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R&D on Small-Pads Micromegas for the Phase-II upgrade of the ATLAS Muon Spectrometer

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In view of the ATLAS Phase II Upgrade, a proposal to extend the detector acceptance of the muon system to large η (up to $|\eta| \sim 4$) is being considered. The aim of the new detector is to tag muons, relying on the combination with the inner detector track for the momentum measurement. The new large- η Muon Tagger should cope with extremely high particle rate, dominated by background hits up to about 10 MHz/cm² in the most forward region. In order to minimize the occupancy, pixel or small-pad readout are needed. Micro-Pattern-Gaseous-Detectors is a suitable technology for this purpose. We present the development of resistive micromegas with O(mm²) pad readout aiming at precision tracking in high-rate environment without efficiency loss up to several MHz/cm². A first prototype has been designed, constructed and tested. It consists of a matrix of 48x16 pads, each pad with rectangular shape and a pitch of 1 and 3 mm in the two coordinates. The active surface of this prototype is 4.8x4.8 cm² with a total number of 768 channels. Characterization and performance studies of the detector have been carried out by means of radioactive sources, X-Rays, cosmic rays and test beam. The results will be presented, along with a new development aiming at the construction of a fully scalable, thousands-channel small-pad detectors, with embedded front-end electronics.

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