Contribution ID: **238** Type: **Recorded Presentation**

The ATLAS RPC upgrade project for the High Luminosity LHC program

The present ATLAS RPC system is a 3D+time tracking detector providing the first level trigger in the ATLAS barrel. It is constituted by 6 concentric cylindrical layers providing independent space-time measurements along the track, with 1ns x 1cm resolution. This system will undergo a major upgrade for the HL-LHC program, consisting in three additional full coverage layers of new generation RPCs, to be installed in the inner barrel region.
The new system will extend from about 70% to about 96% the trigger acceptance; add redundancy to the legacy RPC; increase the trigger selectivity and bring the resolution on the particle velocity to up 0.5%, thanks to the increased time resolution and lever arm.
The new RPCs are an evolution of the BIS78 RPCs, an ATLAS pilot project installed for the LHC RUN3, designed for working at a rate, compatible with Eco-friendly gas mixtures, with space-time performance one order of magnitude better than the present RPCs.
One sensible feature is the front-end electronics rad-hard chip, based on IHP SiGe BiCMOS technology, and integrating a 100 ps sharp discriminator, 70 ps TDC and 4 GBPS serial encoder, all working at 150 ns of fixed latency compatibly with the fastest ATLAS muon trigger.
The project is in advanced design phase aiming to build final prototypes, to start the construction in 2022. In the present contribution the detailed project design, features and plans, along with the first results of official prototypes will be illustrated.

Primary experiment

ATLAS

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Track Classification: Gaseous Detectors