GPDs at HERA & perspectives at CERN

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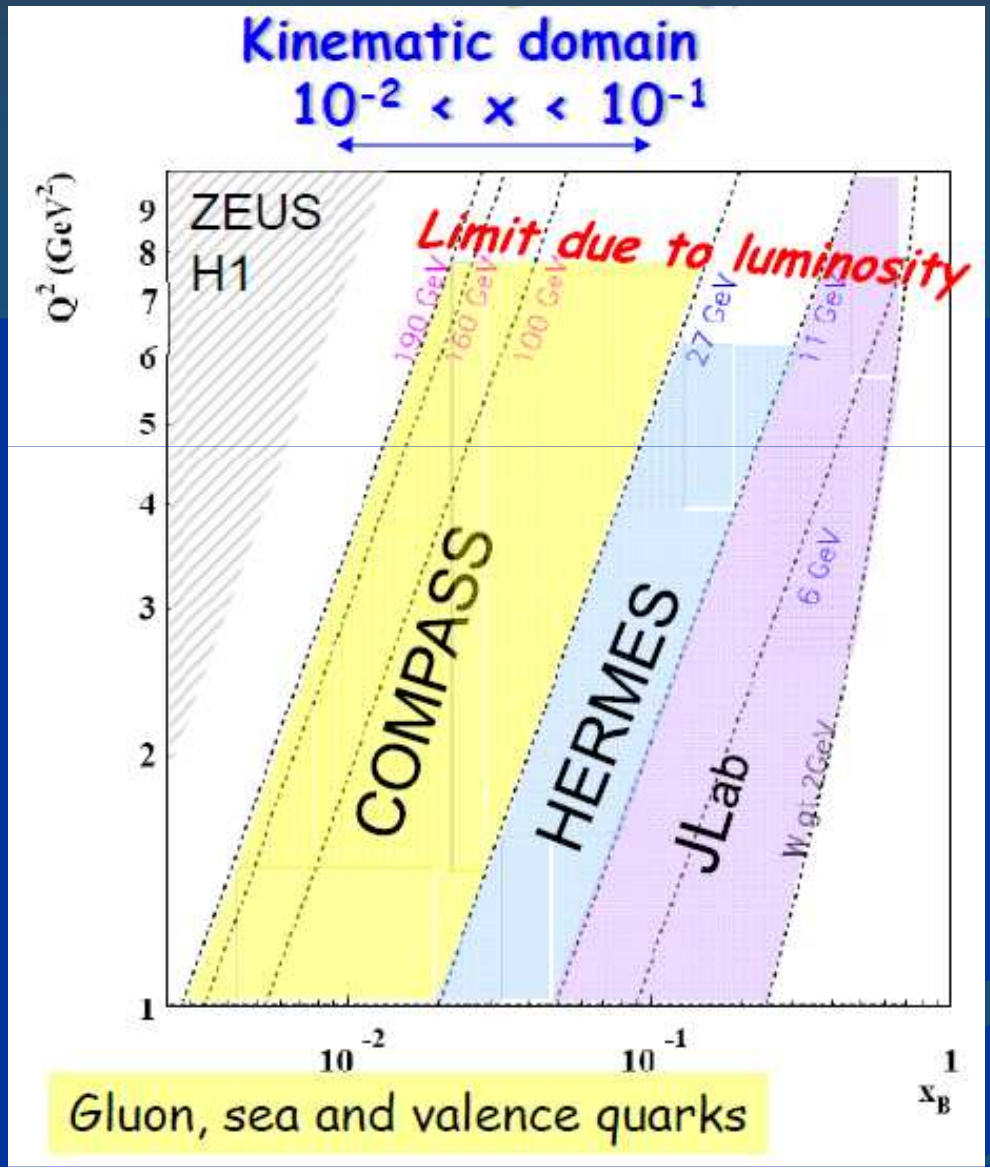
Kinematic plane for DVCS



DVCS
around the world
(*H1/ZEUS/HERMES*
see previous talk)

For the future:

* Jlab: ok
* CERN: LOI level

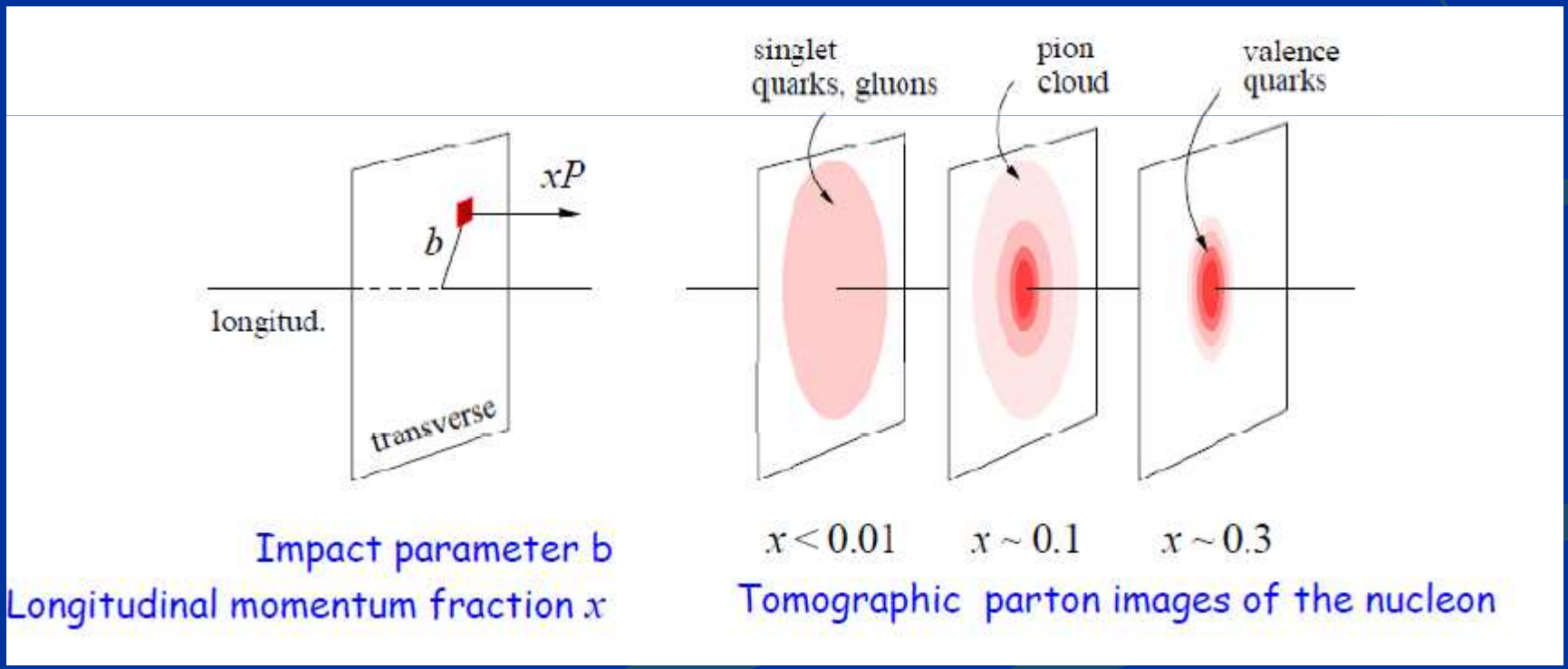
A bit more on GPDs

$\langle p\|\bar{q}(0)\Theta q(y)\|p\rangle$	**Non-Local Forward**	*PDFs*
$\langle p'\|\bar{q}(0)\Theta q(0)\|p\rangle$	**Local Non-Forward**	$F_1(t), F_2(t)\ldots$
$\langle p'\|\bar{q}(0)\Theta q(y)\|p\rangle$	**Non-Local Non-Forward**	H

That's why GPDs are « simply » generalisations of PDFs and Form Factors.

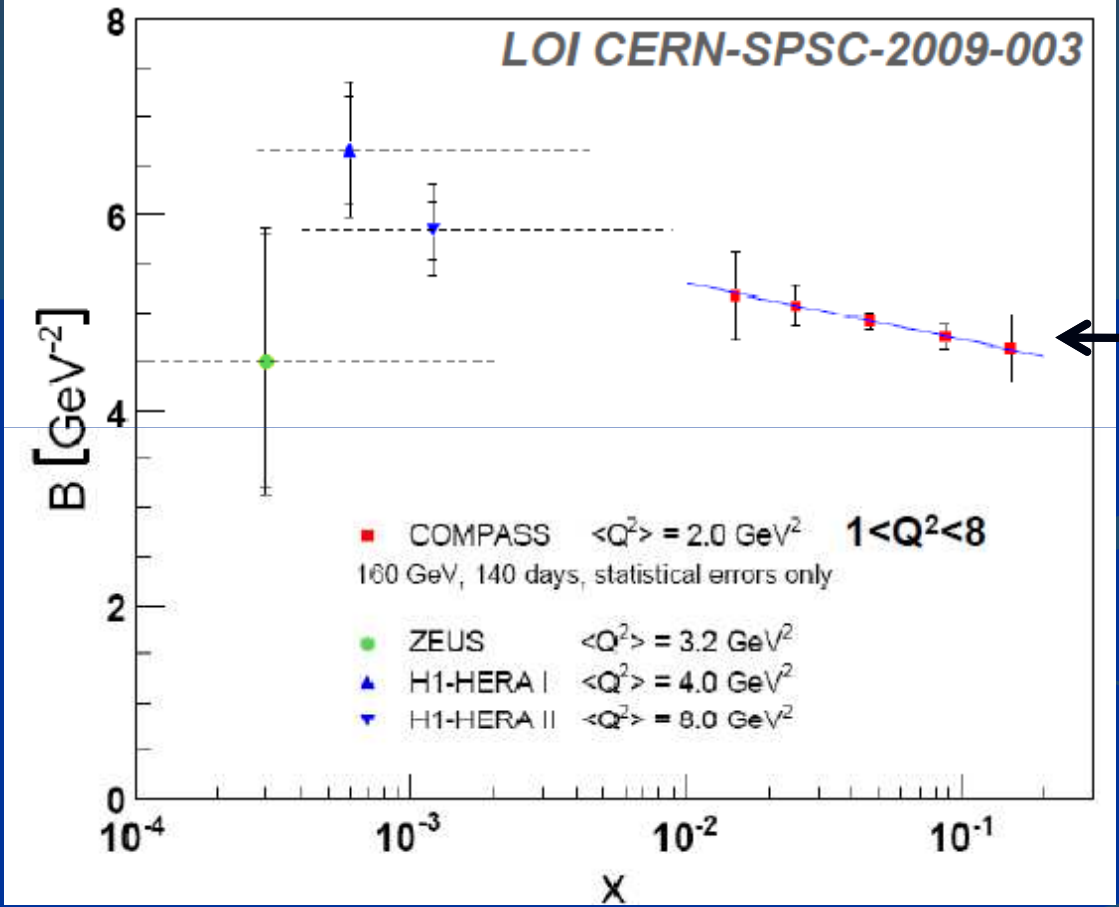
They incorporate both physical contents

F(x,t) dependence of GPD
Tomography
The hedge between FF and PDFs



$d\sigma/dt \sim \exp(bt)$ with $b:=b(x_{Bj})$

Key ingredient for GPDs



Simulations for DVCS @ CERN

Transverse width of sea quarks and gluon ~ 0.65 fm @ $x_{Bj} \sim 10^{-3}$ (H1-ZEUS)

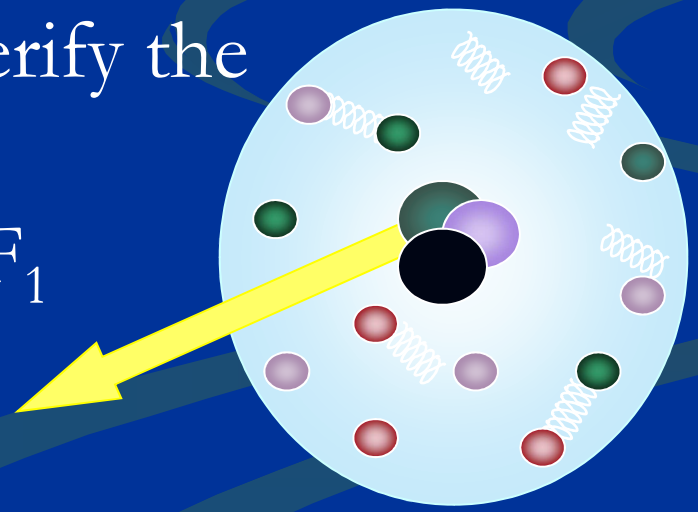
Picture of the proton

* Sea quarks and gluons have a transverse extension of about 0.65 fm in the proton (measured!)
* Indirect determinations => the valence quarks extend over 0.3/0.4 fm (M. Diehl et al.)

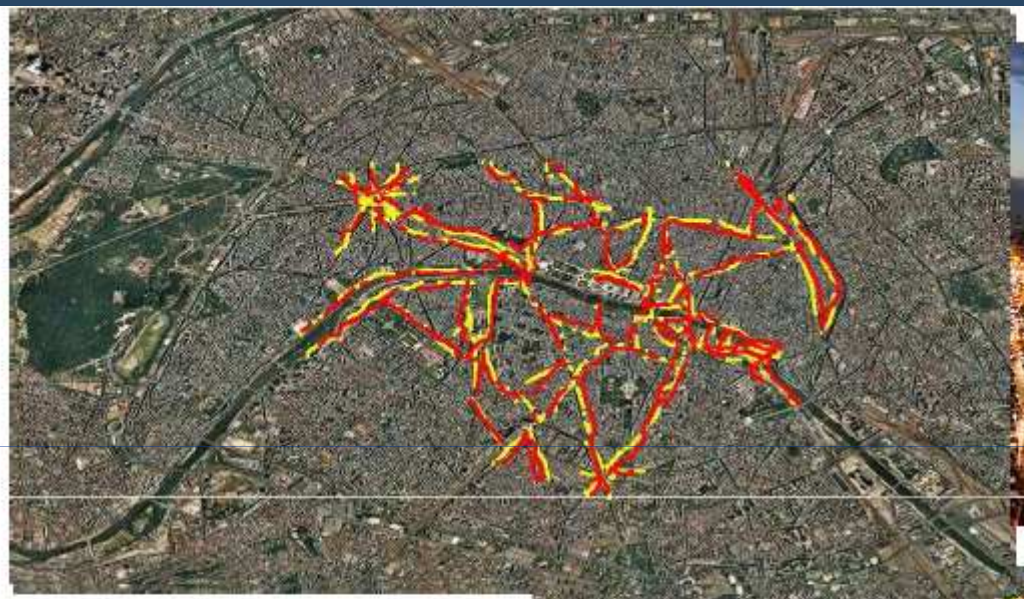
Of course, we need to verify the main sum rules =>

$\int dx[2/3\ Hu - 1/3\ Hd] = F_1$

…



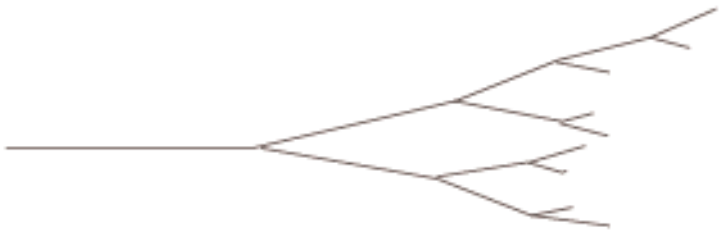
The inverse is correct for Paris



A brief discussion on b(x) & α'

Gribov diffusion: parton branching as random walk in b space

$$\rightarrow \langle b^2 \rangle \propto \alpha' \log(1/x)$$

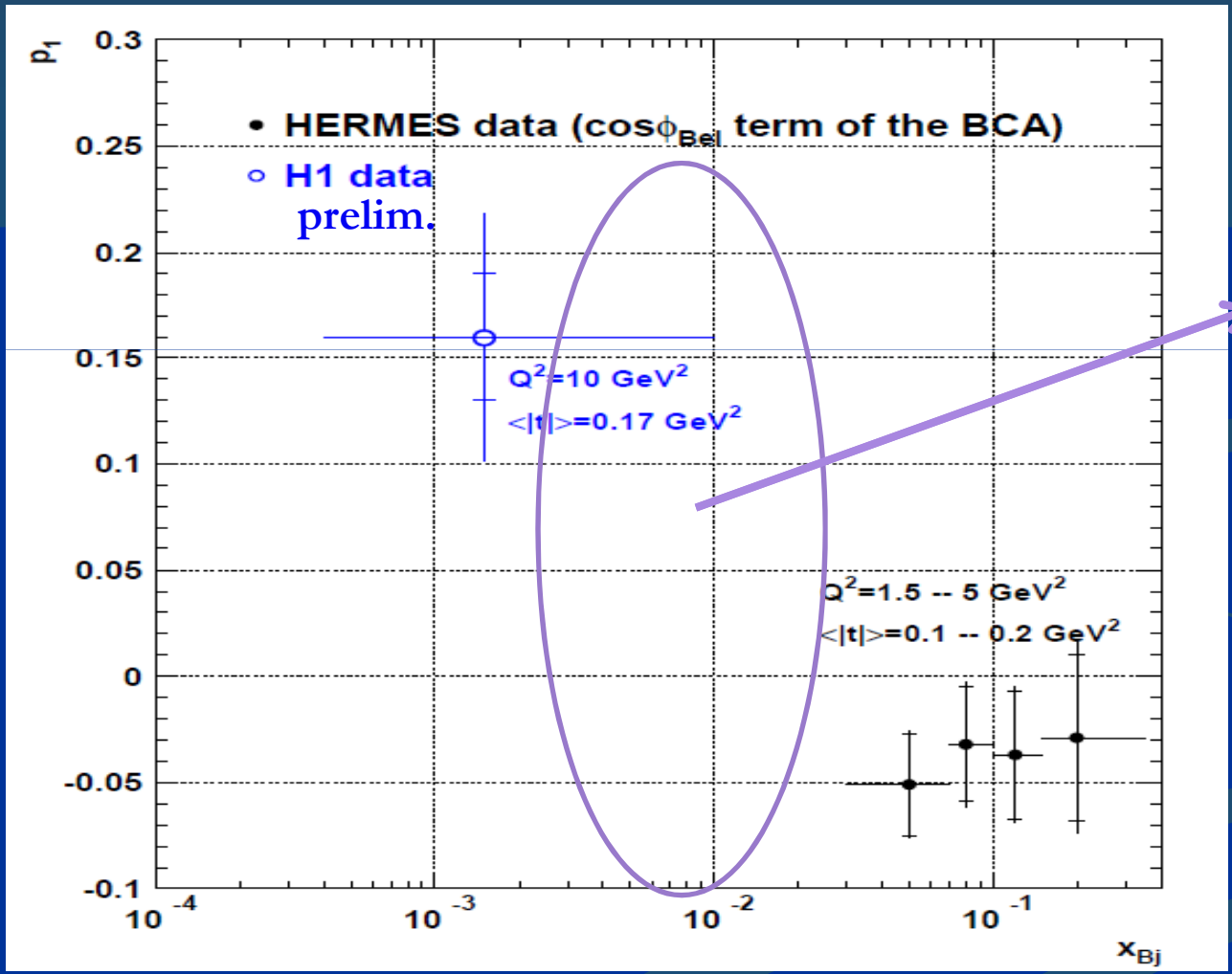


We expect a non zero value of α' due to « basic » (Gribov) diffusion: Emission of more & more partons…

But @ large Q^2, low x: results are different!

Today results on BCA from H1 and HERMES

$BCA = p_1 \cos(\Phi)$



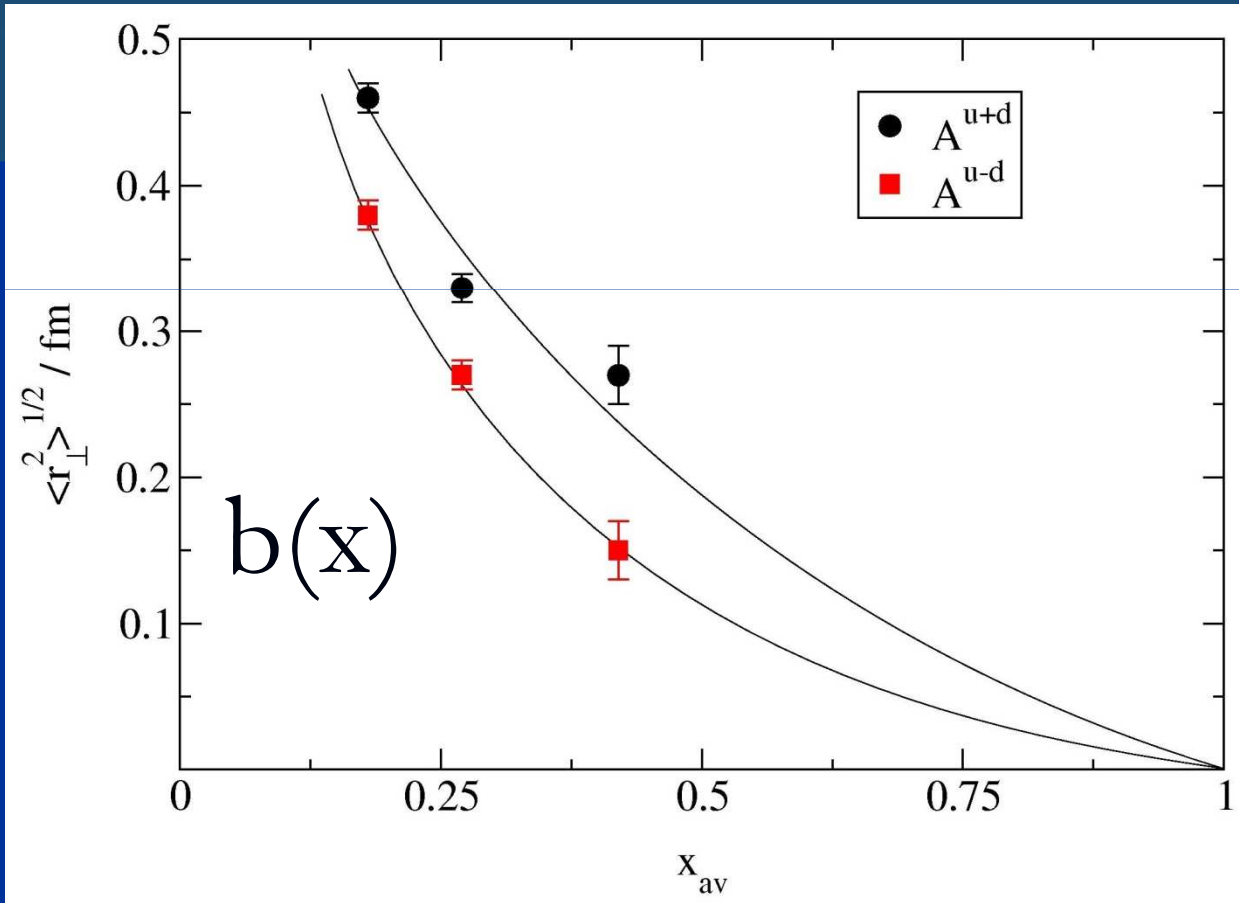
Kin domain of COMPASS @ CERN

This plot is a reflection that α' is large in the HERMES Kin and ~0 for H1.

A nice compatibility with Lattice results

Negele *et al.*,
NP B128 (2004) 170

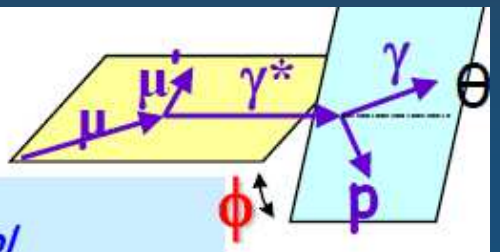
Göckeler *et al.*,
NP B140 (2005) 399

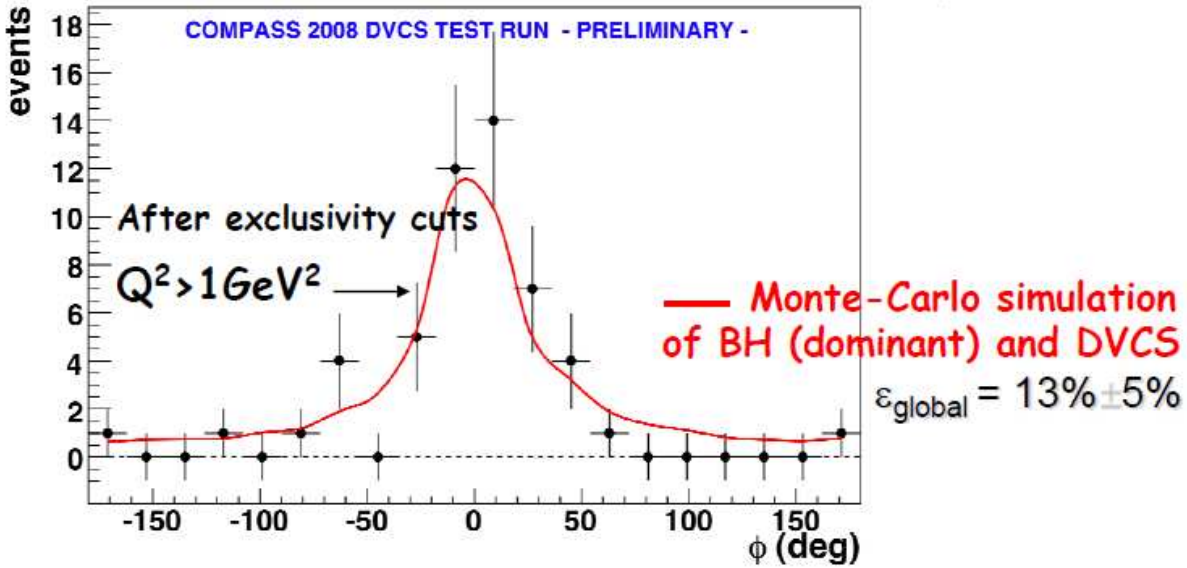


First Results of « DVCS » experiment @ CERN

DVCS + BH with μ+↓ and μ-↑ beam

$$d\sigma_{(\mu p \to \mu p \gamma)} = d\sigma^{BH} + d\sigma^{DVCS}_{unpol} + P_\mu\, d\sigma^{DVCS}_{pol}$$
$$+ e_\mu\, a^{BH}\, \mathcal{R}e\,T^{DVCS} + e_\mu\, P_\mu\, a^{BH}\, Im\,T^{DVCS}$$

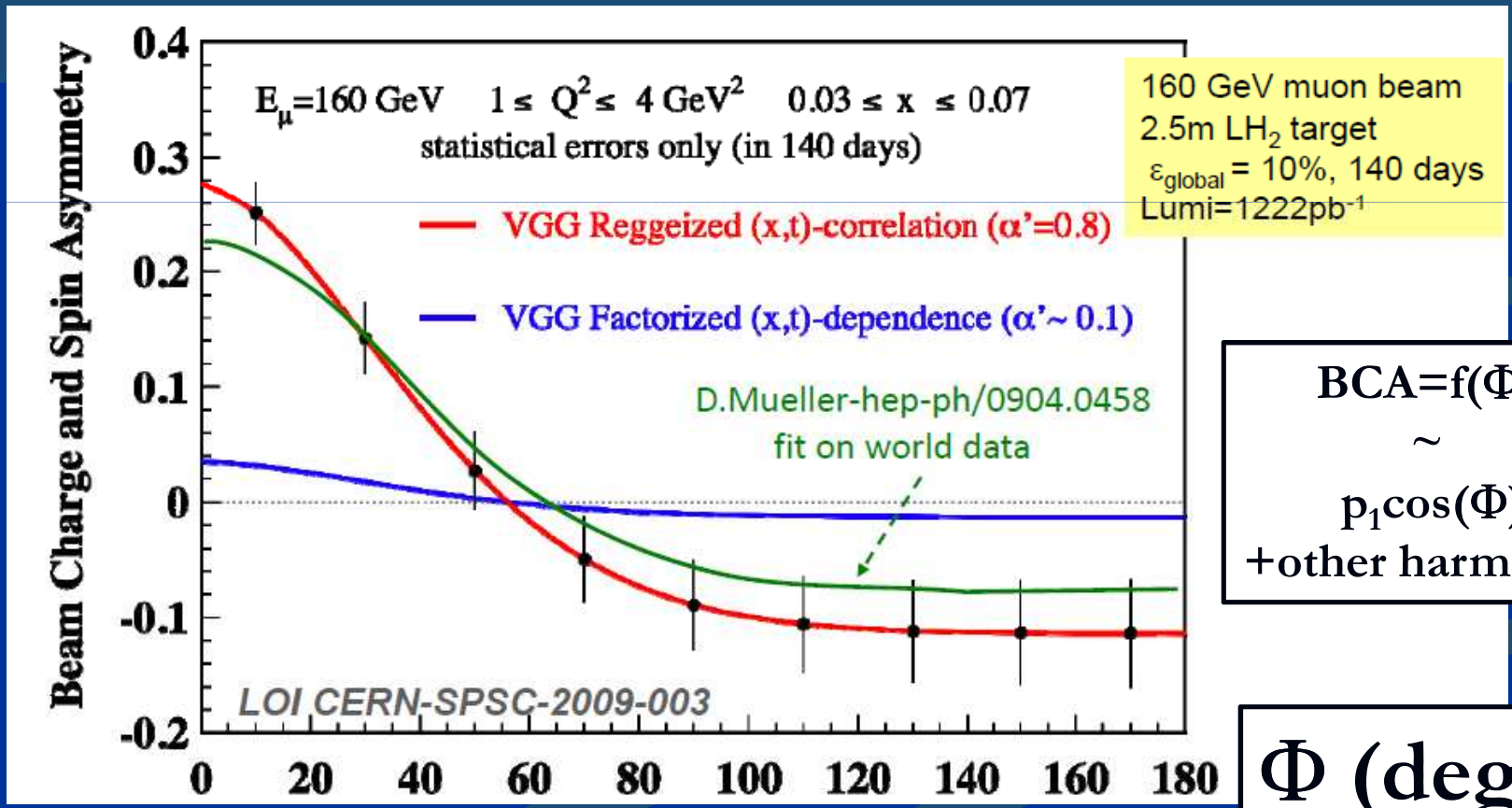




First BH events observed with 2 days run in '08…

Perspectives after 2011
Beam Charge Asymmetry (μ+/μ-)

α' : **b=b0 + α' log(1/x)** with dσ/dt = exp(bt)



BCA=f(Φ)
~
$p_1$cos(Φ)
+other harmonics

Summary and Outlook

HERA measurements: *previous talk*… perspectives given here for H1 versus HERMES and theory

The GPDs program continues with Jlab and *possibly* **COMPASS @ CERN**

Decisive perspective for b(x) & BCA (as shown in previous slides) // proton tomography
Experimental developments // Lattice calculations