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# Charge sharing in Gas Electron Multipliers

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The Gas Electron Multiplier (GEM) has become a widely used technology for high-rate particle physics experiments like COMPASS, LHCb and are being planned to use as the readout system for the upcoming upgrade version of other experiments such as ALICE TPC.
The radiation hardness, ageing resistance and stability against discharges are the main criteria for the long-term operation of such detectors in the high-rate experiments. In particular, discharge is a serious issue as it may cause irreversible damages to the detector as well as the readout electronics. The charge density inside the amplification region is the limiting factor of detector stability against discharges. By using multiple devices and thus, sharing the electron multiplication in different stages, maximum sustainable gain can be shifted upwards by several orders of magnitude. A common explanation for this is connected to the transverse electron diffusion, widening of the cloud and reducing the charge density in the last multiplier. However, this has not been verified yet. There are several ways to distribute the voltages among all electrodes in a multi-GEM set-up depending on the requirement of a particular experiment. In our work, we are using Garfield/Garfield++ simulation framework as a tool to extract the information related to the transverse size of the propagating electron cloud and thus, to estimate the charge density in the GEM holes for multiple stages. For a given gas mixture, we will present the initial results of charge sharing using single and double GEM detectors under different electric field configurations and its effect on other measurable detector parameters such as single point position resolution.

**Primary author:** Ms ROY, Promita (Saha Institute Of Nuclear Physics, HBNI, INDIA)

**Co-authors:** Ms BHATTACHARYA, Purba (Departimento Di Fisica, Istituto Nazionale di Fisica Nucleare, Monserrato CA, Italy.); Mr MUKHOPADHYAY, Supratik (Saha Institute Of Nuclear Physics, HBNI, INDIA.); Mrs MAJUMDAR, Nayana (Saha Institute Of Nuclear Physics, HBNI, INDIA.)

**Presenters:** Ms ROY, Promita (Saha Institute Of Nuclear Physics, HBNI, INDIA); Ms BHATTACHARYA, Purba (Departimento Di Fisica, Istituto Nazionale di Fisica Nucleare, Monserrato CA, Italy.)

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