

The ATLAS RPC system upgrade for the High Luminosity LHC and beyond

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The architecture of the present RPC trigger system in the ATLAS muon barrel was designed according to a reference luminosity of $1034 \text{ cm}^{-2} \text{ s}^{-1}$ with a safety factor of 5, with respect to the simulated background rates corresponding to about 300 fb^{-1} integrated luminosity. HL-LHC will reach a 7.5 times higher luminosity, an expected integrated luminosity of 5000 fb^{-1} and a total duration extended until at least 2040 largely increasing the original detector performance and longevity demand.

ATLAS approved an RPC upgrade plan, to guarantee the performance required by the physics program based on the addition of 272 new generation RPCs in the inner barrel (BI), to increase the redundancy, the selectivity, and provide almost full acceptance. To match the performance requirements, the new RPCs will have a different structure, materials and a high performance front-end electronics, in SiGe technology. The new BI chambers increase the system selectivity and efficiency and at the same time lowers the performance demand on the legacy RPCs, extending thus their longevity to match the HL-LHC target.

We will illustrate the performance of the new detectors and trigger system, as well as the impact on the ATLAS physics performance.

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