



**HEP 2013
Stockholm
18-24 July 2013**



Contribution ID: 781

Type: **Poster Presentation**

Upgrade of the trigger and tracking capabilities of the CMS muon forward system with GEM detectors

The dedicated CMS R&D program was launched to study the feasibility of using micropattern detectors to enhance the performance of the $|\eta| > 1.6$ region in the present CMS muon endcap system. The proposed detector for CMS is a triple-GEM trapezoidal chamber, equipped with 1D readout, with dimensions (990x440-220) cm². GEMs can provide precision tracking and fast trigger information, contributing on one hand to the improvement of the CMS muon Trigger and on the other hand to provide missing redundancy in the high-eta region. The proposed detectors, designed with a new assembly technique, are conceived to meet the stringent requirements given by the hostile environment at CMS.

While during 2010-2011 the collaboration worked on the prototyping of the detector, during the first part of 2012 the new developed assembly technique, that will be used for the mass production, has been adopted. Four full-size Triple GEM-based muon detectors were built by the “GEMs for CMS collaboration” and several measurements have been performed using X-rays and muon/pion beams at the CERN SPS.

In this paper the experience summarized above and results at the beam tests of the performance of the new full-size production prototypes along with the physics justification will be discussed.

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Track Classification: Detector R&D and data handling