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Improving of RPC for Muon System of CMS experiment

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By 2027, the Large Hadron Collider luminosity should increase from 1.5 × 10ˆ34 cm−2 s −1 to 5 × 10ˆ34 cm−2 s −1. For this purpose two more long shutdown periods are scheduled to give the machine and the experiments the necessary time to anticipate these luminosity increases: Long Shutdown 2 (LS2) in 2018/2019 and Long Shutdown 3 (LS3) in 2023/2025. During these long shutdown periods the CMS Collaboration intends to upgrade several subsystems. In particular, the muon system of CMS detector will be extended in both Endcaps to ensure efficient muon triggering and reconstruction in that region at high luminosities. In the Endcap regions, CMS detector is using Cathode Strip Chambers (CSCs) as muon tracking and trigger detectors and Resistive Plate Chambers (RPCs) serve as dedicated trigger detectors and improve the muon reconstruction by providing the excellent timing resolution for identification muon particles. At the present, the four Endcap discs are not fully equipped: RPCs are missing completely and cover only Endcap disks up to $|\eta| = 1.6$. During LS3 these Endcap stations will be instrumented further with new RPCs and Gas Electron Multiplier detectors which will be cover the region of $1.8 < |\eta| < 2.4$. Nowadays, the final design of RPC chambers is developed and the prototypes of double- gap RPCs with gap thickness of 1.4 mm are tested. Study of the main parameter of improved RPC such as: detection efficiency, cluster size, rate capability and so on are performed in Gamma-radiation Facility (GIF++) at CERN with high radiation environment. In this work the GIF++ short description and main results obtained during the test will be presented.

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