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High rate performance of Small-pad Resistive Micromegas. Comparison of different resistive protection concepts.

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Motivated mainly by future upgrades at high-luminosity LHC (HL-LHC) and detectors at future colliders, most of the HEP R&D collaborations are focusing on the design of new particle detectors for operation under very high particle flow.
In the field of Micro-Pattern-Gaseous-Detectors, the small-pad resistive Micromegas prototypes were designed to overcome the actual limitations of standard resistive strip Micromegas chambers. In these new prototypes, pads with 1x3 mm2 area replace the readout strips to reduce the occupancy, and the spark protection resistive layer has been redesigned and optimized with different techniques to permit a safe behaviour of the detector, without efficiency loss, at rates of the order of tens MHz/cm2 over large surfaces.
The firstly-developed design exploits a pad-patterned embedded resistor layout by screen-printing, while the most recent technique involves uniform sputtered DLC (Diamond Like Carbon structure) layers, where the charge evacuates through the several vias connected to the ground.
Comparative studies have been conducted on the performances of the detectors with two resistive layouts, and between two (DLC) prototypes with different pitch of vias and DLC resistivity. The results of the tests performed with high intensity X-rays and with high energy charged particle beams will be presented.

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