

# The upgrade of the CMS muon system for the High Luminosity LHC

Muhammad Bilal Kiani<sup>1\*</sup> on the behalf of the CMS collaboration

<sup>1</sup>. INFN Torino, Via Pietro Giuria, 1, 10125 Torino TO, Italy

\* [kiani@to.infn.it](mailto:kiani@to.infn.it)

Given the High Luminosity phase of the Large Hadron Collider (HL-LHC), which is expected to deliver an instantaneous luminosity 5 times higher with respect to the present value, the muon spectrometer of the CMS experiment will undergo specific upgrades targeting both the electronics and detectors to cope with the new challenging data-taking conditions and to improve the present tracking and triggering capabilities. In the current CMS muon system, different detector technologies have been chosen to optimize its performance, the Drift Tubes (DT) and Resistive Plate Chambers (RPC) are installed in the barrel, complemented by the two end-caps hosting cathode strip chambers (CSC) and RPC. The upgrade of the electronics will target the present system, based on the DT, the CSC, and the RPC. Most of the CSC electronics upgrade has been completed in Long Shutdown 2 (LS2). The electronics upgrade of the DT is planned for LS3 and currently, different prototypes of the new On-Board electronics for DT(OBDT) designs are being tested and validated in CMS in the slice-test demonstrators. The detector upgrades concern the deployment of new stations for the end-cap, where the background rate is expected to be higher. The upgrades are based on the triple gas electron multiplier (GEM) and improved resistive plate chambers (iRPC) technology, featuring improved time and spatial resolution and enhanced rate capability. During LS2 the GE1/1 station, based on the GEM technology has been installed in the end-cap region, covering the pseudo-rapidity range  $1.55 < |\eta| < 2.18$ . Additionally, the installation of two GEM stations is foreseen in the future (GE2/1 and ME0), to improve the muon reconstruction in the end-caps and to extend the coverage of the muon system up to  $|\eta| \sim 2.8$ . The presentation will give an overview of the Muon Spectrometer upgrades, describing the electronics developments for the DT and CSC, and It will provide an overview of the new stations based on triple-GEM (GE2/1, ME0) and iRPC detectors (RE3/1 and RE4/1) that will be installed before Long Shutdown 3.