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Electron losses during drift and mesh transit in an ATLAS-like MicroMegas

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In the MicroMegas detectors currently under construction for the ATLAS New Small Wheel (NSW) upgrade, the conversion region is limited to 5mm thickness. The number of primary ionization-clusters induced by a passing muon is about 10-15, with a few electrons each. The accuracy of the μ TPC reconstruction method relies on the single cluster positions. Consequentially high electron losses during the drift and mesh transit might effect the space resolution.

The Exchangable Mesh MicroMegas (ExMe) is a 40x50cm² active-area prototype with identical geometrical microscopic-parameters to the NSW chambers. In addition it allows an easy exchange of the micromesh and comprises four sectors with different pillar spacing. Two chambers of this type were built using sputtered or screen-printed resistive layers.

A systematic test on the influence of these design parameters (mesh geometry, pillar spacing and resistive layer structure) on electron losses and chamber performance was carried out. Comparison between experimental data and detailed microscopic simulations carried out in Garfield++ disentangled the electron losses during drift and mesh transit. The study resulted in a proposal on parameters for the NSW MicroMegas.

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