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Resistive High Granularity Micromegas for Future Detectors. Status and Perspectives

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The presented project aims to establish the use of single amplification stage resistive MPGD based on Micromegas technology, for a stable and efficient operation up to 10 MHz/cm2 particle rate. Key challenges include the miniaturization of readout elements (small pads at mm2 scale), the optimization of the spark protection system, and ensuring reliability and robustness during operation.
Various resistive patterns were implemented using different techniques, categorized into two families: one employing a pad-patterned configuration and the other utilizing a structure based on a double layer of DLC foils (Diamond Like Carbon structure).
The two categories implement different charge evacuation methods: embedded resistors using independent pads the first, and double DLC uniform resistive foils the latter, relying on a network of dot-connections to ground in the active area.
The presentation will include a comparative analysis of results obtained with different resistive layouts and configurations, emphasizing their response under high irradiation and high-rate exposure, as well as their tracking performance at test-beams. The discussion will highlight the advantages and performance of the solution featuring the double DLC layer.
Comprehensive results from a recently tested medium-sized detector (400 cm^2) will be reported, along with preliminary measurements conducted on the first large-area module (50x40 cm^2) designed as a full-size module for tiling in future experiments. Additionally, initial promising results on the capacitive sharing technique, aimed at reducing the number of readout channels while maintaining high spatial resolution for applications at low to medium rates, will also be presented

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