Track 4: Gas Detectors

Modern gas detectors in particle physics mostly use Micro Pattern Gaseous Detectors for the amplification, which are Gas Electron Multipliers (GEMs) and Micro-MEsh Gaseous Structure (Micromegas). Both have the advantage over the traditional approaches that their smaller structures reduce local field distortions leading to an improved resolution. In addition, they have an intrinsic ion backflow suppression and don't require massive mounting structures.

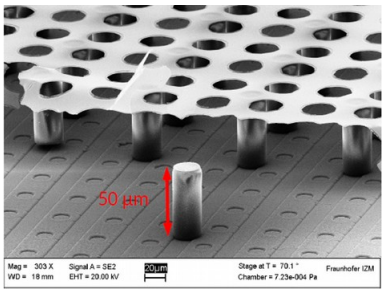
In this track, students will study the properties of gas detectors in simulation and using detector prototypes with GEMs or Micromegas studying their basic characteristics.

Task 1: Iron-55 Spectrum

The energy deposition of the radiation of an iron-55 source results in a specific 2-peak spectrum. Measuring this spectrum, the effective gain and the energy resolution of the system can be determined.

Task 2: GridPix - Measuring Single Electrons

The GridPix is a Timepix pixel chip with a Micromegas gas amplification grid produced on top. This enables it to detect single electrons.
Using a CAST-type GridPix detector, X-ray photons will be reconstructed to determine the gas gain and the energy resolution.



Task 3: Gain Determination by Measuring GEM Currents

Here, the effective gain is be determined by measuring the currents on both sides of a GEM detector and the anode. A gain curve for different voltage settings is measured using specifically developed NIM modules able to measure currents in the nanoampere regime at several kilovolts.

Task 4: Impact of Readout Granularity

The influence of the readout granularity, i.e. the readout pad size, is studied. Therefore, a track fit will be implemented to study simulated tracks of kaons and pions in a time projection chamber which is read out with different pad granularities.