

Irradiation and Gas studies of Micromegas production chambers for the ATLAS New Small Wheel

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The ATLAS upgrade for the HL-LHC phase involves the construction of two New Small Wheel (NSW) for addressing the high rate expected at high rapidity, up to 20 kHz/cm². The wheels will be equipped with two different technologies, small-strips Thin Gap Chambers (sTGC) and Micromegas (MM), with both tracking and triggering capabilities. About 70% of the MM chambers for the first wheel have been tested at the Gamma Irradiation Facility (GIF++) at CERN, where they were exposed to a 14 TBq ¹³⁷Cs source. The chambers were tested at different particle fluxes, up to 60 kHz/cm². Long-term irradiation tests were also performed with different gases in order to test the MM stability. Several parameters have been studied, among them the spark rates, the current linearity as a function of the applied flux and the uniformity among layers and sectors. The role of gas parameters, such as humidity and gas flow, on the chamber performance was also studied. These results showed that the MM technology is capable to afford the high rate expected for the HL-LHC phase.

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