RPC 2022

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Latest results of Longevity studies on the present CMS RPC system for HL-LHC phase.

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The present Compact Muon Solenoid (CMS) Resistive Plate Chambers (RPC) system has been certified for 10 years of Large Hadron Collider (LHC) operation at maximum background rate of 300 Hz/cmˆ2 and integrated charge of 50 mC/cmˆ2. In the next years, during the Phase 2 of the LHC physics program, called High Luminosity LHC (HL-LHC), the accelerator will increase the instantaneous luminosity up to factor five more than the nominal LHC luminosity, providing to experiments an additional integrated luminosity of about 3000 fbˆ-1 over 10 years of operation. At HL-LHC phase, the expected rate and integrated charge are about 600 Hz/cmˆ2 and 840 mC/cmˆ2, respectively (including a safety factor of three) based on Run 2 data and assuming a linear dependence of the background rates as a function of the instantaneous luminosity. Therefore, the HL-LHC phase will be a challenge for the RPC system since the expected operating conditions are much higher with respect to those for which the detectors have been iliadesigned, and could introduce non-recoverable aging effects which can alter the detector properties. A longevity test is then needed to estimate the impact of HL-LHC conditions on the RPC detector performance in order to confirm that the RPC system will survive the harsher background conditions expected at HL-LHC. A dedicated long term irradiation program has been started at CERN Gamma Irradiation Facility (GIF++) since 2016, where few RPC detectors are exposed to intense gamma radiation for long term to mimic the HL-LHC operational conditions. The main detector parameters (currents, rate, resistivity) are continuously under monitoring as a function of the collected integrated charge and the detector performance has been studied with muon beams. The latest results of the irradiation test will be presented.

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