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Gas Mixture Longevity Studies for the CMS Cathode Strip Chambers in Preparation of HL-LHC

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The muon system of the CMS experiment includes 540 Cathode Strip Chambers (CSCs) that serve as the primary source for muon detection and triggering in the endcap region. The CSCs are intended to operate throughout the lifetime of the CMS experiment, including the challenging environment of the HL-LHC era. To access the longevity of the CSCs over the HL-LHC lifespan, a recent campaign of accelerated irradiation studies has been performed at the CERN GIF++ facility. Following, additional irradiation tests of both standard and prototype CSCs with a reduced concentration of CF4 in the gas mixture were also conducted, as part of CERN's intention to minimize greenhouse gas consumption. Introductory studies with a CF4 substitute of lower global warming potential, the hydrofluoroolefine HFO-1234ze, are also being conducted, in the interest of assessing its impact on chamber performance and longevity.

We present the results of the CSC longevity studies, as well as an introduction to a possible CF4-alternative gas mixture for use in the CSCs.

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