OPTIONS FOR GAIN ELEMENTS AND GAS MIXTURES IN A HIGH RATE EIC TIME PROJECTION CHAMBER.

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Demands on a Future EIC Detector

- High rate (high luminosity colliders)
- Limited space available inside of SC magnet (~1.5T)
- Best possible precision for momentum reconstruction, electron energy measurement, hadron and electron PID.
- High quality primary and secondary vertices reconstruction

- TPC is on the EIC list for barrel tracking and PID (good track-finding, momentum reconstruction, dE/dX, and low X₀).

Third component: CH₄.

Summary

TPC gain structure MMG+2 GEMs appears to be an optimal option for EIC TPC in a combination with a gas mixture Ne+CF₄(10%)+CH₄(10%).

- very low IBF, and good Energy resolution.
- fast electron drift velocity, and high ion mobility.
- extremely robust, low HV values on all elements.
- passed “standard” stability test with X-ray gun (~10 nA/cm² Anode current). This conforms very low probability but possible MMG-sparks occur largely due to interaction high momentum particles with a mesh material.
- with Resistor protection on a pad structure there is no HV recovery “dead” time in a event of a spark.
- both MMG and GEM are well tested technologies: R&D, mass production, and utilization in experiments.

Gas mixture option: Ne + CF₄. However, this combination has two issues: a strong e⁻ absorption resonance and Ne²⁺ + CF₄ → Ne⁺ + CF₃ + F.**

Third component: CH₄.

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