Contribution ID: **35** Type: **not specified**

Gas Gains Over 10^4 in Low Pressure SF_6 with a Novel Multi-Mesh ThGEM for Directional Dark Matter Searches

Thursday 14 December 2023 16:30 (20 minutes)

The Negative Ion Drift (NID) gas SF_6 has favourable properties for track reconstruction in directional Dark Matter (DM) searches utilising low pressure gaseous Time Projection Chambers (TPCs). However, the electronegative nature of the gas means that it is more difficult to achieve significant gas gains with regular Thick Gaseous Electron Multipliers (ThGEMs). Typically, the maximum attainable gas gain in SF_6 and other Negative Ion (NI) gas mixtures is on the order of 10^3; whereas electron drift gases like CF_4 and similar mixtures are readily capable of reaching gas gains on the order of 10^4 or greater. In this talk, a novel two stage Multi-Mesh ThGEM (MMThGEM) structure is presented. The MMThGEM was used to amplify charge liberated by an ^{55}Fe X-ray source in 40 Torr of SF_6. By expanding on previously demonstrated results, the device was pushed to its sparking limit and stable gas gains up to ~50000 were observed. The device was further optimised by varying the field strengths of both the collection and transfer regions in isolation. Following this optimisation procedure, the device was able to produce a maximum stable gas gain of ~90000. These results demonstrate an order of magnitude improvement in gain with the NID gas over previously reported values and ultimately benefits the sensitivity of a NITPC to low energy recoils in the context of a directional DM search.

Author: MCLEAN, Alasdair (University of Sheffield)

Presenter: MCLEAN, Alasdair (University of Sheffield)