Contribution ID: **91** Type: **Poster**

P1.17: Analysis of discharge events in the CMS GE1/1 GEM detectors in presence of LHC beam

Monday, 26 June 2023 15:02 (1 minute)

In July 2022, the experiments installed on the Large Hadron Collider accelerator ring started a new data taking phase, Run-3. Before this phase, an upgrade campaign took place during the so called Long Shutdown 2 phase (2018-2022). In particular, the muon system of the CMS experiment has been upgraded with the installation of a new gas detector station, GE1/1, based on Gas Electron Multiplier technology (GEM). The CMS experiment has scheduled the installation of two additional GEM stations: GE2/1 and ME0. The aim of the GEM stations is to maintain the performance of the muon system, reached during the last data taking phase (Run-2), with the increase of instantaneous luminosity expected at the LHC. The installed GE1/1 station covers the pseudorapidity region $1.55<|\eta|<2.18$. GE1/1 participated in the CMS Run-3 data taking from July to November 2022 and, in this period, its detectors were exposed for the first time to the radiation produced during the collisions of the LHC beams, with a center of mass energy of 13.6 TeV. Since the first days of Run-3, where only a few bunches collided in CMS, the GE1/1 detectors started to experience a significant number of discharges, affecting their smooth operation during the data taking. In this talk, we present an analysis of discharges, which started by simply counting the number of discharges occurring per detector. An interesting phenomenon observed was that the discharge rate can vary a lot among the installed detectors; this is due to the fact that the occurrence of discharges is driven by the manufacturing of the GEM foils used in the detectors. Imperfections in their manufacturing can lead to large variation in the discharge rate. In addition, the rate can vary in time, due to the fact that discharges can produce damage at the site generating them, deactivating a particular hole or, in the worst case, producing a short circuit in the GEM foil, deactivating a part of the foil amplification region. We present the evolution of the discharge rate in time and its dependence on the HV working point and on the luminosity delivered by the LHC beams. We present actions taken to mitigate the discharge rate and to assure a smooth detector operation.

Primary author: CALZAFERRI, Simone (Università degli studi di Pavia - INFN Pavia)

Presenter: CALZAFERRI, Simone (Università degli studi di Pavia - INFN Pavia)

Session Classification: Poster (incl. coffee)