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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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