The CMS muon system presently consists of three detector technologies: the silicon strip detector (SST), the gas electrons emission detector (GE2/1), and the microstrip silicon tracker (ME0). These technologies provide high precision in tracking, momentum measurement, and identification of secondary particles from decays near the interaction point. CMS physicists and engineers have worked extensively to improve the performance and longevity of these detectors, with a focus on mitigating radiation effects and optimizing system design. The CMS Muon System and its upgrade section highlights the advancements made to improve the system's efficiency and reliability. For instance, the CMS-FLUKA simulation framework has been used to model the expected background rates and their impact on the CMS experiment. The Radiation Field in the Gamma Irradiator Facility (GIF++) and the HL-LHC have been used as test environments to validate the simulation predictions.

The CMS measurement section discusses the methodology and tools used to measure the performance of the CMS muon system. This includes the use of trigger and reconstruction tools, as well as the CMS-Muon QA/QC Lab. The GE1/1, ME2/1, ME1/1, and ME0 chambers are part of this system, and their performance is regularly monitored and tested. The paper mentions the use of the CMS-GEM QA/QC Lab, which tests the performance of the gas electron emission detectors.

The LHC vs. HL-LHC section compares the LHC and HL-LHC conditions, highlighting the increased luminosities (up to 10^34 cm^-2 s^-1) and the associated increase in neutron-induced hits in the CMS muon system. The Gamma Irradiator Facility (GIF++) is used to simulate these conditions and assess the performance of the muon detectors. The CMS Muon System is expected to perform well under these conditions, with a focus on maintaining high efficiency and minimizing signal loss.

In conclusion, the CMS muon system is designed to withstand the harsh conditions of the HL-LHC, with ongoing research and development aimed at improving its performance and longevity. The collaboration between physicists, engineers, and technologists is crucial in achieving these goals, and the CMS community is well-equipped to meet the challenges of the future LHC operations.