

An experimental study to understand the physics behind charging-up of Gas Electron Multiplier (GEM).

Tuesday 26 May 2020 16:54 (18 minutes)

Charging-up is a common phenomenon observed while working with gaseous ionization detector having dielectric material. It is mainly comprised of two processes namely, the polarization of dielectric due to exposure of high electric field and collection of charges on the dielectric surface. Both of these charging-up processes affect the gain of the detector as they change the local field configuration around the dielectric. In present work, we have studied these effects separately using experimental techniques for a single GEM detector. It has been observed that due to polarization the gain increases following a curve similar to charging-up of a capacitor. However, the radiation charging-up reduces the gain which depends on radiation rate. As the rate increases the rate of collection of charges on GEM dielectric accelerates. Its effects are important for experiments where beam current changes significantly with time and in TPC application which requires gain to be stable over time.

Funding information

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Session Classification: Sensors: Gaseous Detectors

Track Classification: Sensors: Gaseous Detectors