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General overview of ATLAS Upgrades projects for HL-LHC

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With proton-proton collisions about to restart at the Large Hadron Collider (LHC) the ATLAS detector will double the integrated luminosity the LHC accumulated in the ten previous years of operation. After this data-taking period the LHC will undergo an ambitious upgrade program to be able to deliver an instantaneous luminosity of 7.5×10^{34} cm^{-2} s^{-1} allowing to collect more than 3 ab^{-1} of data at $\sqrt{s}$ =14 TeV. This unprecedented data sample will allow ATLAS to perform several precision measurements to constrain the Standard Model Theory (SM) in yet unexplored phase-spaces, in particular in the Higgs sector, a phase-space only accessible at the LHC. The price to pay to be able to collect such a rich data-sample is to upgrade the detector to cope with the challenging experimental conditions that include huge levels of radiation and pile-up events about a factor 5 higher than in the present condition. The ATLAS upgrade comprises a completely new all-silicon tracker with extended rapidity coverage that will replace the current inner tracker detector; a redesigned trigger and data acquisition system for the calorimeters and muon systems allowing the implementation
of a free-running readout system. Finally, a new subsystem called High Granularity Timing Detector that will aid the track-vertex association in the forward region by incorporating timing information into the reconstructed tracks. A final ingredient, relevant to almost all measurements, is a precise determination of the delivered luminosity with systematic uncertainties below the percent level. This challenging task will be achieved by collecting the information from several detector systems using different and complementary techniques.
This presentation will describe the ongoing ATLAS detector upgrade status and the main results obtained with the prototypes, giving a synthetic, yet global, view of the whole upgrade project.

Collaboration

ATLAS

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