies on the use of an SU(3) family symmetry which spontaneously breaks CP symmetry.

Typical observables of such a model are electric dipole moments and LFV processes. In addition, these models can give contributions to CP violation in neutral kaon decay. We show how the latter can be used to restrict the allowed SUSY parameter space, and induce correlations between LFV and EDM predictions.

VII. Unified Theories, Strings, Non-perturbative QFT / 640

SUSY GUTs with Yukawa Unification in the light of data

Author: Diego Guadagnoli[1]

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After a short overview of the hypothesis of Yukawa Unification within SUSY GUTs, I report on its viability in the light of the predictions for quark masses, EW precision data and FCNC processes.
In particular, I discuss the phenomenological difficulties existing when universalities for the soft SUSY-breaking terms at the GUT scale are assumed, and how these difficulties can be overcome in simple and robustly motivated scenarios of non-universalities. Finally, I discuss the falsifiability of the latter scenarios at forthcoming experiments, primarily the LHC.

IV. Heavy Ions / 165

Saturation effects at forward rapidities at LHC

Author: Amir Rezaeian[1]

Co-authors: Andreas SCHäFER [2] ; Boris KOPELIOVICH [3] ; Eugene LEVIN [4] ; Ivan SCHMIDT [3]

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We investigate direct photons and hadrons production at the energies of RHIC and LHC, at different rapidities employing various color-dipole models. The direct photon cross-section peaks at very forward rapidities due to the abelian dynamics of photon radiation. This opens new opportunities for measurement of direct photons at forward rapidities, where the background from radiative hadronic decays is strongly suppressed. Our model calculations show that photon and hadron production

are sensitive to the gluon saturation effects, and strongly depends on the value of the anomalous dimension. We discuss implication of various saturation models for the upcoming LHC data.

III. Higgs and New Physics / 810

Search for BSM physics (non-SUSY) in final states with photons at the Tevatron

Author: Enrique Palencia[1]

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We present the latest Tevatron results in searches for rare and exotic processes requiring photons in the final state. The presentation will include high-Pt searches in the final states with one or two photons plus other high-Pt objects including leptons and missing transverse energy. New limits from a search for a Fermiobphobic Higgs in the diphoton final state are also presented.

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Search for Charged Massive Long-Lived Particles Using Data from D0

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We report on a new search for charged massive stable particles (CMSPs) at the D0 Experiment at the Fermilab Tevatron collider. These electrically charged particles have sufficiently long lifetimes to penetrate through the entire D0 detector before decaying. CMSPs are predicted in many theories beyond the Standard Model. We use time-of-flight information to search for pair-produced CMSPs, based on the signature of two particles, reconstructed as muons, with speed and invariant mass inconsistent with beam-produced muons. The analysis uses data taken by the DO detector in Run II.

III. Higgs and New Physics / 140

Search for Excess Dimuon Production in the Radial Region 1.6<r<10 cm at the D0 Experiment

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We report on a study of events containing at least two muons produced in ppbar collisions at sqrt{s}=1.96 TeV, performed at the D0 experiment using data corresponding to 0.9 fb-1 of integrated luminosity collected during 2008. Motivated by a recent claim of an excess in muons produced at large radius by the CDF collaboration, we study muons that appear to be produced with a radius between 1.6 and 10 cm from the initial pbbar collision point. The experimenta signature is a well reconstructed muon that is missing hits in the innermost layer of the tracking detector. We record 28374 muons that appear to be produced without hits in the first layer of the tracking detector. Based on the measured hit efficiency, we epect 27 662 pm 503 pm 1027 muons from the primary interaction to not have a reconstructed hit in this layer. This gives an observed excess of 712 pm 462 pm 942 events in which one or both muons are produced in the range 1.6 < r < 10 cm, which is expressed as a fraction (0.40 pm 0.26 pm0.53)\% of the total dimuon sample. A small level of excess is expected due to cosmic rays, decays-in-flight of pions and kaons, and hadronic punchthrough, and first estimates of these contributions are made. We therefore see no anomalously large excess of muons produced a few centimeters away from the interaction point.

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Search for Heavy Stable Charged Particles in CMS

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New studies of the CMS collaboration are presented on the sensitivity to searches for Heavy Stable Charged Particles (HCSPs). Such particles appear for example in particular SUSY and extra dimension models. Making use of the redundancy of the CMS experiment to measure the velocity of such heavy particles while traversing the detector, excellent prospects for the discovery of these particles -shoudl they exist- can be demonstrated. These studies are based on detailed detector simulation, including all Standard Model backgrounds. Particular emphasis is given to possible early discoveries, ie with 100 pb-1 or less. Projected 95% CL exclusion limits as function of luminosity are presented as well.

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Search for Hidden Valleys Signatures with the D0 Detector

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We present results of searches for unique experimental signatures that might arise from a hidden sector extension (hidden valley) of the standard model. Reduced couplings to the hidden sector can result in long-lived particle decays that result in highly displaced vertices from di-leptons or di-jets. By searching for such signatures, D0 extends

its discovery potential into previously unexplored phase space.

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Search for Maximal Flavor Violating Scalars in Same-Sign Leptons at CDF

Authors: Monica D'Onofrio[1] ; Thomas Wright[2]

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In models of maximal flavor violation (MxFV) there is at least one new scalar Φ_{FV} which couples to the quarks via $\Phi_{FV} q_i q_j \propto \xi_{ij}$ where $\xi_{i3}, \xi_{3i} \sim V_{tb}$ for $i = 1, 2$ and $\xi_{33} \sim V_{td}$ and V is the CKM matrix. We study MxFV signals of same-sign leptons from same-sign top-quark pair production at CDF. We search for a pair of same-sign leptons, a tagged b-jet and missing transverse energy, and set limits on $m_{\Phi_{FV}}$ and the MxFV coupling ξ.

III. Higgs and New Physics / **483**

Search for Squark Production in R-Parity Violating Supersymmetry at HERA

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A search for squarks in R-parity violating supersymmetry is performed using the full ep data sample collected by the H1 detector at HERA at a centre-of-mass energy of 319 GeV. This corresponds to a total integrated luminosity of 440 pb^{-1}. The resonant production of squarks via a Yukawa coupling lambda' is considered, taking into account direct and indirect R-parity violating decay modes. The results are interpreted in the framework of the Minimal Supersymmetric Standard Model.

III. Higgs and New Physics / **808**

Search for Supersymmetry in final states with photons at the Tevatron

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Models of supersymmetry predict new heavy, neutral particles (neutralinos), that can decay into photon and the lightest supersymmetric particle, the gravitino. We present recent results on searches for these particles in proton-antiproton collisions at the Tevatron. No evidence of new physics is found and results are translated in limits on models of Gauge Mediated Supersymmetry Breaking. Final states that contains a photon and large missing transverse energy are used as well to search for a new light gauge boson in a hidden sector (dark photon) produced in decays of supersymmetric particles. Additional requirements for two spatially close leptons are applied in this case. No evidence for dark photons is found and limits are extracted on their production.

VI. QCD in Hadronic Physics / **502**

Search for a D*p resonance at HERA II

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A possible resonance decaying into the D*-proton final state is investigated in deep inelastic scattering at HERA. The data were taken with the H1 detector in the years 2004 to 2007 and correspond to an integrated luminosity of ~348 pb^-1 thus increasing the available data significantly compared to the analysis of HERAI data.

III. Higgs and New Physics / **589**

Search for a lepton flavor violating τ decay into lK_S and lK_SK_S

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We report results of a search for lepton flavor violating τ decays into lK_S and lK_SK_S using a large data sample accumulated with the Belle detector at the KEKB e^+e^- collider. The sensitivity to the branching fractions is improved significantly compared to previous experiments.

III. Higgs and New Physics / **784**

Search for a light CP-odd Higgs boson in BaBar

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We search for evidence of a light scalar (e.g. a Higgs boson) in the
radiative decays of the narrow Upsilon(2S) and Upsilon(3S) resonances:
Upsilon(2S,3S) −> gamma A^0, A^0 −> mu+ mu- and
Upsilon(3S) −> gamma A^0, A^0 −> tau+ tau-.
Such an object appears in extensions of the Standard Model,
where a light CP-odd Higgs boson naturally couples strongly to b-quarks.
We find no evidence for such processes, and set upper limits on the
effective coupling of the b quark to A^0. We also set an upper limit
on the di-muon and di-tau branching fractions of the eta_b meson.

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Search for diboson production in final states with missing transverse energy and jets at CDF

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We present a search for diboson production in final states with missing transverse energy and jets using the latest amount of data collected by the CDF detector at the Fermilab Tevatron. We select events containing two jets with transverse energies above 25 GeV and significant missing transverse energy (MET). Observing a signal in this event topology is challenging due to the large backgrounds from W+jet and QCD multi-jet production. We present new methods for significantly reducing the QCD multi-jet background in which mis-measured jets lead to large, fake MET within the events. An event by event calculation of MET significance, taking into account the energy resolution of the jets within each event, allows for the removal of events in which the determined significance is below that expected for signal.

I. Neutrino Physics / 765

Search for double beta decay with NEMO-3

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The NEMO-3 experiment located in the Modane Underground Laboratory (LSM)
is searching for neutrinoless double beta decay. The experiment
has been taking data since 2003 with seven isotopes.
The main ones are 7 kg of 100Mo and 1 kg of 82Se.
Data from the initial phase of the experiment show no evidence
for neutrinoless double beta decay which permits setting a 90% CL
lower limit on the half-life time for such a transition.
From these results we can determine an upper limit on the effective
Majorana neutrino mass. NEMO-3 also measures two-neutrino
double beta decays for other isotopes and has
reached the highest precision measurements to date. We will
present the latest results for 150Nd, 130Te, 48Ca and 96Zr.
Such measurements are important for reducing
the uncertainties on calculations for nuclear matrix elements.

NEMO-3 data can also be interpreted in terms of alternative transition models, such as weak right-handed currents or Majoron emission.

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Search for heavy 4th-generation down-type quarks in the same-charge dilepton signature at CDF

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Using data collected at the CDF detector in Run II at the Tevatron we present a search for pair production of heavy down-type quarks, each of which decay to a top quark and a W boson yielding a b+bbar+W+W+W+W final state. The mode in which two same-charge leptons are produced is very sensitive because while the signal branching ratio is reasonable, same-charge dilepton events are rare in the Standard Model. We also impose missing transverse energy and b-tag requirements. We present our preliminary results as well as future prospects for the analysis.

III. Higgs and New Physics / 785

Search for invisible or lepton-flavor-violating Upsilon decays in BaBar

Authors: Justin ALBERT[1] ; Paul de Jong[2]

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We present a search for decay of the Y(1S) meson into undetectable final states, using a sample of Y(3S) mesons collected at the PEP-II/BaBar B-factory. We tag the decay of the Y(3S) into the Y(1S) through a pair of charged pions, and measure the rate at which the Y(1S) decays into particles which do not interact with the BaBar detector. Furthermore, we present a search for charged lepton-flavor violating decays Upsilon –> e+ tau- and Upsilon –> mu+ tau- which probes BSM contributions at the TeV mass scales.

III. Higgs and New Physics / 812

Search for lepto-quark and compositness at the Tevatron

Author: Thomas Nunnemann[1]

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We report on searches for the production of scalar and vector leptoquarks in ppbar collisions at the Tevatron collider. Leptoquarks, which are predicted by several extensions of the Standard Model, are hypothetical particles carrying both lepton and quark flavors. At hadron colliders they can either be pair-produced via the strong interaction or a single leptoquark can be produced in association with a
lepton via the hypothesized leptoquark-lepton-quark coupling. Searches for the pair-production of leptoquarks of all three generations have been performed. No evidence of leptoquarks is found and upper limits on the production cross sections are given. Quark compositeness, large extra dimensions, and TeV-1 scale
extra dimensions are as well searched for in dijet final states. Shapes of dijet angular distributions have been measured over a range of dijet masses, from 0.25 TeV and beyond 1TeV. The data are in good agreement with the predictions of perturbative QCD and are used to constrain new physics models.

III. Higgs and New Physics / **786**

Search for leptoquarks and contact interactions at HERA

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Co-author: The ZEUS and H1 Collaborations [2]

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A search for physics beyond the Standard Model is performed with
high-Q^2 deep inelastic scattering events recorded with
the ZEUS and H1 detectors at HERA. Complete data on scattering of polarized
electrons and positrons from HERA II running are combined with
electron and positron data from HERA I.
ZEUS limits are derived on the effective mass scale
in eeqq contact interactions, on the mass to the Yukawa coupling ratio
for heavy-leptoquark models, on the effective Planck-mass scale in models
with large extra dimensions and on the quark charge radius.
H1 searches for scalar and vector leptoquarks coupling to first, second
and third generation fermions, and sets constraints on leptoquark models,
improving and superceding earlier H1 limits.

III. Higgs and New Physics / **814**

Search for low mass Higgs at the Tevatron (ZH and H to gamma gamma)

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We present a search for a low mass Standard Model Higgs boson produced in association with a Z boson decaying to charged leptons or invisibly into a pair of neutrinos at the Fermilab Tevatron

collider. The final state is characterised by the presence of two b-tagged jets from the Higgs boson decay and two opposite-sign leptons (electron muon, tau) or a large imbalance in the transverse energy of the event due to the Z boson decay. This channel is in all of the decay modes very powerful. We present as well results of a search for SM Higgs bosons decaying to the di-photon final state. Both gluon fusion and associated production processes are exploited. Whilst the branching ratio to the di-photon final state is small in the Standard Model, this channel contributes appreciably to the overall Higgs sensitivity at the Tevatron.

I. Neutrino Physics / 701

Search for neutrinoless double beta decay of Ge-76 with the GERmanium Detector Array "GERDA"

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The study of neutrinoless double beta decay (DBD) is the most powerful approach to the fundamental question if the neutrino is a Majorana particle, i.e. its own anti-particle. The observation of neutrinoless DBD would not only establish the Majorana nature of the neutrino but also represent a determination of its effective mass if the nuclear matrix element is given.
So far, the most sensitive results have been obtained with Ge-76, and the group of Klapdor-Kleingrothaus has made a claim of discovery. Future experiments have to reduce radioactive backgrounds to increase the sensitivity. "GERDA" is a new double beta-decay experiment which is currently under construction in the INFN Gran Sasso National Laboratory,
Italy. It is implementing a new shielding concept by operating bare Ge diodes - enriched in Ge-76 - in high purity liquid argon supplemented by a water shield. The aim of "GERDA" is to verify or refute the recent claim of discovery, and, in a second phase, to achieve a two orders of magnitude lower background index than recent experiments, increasing the sensitive mass and reaching exposure of 100 kg yr.
It be will discuss design, physics reach, and status of construction of "GERDA", and present results from various R&D efforts including long term stability of bare Ge diodes in cryogenic liquids, material screening, cryostat performance, detector segmentation, cryogenic precision electronics, safety aspects, and Monte Carlo simulations.

II. Flavour Physics / 879

Search for new physics at LHCb: CP violation in Charm sector and rare decays of B hadrons

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Search for new physics with long lived particles in ATLAS

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Various models of new physics, including hidden valley models and some supersymmetric models, predict the existence of long lived particles decaying a significant distance away from the interaction point, or even leaving the detector undecayed.
We present ATLAS strategies to improve triggering and reconstruction of these events, and discuss prospects for searches in early LHC data.

III. Higgs and New Physics / 847

Search for non-standard-model Higgs at the LHC with ATLAS

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The discovery prospects of non Standard Model Higgs bosons with the ATLAS detector are presented.
Due to the high branching ratio, results on decay channels that include tau leptons are presented both for the search of the neutral and the charged MSSM Higgs bosons. For the neutral Higgs bosons results on the muon pair final state are also reported. Furthermore, decay scenarios that include SUSY particle cascades are investigated. Finally, in the absence of light Higgs bosons, processes of vector boson scattering at high mass are discussed, in the context of studying the mechanism of electroweak symmetry breaking.
All the studies presented are based on the analysis of Monte Carlo signal and background data simulated in detail through the experimental apparatus.

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Search for optical flashes of astronomical origin with ”Pi of the Sky” prototype.

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“Pi of the Sky” is a robotic telescope project aiming for continuous observation of a large part of the sky with high temporal and optical resolution using wide field-of-view CCD cameras. Its primary goal is to look for optical afterglows associated with the gamma ray bursts (GRB), but it is also well suited to study any kind of short timescale astrophysical phenomena. Due to on-line data analysis in the real time, it has self-triggering capability and can react to external triggers with negative time delay. The prototype apparatus with two cameras has been installed at Las Campanas Observatory in Chile and is in operation since July 2004. We report on observation of the extraordinarily bright prompt optical emission of GRB 080319B. Combined with the prompt gamma-ray detection and with the following broadband observations of the afterglow, our measurement allowed for a new insight into the nature of GRBs. Other observations of the “Pi of the Sky” prototype, including flare star outbursts and identification of variable stars are also discussed.

VII. Standard Model Electroweak Physics / **853**

Search for single top production at HERA

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Searches for single-top production at the ep collider HERA has been performed using data collected by the H1 and ZEUS Collaborations. The H1 collaboration analyzed the full HERA data sample corresponding to an integrated luminosity of 474 pb^-1 looking both at the leptonic and hadronic decay of the W coming from top decay. The ZEUS collaboration analyzed data collected in the running period 2004-2007 corresponding to an integrated luminosity of 277 pb^-1 looking at the leptonic W decay. New ZEUS results have been also combined with a previous search performed with data collected in 1998-2000 for a total integrated luminosity of 359 pb^-1.
The results of the searches have been used to constrain single-top production via flavour changing neutral current (FCNC) transitions. In case of u-t transition mediated by a photon, the HERA constraints are the best to date.

IV. Heavy Ions / **441**

Search for the QCD critical point at SPS energies

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Theoretical calculations locate the QCD critical end point at energies accessible at the CERN Super Proton Synchrotron (SPS). The QCD phase diagram (T - \mu_B) can be scanned by changing the energy and the size of the colliding system.

Several observables were suggested to look for the critical point in ultra-relativistic heavy ion collisions. In the NA49 experiment we studied the energy dependence of such observables for central Pb+Pb collisions at beam energies 20A-158A GeV, and the system size dependence with p+p, C+C, Si+Si, and Pb+Pb collisions at the highest SPS energy.

In this talk we will show the system size dependence of event-by-event mean transverse momentum and multiplicity fluctuations as well as the system size dependence of the signal of intermittency in transverse momentum space. For the energy dependence we will present mean transverse momentum and multiplicity fluctuations, anisotropic flow (v_2), and antibaryon to baryon spectra.

Finally, the critical point search strategy in the future NA61/SHINE experiment will be discussed.

VII. Unified Theories, Strings, Non-perturbative QFT / **44**

Search for the rare decay $D^0 \to \gamma\gamma$ and improved measurement of $D^0 \to \pi^0\pi^0$

Author: James Morris[1]

Co-authors: Amir Rahimi [1] ; Honscheid Klaus [1] ; Joseph Regensburger [1]

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We present preliminary results of the search for the doubly-radiative decay $D^0 \to \gamma\gamma$ and the measurement of the branching fraction of its associated background $D^0 \to \pi^0\pi^0$ in a data sample corresponding to an integrated luminosity of ~470fb^{-1} collected with the BaBar detector at the PEP-II asymmetric e^+e^- collider at SLAC. The long-range, FCNC $\gamma\gamma$ decay provides a test for physics beyond the standard model.

III. Higgs and New Physics / **774**

Search of New Physics with Kaon decays at NA62

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The SM prediction for the ratio of purely leptonic decay rates of the charged kaon $R_K = \Gamma(K_{e2}/\Gamma(K_{\mu 2}))$ has an excellent sub-premille precision. Due to the helicity suppression of the SM contribution, the ratio is sensitive to non-SM effects; in particular, LFV contributions in the MSSM can modify it by a few percent without contradicting any other presently known experimental constraints. Current experimental precision is limited to 4.5%, and is insufficient for a stringent SM test. The NA62 experiment at the CERN SPS is aiming at improving the precision by almost an order of magnitude, using a dedicated data set collected in 2007/08. The status of the analysis will be discussed in detail.

The NA62 experiment will then evolve to the study of ultra-rare kaon decays. The K+ to pi+ nu nubar decay is a flavor changing neutral current process which proceed through box and purely electroweak penguin diagrams. It is very clean theoretically: short distance dynamics dominates, c-quarks contributions have been evaluated to NNLO order at 5%, and the hadronic matrix elements can be parameterized in terms of the K+ to pi0 e+ nubar branching ratio that is well known experimentally.
For these reasons K+ to pi+ nu nubar, together with KL to pi0 nu nubar, is extremely sensitive to new physics contributions. Moreover, it allows a precise measurement of the CKM parameter V_td, independent from B oscillation measurements. The computed branching ratio is (8.0 +- 1.1) 10^(-11). The existing measurement, based on 3 events from E787/949 experiments at BNL, is (1.47 +-1.30 +-0.89) 10^(-10), compatible with the SM within errors. A 10% accuracy measurement is required to provide a significative test of new physics scenarios. This is the goal of the proposed NA62 experiment at the CERN SPS, that aims to collect about 80 events in two years of data taking, keeping background contamination lower than 10%. The experiment will be based on the NA48 apparatus and will use the same CERN-SPS beam line which produced the kaon beam for the NA48 experiment. The experiment is being designed to reach 10^(-12) sensitivity per event, exploiting a decay in flight technique which allows to reach a 10% signal acceptance.The detector requires a sophisticated technology for which an intense R&D program has started. The flux of K+ will be about 100 times higher than for NA48, opening many other physics opportunities. The status of the project, the R&D program and the perspectives of the experiment will be discussed.

VII. Standard Model Electroweak Physics / **851**

Searches for New Physics in the Top Quark Sector at CDF

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Fifteen years following the first glimpses of the top quark at Fermilab's Tevatron, physicists are now able to explore top quark physics with substantial precision. With 40 times the data of Run 1, we are learning much about the nature of this peculiarly heavy quark, and we are looking for hints of physics beyond the Standard Model in the top quark sector. We present exciting new results on searches for new physics in the top quark sector at CDF, in which we constrain possibilities for new physics mimicking top quarks in our data sample, and look for anomalous top quark properties. In particular we set limits on the production of of a 4th generation top-like quark, which also constrains models such as little Higgs with T-parity, Beautiful Mirrors, and massive KK gluons. Constraints from baryogenesis indicate that SUSY stop could be lighter than the top quark. Such stop signatures can be very similar to those from top events, and we place the first limits on these signatures. In addition, we present searches for resonant top production, as well as a measurement of the top quark forward-backward asymmetry, which is a test of discrete symmetries and strong interactions at large Q^2, and use this to search for massive Z'-like bosons or axi-gluons. Some of these new results are tantalizing, and indicate that the Tevatron data are as interesting as ever.

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Searches for SUSY in leptons+jets+MET final states

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If supersymmetry would manifest itself at a low mass scale it might be found already in the early phase of the LHC operation. Generic signatures for supersymmetry in pp-collisions consist of high jet multiplicity, large missing transverse energy (MET) as well as leptons in the final state. The presence of charged leptons makes these signature more robust and therefore facilitates their application in early data-taking. This talk will review the CMS search strategy and prospects for a SUSY discovery in the single lepton and di-lepton final states.

III. Higgs and New Physics / 805

Searches for chargino/neutralino production at the Tevatron

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The production of chargino-neutralino pairs and their subsequent leptonic decays is one of the most promising supersymmetry (SUSY) signatures at the Tevatron proton- antiproton collider. We present here the most recent results on the search for the three-lepton and missing-transverse-energy SUSY signature using data

collected with the CDF and D0 detectors. At CDF, chargino-neutralino pairs are also searched for using events with a Z (to e+e-), two or more jets from a W decay, and large missing transverse energy. The presented results, based on data corresponding to 2.7/fb of integrated luminosity, are interpreted in the minimal supergravity scenario.

III. Higgs and New Physics / **751**

Searches for excited fermions at HERA

Author: Zhiqing Zhang[1]

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Searches for excited electrons, excited neutrinos and excited quarks are perfomed using the full $e^{\pm}p$ data sample collected by the H1 experiment at HERA, corresponding to a total luminosity of 475 pb^{-1}. The electroweak decays of excited fermions into standard model fernions and γ, Z or W bosons are considered. No evidence for excited fermion production is found. Mass dependent exclusion limits on excited fermion production cross sections and on the ratio f/Λ of the coupling to the compositeness scale are derived within gauge mediated models.

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Searches for fourth generation quarks

Author: Yuan Chao[1]

[1] *National Taiwan University*

It is still a mystery why the Standard Model as we know it has three families. At new high energy colliders it is worthwhile to search for a new additional family – which obviously would have a heavy neutrino to avoid the LEP bounds. This presentation discusses new studies made with the CMS detector for the search of new heavy b-like quarks in several different decay modes and for different possible mass regions.These studies are based on detailed detect or simulation, including all Standard Model backgrounds. Particular emphasis is given to possible early discoveries, ie with 100 pb-1 or less. Projected 95\% CL exclusion limits as function of luminosity are presented as well.

III. Higgs and New Physics / **815**

Searches for high mass Higgs at the Tevatron (WW(*) final states)

Author: Dean Hidas[1]

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We present searches for standard model Higgs production in p-pbar collisions at sqrt(s) = 1.96 TeV using the latest amount of data collected by the CDF and D0 detectors at the Fermilab Tevatron. We consider the diboson decay channel H->WW, the dominant decay mode for Higgs boson masses above 140 GeV/c^2. We also require that both W bosons decay leptonically. In order to maximize sensitivity, a combined matrix element method and neural network approach is used to distinguish signal from the large backgrounds. All Higgs production modes are considered, and cross-section limits relative to the combined standard model predictions are presented. In addition, searches for the Standard Model Higgs boson produced via the WH to WWW(*) process are presented.

III. Higgs and New Physics / **813**

Searches for low mass Higgs at the Tevatron (WH and ttH final states)

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We present a search for a low mass Standard Model Higgs boson produced in association with a W boson at the Fermilab Tevatron collider. The search is performed in events containing one lepton (electron, muon or tau), an imbalance in the transverse energy, and one or two b-tagged jets with about 5 fb-1 of data. This channel is one of the most powerful in the search for a low mass Higgs at the Tevatron, and results for several searches employing different techniques are presented. A search for the Standard Model Higgs boson produced in association with top anti-top quark pairs is also reported.

III. Higgs and New Physics / **817**

Searches for non-SM higgs at the Tevatron

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We present searches for beyond standard Model Higgs production using the latest amount of data collected by the CDF and D0 detectors at the Fermilab Tevatron. Supersymmetric extensions of the standard model can yield enhanced Higgs production of a neutral MSSM Higgs boson, A, depending on the parameter tan(Beta). Separate searches are carried out for an A decaying to tau leptons or b-quarks, and set exclusion regions in tan(Beta) versus m_A space for each analysis. A search for the lightest neutral CP-even Higgs boson (h) in the next-to-minimal supersymmetric standard model is also carried out, where the h decays to a pair of lighter (<10 GeV) neutral pseudoscalar Higgs bosons (a) and the a bosons decay both to two muons or one to two muons and the other to two taus. This new search at the Tevatron is performed by looking for events with two pairs of collinear muons or a pair of collinear muons and missing transverse energy due to the tau decays. We present as well searches for MSSM charged Higgs bosons originating from top quark decay, and searches for higgs in technicolor models using events with a W boson, 2 jets and one or more b-tags.

III. Higgs and New Physics / **806**

Searches for squarks and gluinos at the Tevatron

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We present results on a search for squarks and gluinos performed on data from proton-antiproton collisions collected using the CDF and D0 detectors at the Fermilab Tevatron. Events with multiple jets of hadrons and large missing transverse energy in the final state are studied within the framework of minimal supergravity (mSUGRA) and assuming R-parity conservation. At D0, the search for squarks has also been performed in the topology of multijet events accompanied by large missing transverse energy and at least one tau lepton decaying hadronically. Preliminary results are presented.

I. Cosmology and Gravitational Waves / 973

Searches for stochastic gravitational waves in LIGO and VIRGO data

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I shall review stochastic sources of gravitational waves and prospects of their detection. A stochastic background of gravitational waves is expected to arise from a superposition of a large number of unresolved gravitational-wave sources of astrophysical and cosmological origin. I shall present the status of
the searches for stochastic gravitational wave sources by the LIGO and VIRGO projects. I shall outline the data analysis methods used in these searches and I shall give details of the recent results. I shall discuss implications of these searches for cosmology.

III. Higgs and New Physics / 807

Searches for third generation squarks at the Tevatron

Author: Miguel Vidal[1]

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In the Minimal Supersymmetric Standard Model (MSSM), the large mixing between the
chiral states of the scalar partnerparticles of the standard model fermions might lead
to small masses for sbottom and stop quarks. Dedicated searches are carried out
in final states with large missing transverse energy and at least two jets, where
at least one of the jets is required to be b-tagged (sbottom searches) or c-tagged (stop searches). Most recent results from several analysis performed by the CDF and D0 collaborations are presented.

VII. Unified Theories, Strings, Non-perturbative QFT / 1003

Selected aspects of recent work in heterotic string phenomenology.

Author: James Gray[1]

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I will briefly review some aspects of recent work in heterotic string and M-theory as applied to string phenomenology. Emphasis will be placed on describing the strengths and weaknesses of this type of string construction as related to both model building and moduli stabilization.

VII. Standard Model Electroweak Physics / 910

Selected electroweak results using tau leptons at BaBar

Author: Elisa Guido[1]

[1] *INFN & University Genova*

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A selection of electroweak measurements performed by the BaBar experiment operating at the Stanford Linear Accelerator Center is presented.
Using a sample of 122 million Y(3S) decays, we measure the ratio
R = BR(Y(1S) -> tautau)/BR(Y(1S) -> mumu); the
measurement is intended as a test of the lepton universality and
as a search for a light pseudoscalar Higgs boson in NMSSM
scenarios. Such a boson could appear in a deviation of the ratio
R from 1. The analysis exploits the decays Y(3S) -> Y(1S)pi+pi-,
Y(1S) -> l+l-, where l=mu,tau.
We also present a search for the non-conservation of lepton flavor in the
decay tau -> mu/e gamma performed with 967 M tau decays from e+e-
annihilations at a center-of-mass energy corresponding to Y(2S), Y(3S) and
Y(4S) resonances.
Two additional results are based only on data recorded by BaBar at the Y(4S) resonance.
The first result is a precision measurement of the mass of the
tau lepton using 423 fb-1 of data. Using a pseudomass endpoint method, we determine
the tau mass and we also measure the mass difference between the tau+
and tau-. Finally, precise measurements of the tau- -> KS0 pi- (pi0) nu_tau branching
fraction and hadronic mass distribution are made using ~ 384 fb-1 of
data. The mass and width of K*(892)- meson
are found to be significantly different from PDG averages from
those found in hadroproduction but are consistent with the recent
measurements made by Belle using the same tau decay mode as
considered here.

VI. QCD in Hadronic Physics / 577

Selected recent HERMES results on parton distribution and fragmentation functions

Author: Klaus Rith[1]

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The HERMES experiment at HERA has performed a new determination of the strange quark distribution s(x) from multiplicities of charged kaons in semi-inclusive deep-inelastic scattering (SIDIS) of 27.6 GeV electrons/positrons from deuterium. The extracted distribution function (DF) is much softer than that previously derived from dimuon events in neutrino/antineutrino scattering and those currently used in global PDF fits.
Azimuthal asymmetries of identified hadrons in SIDIS from a transversely polarized hydrogen target and from unpolarized hydrogen and deuterium targets were measured. The former are caused by a convolution of the chiral-odd Collins fragmentation function (FF) and quark transversity (DF) or the convolution of the unpolarized FF and the naive time-reversal odd Sivers DF which can be related to orbital angular momenta of quarks in a polarized nucleon. The latter allow to access flavour dependent information about quark intrinsic transverse momenta and spin-orbit correlations. Examples are the Cahn effect, generated by the non-zero transverse motion of quarks and the Boer-Mulders effect, originating from a coupling between quark transverse momentum and transverse spin.

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Semileptonic decays of D mesons at CLEO

II. Flavour Physics / 930

Semileptonic decays of D mesons at CLEO

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please see abstracts 634 and 637.

VII. Standard Model Electroweak Physics / 694

Sensitivity to anomalous quartic gauge couplings in photon-photon interactions at the LHC

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The exclusive two-photon production at the LHC of pairs of W and Z bosons provides a novel and unique test-ground for the electroweak gauge boson sector. In particular it offers, thanks to high gamma-gamma center-of-mass energies, large and direct sensitivity to the anomalous quartic gauge couplings otherwise very difficult to investigate at the LHC. An initial analysis has been performed assuming leptonic decays and generic acceptance cuts. Simulation of a simple counting experiment has shown for the integrated luminosity of 10 fb-1 at least four thousand times larger sensitivity to the genuine quartic couplings, a_0^W, a_0^Z, a_C^W and a_C^Z, than those obtained at LEP. The

impact of the unitarity constraints on the estimated limits has been studied using the dipole form-factors. Finally, differential distributions of the decay leptons have been provided to illustrate the potential for further improvements of the sensitivities.

Plenary Session 5 / 1025

Short presentation of the next HEP-EPS conference

III. Higgs and New Physics / 706

Signatures of Heavy Vectors in Higgsless models

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Co-authors: Gino Isidori [1] ; Oscar Cata [1]

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One or more heavy spin-1 fields may replace the Higgs boson in keeping perturbative unitarity up to a few TeV while at the same time account for the ElectroWeak Precision Tests. We study the Drell-Yan production of heavy vector and axial-vector states of generic Higgsless models at hadron colliders. We analyse in particular the l+l-, WZ, and three SM gauge boson final states. In the l+l- case we show how present Tevatron data restricts the allowed parameter space of these models. The two and three gauge boson final states (especially WZ, WWZ, and WZZ) are particularly interesting in view of the LHC, especially for light axial-vector masses, and could shed more light on the role of spin-1 resonances in the electroweak precision tests.

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Signatures of Long-lived Exotic Particles at Colliders

Authors: David Milstead[1] ; Rasmus Mackeprang[2]

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The search for stable exotic hadrons is a promising way to observe new physics processes at collider experiments. For example, R-hadrons are predicted in a number of supersymmetry scenarios such as split-supersymmetry and gauge-mediated supersymmetry breaking. The discovery potential for such particles can be enhanced or severely suppressed by their interactions with matter as they pass through a detector. This talk describes the predictions of a Geant-4-implemented Regge-based model for the interactions in matter of stable hadrons containing a long-lived exotic parton which can have a range of colour and electric charges. Comparisons are made with a generic scattering model, and the implications of this work on future searches at the LHC are discussed. Furthermore, previously obtained limits from collider experiments are revisited and discussed in the light of this work.

IV. Detectors (LHC and R&D) and Accelerators / 191

Silicon Detectors for the sLHC - an Overview of Recent RD50 Results

Author: Ulrich Parzefall[1]

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It is foreseen to significantly increase the luminosity of the Large Hadron Collider(LHC) at CERN around 2018 by upgrading the LHC towards the sLHC (Super-LHC). Due to the radiation damage to the silicon detectors used, the physics experiment will require new tracking detectors for sLHC operation. All-silicon central trackers are being studied in ATLAS, CMS and LHCb, with extremely radiation hard silicon sensors on the innermost layers. The radiation hardness of these new sensors must surpass the one of LHC detectors by roughly an order of magnitude. Within the CERN RD50 collaboration, a massive R&D programme is underway to develop silicon sensors with sufficient radiation tolerance. Among the R&D topics are the development of new sensor types like 3D silicon detectors designed for the extreme radiation levels of the sLHC. Figure 1 shows a sketch of a double-sided 3D silicon sensor, with Figure 2 displaying a cross-section of a 3D detector of the type shown in Figure 1.
We will report on the recent results obtained by RD50 from tests of several detector technologies and silicon materials at radiation levels corresponding to SLHC fluences. Based on these results, we will give recommendations for the silicon detectors to be used at the different radii of SLHC tracking systems.

I. Neutrino Physics / 696

Single pion production induced by neutrino-nucleon interactions

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A proper prediction of the cross sections for single pion production in neutrino-nucleon scattering is an important ingredient of the long base-line oscillation experiment analysis (see experiments: K2K, MiniBooNE and T2K).

I will present the re-analysis of the single pion production data collected in the 12-ft ANL and 7-ft BNL bubble chamber experiments (neutrino-deuteron scattering data). It has been claimed that the ANL and BNL data are incompatible. In this presentation I will show that ANL and BNL data are consistent. The impact of the deuteron structure effect on the final fits will be also discussed.

The new consistent fit of the C5A axial form factor is the main result of our analysis. The fit is applied to the NuWro Monte Carlo (MC) generator and then used to predict $\sigma(CC\pi^+)/\sigma(CCQE)$ ratio for the K2K and MiniBooNE experiments. We compute also the cross sections for the single pi0 production in the neutral current neutrino-nucleon scattering. The neutral current pi0 production is the dominant background to the measurement of the $nu_\mu \to nu_e$ oscillation planned to be observed at the T2K experiment. The resulting cross sections are calculated together with the uncertainties coming from the uncertainties of the original experimental data.

I. Cosmology and Gravitational Waves / 134

Singlet dark matter effects on Higgs boson driven inflation

Author: Sherwin Love[1]

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A minimal candidate for non-baryonic dark matter is provided by a single standard model singlet. The quantum mechanical effects of this singlet are explored in a model where the Higgs boson has a large non-minimal coupling to the Ricci scalar and plays the role of the inflaton. Imposition of the slow roll inflation cosmological constraints restricts the allowed values of the Higgs boson mass, its coupling to the dark matter and the dark matter self-coupling.

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Soft matrix elements in the non-local chiral quark model

Author: Piotr Kotko[1]

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In presence of the hard scale amplitudes for high energy processes factorize into perturbative and soft part. While the former can be calculated within QCD, the latter has to be either obtained from experiment or treated by non-perturbative methods. One of the possibilities is to use low energy effective models, which incorporate dynamical chiral symmetry breaking, as a one of the most important phenomena at this scale. Moreover, realistic models have to take into account the non-local interactions. In the present talk we consider semibosonized Nambu-Jona-Lasinio model, where the non-locality emerges as a momentum dependence of constituent quark mass. Technically, it serves as a natural way of Lorentz covariant regulator of the loop integrals at high momenta, which is needed in order to make the calculations finite. On the other hand, momentum dependence of the mass forces us to replace standard local currents by the non-local ones. Their precise form is in general not restricted, therefore they have to be modelled. In order to demonstrate simple choice of the non-local vector current, we use the photon distribution amplitudes and an ansatz for the momentum dependence of mass allowing for analytic calculations.

As an example of the more advanced applications of the non-local chiral quark model (NCQM), we consider recently proposed pion-photon transition distribution amplitudes (TDA). They are in some sense similar to the ordinary generalized parton distribution functions, however they are non diagonal in the states - instead of transition between two hadrons with different momenta we deal with the hadron and the real photon. TDA's appear as a universal non perturbative input in backward Compton scattering or hadron-antihadron anihilation into two photons. From the point of view of the NCQM's TDA's are very interesting objects to study, because they have to satisfy several properties originating from Lorentz invariance (so called polynomiality), Ward identities and axial anomaly.

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Solar neutrino oscillations and non–standard physics

Author: Mariam Tórtola[1]

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The presence of neutrino oscillations in the solar neutrino flux is nowadays a fact supported by all the existing solar neutrino experiments and unambiguously confirmed by the reactor experiment KamLAND. In this talk we will review the current status of the solar neutrino parameter determination after the latest results from the Sudbury and Borexino solar experiments. We will also discuss the robustness of the oscillation interpretation of solar neutrino data with respect to the presence of non-standard neutrino properties or non-standard physics in the Sun.

I. Cosmology and Gravitational Waves / 87

Solving the Li problem by long lived stau in a stau-neutralino coannihilation scenario

Author: Masato Yamanaka[1]

Co-authors: Joe Sato [2] ; Kazunori Kohri [3] ; Masafumi Koike [2] ; Takashi Shimomura [4] ; Toshifumi Jittoh [2]

[1] *ICRR, university of Tokyo*

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[3] *Lancaster University*

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A scenario of the big-bang nucleosynthesis is analyzed within the minimal supersymmetric standard model, which is consistent with a stau-neutralino coannihilation scenario to explain the relic abundance of dark matter. We find that we can account for the possible discrepancy of the abundance of 7Li between the observation and the prediction of the big-bang nucleosynthesis by taking the mass of the neutralino as 300GeV and the mass difference between the stau and the neutralino as (100 – 120)MeV. We can therefore simultaneously explain the abundance of the dark matter and that of 7Li by these values of parameters. The lifetime of staus in this scenario is predicted to be O(100 – 1000) sec.

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Special Address

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Plenary Session 1 / 933

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Prof. Frank Wilczek

III. Higgs and New Physics / 654

Squark and gluino production at the LHC

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The production of coloured supersymmetric particles is an important SUSY discovery channel at the LHC. Therefore it is essential to know the theoretical predictions for squark and gluino production cross sections with high accuracy. Higher order QCD corrections are dominated by the emission of soft gluons from initial and final state particles. The effects of soft gluon emission can be treated systematically to all orders by means of resummation techniques. In this talk I report on the calculation of the resummed cross sections for squark- and gluino-production processes in hadronic collisions and present the currently most precise predictions for these cross sections at the LHC.

VII. Standard Model Electroweak Physics / 445

Standard Model Prediction for the Muon Anomalous Magnetic Moment

Authors: Friedrich Jegerlehner[1] ; Simon Eidelman[2]

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[2] *Budker Institute of Nuclear Physics, Novosibirsk*

Corresponding Author: simon.eidelman@cern.ch

An update of the theoretical prediction for the muon anomalous magnetic moment within the Standard Model is presented. It is based on recent low energy e+e- data for the leading order hadronic contributions as well as developments in the estimates of the hadronic light-by-light term. The theoretical prediction is confronted to the world average value of the experimentally measured muon anomaly.

VII. Unified Theories, Strings, Non-perturbative QFT / 85

Standard(-like) Model from an SO(12) Grand Unified Theory in six-dimensions with S(2) extra-space

Author: Joe Sato[1]

Co-author: Takaaki Nomura [1]

[1] *Saitama University*

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We analyze a gauge-Higgs unification model which is based on a gauge theory defined on a six-dimensional spacetime with an S^2 extra-space. We impose a symmetry condition for a gauge field

and non-trivial boundary conditions of the S^2. We provide the scheme for constructing a four-dimensional theory from the six-dimensional gauge theory under these conditions. We then construct a concrete model based on an SO(12) gauge theory with fermions which lie in a 32 representation of SO(12), under the scheme. This model leads to a Standard-Model(-like) gauge theory which has gauge symmetry SU(3) $\times$ SU(2)$_L$ $\times$ U(1)$_Y$($\times$ U(1)^2) and one generation of SM fermions, in four-dimensions. The Higgs sector of the model is also analyzed, and it is shown that the electroweak symmetry breaking and the prediction of W-boson and Higgs-boson masses are obtained.

12

Stationary condition in a perturbative approach for mass varying neutrinos

Author: Alex Bernardini[1]

Co-author: Orfeu Bertolami [2]

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A perturbative approach for arbitrary choices of the equation of state of the universe is introduced in order to treat scenarios for mass varying neutrinos (MaVaN's) coupled to the dark sector.
The generalized criterion for the applicability of such an approach is expressed through a constraint on the coefficient of the linear perturbation on the dark sector scalar field.
This coefficient depends on the ratio between the variation of the neutrino energy and the scalar field potential.
Upon certain conditions, the usual {\em stationary condition} found in the context of MaVaN models together with the perturbative contribution can be employed to predict the dynamical evolution of the neutrino mass.
Our results clearly indicate that the positiveness of the squared speed of sound of the coupled fluid and the model stability are not conditioned by the {\em stationary condition}

III. Higgs and New Physics / **837**

Statistical issues for Higgs and new physics searches

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How should we interpret discovery sensitivity plots and exclusion plots?
What are the expected limits vs the actual ones?
Was the look elsewhere effect taken into account?
Why do Bayesian and frequentist approaches sometimes give very different answers?
In a short review we will try to answer these and other questions that some of us wanted to ask but wouldn't dare.

I. Neutrino Physics / **18**

Status of Cuore experiment and last results from Cuoricino

Author: Elena Guardincerri[1]

[1] *INFN Genova*

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CUORE is a cryogenic-bolometer detector consisting of 988 TeO2 crystals, 750 g each, operated at a temperature of 10 mK, currently under construction in Gran Sasso Underground Laboratory.
Its goal is to search for neutrinoless double beta decays with a sensitivity to the effective neutrino mass as low as a few tens of meV.
CUORICINO, its pilot experiment, has proven the feasibilty of CUORE, setting moreover the current lower limit on the lifetime of 130Te for neutrinoless double beta decay: we report on the up-to-date CUORICINO results and discuss the prospects for CUORE.

II. Flavour Physics / **668**

Status of the CKM matrix as of Summer 2009 and sensitivity to New Physics

Author: Jose Ocariz[1]

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We summarise the current status of the Cabbibo-Kobayaski-Maskawa matrix describing mixing and CP violation in the quark sector. We review the main ingredients of the global CKM analysis, with an emphasis on recent results and their impact. We assess the compatibility between various sources of information. We discuss the role of theoretical and experimental uncertainties.
We use current data to analyse scenarios of potential deviations from the flavour sector in the Standard Model, by setting constraints on additional effective parameters accounting for possible New Physics effects.

I. Neutrino Physics / **253**

Status of the OPERA neutrino experiment

Author: Henri PESSARD[1]

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The OPERA long-baseline oscillation experiment is located in the underground Gran Sasso laboratory in Italy. OPERA has been designed to observe nu-mu -> nu-tau appearance in the CNGS nu-mu beam, 730 km away from its source at CERN. The apparatus consists of a large set of emulsion-lead targets combined with electronic detectors. First runs in 2007 and 2008 helped checking that detector and related emulsion facilities are fully operational and led to successful first analysis of collected data. The talk, after a short description of the OPERA setup, will present an updated status report on data reconstruction and analysis applied to present samples of neutrino events.

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Status of the T2K experiment

Author: Ken Sakashita[1]

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T2K (Tokai-to-Kamioka) is a second generation long baseline neutrino experiment utilizing a newly built neutrino source with a MW class high energy proton accelerator complex (J-PARC neutrino facility), a near neutrino detector (ND280) to characterize the neutrino beam 280 meters from the source, and Super-Kamiokande as the far detector at 295 km.

The primary motivation for T2K is the discovery of the nu_mu to nu_e conversion phenomena and, as a consequence, the finite value of the theta_13 mixing angle. It will also conduct a precise measurement of theta_23 and the mass difference of neutrino mass eigenstate. The ultimate goal for T2K is to establish the lepton flavor mixing structure.

Construction of the J-PARC neutrino facility was completed in March 2009 and engineering operation of the T2K started as scheduled the following month. This talk will provide a general introduction to T2K, and present the current beam commissioning status and the status of preparations towards the start of the experiment in fall 2009.

I. Neutrino Physics / **771**

Status of the T2K experiment

Author: Ken Sakashita[1]

[1] *HIGH ENERGY ACCELERATOR RESEARCH ORGANIZATION, KEK*

Corresponding Author: kensh@post.kek.jp

T2K (Tokai-to-Kamioka) is a second generation long baseline neutrino experiment utilizing a newly built neutrino source with a MW class high energy proton accelerator complex (J-PARC neutrino facility), a near neutrino detector (ND280) to characterize the neutrino beam 280 meters from the source, and Super-Kamiokande as the far detector at 295 km.

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I. Astroparticle Physics / **101**

Status of the XENON100 experiment for WIMP direct detection

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The XENON100 experiment aims to directly detect cold dark matter particles via their elastic collisions with Xenon nuclei. On this purpose a ultra-low background double phase (liquid-gas) xenon filled time projection chamber with a total mass of 170 kg (70 in the target region and 100 kg in the active shield) has been installed at the Gran Sasso Underground Laboratory and is currently taking calibration data. In this talk the background predictions based on Monte Carlo simulations with input from screening of detector and shield materials will be presented. Moreover the design and performance of the detector and its associated systems, based on the calibration runs will be also presented.

IV. Detectors (LHC and R&D) and Accelerators / **642**

Status of the international Muon ionization cooling experiment

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Muon ionization cooling provides the only practical solution to prepare high brilliance beams necessary for a neutrino factory or muon colliders. The muon ionization cooling experiment (MICE) is under development at the Rutherford Appleton Laboratory (UK). It comprises a dedicated beam line to generate a range of input emittance and momentum, with time-of-flight and Cherenkov detectors to ensure a pure muon beam. A first measurement of emittance is performed in the upstream magnetic spectrometer with a scintillating fiber tracker. A cooling cell will then follow, alternating energy loss in liquid hydrogen and RF acceleration. A second spectrometer identical to the first one and a particle identification system provide a measurement of the outgoing emittance. By July 2009 it is expected that the beam and first set of detectors will have been commissioned and a first measurement of input beam emittance may be reported. Along with the steps in the measurement of emittance reduction (cooling) that will follow later and in 2010.

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Stellar lumps of mass varying particles

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The theoretical conception of compact structures that share the key features of mass varying mechanisms provides by itself the conditions for establishing the equilibrium and stability of stellar massive objects.
We investigate static, spherically symmetric solutions of Einstein equations for a fluid of mass varying particles of non-baryonic matter (neutrinos or dark matter) which forms stable structures through attractive forces mediated by a background scalar-field (dark energy).

Assuming that the non-baryonic matter consists in a gas of weakly interacting particles, for practical reasons, the coupling with the scalar field is converted into a dependence of the mass on the radial coordinate of the curved space-time.
The stability analysis reveals that our static solutions become dynamically unstable for different Buchdahl's limits of the ratio between the total mass-energy and the stellar radius, M
bbR/R.
An external observer can also find regular solutions that have Schwarzschild black-holes similar characteristics.
Our analysis leaves open the questions whether such solutions exist, which are both regular and stable.

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Stopping in ultrarelativistic nuclear collisions - results from NA49

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It is now generally accepted that heavy ion collisions at ultra relativistic energies result in a fireball of matter with high density and temperature. Such conditions prevail, when the incoming nucleons deposit enough of their kinetic energy in the reaction zone. Little is known about this stopping process and about possible differences between the stopping of the incident nucleons in elementary nucleon-nucleon interactions and nucleus-nucleus collisions.
The longitudinal momentum of the net baryons after the collision is a suitable observable to characterize the energy loss (stopping) of the incident nucleons. In this contribution we present a systematic study of the rapidity distributions of net protons and Lambda hyperons as function of centrality in Pb+Pb collisions at 158 and 40 GeV per nucleon incident energy. The experimental nuclear collision data are compared to data from elementary nucleon-nucleon interactions, to results of microscopic transport model calculations, and to expectations from a core-corona picture in which the reaction zone consists of a hot and thermalized core (central fireball) and a corona with characteristics given by elementary nucleon-nucleon interactions.

VI. QCD in Hadronic Physics / 858

Strangeness Production in Deep-Inelastic ep Scattering at HERA

Author: Katja Krueger[1]

Co-author: Julia Ruiz Tabasco [2]

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The production of strange hadrons is investigated using deep-inelastic scattering events measured with the H1 detector at HERA. The measurements of K_s and Lambda production are performed in two regions of phase space defined by the negative four-momentum transfer squared of the photon Q^2. The K_s and Lambda production cross sections and

their ratios are determined and presented differentially as a function of several kinematical variables. The K_s production rate is compared to the production of charged particles in the same region of phase space. In addition, the Lambda - Anti-Lambda asymmetry is measured. The production of K*(892) vector mesons in deep-inelastic scattering at low Q^2, observed through the decay chain K*+- −> K0s pi+-*, is measured for the first time at HERA. The analysis is based on data taken in the HERA-II running period. Inclusive cross sections are presented as a function of the transverse momentum squared P_T^2, the rapidity y and the centre-of-mass energy W of the hadronic final state. The data are compared to theoretical predictions, based on leading order Monte Carlo programs with parton showers.

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Strategies for btagging calibration using data at CMS

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The CMS Collaboration is studying several algorithm to discriminate jets coming from the hadronization of b quarks from the lighter background. These will be used to identify top quarks and in searches of the Higgs boson and non-Standard Model processes. A reliable estimate of the performance of these algorithms is therefore crucial, and methods to estimate efficiencies and mistag rates directly on data are needed. While on simulated data it was shown the btagging algorithms are shown to reach adequate performance for standard model and beyond analyses, when searching for the better b efficiency / light rejection, it is definitely not trivial extract and validate these figures on real data. The CMS Monte Carlo simulation, even if tuned for more than 10 years, is in fact not expected to be reliable on the first data, and large discrepancies can also come from the experimental inputs on the production of heavy flavours. The CMS btagging group has prepared several strategies to extract efficiencies and rejection rates from data, which should work even on the first data (10 pb-1). Three methods are currently studied. The first extracts rejection rates from light quarks looking at tracks with negative impact parameter, and using these distributions to model the mistag rate due to detector effects like resolutions, badly reconstructed tracks etc. The second method uses samples with reconstructed muons; by applying cuts on b-tagging and on the pT of the muon relative to the jet, a system of equations can be constructed which leads to the direct extraction of efficiencies and rejections. The third method uses ttbar events with semi leptonic or fully leptonic W decays, and uses likelyhood-based and event counting based methods to estimate the efficiencies. The strategies here described are studied taking into account the possible startup scenarios of LHC, and are currently being expanded to take into account the miscalibration scenarios (alignment etc) which CMS can show at the startup.

VII. Unified Theories, Strings, Non-perturbative QFT / 759

String Cosmology

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During the past decade, the study of the cosmological implications of string theory has evolved into a very active and fruitful field of research. The remarkable progress in this area is to a large extent driven by the impressive advances in observational cosmology as well as by important theoretical

progress, in particular, regarding the problem of moduli stabilization in string compactifications. In this talk, I will review some of the highlights of string cosmology, focusing on aspects of moduli stabilization, de Sitter vacua, inflation, cosmic strings and gravitational waves.

VII. Unified Theories, Strings, Non-perturbative QFT / 754

String Phenomenology

Author: Joseph Conlon[1]

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I discuss string phenomenology, gauge threshold corrections and LARGE volume models. I describe scenarios for moduli stabilisation and supersymmetry breaking.

Plenary Session 2 / 950

String theory

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IV. Heavy Ions / 376

Strong and Electromagnetic Interactions at SPS Energies

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Particle production in Pb-Pb collisions and hadron-induced reactions has been measured at a beam energy of 158 GeV per nucleon. The measurements provide full double differential coverage in a wide range of longitudinal and transverse momenta, including the central ("mid-rapidity") area and extending far into the projectile fragmentation region.

The resulting analysis shows the heavy-ion reaction as a mixture of different processes. On one hand, the transition from the elementary (proton-proton) to the nuclear (Pb-Pb) collision induces a visible modification of produced particle spectra. This effect is particularly important at higher transverse momenta.

On the other hand surprising phenomena, like the presence of large and strongly varying structures in the shape of the double differential cross section d^2sigma/dx_Fdp_T, are induced by the final state electromagnetic interaction between produced particles and the charged spectator system. This effect is largest in peripheral collisions and at low transverse momenta, where it results in a deep valley in the x_F-dependence of the produced pi+/pi- ratio.

The basic characteristics of the electromagnetic phenomenon described above agree with these presented in an earlier theoretical work [1,2]. Versatile information on the heavy-ion reaction mechanism becomes therefore available. In particular, the electromagnetic effect is sensitive to the initial conditions of particle production (time of final state hadron emission, distance of the formation zone

from the two spectator systems, size of the emission source). As a result, it provides new information on the space and time evolution of the particle production process.

[1] A.Rybicki, A.Szczurek, Phys.Rev.C75 (2007) 054903
[2] A.Szczurek, A.Rybicki, A.Gorski, J.Phys.G34 (2007) S827

V. QCD at Colliders / 1008

Studies of W and Z production with the LHCb experiment

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We report on studies of W and Z boson production in the LHCb experiment. Strategies for triggering, boson selection and background reduction are described. Prospects for differential cross-section measurement are given, with estimates of statistical and systematic errors. The sensitivity of the differential cross sections to parton density functions is discussed.

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Studies of W boson production in the forward region with LHCb

Author: Victor Egorychev[1]

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We report on studies of W boson production in the LHCb experiment.
Strategies for triggering, boson selection and background reduction are described. Prospects for differential cross-section measurement are given, with estimates of statistical and systematic errors. The sensitivity of the differential cross-section to uncertainties in parton density functions is discussed

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Studies of Z boson production in the forward region with LHCb

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We report on studies of Z boson production in the LHCb experiment. Strategies for triggering, boson selection and background reduction are described. Prospects for differential cross-section measurement are given, with estimates of statistical and systematic errors. The sensitivity of the differential cross section to uncertainties in parton density functions is discussed.

V. QCD at Colliders / 783

Studies of forward jets and production of W,Z within kt factorisation approach

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We are interested in processes which probe partonic structure where
the partons carry a small fraction of the protons momentum.
In particular the physics of forward jets and production of W,Z,
bosons allows for this studies.
In our approach we apply kt factorisation
framework and perform simulations using Monte Carlo generator CASCADE.

I. Astroparticle Physics / 54

Studies of the ultra-high energy cosmic ray composition at the Pierre Auger Observatory

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The hybrid Pierre Auger Observatory, consisting of fluorescence detector with 24 telescopes and of surface detector with more than 1600 water Cherenkov stations, has been collecting quality data since January 2004. In this contribution we present current results of studies of ultra-high energy cosmic ray composition. The depth of maximum of air showers determined using fluorescence telescopes and the magnitude of the fluctuations of this maximum depth are reported as functions of energy. The mass composition is then derived from these data using modern hadronic interaction models, and subsequently the contraints are given on the parameters of the hadronic interactions in the ultra-high energy region. These results are also compared with the observables obtained independently from the surface array of water Cherenkov detectors, which are also sensitive to the mass composition, in particular with a risetime of the signals and with azimuthal
assymetries of the time distributions. Finally, we also briefly discuss the new limits on the flux of ultra-high energy photons and of diffuse ultra-high energy neutrinos, and we investigate the impact of these limits on top-down models of cosmic rays origin.

VI. QCD in Hadronic Physics / 580

Study of Υ(5S) decays to B^0 and B^+ mesons

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The Υ(5S) decays to channels with B^+ and B^0 mesons are studied using a 23.6 fb~$^{-1}$ data sample collected on the Υ(5S) resonance with the Belle detector at the KEKB asymmetric energy e^+e^- collider. Using fully reconstructed B mesons, we measure the total B^+ and B^0 production rates per $b\bar{b}$ event and the two-body, three-body and four-body channel Υ(5S) decay fractions for events with B mesons.

II. Flavour Physics / 1024

Study of Bs → Ds+(*) Ds-(*) and Bs → phi phi Decays at CDF II

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Under certain theoretical assumptions, the branching fraction of Bs → Ds+() Ds-() is directly sensitive to the relative decay width difference DeltaGamma_CP/Gamma in the Bs system, which is predicted to be sizable in the standard model. Using approx. 4 fb-1 of data collected by the CDF II detector at the Tevatron ppbar collider, we are currently performing an exclusive selection of Bs → Ds+() Ds-() signal candidates in several hadronic modes. In contrast to former branching fraction measurements of this decay, we will be able to disentangle Bs → Ds+() Ds-() and measure the branching fractions of Bs → Ds+ Ds-, Bs → Ds+*Ds-, and Bs → Ds+* Ds-* separately.
Yet another interesting mode is the decay of the Bs into a phi pair: this is a vector-vector decay dominated by b→sss penguin transition which is a sensitive probe for possible new physics effects. The only existing sample of this mode was reconstructed by the CDF experiment from 0.2 fb-1 of data, and consisted of only 8 signal events. Here we present new results based on a clean sample of about 300 Bs → phi phi decays reconstructed by the CDF II detector in a dataset with an integrated luminosity of about 3 fb-1.

II. Flavour Physics / 648

Study of CP violation in Bs -> J/psi phi decays at CDF

Author: The CDF Collaboration[1]

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The first measurement of CP violation phase beta_s in Bs -> J/psi phi decays in 2007 generated considerable interest. The interest was caused by the small deviation from the SM. While not sufficiently significant, together with other measurements it is suggestive of a possible new physics contribution. In the subsequent update using 2.8 fb-1 of data collected by CDF II detector deviation from the SM further increased. We present latest CDF results on the mean decay width Gamma_s and CP violating phase beta_s, based on an angular- and time-dependent analysis of the Bs -> J/psi phi decays, including determination of the flavor of the Bs meson at production time.

II. Flavour Physics / 869

Study of Decays Bd to J/psi K* and Bs to J/psi phi whith the D0 detector

III. Higgs and New Physics / 761

Study of SUSY particles properties at the future International Linear Collider with the International Large Detector

Author: Katarzyna Wichmann[1]

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Recently, Letters of Intent (LoI) for experiments at the International Linear Collider (ILC) have been submitted. Among the three proposals is the International Large Detector (ILD) concept which is at the focus of these studies.
From various subjects addressed in the LoI, a wide spectrum of studies of SUSY particle properties is presented here. Most of them are benchmark reactions for the ILC and can be used both in physics studies and in work on detector design and optimization, respectively. All studies were performed with a full detector simulation using GEANT4, which is a great improvement compared to the previous results with much less detailed, so called "fast", simulation (SIMDET). The importance of this improved simulation is reflected in the results. The presented analyzes have been chosen to be the most challenging for the detector to study its performance and guide the detector development.
Additionally an important problem of unavoidable beam induced backgrounds at linear colliders is addressed and ways of reducing its impact on physics studies are shown for an example SUSY analysis.

V. QCD at Colliders / 988

Study of jet production and subjet distributions in deep inelastic scattering at HERA

Authors: Claudia Glasman[1] ; Monica Turcato ZEUS Collaboration[2]

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Inclusive jet cross sections in charged current deep inelastic scattering (DIS)
and three-jet production in DIS and photoproduction were studied with the ZEUS detector at HERA.

For the study of inclusive jet-production in charged current DIS, differential
cross sections are presented as functions of Q2, Bjorken x and the jet transverse energy
and pseudorapidity. The dijet invariant mass cross section is also presented.
Observation of three- and four-jet events in charged-current e±p processes is
reported for the first time. The predictions of next-to-leading-order
(NLO) QCD calculations are compared to the measurements. The data have the potential to
constrain the u and d valence quark distributions in the proton if
included as input to global fits.

For the study of three-jet production measurements of differential cross sections are presented as functions of angular correlations between the three jets in the final state and the proton-beam direction. These correlations provide a stringent test of perturbative QCD and show sensitivity to the contributions from different colour configurations. Fixed-order perturbative QCD calculations assuming the values of the colour factors C_F, C_A and T_F as derived from a variety of gauge groups were compared to the measurements to study the underlying gauge group symmetry. The measured angular correlations in the deep inelastic ep scattering and photoproduction regimes are consistent with the admixture of colour configurations as predicted by SU(3) and disfavour other symmetry groups, such as SU(N) in the limit of large N.

Subjet distributions were also measured in neutral current deep inelastic ep scattering with the ZEUS detector at HERA using an integrated luminosity up to 334 pb-1. Jets were identified using the kT cluster algorithm in the laboratory frame. Subjets were defined as jet-like substructures identified by a reapplication of the cluster algorithm at a smaller value of the resolution parameter ycut. Measurements of subjet distributions for jets with exactly two or three subjets are presented as functions of observables sensitive to the pattern of parton radiation and to the colour coherence between the initial and final states. In the case of three subjets measurements are also presented as functions of angular correlations between the three subjets which provide a stringent test of perturbative QCD and show sensitivity to the contributions from different colour configurations. Perturbative QCD predictions give an adequate description of the data.

III. Higgs and New Physics / 740

Study of multi-muon events produced in ppbar collisions with CDF

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We report a study of multi-muon events produced at the Fermilab Tevatron collider and recorded by the CDF II detector. In a data set acquired with a dedicated dimuon trigger and corresponding to an integrated luminosity of 2100pb-1, we isolate a significant sample of events in which at least one of the muon candidates is produced outside of the beam pipe of radius of 1.5 cm. The production cross section and kinematics of events in which both muon candidates are produced inside the beam pipe are successfully modeled by known QCD processes which include heavy flavor production. In contrast, we are presently unable to fully account for the number and properties of the remaining events, in which at least one muon candidate is produced outside of the beam pipe, in the terms of the same understanding of the CDF II detector, trigger, and event reconstruction. Several topological and kinematic properties of these events are presented. The events offer a plausible resolution to long-standing inconsistencies related to b-bbar production and decay.

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Study of tau-pair production with the ZEUS detector at HERA

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A search for events containing two high-transverse-momentum tau leptons has been performed with the ZEUS detector at HERA, using the data sample collected between 2004 and 2007, corresponding to 0.36 fb^-1. At least one of the tau candidates is required to decay hadronically, while the second tau is required to decay either in an electron or in hadrons. The number of observed tau pairs has been compared with the prediction from the Standard Model, where the largest contribution is expected from Bethe-Heitler interactions. Possible deviations from the Standard Model, especially at high invariant masses of the tau pair, have been searched for.

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Study the Signature of Ultra High Energy Neutrino Interactions in Matter

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The ultra-high energy neutrinos play one of the most important acts in astroparticle physics. There are many experiments on going and proposed to detect them. We study the radio/acustic signal from UHE neutrino induce particle showers by using ab initio method in time domain. Our study can provide general rule for radio/acustic detector design and deploy.

IV. Detectors (LHC and R&D) and Accelerators / 819

Super KEKB and Belle II

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The Belle detector at the KEKB electron-positron collider has collected approximately 800 million Upsilon(4S) events in its decade of operation. The KEKB group has proposed Super-KEKB, an upgrade of KEKB to increase the luminosity by two orders of magnitude during a three-year shutdown, with an ultimate goal of 8 x 10^35/cm^2/s luminosity. To exploit the improved luminosity, an upgrade of the Belle detector has been proposed. A new international collaboration Belle-II is being formed, with a broader participation of European institutions. Super-KEKB and Belle-II were officially placed on the KEK 5-year Roadmap. The talk will present basic plans of the accelerator upgrade, as well as key improvements of the detector. More details will be given on the DEPFET pixel detector that will be designed and built in Europe.

Joint EPS - EFCA meeting / 1021

Super-B factories

721

SuperNEMO - the next generation double beta decay experiment

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The SuperNEMO experiment is being designed to search for neutrinoless double beta decay to test if neutrinos are Majorana particles. The experimental technique follows that of the currently running NEMO-3 experiment, which successfully combines tracking and calorimetry to measure the topology and energy of the final state electrons. Unique particle identification capabilities of SuperNEMO will be employed with about 100 kg of 82Se and will reach sensitivity to a half-life time of about 2*10*26 years, which corresponds to Majorana neutrino masses of about 50 meV, depending on the calculated value of the nuclear matrix element. The construction of the 'demonstrator' module with about 5 kg of 82Se is expected to commence in 2010, and, if successful, will be followed by 19 more of similar modules. In this talk, we will present the current status of the SuperNEMO project.

VII. Standard Model Electroweak Physics / 845

TOP-MASS MEASUREMENTS FROM DØ

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We present three analyses of the mass of the top quark (mt) using top-antitop candidate events collected by the DO experiment during the current run of the Fermilab Tevatron Collider: (i) a 3.6 events/fb sample of data in the lepton+jets channel analyzed to extract a precision value of mt using the "Matrix-Element" method (ME), wherein each event probability is calculated from the differential production cross section as a function of mt and the overall jet energy scale, with the latter partly constrained by the two jets from W decay into q'q, (ii) first measurement of the mass difference between top and antitop quarks as a check of CPT invariance in the quark sector, also utilizing the ME method in lepton+jets channels, corresponding to a 1event/fb data sample, and (iii) measurements of mt in dilepton final states (updated to 3.6 events/fb), based on "matrix" weighting, "neutrino" weighting and the ME method, relying, respectively, on the likelihood of observing the events in data for a range of assumed mt values, distributions generated from event weights used to compare the calculated and reconstructed missing transverse energies, and event probabilities based on the leading-oder differential cross section as a function of assumed mt.

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The ATLAS Computing Model

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The ATLAS computing model was constructed to exploit the opportunities of the Grid in handling the large volumes of data from the Large Hadron Collider and to allow easy and relatively local

access to data for all of its collaborators worldwide. Despite delays with collision data, the model has now been tested with beam-related and cosmic ray data, and much has been learned. The model has retained its overall design, but with adjustments for the actual functionality of the delivered Grid middleware and services, and for the realities of data access. While much has still to be learned, the model has worked effectively. This presentation will cover the roles of the various Tiers, the resources required and the expected workflows.

IV. Detectors (LHC and R&D) and Accelerators / **972**

The ATLAS Trigger System: Recent Experience and Future Plans

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This paper will give an overview of the ATLAS trigger design and its innovative features. It will describe the valuable experience gained in running the trigger reconstruction and event selection in the fastchanging
environment of the detector commissioning during 2008. It will also include a description of the trigger selection menu and its 2009 deployment plan from first collisions to the nominal luminosity.
ATLAS is one of the two general-purpose detectors at the Large Hadron Collider (LHC). The trigger system needs to efficiently reject a large rate of background events and still select potentially interesting ones
with high efficiency. After a first level trigger implemented in custom electronics, the trigger event selection
is made by the High Level Trigger (HLT) system, implemented in software. To reduce the processing time to
manageable levels, the HLT uses seeded, step-wise and fast selection algorithms, aiming at the earliest
possible rejection of background events. The ATLAS trigger event selection is based on the reconstruction of
potentially interesting physical objects like electrons, muons, jets, etc.
The recent LHC startup and short single-beam run provided the first test of the trigger system against real data. Following this period, ATLAS continued to collect cosmic-ray events for detector alignment and
calibration purposes. Both running periods provided very important data to commission the trigger reconstruction and selection algorithms. Profiting from this experience and taking into account the ATLAS
first year physics goals, we are preparing a trigger selection menu including several tracking, muon-finding
and calorimetry algorithms. Using Monte Carlo simulated data, we are evaluating the impact of the trigger
menu on physics performance and rate.

IV. Heavy Ions / **730**

The BRAHMS results on the proton-to-pion ratio pT-dependence in the RHIC range of baryo-chemical potential

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The BRAHMS results on the proton-to-pion ratio pT-dependence in the RHIC range of baryo-chemical potential

N. Katryńska, Z. Majka (for the BRAHMS Collaboration)

BRAHMS measurement of proton-to-pion ratios in Au+Au and p+p at (s NN) ½ = 62.4 GeV and 200 GeV will be presented as a function of transverse momentum and collision centrality within the pseudorapidity range 0 < η < 3. The baryo-chemical potential, μB, for the indicated data spans from μB ~ 25 MeV ((s NN) ½ = 200 GeV, η = 0) to μB ~ 260 MeV ((s NN) ½ = 62.4 GeV, η ~ 3) [1]. A striking agreement between p/π(p T) ratio measured for Au+Au collisions at (s NN) ½ = 200 GeV (η ~ 2.2) and at (s NN) ½ = 62.4 GeV (η ~ 0) is observed, where the properties of the bulk medium can be described with the common value of μB = 65 MeV. The p/π ratio for Au+Au system at (s NN) ½ = 62.4 GeV, η ~ 3 reaches astounding value of 8-10 at pT = 1.5 GeV/c. For these energy and pseudorapidity interval no centrality dependency of p/π ratio is observed. Comparison of the measured p/π+ and pbar/π- ratios at different beam energies and rapidities with theoretical models [2,3,4] will be provided.

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IV. Detectors (LHC and R&D) and Accelerators / 775

The CALICE hadron calorimeters - beam test results and new developments.

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A prototype of a highly granular CALICE scintillator-steel hadron calorimeter using SiPMs as photodetectors has been tested in electron and hadron beams at CERN and Fermilab in the energy range 1-80 GeV. More than 7600 SiPMs - the highest number ever used - performed well over a period longer than 2 years and did not show an increase of noise. The electron data were used to validate the detector understanding and its calibration. The analysis of the first part of data from hadron beams leads to the energy resolution of 61%/√E which can be further improved to 49%/√E applying energy dependent weights. The data on the longitudinal and transverse shower shapes allow discrimination among hadronization models of GEANT4. Specifically QGSP_BERT and LHEP predictions were compared to the data. The beam test data allow in situ calibration possibilities to be evaluated.

The next step in the calorimeter development for the ILD detector of the ILC, is the construction of a technical prototype - a calorimeter wedge segment of dimensions 80 x 110 x 230 cm3 with most of the front-end and calibration electronics included in the detector volume. The electronics aims at several new goals - power pulsing, auto-triggering, analogue pipelining and ADC and TDC integration.

We also present the alternative concept of a Digital Hadron Calorimeter (DHCAL) for use in a detector optimized for the application of Particle Flow Algorithms to the measurement of jet energies. We report on two lines of R&D being pursued by the CALICE Collaboration following different read-out and integration concepts.
Both are based on glass resistive pad chambers with 1 cm2 pad read-out, alternative amplification techniques like GEMs or Micromegas are also being considered.

One series of studies applies a single threshold (1-bit) to the signal charges, providing digital readout with the front end part integrated on the pad board. We report on detailed measurements with a

small scale prototype in the Fermilab test beam using muons, positrons, pions, and protons and in the laboratory using cosmic rays. The results validate the concept and have served as the basis for the design to fully instrument the 1m3 CALICE test beam absorber structure. An update on the ongoing construction of the active modules will be given.

An alternative approach is to use semi-digital readout electronics following a design close to the one to be used in the future linear collider experiments. One feature of this electronics integration concept is that it would not require active cooling but rely on power-pulsed electronics. Based on this concept, a small prototype was built and tested with success at the CERN PS test beam in 2008. To validate completely this new concept a scalable prototype structure of 1m^3 volume is being planned. A few GRPCs as large as 1 m^2 were built with a new design with emphasis on minimized dead zones and optimized gas flow. The GRPCs were tested with an electronics board of the same size, containing 144 64-channel ASICs, representing the largest ever built with the embedded electronics scheme.

IV. Detectors (LHC and R&D) and Accelerators / **401**

The CMS Electromagnetic Calorimeter: Construction, Commissioning and Calibration

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The Compact Muon Solenoid (CMS) detector at the Large Hadron Colider (LHC) is ready for first collisions. The Electromagnetic Calorimeter (ECAL) of CMS, a high resolution detector comprised of nearly 76000 lead tungstate crystals, will play a crucial role in the coming physics searches undertaken by CMS. The design and performance of the CMS ECAL with test beams, cosmic rays, and first single beam data will be presented. In addition, the status of the calorimeter and plans for calibration with first collisions will be discussed.

III. Higgs and New Physics / **203**

The Constrained E6SSM

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I will discuss the predictions of a constrained version of the exceptional supersymmetric standard model (cE6SSM), with a universal high energy soft scalar mass, soft trilinear coupling and soft gaugino mass. The spectrum includes a light gluino, a light wino-like neutralino and chargino pair and a light bino-like neutralino, with other sparticle masses except the lighter stop being much heavier. I will also discuss scenarios with an extra light exotic colour triplet of fermions and scalars and a TeV scale Z', which lead to early exotic physics signals at the LHC.

IV. Detectors (LHC and R&D) and Accelerators / **82**

The Dark Energy Camera - a New Instrument for the Dark Energy Survey

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The discovery that the universe is accelerating, not slowing down from the mass it contains, is the surprise that sets the initial research program of 21st Century cosmology. The Dark Energy Survey (DES) is a next generation sky survey aimed directly at understanding this mystery. DES is designed to measure the dark energy equation of state parameter with four complementary techniques: galaxy cluster counts, weak lensing, angular power spectrum and type Ia supernovae. We present an overview of the DES instrument (DECam) which will be mounted at the prime focus of the Blanco 4m telescope at CTIO. DECam includes a 3 square degree focal plane covered by 62 2kx4k CCDs, a five element optical corrector, up to eight filters, a modern readout and control system, and the associated infrastructure for operation in a new prime focus cage. We will use the 250 micron thick fully-depleted CCDs developed at Lawrence Berkeley National Laboratory (LBNL). DECam also includes design features to enhance the image quality and the efficiency of operations. DECam will be devoted to the DES for 30% of the time over five years and will otherwise be available to the community as an NOAO facility instrument. We will review the status of the construction of the instrument highlighting the results of this summer's full scale integration tests.

I. Cosmology and Gravitational Waves / **83**

The Dark Energy Survey

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The discovery that the universe is accelerating, not slowing down from the mass it contains, is the surprise that sets the initial research program of 21st Century cosmology. The Dark Energy Survey is a next generation sky survey aimed directly at understanding this mystery. We will build an extremely red sensitive 500 Megapixel camera, a 1 meter diameter, 2.2 degree field of view prime focus corrector, and a data acquisition system fast enough to take images in 17 seconds. The cage containing the system mounts at the prime focus of the Blanco 4-meter telescope at CTIO, a southern hemisphere NOAO telescope.
Over 5 years we will use 30% of the available time on the telescope to pursue a high precision multi-bandpass wide area survey, designed to produce photometric redshifts from $0.2 < z < 1.3$. The survey g,r,i,z data will cover 5000 sq-degrees, with 4000 sq-degrees overlapping the Sunyaev-Zeldovich CMB survey being conducted by the South Pole Telescope.
Our 4 science goals aim at extracting cosmological information on the dark energy from 1) cluster counting and spatial distribution of clusters at $0.1 < z < 1.3$, 2) the shifting of the galaxy spatial angular power spectra with redshift, 3) weak lensing measurements on several redshift shells to $z\sim1$, and 4) 2000 supernovae at $0.3 < z < 0.8$.
The signature of dark energy being a cosmological constant is that the dark energy density remains constant while the universe expands; technically that $w=-1$ and that $dw/dt = 0$. We aim at a 5%-15% precision measurement in w from each of our experiments, and a 30% measurement in w'. Combined, they provide both stronger constraints and a check on systematic errors.

I. Neutrino Physics / **708**

The Daya Bay Reactor Neutrino Oscillation Experiment

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The Daya Bay reactor neutrino experiment aims to measure the last unknown neutrino mixing parameter θ_{13} with a sensitivity of $\sin^2 2\theta_{13} < 0.01$ at 90\% C.L.
The experiment will measure the flux and energy spectrum of reactor antineutrinos through the inverse beta-decay reaction on protons with three sites at different distances from the reactor cores.
This measurement will provide a better understanding of the neutrino mixing matrix and will also give direction to future experiments probing CP violation in the lepton sector and the neutrino mass hierarchy. An overview, current status, and schedule of the experiment will be presented.

VII. Standard Model Electroweak Physics / 936

The Discrepancy Between tau and e+e- Spectral Functions Revisited and the Consequences for the Muon Magnetic Anomaly

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We revisit the procedure for comparing the pi pi spectral function measured in tau decays to that obtained in e+e- annihilation. We re-examine the isospin-breaking corrections using new experimental and theoretical input, and find improved agreement between the tau- –> pi- pi0 nu_tau branching fraction measurement and its prediction using the isospin-breaking-corrected e+e- –> pi+pi- spectral function, though not resolving all discrepancies. We recompute the lowest order hadronic contributions to the muon g-2 using e+e- and tau data with the new corrections, and find a reduced difference between the two evaluations. The new tau-based estimate of the muon magnetic anomaly is found to be 1.9 standard deviations lower than the direct measurement.

I. Cosmology and Gravitational Waves / 380

The Evolution of the Large Scale Structure of the Universe from z~2 until now

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We discuss the evolution of clustering of galaxies back to z~2. For that purpose we use the VIMOS-VLT Deep Survey (VVDS) data. We analyze the evolution of the projected two-point correlation function for the global galaxy population and for particular galaxy classes, with different intrinsic luminosities, spectral types, colors and other properties. For the brightest galaxies (with L>L*), for instance, the shape of the correlation function deviated from the power-law much more strongly at z~1 than it is observed now. This finding can be interpreted e.g. in the framework of Halo Occupation Distribution models (HODs) and implies a significant change in the way luminous galaxies traced dark-matter halos at z~1 with respect to now. Our observations represent an important constraint for models trying to reproduce the evolution of galaxy clustering. They also give indications about

the evolution of the position of the most probable host galaxies of gravitational waves-related and high-energy phenomena in the large scale structure.

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The Expected Performance of the ATLAS Inner Detector

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The ATLAS inner detector will see of the order of 1000 charged particle tracks for every beam crossing at the design luminosity of the CERN Large Hadron Collider (LHC).
This talk summarizes the design of the detector and outlines the reconstruction software.
The expected performance for reconstructing single particles is presented, along with an indication of the vertexing capabilities.
The effect of the detector material on electrons and photons is discussed along with methods for improving their reconstruction.
The studies presented focus on the performance expected for the initial running at the start-up of the LHC.
Results from the 2008 cosmic-ray running are also included.

IV. Detectors (LHC and R&D) and Accelerators / 970

The FP420 Project and GasToF: A Picosecond Timing Detector

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FP420 is an R&D project to assess the feasibility of installing proton detectors at 420m from the ATLAS and/or CMS interaction point(s) at the LHC, allowing the measurement, in high luminosity environment, of the spatial position and arrival time of protons scattered at very low angles with fractional momentum loss between 0.2% and 2%. This is expected to open a new program of electroweak, QCD and beyond-the-Standard-Model physics. The challenges of the project are presented, along with the solutions envisaged, notably for the detectors and the original moving mechanism to bring the detectors close to the beam, as recently reported in arXiv:0806.0302. The progress since then is discussed, in particular in the design and prototyping picosecond resolution time-of-flight detectors capable of accurate vertex reconstruction for background rejection at high-luminosities as well as in the in-situ calibration techniques.
GasToF - a Cerenkov detector filled with dense gas and readout by fast MCP-PMTs is proposed for very precise ToF measurements of forward-scattered protons at the LHC. The test beam results, cosmic ray measurements and detailed simulations are presented showing that the GasToF detectors reach the time resolution of several ps and high efficiency very close to its mechanical edge. Operation of GasToF in high luminosity conditions depends on the performance of MCP-PMTs at large event rates. Several studies were performed using a dedicated fast laser setup for testing two kinds of MCP-PMTs - the Hamamatsu R3809U-50 and the Photek 210, and the obtained results are reported.

IV. Detectors (LHC and R&D) and Accelerators / 372

The Fast Tracker Architecture for the LHC baseline luminosity

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Hadron collider experiments search for extremely rare processes hidden in much larger background levels. Only a tiny fraction of the produced collisions can be stored on tape and an enormous real-time data reduction is needed. This requires massive computing power to minimize the on-line execution time of complex algorithms. A multi-level trigger is an effective solution for an otherwise impossible problem.
The Fast Tracker (FTK) [1], [2] has been proposed for high quality track finding at very high rates (Level-1 output rates) for LHC experiments. FTK will use FPGA and ASIC devices in order to complement CPUs. FTK beats the combinatorial challenge with special associative memories, where parallelism is exploited to the maximum level. They compare the track detector hits to all pre-calculated track patterns at once.
The system design is defined and proposed for high-luminosity studies including low-Pt B physics and high-Pt signatures for Level-2 selections: b-jets, tau-jets, and isolated stiff light leptons. We test FTK algorithms using Atlas full simulation with WH and Hqq events at 10^-34 cm-2 s-1. The reconstruction quality is evaluated comparing FTK results with the tracking capability of an offline tracking algorithm. We show that similar resolutions and efficiencies are reached by FTK. The on-line use of the whole silicon tracker is necessary to obtain the low fake rate typical of the offline. We study the event timing inside the pipelined, data-driven FTK architecture. We compare different architectures to optimize the latency and hardware system size.

FOOT Notes.
[1] The fast tracker processor for hadronic collider triggers,
Annovi, A et al.; ;
Nuclear Science, IEEE Transactions on
Volume 48, Issue 3, Part 1, June 2001 Page(s):575 - 580
[2] Hadron collider triggers with high-quality tracking at very high event rates, Annovi, A. et al.;
Nuclear Science, IEEE Transactions on
Volume 51, Issue 3, Part 1, June 2004 Page(s):391 - 400
[3] Performance of the Proposed Fast Track Processor for Rare Decays at the ATLAS Experiment, Brubaker, E.;
Nuclear Science, IEEE Transactions on
Volume 55, Issue 1, Part 1, Feb. 2008 Page(s):145 - 150

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The Fermion Amplitude Probability as a Trace over Spinor Indices

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We re express the fermion probability amplitude as a trace over spinor indices; this reformulation puts the probability amplitude and the probability on equal footing at the computation level. We test the power of the trace formula in two applications: The calculation of the fermion charge-current using a symbolic program and the analytic computation by hand of the quark dipole magnetic moment.

IV. Detectors (LHC and R&D) and Accelerators / 33

The High Level Trigger for Rare Decays at LHCb

Author: Victor Egorychev[1]

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Present constraints on physics beyond the Standard Model are heavily influenced by measurements of rare processes where observables are theoretically well controlled. Rare B decays will offer opportunities to make further world class constraints on new physics at the LHC, and a host of such decays will be studied at the LHCb experiment.

Given the small bb-bar cross-section expected and the very rare decays in question, the trigger is a critical aspect of isolating such decays in the LHC experimental environment. At LHCb the trigger will consist of a first level hardware trigger, based on searching for high transverse energy objects, and a second 'High Level Trigger' based on software algorithms running on a CPU-farm. Developing suitable algorithms for the latter, and understanding their operation, will be one of the central challenges in delivering the first physics measurements. In this paper, the trigger strategy for several of the most promising measurements will be outlined. In addition to isolating suitable signal samples, many measurements will require control channels to establish efficiencies and to provide calibration samples for various effects. The plans for acquiring such ancillary samples will also be detailed. We will also discuss how we will deal with biases introduced in the angular acceptance for the Bd -> K*0 mu+ mu- decay and lifetime biases in the Bs
-> phi gamma decay.

We will summarise with the expected effects of the trigger on our statistical and systematic errors.

IV. Detectors (LHC and R&D) and Accelerators / 566

The Intensity Frontier at Fermilab

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As the highest energy collider in the world, the Tevatron has been the centerpiece of Fermilab's physics program for more than 20 years. This will all change with the imminent startup of CERN's LHC.

This talk will describe how the lab plans to redefine its mission in terms of the "intensity frontier", with a program focusing on neutrino physics, precision measurements and cutting edge accelerator R&D. The key component of this plan is an intense new proton source, referred to as "Project X". Project X and its associated physics program will be described in detail in the context of related programs worldwide. Also discussed will be intermediate plans which will support that lab's physics programs while Project X is being designed and constructed.

I. Neutrino Physics / 769

The International Design Study for the Neutrino Factory

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The International Design Study for the Neutrino Factory (the IDS-NF) has been established by the Neutrino Factory community to deliver the Reference Design Report (RDR) for the facility by the 2012 decision point identified by the Strategy Group of C.E.R.N. Council. The discovery reach of the Neutrino Factory will be presented and compared with alternative techniques (beta-beam and super-beam). The motivation for measurements of the neutrino-mixing parameters with a precision approaching that with which the quark-mixing parameters are known will be reviewed briefly. The baseline design for the facility will be described and its performance presented.

I. Astroparticle Physics / 95

The KM3NeT project: Towards a km^3-scale neutrino telescope in the Mediterranean Sea

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In recent decades we have gained a tremendous amount of knowledge on our Universe. However, up to now astronomical observations have been restricted to the electromagnetic spectrum. The detection of cosmic high-energy neutrinos (>~ 1 TeV) will complement the information from these observations and at the same time provide completely new insights. The low interaction probability, which renders neutrinos perfect cosmic messengers, also poses a large challenge for their detection. Calculations indicate that neutrino telescopes of km^3-scale are necessary to detect neutrino fluxes from Galactic or extra-Galactic objects such as supernova remnants or gamma-ray bursts which are thought to produce neutrinos up to the PeV scale. KM3NeT, which is currently in the design phase, targets to instrument at least one km^3 of deep-sea water in the Mediterranean Sea, its field of view complementing the IceCube neutrino telescope at the South Pole and exceeding it in sensitivity by a substantial factor. The presentation reports on the current status of the KM3NeT project and on possible solutions for the various technical challenges encountered when building an off-shore detector in water depths of several kilometers. It will also discuss first estimates of the expected sensitivity of the detector for different source classes.

I. Neutrino Physics / 982

The LAGUNA project - towards the giant, liquid base detectors for proton decay searches and for low energy neutrino astrophysics.

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The LAGUNA project and its present status will be presented. Some aspects of the physics potential of three liquid base (liquid argon, scintillator and water), large scale particle detectors will be also discussed.

III. Higgs and New Physics / 738

The LHC Signatures of the Extended Gauge Structures in Supersymmetry

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The extensions of the minimal supersymmetric model (MSSM), driving mainly from the need to solve the \mu problem, involve novel matter species and gauge groups. These extended MSSM models can be searched for at the LHC via the effects of the gauge and Higgs bosons or their fermionic partners. Traditionally, the focus has been on the study of the extra forces induced by the new gauge and Higgs bosons present in such models. An alternative way of studying such effects is through the superpartners of matter species and the gauge forces. In this talk, we thus consider a U(1)' gauge extension of the MSSM, and perform a detailed study of the signatures of the model through the production and decays of the scalar quarks and gluino, which are expected to be produced copiously at the LHC. After a through study of the distinctive features of such models with regard to the signatures at the LHC, we carry out a detailed Monte Carlo analysis of the signals from the process pp-> n leptons + m jets + EMT, and compare the resulting distributions with those predicted by the MSSM. Our results show that the searches for the extra gauge interactions in the supersymmetric framework can proceed not only through the forces mediated by the gauge and Higgs bosons but also through the superpartner forces mediated by the gauge and Higgs fermions. Analysis of the events induced by the squark/gluino decays presented here is complementary to the direct Z' searches at the LHC.

IV. Detectors (LHC and R&D) and Accelerators / 35

The LHCb Upgrade

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The LHCb detector has been designed to study CP violation and other rare phenomena in B-meson decays up to a luminosity of $\sim 5.10^{32}\mathrm{cm}^{-2}\mathrm{s}^{-1}$. We will describe the current limitations that prevent LHCb from exploiting the much higher luminosities available at the LHC, and what modifications can be made that allow data taking at an order of magnitude higher instantaneous luminosity. The aim of the LHCb upgrade is to increase the yields in hadronic B-decay channels by about a factor twenty, while for channels with leptons in the final state a factor ten increase in statistics is envisaged.

II. Flavour Physics / 99

The MSSM with large tan(beta) beyond the decoupling limit

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If the parameter tan beta of the MSSM is large, enhanced loop corrections must be resummed to all orders in perturbation theory. We perform this resummation for flavour-diagonal and flavour-violating tan-beta-enhanced corrections without resorting to the decoupling limit, in which the MSSM is reduced to an effective 2HDM. Our results enable us to clarify the dependence of the resummed expressions on the renormalization scheme and to cover two new classes of processes with supersymmetric particles, which are both intractable with the conventional effective-2HDM method: The first class are collider processes with external supersymmetric particles; the second class are loop processes which vanish in the decoupling limit of supersymmetry. Applying the resummation formulae to FCNC processes in B physics, we find an interesting new effect in observables in which the chromomagnetic effective operator is important.

III. Higgs and New Physics / 677

The Probable Fate of the Standard Model

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Extrapolating the Standard Model to high scales using the renormalisation group, three possibilities arise, depending on the mass of the Higgs boson: if the Higgs mass is large enough the Higgs self-coupling may blow up, entailing some new non-perturbative dynamics; if the Higgs mass is small the effective potential of the Standard Model may reveal an instability; or the Standard Model may survive all the way to the Planck scale for an intermediate range of Higgs masses. We evaluate the relative likelihoods of these three possibilities, on the basis of a global fit to the Standard Model made using the Gfitter package. This uses the information about the Higgs mass available directly from Higgs searches at LEP and now the Tevatron, and indirectly from precision electroweak data. We find that the blow-up' scenario is disfavoured at the 99\% confidence level (96\% without the Tevatron exclusion), whereas themetastable' and 'survival' scenarios both remain quite plausible. A future measurement of the mass of the Higgs boson could determine the fate of the Standard Model.

VI. QCD in Hadronic Physics / 555

The Quark Model via an hbar expansion of QCD

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I discuss the possibility that the quark model emerges as the lowest order of an hbar expansion of QCD bound states. Bound state calculations are generally complicated by backward (in time) motion of their relativistic constituents (Z-graphs, corresponding to pair production in a time-ordered formulation). I show that in the absence of loops (i.e., at lowest order in hbar) bound state dynamics may equivalently be formulated using a vacuum where all antifermion states are filled (d^\dag|0> = 0) and fermions only propagate forward in time. The derivation of the Dirac equation in an external potential then becomes straightforward. Fermion-antifermion states are bound by the instantaneous Coulomb (A^0) potential which is determined by the equation of motion (EOM) for each Fock state amplitude. The EOM has a homogeneous solution which gives a linear potential when the direction of the instantaneous field is along the pair separation, as required for minimal action. The solutions are expected to be exact at lowest order in hbar, as evidenced by the fact that the the bound states (evaluated at equal time in all frames) have Lorentz covariant energies, while their relativistic wave functions transform in a novel way.

IV. Detectors (LHC and R&D) and Accelerators / **448**

The STAR Tracking Upgrade

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The STAR collaboration is preparing a tracking detector upgrade, the Heavy Flavor Tracker (HFT) and
the Forward GEM Tracker (FGT) to further
investigate fundamental properties of the new state of strongly interacting matter produced
in relativistic-heavy ion collisions at RHIC and to provide fundamental studies of the
proton spin structure and dynamics in high-energy polarized proton-proton collisions at RHIC.

The HFT is based on a novel two-layer CMOS active-pixel sensor detector together with a conventional
two-layer silicon-strip/silicon-pad detector.

The FGT upgrade will consist of six triple-GEM detectors with two dimensional readout arranged in disks along the beam axis. The FGT project has completed an extensive R&D program of industrially produced GEM foils at Tech-Etch Inc. in comparison to GEM foils produced at CERN based on optical measurements, testbeam and
^{55}Fe source measurements of a triple-GEM prototype detector using
10×10cm^2 GEM foils. The FGT project requires large GEM foils which are currently being tested.

The HFT and FGT design, the status of full prototype tests along with the HFT and FGT construction and the installation schedule will be presented.

IV. Detectors (LHC and R&D) and Accelerators / **729**

The T2K TPCs

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The Tokai-to-Kamiokande (T2K) experiment is a second generation long baseline neutrino oscillation experiment which will start taking data at the end of 2009. A high intensity muon neutrino beam produced at the new JPARC proton accelerator complex at Tokai, Japan is aimed at the Super-Kamiokande detector which is 295 km away. The goals of the experiment include the precision measurement of the muon neutrino disappearance parameters theta23 and Delta m23^2 and the determination of theta13 by the measurement of the muon neutrino to electron neutrino appearance signal.

A near detector complex (ND280) located 280 m from the target will be used to measure the neutrino energy spectrum, flavour content and interaction rates of the unoscillated beam. The tracking part of ND280 consists of two finely segmented scintillator modules (FGDs) and three large gaseous Time Projection Chambers (TPCs) operated within a 0.2 T magnetic field provided by the ex UA1/Nomad magnet.

The TPCs are designed to measure the charge, the momentum, and the identity of charged particles through ionization loss in the gas. 72 micromegas modules, with an equivalent surface of 9 m^2 will equip the three TPCs.

The first TPC has already been constructed and tested with a particle beam and cosmic ray muons. The TPCs will be installed at JPARC in 2009.
The design and construction aspects, the present construction status and results from a beam test operated at TRIUMF with the first fully equipped TPC will be presented.

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The cNMSSM: low-energy phenomenology and possible signatures at the LHC

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We briefly motivate the next-to-minimal supersymmetric extension of the Standard Model (NMSSM). In the NMSSM, a richer Higgs and neutralino spectrum allow for many interesting phenomena that are not present in the minimal supersymmetric extension of the Standard Model.
We propose a supergravity inspired version of the NMSSM (cNMSSM). After considering the different constraints on the parameter space (such as LEP and dark matter constraints), we discuss the phenomenology of the model, the implications regarding dark matter detection, and the prospects for the LHC (sparticle searches and displaced vertices).

I. Astroparticle Physics / 766

The cosmic-ray electron spectrum measured with H.E.S.S.

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The measurement of very-high-energy cosmic-ray electrons is
intrinsically difficult due to their very steep spectrum with low fluxes
and an enormous background of hadronic cosmic rays. The large collection

areas needed for such a measurement can be provided by ground-based imaging atmospheric Cherenkov telescopes. The High Energy Stereoscopic System (H.E.S.S.) has performed the first ground-based cosmic-ray electron measurement and thereby extended the measured range of the spectrum to several TeV. Here the H.E.S.S. measurement is presented, as well as an extension of the H.E.S.S. spectrum towards lower energies. At these energies, H.E.S.S. can probe recent ATIC measurements, which have been interpreted in terms of dark matter scenarios.

V. QCD at Colliders / **742**

The exclusive NLO DGLAP kernels for Non Singlet evolution

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We report here on the ongoing project, called KRKMC,
in which NLO DGLAP evolution is performed for
the exclusive multiparton distributions
with the help of the exclusive kernels.
These kernels are calculated within the two-parton phase space
for bremsstrahlung subset of the Feynman diagrams of the non-singlet evolution,
using Curci-Furmanski-Petronzio factorization scheme.
The multiparton distribution with multiple use of
the exclusive NLO kernels is implemented in the Monte Carlo program
simulating multi-gluon emission from single quark emitter.

I. Astroparticle Physics / **828**

The first year of Fermi LAT: a new light on the high-energy Universe

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For almost one year the Large Area Telescope on board the Fermi observatory has been surveying high-energy phenomena in our Universe. We will present an overview of the status of the mission and of some results from the first year of observations: detection of high-energy gamma-ray bursts, the discovery of new populations of gamma-ray sources, measurement of the cosmic-ray electron spectrum up to 1 TeV and non-confirmation of the excess of diffuse GeV gamma-ray emission seen by EGRET.

Joint EPS - EFCA meeting / **1019**

The future of accelerator based neutrino physics

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Joint EPS - EFCA meeting / 1017

The high-energy frontier

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IV. Detectors (LHC and R&D) and Accelerators / 758

The next energy-frontier accelerator – a linear e+e- collider?

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Two options for a linear e+e- collider are presently under development, the ILC and CLIC. The energy reach of the two machines is different, which leads to two different technological choices. ILC is based on superconducting acceleration technology, the CLIC design uses a two-beam acceleration system with normal conducting copper cavities. Nevertheless considerable synergy between the two design groups has been developed. The talk will highlight the major differences a well as the status and the plans of both machines.

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The role of high-pT particle identification in jet-underlying event correlations

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Jet matter interaction remains a central question and a theoretical challenge in heavy-ion physics and might become important in high-multiplicity events in proton-proton collisions at top LHC energies. Full jet measurements at LHC are hoped to reconstruct the complete energy loss process and fragmentation of the hard parton in the medium. Since, jet reconstruction will be constrained to small cone sizes, study of the connection between jets and their underlying event could provide a differential tool combined with particle identification in a wide momentum range.

In this talk we address the physics motivation to build a novel particle identification detector, in the LHC upgrade program, that is able to identify charged hadrons in the momentum range (10 GeV/c < pT < 30 GeV/c) on track-by-track basis, where the signatures of jet quenching are still expected to be observable. Furthermore, we discuss jet-underlying event correlations in dijet events, focusing on flavour composition and distribution with respect to the jet axes.

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The τ − ⟶ π − π + π − ντ decay and the a1 ρπ - Lagrangian

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Processes in which the a1 resonance either dominates (τ − ⟶ π − π + π − ντ , K+ ⟶ π + l+ l− , e+ e− ⟶ 4π) is supposed to play an important role (photon and dilepton production from a meson gas) are linked together using the meson dominance (MD) hypotestis. The mixing angle of a two-part a1 ρπ - Lagrangian is first fixed together with the mass and width in the a1 propagator by fitting the observed three-pion mass spectrum in the τ − ⟶ π − π + π − ντ decay.

V. QCD at Colliders / **474**

Three- and Four-jet Production at Low x at HERA

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Three- and four-jet production is measured in deep-inelastic ep scattering at low x and Q^2 with the H1 detector using an integrated luminosity of 44.2 pb^-1. Several phase space regions are selected for the three-jet analysis in order to study the underlying parton dynamics from global topologies to the more restrictive regions of forward jets close to the proton direction. The measurements of cross sections for events with at least three jets are compared to fixed order QCD predictions of $\mathcal{O}(\alpha_s^2)$ and $\mathcal{O}(\alpha_s^3)$ and with Monte Carlo simulation programs where higher order effects are approximated by parton showers. A good overall description is provided by the $\mathcal{O}(\alpha_s^3)$ calculation. Too few events are predicted at the lowest $x \sim 10^{-4}$, especially for topologies with two forward jets. This hints to large contributions at low x from initial state radiation of gluons close to the proton direction and unordered in transverse momentum. The Monte Carlo program in which gluon radiation is generated by the colour dipole model gives a good description of both the three- and the four-jet data in absolute normalisation and shape.

II. Flavour Physics / **983**

Three-body charmless hadronic B decays at BABAR

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We present recent results from the BABAR experiment on three-body charmless hadronic B decays. The results include searches for the decay of charged B mesons to the final state KSKSpi+ and for neutral B mesons to pi0KSKS, etaKSKS and eta'KSKS. We also present a Dalitz-plot analysis of charged

B decays to the final state pi+pi+pi-. All analyses use a sample of approximately 465 million BBbar pairs collected by the BABAR detector at the PEP-II asymmetric energy B-factory at SLAC.

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Three-body charmless hadronic B decays at BABAR

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III. Higgs and New Physics / 684

Three-loop Corrections to the Mass of the Light Higgs Boson in the MSSM

Author: Philipp Kant[1]

Co-authors: Luminita Mihaila [1] ; Matthias Steinhauser [1] ; Robert V. Harlander [2]

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The Minimal Supersymmetric extension of the Standard Model (MSSM) predicts the existence of a light neutral Higgs Boson. Once found at the LHC, its mass will immediately become a precision observable.

The theoretical value of the Higgs mass is subject to large radiative corrections. Due to the large top Yukawa coupling, loops of top quarks and their superpartners provide the dominant contribution to the radiative corrections.
We present a calculation of the SUSY-QCD corrections to these diagrams, up to the three-loop order.

We find that our results are relevant compared with the expected experimental accuracy at the LHC and significantly reduce the theoretical uncertainty.

V. QCD at Colliders / 560

Threshold resummation for the LHC: all order colour structure and application to squark production

Author: Christian Schwinn[1]

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We present a factorization formula for the production of pairs of heavy coloured particles in hadronic collision at the production threshold. We construct a basis in colour space that diagonalizes the soft function appearing in the factorization formula to all orders in perturbation theory. We perform a

resummation of soft gluon effects in momentum space and present results for the example of squark-antisquark production at the LHC.

VII. Standard Model Electroweak Physics / **804**

Top Cross Section and properties measurements at LHC

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The top quark will be a fundamental element of the early physics program at the Large Hadron Collider (LHC). The LHC unparalleled energy of the proton-proton collisions and large top quark production may provide an improved reach in several top quark measurements.
We will show the expected performance of the ATLAS and CMS experiments with a focus on the early measurements of the top pair and single top production. The LHC prospects of the measurement of the Vtb element of the Cabibbo-Kobayashi-Maskawa (CKM) from top pairs and single top will be discussed. We will also describe the LHC potential for the study of the top quark properties and physics beyond the Standard Model coupled to the top quark sector, discussing the measurements of the top quark charge, spin, spin correlation, new heavy gauge bosons and decays related to flavor changing neutral currents.
The sensitivity of the ATLAS and CMS experiments wll be analyzed under different scenarios of LHC center of mass energy and integrated luminosity.

VII. Standard Model Electroweak Physics / **836**

Top cross section and SM properties at CDF

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With the large dataset accumulated by CDF (more than 3 fb-1), we are able to make stringent tests on the properties of top quark. By studying production rates and distributions sensitive to the production and decay mechanisms of top quarks, we can search for contamination from non-standard model particles, or subtle differences in the electroweak or strong interactions that govern top quark interactions. We are able to measure the top cross section in many different decay channels with unprecedented precision, and uncertainties comparable to those of theoretical predictions. We will present the most recent measurements along with their combined result. We will also present the most recent and precise measurements of other properties of the top quark such charge, lifetime, width, and more carried out by the CDF collaboration at Fermilab.
Three CDF measurments of the transverse polarization of W bosons from top decays have tested the V-A nature of the weak interaction. We have set the most stringent limits on the existence of V+A coupling in top decays, which is predicted by some models of new physics.

VII. Standard Model Electroweak Physics / **909**

Top cross section/SM properties (D0)

Author: Sebastien GREDER[1]

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We present the measurement of the top anti-top quark pair production cross section in dilepton, lepton+jets and tau+lepton final states using up to 4 fb^-1 of data collected with the D0 detector at the Fermilab Tevatron collider. We also present the combination of these channels and extract the top quark mass comparing the measured cross section to calculations in higher order QCD. Furthermore we study properties of the top quark decay products such as helicity fractions of the W bosons. W boson helicity fractions are also sensitive to the ratios of different anomalous Wtb couplings. We set simultaneous limits on left-handed vector and right-handed vector, and left-handed vector and right-handed tensor Wtb couplings and combine this with results from a search for anomalous Wtb couplings in single top production.

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Top mass measurement at LHC with the ATLAS detector

Author: Di Ciaccio Anna[1]

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The LHC will be the first top quark factory. ttbar pairs will be produced at such a high rate that the statistical error on the top quark mass measurement will soon become negligible.
A precise top quark mass measurement is of great importance for LHC experiments because it is one of the fundamental parameters of the Standard Model and because, during the LHC start-up, it will be a high mass reference candle. We present studies performed in order to estimate the potential of ATLAS to measure the top quark mass from the first few hundred pb^-1 of data.

Plenary Session 3 / 953

Top physics (exp)

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VII. Standard Model Electroweak Physics / 840

Top quark mass measurements at CDF and Tevatron combinations

Author: Jacob Linacre[1]

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We report the results of the measurements of the top quark mass using top pair events corresponding to an integrated luminosity of more than 4 fb-1 from proton-antiproton collisions at the Tevatron, recorded by the CDF II detector. We present different results using various techniques in the lepton+jets, dilepton, and all-jets channels, and describe the current status of the systematic uncertainties. We present also a combination by the TevEWWG (Tevatron electroweak working group) of the best top mass results from CDF and D0 in Run 1 and Run 2 of the Tevatron. This result is the current world average, and offers an uncertainty almost reaching 1 GeV. The new mass value has been included in traditional LEP EWWG fits to precision electroweak data, and implications for the Standard Model Higgs have been derived.

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Top quark pair production at the LHC with the ATLAS detector

Author: Di Ciaccio Anna[1]

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Corresponding Authors: anna.diciaccio@roma2.infn.it, ta@physik.uni-bonn.de

An accurate determination of the top quark pair production cross section at the LHC provides a valuable measurement of the Standard Model. Given the high statistics which will be available, this check can be performed relatively fast after the turn on of the LHC. The prospects for measuring the total top quark pair cross section with the ATLAS detector during the initial period of LHC running will be presented, using both the single lepton and dilepton channels

VII. Standard Model Electroweak Physics / 842

Top-Quark Production at Hadron Colliders

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The study of the properties of the top quark is one of the main goals of the Large Hadron Collider (LHC) physics program. The experimental precision expected at the LHC requires the knowledge of several top-quark related observables beyond leading order in the strong coupling constant. In this talk I briefly review the status of the theoretical predictions for the top-quark production processes at hadron colliders. Special attention will be devoted to recent progress in the calculation of NNLO corrections to the top-quark pair production cross
section.

II. Flavour Physics / 98

Towards a unitary Dalitz plot analysis of three- body hadronic B decays

Author: Leonard Lesniak[1]

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Dalitz plot analysis of three-body hadronic final states in B decays should
be performed in a unitary approach. A first step towards this goal will be to
enforce two-body unitarity. Here we apply this concept to the K pi channel for
the B −> K pi pi decays by using a unitary coupled channel model to describe
the kaon-pion interactions. The weak decay amplitudes, derived in QCD
factorization, are supplemented by phenomenological contributions to the penguin amplitudes. Strong
interaction amplitudes are constrained by chiral symmetry, QCD and experimental data on meson-
meson interactions. The strange K pi scalar and vector form factors, which
appear naturally in the factorization approach, are used to calculate the K pi
effective mass and helicity angle distributions, branching ratios,
CP asymmetries and the phase difference between the B0 and anti B0 decay
amplitudes to K*(892) pi. The fit on the parameters of our phenomenological
amplitudes lead to a good agreement with the experimental data, particularly for the kaon-pion
effective mass distributions. However, our predicted
*B^\pm −> K*0(1430) pi^\pm, K*0(1430) −> K ^\pm pi^\mp branching
fraction, equal to (11.6 \pm 0.6) 10^{-6}, is smaller than the results
of the Belle and BaBar collaborations, obtained from isobar model analyses.
A new parameterization of the S-wave K pi effective mass distribution, based on the knowledge of
the K pi scalar form factor, is proposed [1]. It can be used in future experimental
Dalitz plot analyses.

Reference:

[1] B. El-Bennich, A. Furman, R. Kaminski, L. Lesniak, B. Loiseau, and B. Moussallam,
CP violation and pion-kaon interactions in B −> K pi pi decays,
arXiv:0902.3645 [hep-ph], accepted for publication in Phys. Rev. D.

VI. QCD in Hadronic Physics / 723

Transverse target spin asymmetries on a proton target at COMPASS - on behalf of the COMPASS collaboration

Author: Andreas Richter[1]

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Three distribution functions are needed to fully describe the nucleon at leading twist: the unpolarized distribution function q(x), the helicity distribution function $\Delta q(x)$ and the transversity spin distribution function $\Delta_T q(x)$. Transversity and transverse momentum-dependent parton distribution functions (TMDs) are been measured in semi-inclusive deep inelastic scattering (SIDIS) by using a a transversely polarized target at the COMPASS experiment. COMPASS is a fixed target experiment at the CERN M2 beamline, which provides a 160 GeV/c polarized μ^+ beam. In the years 2002-2004 COMPASS has collected data with the ^{6}LiD target polarization oriented transversely with respect to the muon beam direction for about 20% of the running time, to measure these transverse spin effects. In 2007, COMPASS has used for the first time a proton NH_3 target with the data taking time equally shared between longitudinal and transverse polarization of the target. The Collins and Sivers asymmetry from the 2007 run will be presented and commented here; furthermore an overview of the results obtained with a deuteron target will also be given.

V. QCD at Colliders / 154

Transverse-momentum resummation for gaugino-pair production at hadron colliders

Author: Jonathan Debove[1]

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We present a first precision analysis of the transverse-momentum spectrum of gaugino pairs produced at the Tevatron and the LHC with center-of-mass energies of 1.96 and 10 or 14 TeV, respectively. Our calculation is based on a universal resummation formalism at NLL order, which is consistently matched to the perturbative prediction at O(\alpha_s). Numerical results are given for the "gold-plated" associated production of neutralinos and charginos decaying into three leptons with missing transverse energy as well as for the pair production of neutralinos and charginos at two typical benchmark points in the constrained MSSM. We show that the matched resummation results differ considerably from the Monte Carlo predictions employed traditionally in experimental analyses and discuss the impact on the determination of SUSY mass parameters from missing stransverse mass spectra. We also investigate in detail the theoretical uncertainties coming from scale variations, parton-density functions, and non-perturbative effects.

V. QCD at Colliders / 45

Traveling wave solution of the Reggeon Field Theory

Author: Robi Peschanski[1]

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We identify the nonlinear evolution equation in impact-parameter space for the Supercritical Pomeron" in Reggeon Field Theory as a 2-dimensional stochastic Fisher-Kolmogorov-Petrovski-Piscounov equation. It exactly preserves unitarity and leads in its radial form to an high energy traveling wave solution corresponding to anuniversal" behaviour of the impact-parameter front profile of the elastic amplitude; Its rapidity dependence and form depend only on one parameter, the noise strength, independently of the initial conditions and of the non-linear terms restoring unitarity. Theoretical predictions are presented for the three typical distinct regimes corresponding to zero, weak and strong noise. They have phenomenological implications for total and differential hadronic cross-sections at colliders.

III. Higgs and New Physics / 61

Trilepton production at the CERN LHC: SUSY Signals and Standard Model Backgrounds

Author: Edmond Berger[1]

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Events with three or more isolated leptons in the final state are known to be signatures of new physics phenomena at high energy collider physics facilities. Standard model sources of isolated trilepton final states include gauge boson pair production such as WZ and $W\gamma^*$, and $t\bar{t}$ production. We demonstrate that leptons from heavy flavor decays, such as $b \to lX$ and $c \to lX$, provide sources of trileptons that can be orders-of-magnitude larger after cuts than other standard model backgrounds to new physics processes. We explain the physical reason heavy flavor backgrounds survive isolation cuts. We propose new cuts to control the backgrounds in the specific case of chargino plus neutralino pair production in supersymmetric models. After these cuts are imposed, we show that it should be possible to find at least a 4 sigma excess for supersymmetry parameter space point LM9 with 30 fb^{-1} of integrated luminosity.
This presentation is based on Phys. Rev. {\bf D78}, 034030 (2008) [e-Print: arXiv:0805.3720 [hep-ph]] by E.L. Berger and Z. Sullivan and subsequent work.

V. QCD at Colliders / 1005

Two and Three-jet measurements at D0

Author: Nirmalya Parua[1]

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We present measurements involving two jets in ppbar collisions
at a center of mass energy of 1.96 TeV with the D0 detector at the Fermilab
Tevatron Collider.
We present dijet angular distributions and invariant mass distributions.
The data are in good agreement with the prediction of perturbative QCD,
and are used to constrain several new physics models including
quark compositeness, large extra dimensions in case of angular distribution and
resonances like excited quarks
and W' and Z' bosons decaying into dijets in case of dijet mass distributions.

743

Two-loop renormalization of vector, axial-vector and tensor fermion bilinears on the lattice

Authors: Apostolos Skouroupathis[1] ; Haralambos Panagopoulos[1]

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We compute the two-loop renormalization functions, in the RI' scheme, of local bilinear quark operators ($\bar{\psi}\Gamma\psi$), where Γ corresponds to the Vector, Axial-Vector and Tensor Dirac operators, in the lattice formulation of QCD. We consider both the flavor nonsinglet and singlet operators.
We use the clover action for fermions and the Wilson action for gluons. Our results are given as a polynomial in csw, in terms of both the renormalized and bare coupling constant, in the renormalized Feynman gauge.
Our results are also presented in the MSbar scheme, for easier comparison with calculations in the continuum, generalized to fermions in an arbitrary representation. Finally, we discuss some special features of superficially divergent lattice integrals at two loops.

Plenary Session 1 / **947**

Ultra High-Energy Cosmic Ray Observations: Status and Prospects

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Plenary Session 3 / **963**

Ultrarelativistic Heavy Ions

VII. Unified Theories, Strings, Non-perturbative QFT / **9**

Understanding the structure of the proton: From HERA and Tevatron to LHC

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We discuss the perspectives concerning a better determination of the proton structure in terms of quarks and gluons at LHC after describing the results coming from HERA and Tevatron. In a second part of the review, we describe the diffractive phenomena at HERA and Tevatron and the consequences for LHC. The focus will be given on perspectives for LHC, essentially on early measurements that could be done in a reduced energy mode, as forseen. Experimental aspects and impact on unkowns from the theory will be discussed.

II. Flavour Physics / **682**

Update of the Unitarity Triangle Analysis

Authors: Achille Stocchi[1] ; Carlo Schiavi[2] ; Cecilia Tarantino[3] ; Enrico Franco[4] ; Fabrizio Parodi[2] ; Guido Martinelli[4] ; Luca Silvestrini[5] ; Marcella Bona[6] ; Marco Ciuchini[7] ; Maurizio Pierini[6] ; Vincenzo Vagnoni[8] ; Viola Sordini[9] ; Vittorio Lubicz[3]

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We present the update of the Unitarity Triangle (UT) analysis within the Standard Model (SM) and beyond. Within the SM, combining the direct measurements on sides and angles, the UT turns out to be overconstraint in a consistent way, showing that the CKM matrix is the dominant source of flavour mixing and CP-violation and that New Physics (NP) effects can appear at most as small corrections to the CKM picture. Generalizing the UT analysis to investigate NP effects, constraints on b -> s transitions are also included and both CKM and NP parameters are fitted simultaneously. While no evidence of NP effects is found in K- \bar K and Bd-\bar Bd mixing, in the Bs- \bar Bs mixing an hint of NP is found. The UT analysis beyond the SM also
allows us to derive bounds on the coefficients of the most general DeltaF = 2 effective Hamiltonian, that can be translated into bounds on the NP scale.

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Updated Numerical Analysis of eV Seesaw with Four Generations

Author: Fei-Fan Lee[1]

Co-author: Wei-Shu Hou [1]

[1] *Department of Physics, National Taiwan University, Taipei 106, Taiwan.*

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We extend the so-called “eV seesaw” scenario, where M_R is of eV order, to four lepton generations. The fourth generation gives a heavy pseudo-Dirac neutral lepton, which largely decouples from other generations and is relatively stable. The framework naturally gives 3 active and 3 sterile neutrinos. We update a previous numerical analysis of a 3+3 study of the LSND anomaly, taking into account recent results from the MiniBooNE experiment. In particular, we study the implications for the third mixing angle sin^2(θ_13), as well as CP violation.

25

V0 production studies at LHCb using the first LHC data

Author: Victor Egorychev[1]

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Although QCD is firmly established as the fundamental theory of strong interactions, the fragmentation process from partons into hadrons is still poorly understood. Phenomenological models tuned to Tevatron data show significant differences when extrapolated to LHC energies. The hadronization process can be probed at the LHC by studying V0 production, i.e. the production of KS mesons and Lambda hyperons. The LHCb experiment, with a rapidity range complementary to that of the other LHC detectors, offers a particularly interesting environment, covering the forward region where the existing models are very tunable but lack predictive power. The first 100 millions minimum bias events at LHCb will already provide a high-statistics and high-purity V0 sample. Measurements will include differential cross sections and production ratios for different strange particles as a function of rapidity and transverse momentum. The analysis can naturally be extended to cover heavier hyperons as well, and eventually lead, with larger data sets obtained with a J/psi trigger, to b-baryon spectroscopy with J/psi-hyperon final states.

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VISPA - Visual Physics Analysis on Linux, Mac OS X and Windows

Authors: Andreas Hinzmann[1] ; Gero Müller[1] ; Jan Steggemann[1] ; Martin Erdmann[1] ; Michael Brodski[1] ; Robert Fischer[1] ; Tatsiana Klimkovich[1] ; Thomas Münzer[1] ; Tobias Winchen[1]

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Modern physics analysis is an iterative task consisting of prototyping, executing and verifying the analysis procedure. For supporting scientists in each step of this process, we developed VISPA: a toolkit based on graphical and textual elements for visual physics analysis. Unlike many other analysis frameworks VISPA runs on Linux, Windows and Mac OS X.

VISPA can be used in any experiment with serial data flow. In particular, VISPA can be connected to any high energy physics experiment. Furthermore, datatypes for the usage in astroparticle physics have recently been successfully included.

An analysis on the data is performed in several steps, each represented by an individual module. While modules e.g. for file input and output are already provided, additional modules can be written by the user with C++ or the Python language. From individual modules, the analysis is designed by graphical connections representing the data flow. This modular concept assists the user in fast prototyping of the analysis and improves the reusability of written source code.

The execution of the analysis can be performed directly from the GUI, or on any supported computer in batch mode. Therefore the analysis can be transported from the laptop to other machines.

The recently improved GUI of VISPA is based on a plug-in mechanism. Besides components for the development and execution of physics analysis, additional plug-ins are available for the visualization of e.g. the structure of high energy physics events or the properties of cosmic rays in an astroparticle physics analysis. Furthermore plug-ins have been developed to display and edit configuration files of individual experiments from within the VISPA GUI.

I. Astroparticle Physics / 57

Vertical Array in Space for Horizontal Air-Showers

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The detection of vertical High Energy Cosmic Rays is blurred in ground arrays by Coulomb spread of air-shower secondaries. These showers grows in a well knon conic random tree. High Altitude horizontal airshowers are totally different: the low air density allows the spread of the shower in a thin fan-like shape of huge lenghts. Their arrival angle at horizons select, in a fine- tuning, their slath-depth and energy ; their shower distances inferr their primary compositions. Electron pair fingers opens in a wide forked tails differently on Earth: At geomagnetic equator the spread is vertical while

at Poles the fan spread are horizontally tangent to the Earth atmosphere. At equator long array of element from balloons or satellites may reveal the thin twin spread of HECR skimming showering. Below the Earth edge, rarest but significant EeV tau air-shower may finally reveal the UHE GZK (few EeV) tau neutrino whose skimming tau are escaping and decaying from Earth edge in high quotas air.

II. Flavour Physics / 126

Vus and lepton universality from kaon decays at KLOE

Author: Erika De Lucia[1]

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KLOE has measured most decay branching ratios of K_S, K_L amd K^+- mesons.
It has also measured the K_L and the K^+- lifetime and determined the shape
of the form factors involved in kaon semileptonic decays.
We present a description of the above measurements and a well organized
compendium of all of our data, with particular attention to correlations.
These data provide the basis for the determination of the CKM parameter
V_us and a test of the unitary of the quark flavor mixing matrix.
We also test the lepton universality in Kl3 decays and place bounds
on new physics using measurements of V_us from Kl2 and Kl3 decays.
All of the above measurements, together with the results on KS, KL and K+-
decays published during 2006 and 2007 have recently combined in
JHEP 04 (2008) 059, to obtain the KLOE determination of Vus.

A measurement of the ratio R_K=Gamma(Ke2)/Gamma(Kmu2) with 1.3% accuracy
has also been performed. The result is based on 2.2 fb-1 of data collected
at the Frascati e+e- collider DAFNE. Recently, it has been pointed out that in a supersymmetric
framework, lepton flavor changing processes mediated by the charged Higgs
could occur, in particular in the kaon decay to an electron and tau
neutrino. In this scenario, deviations of up to few percent on R_K from SM
expectation are quite possible. The measurement will be described, and its
theoretical implications will be discussed.

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Vus and lepton universality from kaon decays with the KLOE detector

Author: Collaboration The KLOE[1]

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KLOE has measured most decay branching ratios of K_S, K_L amd K^+- mesons.
It has also measured the K_L and the K^+- lifetime and determined the shape
of the form factors involved in kaon semileptonic decays.
We present a description of the above measurements and a well organized
compendium of all of our data, with particular attention to correlations.
These data provide the basis for the determination of the CKM parameter
V_us and a test of the unitary of the quark flavor mixing matrix.
We also test the lepton universality in Kl3 decays and place bounds

on new physics using measurements of V_us from Kl2 and Kl3 decays.
The most recent measurements published on this subject are:
JHEP 12(2007)105 (KLm3 scalar form factor);
JHEP 01(2008) 073 (K+- lifetime);
JHEP 02(2008) 098 (absolute semileptonic K+- BRs);
PLB 666 (2008) 305 (BR of K+ -> pi+pi0).
All of the above measurements, together with the results on KS, KL and K+- decays published during 2006 and 2007 have recently combined in JHEP 04 (2008) 059, to obtain the KLOE determination of Vus.
Furthermore, we expect to obtain soon new results on the KS lifetime, KL lifetime and the BR for the K+- to 3 charged pion.

VII. Standard Model Electroweak Physics / 876

W & Z boson production (D0)

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We present measurements conducted at D0 that involve W and Z boson production. The talk includes the measurement of the W charge asymmetry where W decays into an electron and a neutrino; a study of Z at low momentum where Z decays into electrons or muons, done using a novel technique; and precise measurement of the forward-backward asymmetry in both di-muon and di-electron channels.

VII. Standard Model Electroweak Physics / 821

W & Z boson production (LHC)

Author: Aristotelis Kyriakis[1]

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The LHC is a discovery machine. Both CMS and ATLAS detectors are ready for collecting the first data from the pp collisions. Electroweak measurements is an important tool to demonstrate the detectors physics performance and to understand new physics scenarios since W & Z bosons are the building block of some of them . This talk is focused in the study of the W & Z boson production with the early data, the study of Z forward-backward asymmetry and the W charge assymetry

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W and Z Production Studies at CDF

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Precise studies of distributions and asymmetries in W and Z production offer constraints on the parton content of protons. Improving the knowledge of parton content can help avoid systematic limitations in measuring the mass of the W boson. Measurements of Z rapidity and W charge asymmetry in fb-1 samples are presented.

VII. Standard Model Electroweak Physics / 849

W and Z boson production (CDF)

Author: Krzysztof Sliwa[1]

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Precise studies of distributions and asymmetries in W and Z production offer constraints on the parton content of protons. Improving the knowledge of parton content can help avoid systematic limitations in measuring the mass of the W boson. Measurements of Z rapidity and W charge asymmetry in fb-1 samples are presented.

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W and Z physics (exp)

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VII. Standard Model Electroweak Physics / 776

W boson mass measurement in the ATLAS experiment

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A precise measurement of the mass of the W boson will be essential to provide improved indirect constraints, e.g. on the Higgs boson mass. Using new methods developed for this challenging measurement, the performance expected is presented, evaluating various sources of systematic uncertainties, both of experimental and theoretical nature. The focus of this contribution will be on the expectation for the initial data taking and results will be shown for an integrated luminosity of 15 pb-1.
Prospects on the total uncertainties which may be obtained with an integrated luminosity of 10 fb-1 will be given.

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W boson mass measurement with early data

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A precise measurement of the mass of the W boson will be essential to provide improved indirect constraints, e.g. on the Higgs boson mass. Using new methods developed for this challenging measurement, the performance expected is presented, evaluating various sources of systematic uncertainties, both of experimental and theoretical nature. The focus of this contribution will be on the expectation for the initial data taking and results will be shown for an integrated luminosity of 15 pb-1.
Prospects on the total uncertainties which may be obtained with an integrated luminosity of 10 fb-1 will be given.

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WINHAC - the Monte Carlo event generator for single W-boson production in hadronic collisions

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The charged-current Drell-Yan process, i.e. single W-boson production with leptonic decays in hadronic collisions, will play an important role in the experimental programme at the LHC. It will be used for improved measurements of some Standard Model parameters (such as the W-boson mass and widths, etc.), for better determination of the Higgs-boson mass limits, in "new physics' searches, as a "standard candle" process, etc. In order to achieve all these goals, precise theoretical predictions for this process in terms of a Monte Carlo event generator are indispensable. In this talk the Monte Carlo event generator WINHAC for the charged-current Drell-Yan process will be presented. It features higher-order QED corrections within the exclusive Yennie-Frautschi-Suura exponentiation scheme with the 1st order electroweak corrections. It is interfaced with PYTHIA for QCD/QED initial-state parton shower as well as hadronization. It includes options for proton-proton, proton-antiproton and nucleus-nucleus collisions. Moreover, it allows for longitudinally and transversely polarized W-boson production. It has been cross-checked numerically to high precision against independent programs/calculations. Some numerical results from WINHAC will also be presented. Finally, interplay between QCD and electroweak effects will briefly be discussed.

VI. QCD in Hadronic Physics / 131

Why dispersion relations help in description of pion-pion amplitudes and lead to precise determination of the f0(600) (sigma) parameters?

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Significant progress in description of pi-pi amplitudes has been
recently made [1,2]. We present amplitudes fitted both to well known and to newest experimental data. In fits we use additional theoretical constraints from forward dispersion relations, sum rules and from twice and once subtracted dispersion relations.
The latter two (so called Roy's and GKPY equations) are derived with imposed
crossing symmetry condition for the pi-pi S and P waves and provide strong constraints
for errors of phase shifts and inelasticities below 1 GeV.
In this way very demanding and model independent test for pi-pi amplitudes
fitted to experimental data is constructed and proposed.
We show that constraints from this test imposed on the pi-pi amplitudes lead to very precise determination of parameters of the f0(600) (sigma) pole and pi-pi threshold parameters in good agreement with ChPT.
We compare once and twice subtracted dispersion relations and conclude that the former ones provide more stringent consistency check for parameterizations of the pi-pi amplitudes.
Our analysis is based only on unitarity, analyticity and crossing symmetry.

References:

[1] B. Ananthanarayan et al., Phys. Rept. 353, 207 (2001).
[2] R. Kaminski, J.R. Pelaez and F.J. Yndurain, Phys. Rev. D 77, 054015
(2008).

III. Higgs and New Physics / **63**

Wrong vertex displacements due to Lee-Wick resonances at LHC

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We show how a resonance from the recently proposed Lee-Wick Standard Model could lead to wrong vertex displacements at LHCb.

We study which could be the possible 'longest lived' Lee-Wick particle that could be created at LHC, and we study its possible decays and detections. We conclude that there is a region in the parameter space which would give wrong vertex displacements as a unique signature of the Lee-Wick Standard Model at LHCb. Further numerical simulation shows that LHC era could explore these wrong vertex displacements through Lee-Wick leptons below 500GeV.

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b -> d and other charmless B decays at BELLE

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b -> d and other charmless B decays at Belle

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Observation of $B^+ \to \bar{K}^{*0}(892)K^+$ at Belle

We present a measurement of the branching fraction for the process $B^+ \to \bar{K}^{*0}(892)(\to K^-\pi^+)K^+$ based on a data sample of 657×10^6 $\Upsilon(4S) \to B\bar{B}$ events collected with the Belle detector at the KEKB e^+e^- asymmetric-energy collider. A measurement of the charge asymmetry of A_{CP} for this process is also presented.

Measurement of $B^0 \to K^+\pi^-K^-\pi^+$ Decays and Search for $B^0 \to K^{*0}\bar{K}^{*0}$ and $B^0 \to K^{*0}K^{*0}$

We report on a search for the decay $B^0 \to K^{*0}\bar{K}^{*0}$ and $B^0 \to K^{*0}K^{*0}$ and other charmless modes with a final $K^+\pi^-K^-\pi^+$ state. These results are obtained from a data sample containing 657×10^6 $B\bar{B}$ pairs collected with the Belle detector at the KEKB asymmetric-energy e^+e^- collider.

Search for $B \to \phi\pi$ decays at Belle

We search for the charmless decays $B^+ \to \phi\pi^+$ and $B^0 \to \phi\pi^0$, which proceed through an external electroweak penguin diagram in the Standard Model. The analysis is based on a data sample of 657 million $B\bar{B}$ pairs collected at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB e^+e^- storage ring.

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b -> s hadronic decays at Belle

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b -> s hadronic decays at Belle

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Study of $B^+ \to \rho^+\omega$ decay at Belle

We report the results of a search for the charmless decay $B^+ \to \rho^+\omega$. The analysis is based on a large data sample recorded at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric-energy e^+e^- collider.

Study of inclusive $B \to X_s\eta$ at Belle

We report results on a search for inclusive high momentum η decays of the B meson using a large data sample accumulated at the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric e^+e^- collider.

Measurements of $B \to \phi\phi K$ Decays

We report improved measurements of the charmless decay $B \to \phi\phi K$ using a 605 fb^{-1} data sample collected on the $\Upsilon(4S)$ resonance with the Belle detector at the KEKB asymmetric energy e^+e^-

collider. The results of the related charmonium decays such as $B \to J/\psi K$ and $J/\psi \to \phi\phi$ are also shown.

Measurements of Charmless Hadronic $b \to s$ Penguin Decays in the $\pi^+\pi^-K^+\pi^-$ Final State and Observation of $B^0 \to \rho^0 K^+\pi^-$

We report measurements of charmless hadronic B^0 decays into the $\pi^{\pi^-}K^+\pi^-$ final state. The analysis uses a sample of 657×10^6 $B\bar{B}$ pairs collected with the Belle detector at the KEKB asymmetric-energy e^+e^- collider at the $Y(4S)$ resonance. The decay $B^0 \to \rho^0 K^+\pi^-$ is observed for the first time; the significance is 5.0σ and the corresponding partial branching fraction for $M_{K\pi} \in (0.75, 1.20)$ GeV$/c^2$ is $[2.8 \pm 0.5(stat) \pm 0.5(syst)] \times 10^{-6}$. We also obtain the first evidence for $B^0 \to f_0 K^+\pi^-$ with 3.5σ significance and for $B^0 \to \pi^+\pi^-K^{*0}$ with 4.5σ significance. For the two-body decays $B^0 \to \rho^0 K^{*0}$ and $B^0 \to f_0 K^{*0}$, the significances are 2.7σ and 2.5σ, respectively, and the upper limits on the branching fractions are 3.4×10^{-6} and 2.2×10^{-1} at 90\% confidence level.

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g_B*Bpi coupling in the static heavy quark limit

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It is common to use the Heavy Meson Chiral Perturbation Theory to modelise the transitions involving heavy mesons and soft pions. The corresponding effective Lagrangian has few couplings: one of them is g_B*Bpi parameterising the transition between B, B* and a soft pion. As the process B* –> B pi is forbidden kinematically, the coupling is not accessible to experiment and has to be determined non perturbatively.
In this talk I will present a recent extraction of that coupling in the static heavy quark limit by means of lattice simulations of QCD in which the effect of Nf=2 dynamical quarks have been taken into account and whose the lattice spacings are sufficiently small to allow a reasonable control on cut-off effects.