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A Novel Two-Dimensional Readout Design for Floating Strip Micromegas Detectors

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Floating strip Micromegas detectors are highest-rate capable particle detectors with excellent spatial and time resolution, allowing single particle tracking with fluxes up to at least 7 MHz/cm^2 by collecting the amplified ionization charge on copper anode strips kept at a slightly floating electrical potential. The charge signal is decoupled by two layers of readout strips in x and y, insulated by thin Kapton layers. A complete understanding of the signal formation in the detector, particularly on the y-strips, is achieved: simulations disentangle the signal coupling due to alternating weighting field lines with respect to the ion velocity vector and the response of charge sensitive front-end electronics. Different two-dimensional anode designs with optimized field geometry have been developed based on the simulations. We present the performance of the detector for the different designs measured in 20 MeV proton/neutron and 180 GeV pion/muon beams, using APV25 front-end boards.

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