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CMS RPC background studies and measurements

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The RPC (Resistive Plate Chamber) system at CMS detector operates successfully during Run-1 and Run-2 of the LHC program. During 2018 data taking, the instantaneous luminosity reached values of about of $2 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$. During the planned HL-LHC period the instantaneous luminosity is expected to reach up to $5 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ in the base scenario, and up to $7.5 \times 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ in the ultimate scenario, leading to very high expected radiation background. The exposure to such a high radiation levels can affect the system performance leading to a faster ageing and reduced detector performance. From the other side, the expected particle fluxes and fluence are directly related to the detector rate capability requiring strong radiation hardness of the readout electronics. It may lead to a drastically increase of the trigger rates. Different approaches have been used to study and analyze the RPC rates during data taking periods. The experimentally measured rates have been extrapolated to higher luminosity scenarios. In the present document we are reporting the RPC rates measured in 2018 and the expectations for the HL-LHC period. A comparison to the MC expectation is included as well.

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