

# Experience with the Triple-GEM detectors at the LHC CMS experiment

Friday, 31 May 2024 08:50 (20 minutes)

To improve the muon tracking and triggering capability of the most forward part of its muon spectrometer CMS has decided to install, for the High Luminosity LHC, three stations of large ( $> 1$  m long) Triple-GEM detectors. These stations are named GE1/1, GE2/1 and ME0, respectively. While GE1/1 and GE2/1 will work jointly with the existing CMS Cathode Strip Chambers (CSC) in the pseudo-rapidity range  $1.6 < |\eta| < 2.4$ , ME0 will extend the pseudo-rapidity coverage of the CMS muon system up to 2.8.

GE1/1 was installed within CMS in 2020 and is successfully recording LHC data since July 2022. GE1/1 consists in 72 Super-Chambers, each made of two large back-to-back Triple-GEM detectors. The installation of GE2/1, almost twice larger than GE1/1 is starting at the end of 2023 and will proceed during the successive LHC end-year technical stops. ME0, which is embedded within the new CMS forward calorimeter, will be installed in 2027.

In this contribution we will present the experience and latest results of the brand new GE1/1 system: the detector performance in the LHC environment (including the 2023 LHC Heavy Ion run), the stability of the system, and the lessons learned which impacted the design of GE2/1 and ME0 systems. We will also review the status of the production of GE2/1 and ME0.

Being the unique muon station at  $|\eta| > 2.4$ , ME0 will be made of 6 layers of Triple-GEM detectors, which will operate with background particle fluxes ranging from 3 to 150 kHz/cm<sup>2</sup>. Both the maximum background rate and the large range of flux set new challenges to the technology. The final results from the ME0 R&D program will also be presented

## Collaboration

### Role of Submitter

I am the presenter

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**Session Classification:** Gas Detectors - Oral session

**Track Classification:** T6 - Gas Detectors