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Data acquisition and online control system for new gas-electron multiplier detectors in the endcap muon system of the CMS experiment (12' + 3')

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A new data acquisition and on-line control system is being developed for gas-electron multiplier (GEM) detectors which will be installed in the forward region ($1.6 < |\eta| < 2.2$) of the CMS muon spectrometer during the 2nd long shutdown of the LHC, planned for the period 2018-2019. A prototype system employs the TOTEM VFAT2 ASIC that will eventually be replaced with the VFAT3 ASIC, under development. The front-end ASIC communicates over printed circuit lines with an intermediate on-detector board called the opto-hybrid. Data, trigger, and control information is transmitted via optical fiber between the opto-hybrid and an off-detector readout system using micro-TCA technology. On-line software, implemented in the CMS XDAQ framework, includes applications for latency and HV scans, and system management. We report on the operational status of the prototype system that has been tested using cosmic ray muons and extracted high-energy particle beams. This work is preparatory for the operation of a prototype GEM detector system to be installed in the CMS experiment in 2017.

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