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Improved RPC for CMS muon system upgrade for HL-LHC

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During the High Luminosity LHC (HL-LHC), the instantaneous luminosity would be increased to $5 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ delivering integrated luminosity of 3000 fb^{-1} over 10 years of operation starting from 2026. In view of HL-LHC, CMS muon system will be upgraded to sustain efficient muon triggering and reconstruction performance. Resistive Plate Chambers (RPC) are served as dedicated detectors for muon triggering due to their excellent timing resolution, hence RPC's will be extended upto pseudo rapidity of 2.4. Before long shutdown 3 (LS3), RE3/1 and RE4/1 stations of endcap will be equipped with a new improved Resistive Plate Chambers (iRPCs) having different design and geometry wrt present RPC system. The iRPC geometry configuration allows to improve the rate capability and hence to survive the harsh background condition during HL-LHC. Also, new electronics equipped with excellent timing precision measurement ($<150\text{ps}$) are developed to read out the RPC detectors from both side of the strips to allow good spatial resolution along them. The performance of iRPC has been studied with gamma radiation at Gamma Irradiation Facility (GIF++) at CERN. The longevity study is ongoing which must certify the iRPC for the HL-LHC running period. The main detectors parameters (currents, rate, resistivity) are regularly monitored as a function of the integrated charge. The preliminary result of the detector performance will be presented.

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