

Performance of the CMS RPC upgrade using 2D fast timing readout system

A new generation of RPC chambers capable to withstand high particle fluxes (up to 2000 Hz/cm²) and instrumented with a precise timing readout electronics is proposed to equip two of the four high eta stations of the CMS muon system.

Doublet RPC detectors each made of two 1.4 mm HPL electrodes and separated by a gas gap of the same thickness are proposed. The new scheme reduces the amount of the avalanche charge produced by the passage of a charged particle through the detector. This improves the RPC rate capability by reducing the needed time to absorb this charge. To keep the RPC efficiency high a sensitive, low-noise and high time resolution Front-End Electronics is needed to cope with the low charge signal. An ASICS called PETIROC that has all these characteristics is proposed to read out the new chambers.

Thin (0.6 mm) Printed Circuit Board (PCB), 160 cm long, equipped with pickup strips of 0.75 cm pitch will be inserted between the two RPC detectors. The strips will be read out from both ends, using the arrival time difference to determine the Y position. The absolute time measurement will be also used with the aim to reduce the data ambiguity due to the expected high pileup at the future HL-LHC.

The results from RPC chamber equipped with the new readout system will be presented based on a complete set of laboratory electronic measurements and test beams. An excellent time and position resolution is obtained with the new chamber thanks to the new readout system.

Primary author: SHCHABLO, Konstantin (Centre National de la Recherche Scientifique (FR))

Presenter: SHCHABLO, Konstantin (Centre National de la Recherche Scientifique (FR))

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