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ATLAS Upgrades for the next Decades

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After the successful LHC operation at the center-of-mass energies of 7 and 8 TeV in 2010 - 2012, plans are actively advancing for a series of upgrades of the accelerator, culminating roughly ten years from now in the high luminosity LHC (HL-LHC) project, delivering of the order of five times the LHC nominal instantaneous luminosity along with luminosity leveling. The final goal is to extend the dataset from about few hundred fb⁻¹ expected for LHC running to 3000 fb⁻¹ by around 2035 for ATLAS and CMS. In parallel the experiments need to be keep lockstep with the accelerator to accommodate running beyond the nominal luminosity this decade.

Current planning in ATLAS envisions significant upgrades to the detector during the consolidation of the LHC to reach full LHC energy and further upgrades. The challenge of coping with the HL-LHC instantaneous and integrated luminosity, along with the associated radiation levels, requires further major changes to the ATLAS detector. The designs are developing rapidly for a new all-silicon tracker, significant upgrades of the calorimeter and muon systems, as well as improved triggers and data acquisition. This report summarizes various improvements to the ATLAS detector required to cope with the anticipated evolution of the LHC luminosity during this decade and the next.

Summary

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