

Options for gain elements and gas mixtures in a high rate EIC Time Projection Chamber

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☒☒ In order to investigate options for a future high rate TPC we have tested various gas gain structures and gas mixtures. Our goal was to focus on crucial TPC parameters: ion back flow, energy resolution (dE/dx), electron and ion drift speed, electron diffusion (in E- and B-fields), and stability. We concentrated on two options for the gain structure: 4 GEMs and MMG+2GEMs. We investigated a potential instability (MMGs) that occurs primarily from a high voltage (HV) power supply (PS) voltage drop in reaction to a discharge. It was demonstrated that a resistive protection layer on a readout structure reduces the HV PS voltage drop after a spark to practically negligible levels. The hybrid micro-pattern gas amplification stage allows for a TPC design that can operate in a continuous mode, serves as an option to limit space charge distortions in high-rate TPCs, and guarantees that dE/dx , space reconstruction resolution, drift parameters and detector stability will not be compromised.

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