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Longevity test of ATLAS Micromegas detectors at the CERN GIF++ facility

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The ATLAS muon spectrometer will face an increase of particle rate, specially at high rapidity, consequently of the larger instantaneous luminosity for the HL-LHC phase, expected to attain $5x10^{34}$ $cm^{-2}s^{-1}$.
The New Small Wheel (NSW) of the ATLAS muon spectrometer endcap is equipped with small-strip Thin Gap Chambers (sTGC) and Micromegas (MM), able to provide good tracking and triggering performances in this dense environment.
MM detectors were foreseen to operate with Ar:CO2 93:7% gas mixture, however the ternary Ar:CO2:iC4H10 93:5:2% gas mixture has demonstrated to provide a better high voltage stability and a larger pulse height, useful for inclined track reconstruction.
Due to the hydrocarbon content in the mixture, an extensive aging campaign is ongoing at the Gamma Irradiation Facility (GIF++) at CERN on MM production detectors,
where they are long term exposed to a 11.6 TBq 137Cs source, accumulating so far a charge equivalent to several years of HL-LHC operations.
Several parameters have also been studied and optimised, such as current dependency on the gas flow, mesh transparency and ion back flow as a function of drift voltage,
as well as tracking performances using 80 GeV muon beam.
This contribution will describe the results obtained from the above studies, showing the good response of the detector after several years of irradiation
and demonstrating the robustness of ATLAS MM detectors under intense particle rates.

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