Contribution ID: **349** Type: **Talk**

# Small-Pad Resistive Micromegas –Rate capability for different spark protection resistive schemes

*Wednesday, 29 July 2020 16:15 (15 minutes)*

Micromegas are among the most promising micro pattern gaseous detector (MPGD) technologies for applications in high energy physics (HEP). Micromegas are very versatile. They can be used for precision tracking and trigger, in particle flow calorimetry sampling, as anode planes for RICH detectors or for time projection chambers.
Driven mainly by future upgrades of existing experiments at high-luminosity LHC (HL-LHC) and for applications at future accelerators, we started a R&D project to push further this technology for operations under very high particle flow.
Small Pad resistive Micromegas detectors were designed to operate as precision trackers up to rates of tens MHz/cm2, three order of magnitudes higher than current applications. The miniaturization of the readout elements and the optimization of the spark protection system, as well as the stability and robustness under operation, are the primary challenges of the project.
Several small-pad Micromegas detectors have been built with similar anode planes, segmented with a matrix of 48x16 readout pads with a rectangular shape (0.8x2.8 mm2) and with a pitch of 1 and 3 mm in the two coordinates. The active surface is 4.8x4.8 cm2 with a total number of 768 channels, routed off-detector for readout. Covering the anode plane, a resistive layer quenches the spark occurrences, improving the robustness of the Micromegas design. The scheme and configuration of the resistive spark suppression layer is specific to the geometry of the readout electrodes. For the small-pad resistive Micromegas detectors, two different schemes were implemented to be compatible with their small rectangular pad electrodes. The first scheme involves a pad-patterned layer with embedded resistors for each readout pad. The second scheme implements a double layer of uniform Diamond-Like-Carbon (DLC) resistive foils as resistive planes, covering all the active area. In this scheme a net of low resistive silver vias evacuates the current from the double layer of DLC to ground, avoiding that the current spread on all the planes, encountering a large resistance and in turn reducing the rate capability. For each technique different configurations and resistivity values have been adopted.
Characterization and performance studies of the detectors have been carried out by means of radioactive sources, X-Rays. Conclusive results and a comparison of the performance obtained with the different resistive layouts and different configurations will be presented. In particular, they concern on the response under high irradiation and high rate exposure, and its dependence on the dimensions of the exposed surface. Results from high energy muon beam (at CERN-SPS) and from a first test beam of 300 MeV/c pions (at PSI) will also be presented.

## Secondary track (number)

**Primary author:** CAMERLINGO, Maria Teresa (Universita e INFN Roma Tre (IT))

**Co-authors:** IODICE, Mauro (INFN - Sezione di Roma Tre); PETRUCCI, Fabrizio (Universita e INFN Roma Tre (IT)); SEKHNIAIDZE, Givi (Universita e sezione INFN di Napoli (IT)); ROSSI, Eleonora (Universita e INFN Roma Tre (IT)); ALVIGGI, Mariagrazia (Universita e sezione INFN di Napoli (IT)); IENGO, Paolo (CERN); DI DONATO, Camilla (Universita e sezione INFN di Napoli (IT)); DELLA PIETRA, Massimo (Universita e INFN, Napoli (IT)); CANALE, Vincenzo (Universita e sezione INFN di Napoli (IT))

**Presenter:** CAMERLINGO, Maria Teresa (Universita e INFN Roma Tre (IT))

**Session Classification:** Detectors for Future Facilities (incl. HL-LHC), R&D, Novel Techniques

**Track Classification:** 13. Detectors for Future Facilities (incl. HL-LHC), R&D, Novel Techniques