

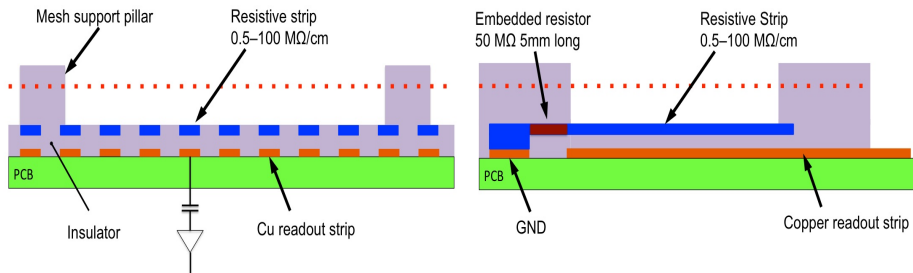
Development of large-area resistive-strip micromegas chambers for the ATLAS muon system upgrade

In 2018 it is foreseen to replace the existing small wheels to cope with the expected high luminosity. Resistive-strip micromegas have been chosen as precision chambers as the baseline for the upgrade of the Small Wheels.

Micromegas in the Small Wheels

- Replace the muon chambers of the Small Wheels with 128 micromegas chambers of 0.5 m² to 2.5 m² area, each
- Micromegas provide precision, 2nd coordinate measurement and trigger functionality in a single device
- Each chamber comprises eight active layers, arranged in two multilayers: a total of about 1200 m² of detection layers; 2M readout channels (30k trigger channels)

Resistive chamber design



Performance

- Spatial resolution $\sim 30\mu\text{m}$ (Ar:CO₂ 93:7)
- Single plane efficiency 98%
- Gains above 10⁴
- Clean signals up to $>1 \text{ MHz/cm}^2$, with some loss of gain
- Stable response over duration of neutron irradiation equivalent to 20 years LHC ($5 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$)

R&D Reached milestones

- Large area chambers
- 2D readout (x-y, x-u-v)
- Inverted HV scheme (mesh on GND)

Short-term plans

- Summer 2012 1x1 m² chamber
- End of 2012 1x2 m² chamber
- Readout integration to ATLAS DAQ

Prototypes in ATLAS

Installed during winter shutdown 2011

- Chamber 9x4.5cm² at MBTS z=3.5m r=1
- 4 Chambers on SW CSC s.9

