GE1/1 Sustained Operations Investigations

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In this contribution, we will present the results of the investigations into the sustained operation of the triple-GEM (gas electron multiplier) detectors of the GE1/1 system, which is planned for installation into the Compact Muon Solenoid (CMS) in 2019-2020 (LS2).

Ten "slice test" detectors were installed into the CMS endcap in January 2017. These detectors are read out on the front end using 24 VFAT2 chips and a corresponding v2 optohybrid board, and from the back end utilizing a microTCA crate containing CTP7 and AMC13 boards. An additional two detectors were added in 2018, which represent the newer VFAT3-based design. Data was recorded throughout the 2017-2018 runs, using both cosmic ray muons and LHC collisions. During the slice test, a loss of VFAT2 input channels was observed, with two detectors exhibiting rapidly-increasing channel loss starting from mid-2018.

Concurrent investigations into the cause of the channel loss were launched, one using the in-situ data from P5, and the other seeking to recreeate the loss in the controlled setting of an external lab. Results from each of these investigations, and the steps that were taken to prevent such channel loss in the future, will be reported in this contribution.