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Passive Gating Grid Studies for a Time Projection Chamber

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A Time Projection Chamber (TPC) is a good candidate as the main tracking device for many experiments.
A TPC measures space points of charged tracks, which provide momentum resolution and particle identification for a variety of measurements.
In high multiplicity environments a TPC has to cope with the build-up of space charge in the drift volume which is created by two major effects; primary ionization and Ion Back Flow (IBF) from an amplification device.
Primary ionization is inevitable and one concentrates on combating IBF. Traditionally, this is accomplished with a temporarily powered gating grid which absorbs all charge carriers. However, this limits the operation of a TPC to very limited readout rates. To overcome this limit micropattern gas detectors (MPGD) will be implemented in future TPCs. MPGDs are inherently capable to reduce IBF yet not at an optimum level. A passive or statically powered gating grid might optimize the IBF reduction.
We have simulated woven wire meshes, different patterns of etched meshes, hexagonal micropattern meshes and static bi-polar wire gating grids. We have studied several options to achieve good electron transparency for the primary electrons and high blocking for the ions coming from the amplification stage. In this presentation, we will discuss the results and provide conclusions for overcoming IBF.

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