

# Background sensitivity studies for GEM based detectors using a geant4 simulation

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One of the main challenges the CMS collaboration must overcome during the phase-2 upgrade is the radiation damage to the detectors from the high integrated luminosity of the LHC and the very high pileup. The LHC will produce collisions at a rate of about  $5 \times 10^9/s$ . The particles emerging from these collisions and the radioactivity they induce will cause significant damage to the detectors and on-board electronics, in addition, background particles from this radiation field can induce spurious signals resulting in a progressive degradation of the detector performance. A detailed simulation study of background particles and their interactions in a Gas Electron Multiplier based detector was performed using a standalone Geant4 simulation. Relevant information such as the probability to generate a signal (sensitivity), properties of secondary particles among others was extracted, this information leads to reduced uncertainties on experimental observables (i.e. accumulated charge) and could contribute on optimizing the detector design and an accurate estimation on the exposure time in the irradiation facilities. Finally the simulation results are compared with experimental measurements collected in past irradiation campaigns of GEM detectors at CERN.

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