



Contribution ID: 23

Type: not specified

## First successful demonstration of operating a helium gas cooled pixel detector

Wednesday 8 June 2022 11:15 (20 minutes)

The Mu3e experiment searches for the lepton flavour violating decay  $\mu^+ \rightarrow e^+ e^- e^+$  with an ultimate aimed sensitivity of 1 event in  $10^{16}$  decays. This goal can only be achieved by reducing the material budget per tracking layer to  $X/X_0 \approx 0.1\%$  and by using gaseous helium as coolant, a novelty for particle detectors. The pixel detector itself is based on High-Voltage Monolithic Active Pixel Sensors (HV-MAPS) which are thinned down to  $50\ \mu\text{m}$ .

This talk presents the realization of the gaseous helium cooling system. Thermal studies of the two inner pixel layers, corresponding to the Mu3e vertex detector, will be shown including the first successful operation of a thin pixel detector cooled with gaseous helium. A miniature turbo compressor circulates the helium. Optimized channels with low pressure drop distribute the gas to the detectors. A mass flow of  $2\ \text{g/s}$  is sufficient to keep the detector temperatures well below  $70^\circ\text{C}$  for a heat load of up to  $350\ \text{mW/cm}^2$  and an inlet helium temperature of  $0^\circ\text{C}$ .

This study shows that gaseous helium cooling for future tracking detectors is definitely a viable option.

**Authors:** RUDZKI, Thomas; MEIER AESCHBACHER, Frank (Paul Scherrer Institut)

**Presenter:** RUDZKI, Thomas