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Longevity and eco-gas studies in the CMS cathode strip chamber muon detector

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The cathode strip chambers (CSCs) of the CMS experiment are a type of multi-wire proportional chamber that operates with a mixture of Ar, CO₂, and CF₄ gases. CF₄ is a well known component preventing aging of the anode wires. It has, however, a high global warming potential (GWP), and reducing our reliance on it is critical for improving the ecological sustainability of the experiment. As one of the prompt solutions, CMS CSCs use recuperated CF₄ while studies on possible reduction and or gas substitution are performed in parallel. One such investigation, presented here, uses small prototype CSCs, known as miniCSCs, which have only two layers. Detector performance and longevity are evaluated across a wide range of experimental conditions and gas mixtures. These chambers undergo accelerated aging using highly active ⁹⁰Sr sources, while performance is continuously monitored for signs of degradation.

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