Contribution ID: **22** Type: **not specified**

The Mu3e ultra-low-mass tracker

Monday 25 June 2018 17:00 (30 minutes)

The Mu3e experiment uses an ultra-low mass tracking and timing detector to search for the very rare decay $^{+} \rightarrow e^{+}e^{-}e^{+}$. The tracks to be observed in this experiment will have a maximum momentum of about 53 MeV, hence the need for very thin detectors. The silicon pixel detector is in a barrel shape and the physics performance requires for a material budget per layer of about 0.1 % x/X_0. The pixel sensor is a monolithic HV-CMOS design which allows them to be thinned down to 50 µm. The high-density interconnect (HDI) is a flex circuit made with aluminium as conductor. The chip produces about 250 mW/cm^2 heat, which is cooled away by gaseous helium. All this will be integrated with two compact timing trackers (scintillating fibres and tiles) inside a 1 T magnetic field.

This talk will focus on the many mechanical challenges this detector design offers. After an overview, the main parts will be presented and what solutions for the mechanics have been found to meet the requirements. The current detector design integrates all parts (electronics, mechanics, cooling and power supplies) and is currently being built as a full mock-up. Unorthodox choices were required to reduce the material, including polyimide carrying structures (25 µm thin) with integrated helium cooling channels, the use of 3d-printed structures for the gas distribution, conductively cooled copper rods for powering, to just highlight a few unique solutions developed. A strong emphasis has been put on simulation of critical components and concepts. They were compared to measurements in the laboratory using representative mock-up parts of the pixel modules and components of the Helium cooling.

Author: MEIER, Frank (Ruprecht Karls Universitaet Heidelberg (DE))

Presenter: MEIER, Frank (Ruprecht Karls Universitaet Heidelberg (DE))