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A setup to measure ion mobility in Argon and Neon based gas mixtures

To better understand the performance of different gas mixtures in gaseous detectors it is crucial to know the ion drift velocity v_{Drift} in these gases. E.g. ions moving through the gas volume can create space charges and hence field distortions inside the detector. Knowing v_{Drift} (or the ion mobility μ) as function of the electrical field allows to simulate and correct for such distortions.

In order to measure μ a small gaseous detector utilising Gas Electron Multipliers (GEM foils) was constructed. A stack of three foils provides the gas amplification in this detector. At a distance d_{Drift} above the GEM stack a wire grid is mounted, followed by the drift cathode. In addition, the drift volume is equipped with a field cage. The gap between grid and cathode is used to accelerate ions, which were produced in the GEM stack and drifted towards the drift cathode. Then the ion signal is read out either at the wire grid or at the cathode itself. In order to measure v_{Drift} the time difference between the electron signal on the pad plane and the ion signal is measured. Together with d_{Drift} the velocity of the ions - as well as the mobility - as function of the electrical field can be calculated.

During the construction of the detector different drift distances were examined as well as different ways of accelerating the ions. Several measurements were done with Ar and Ne based gas mixtures.

Primary author: DEISTING, Alexander (Ruprecht-Karls-Universitaet Heidelberg (DE))

Presenter: DEISTING, Alexander (Ruprecht-Karls-Universitaet Heidelberg (DE))

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