# Ideas for Beam Particle Tracking and ID in the ProtoDUNE Beamlines

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ProtoDUNE Beamline Instrumentation WG Kickoff Meeting

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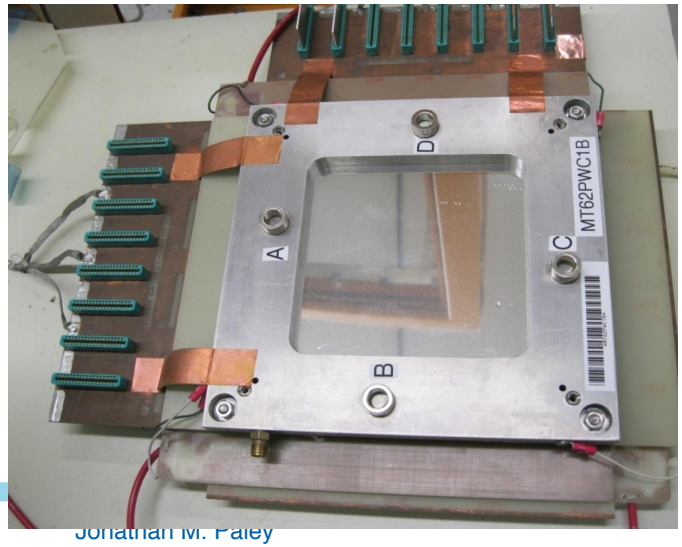
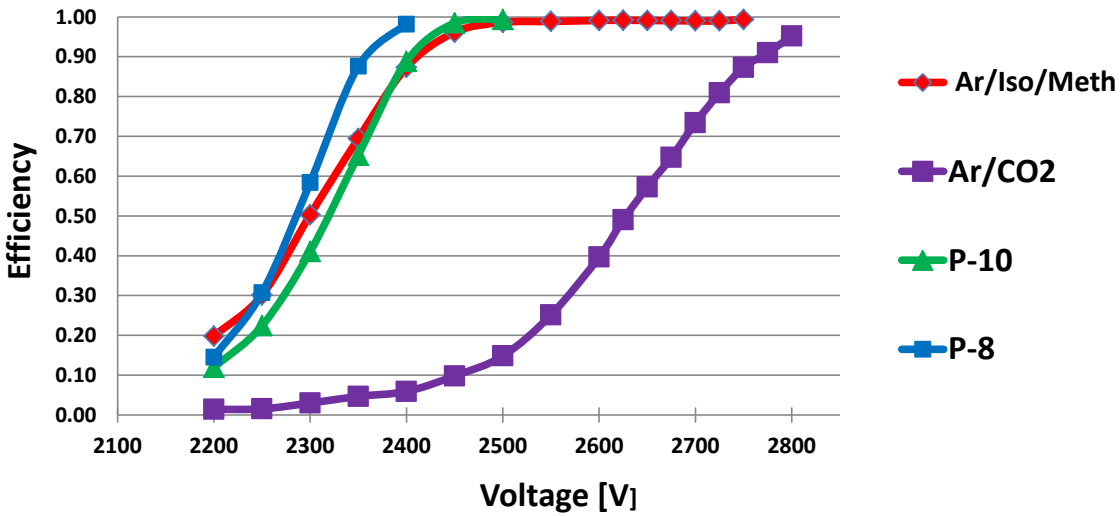
Fermilab

# Beam Particle Tracking

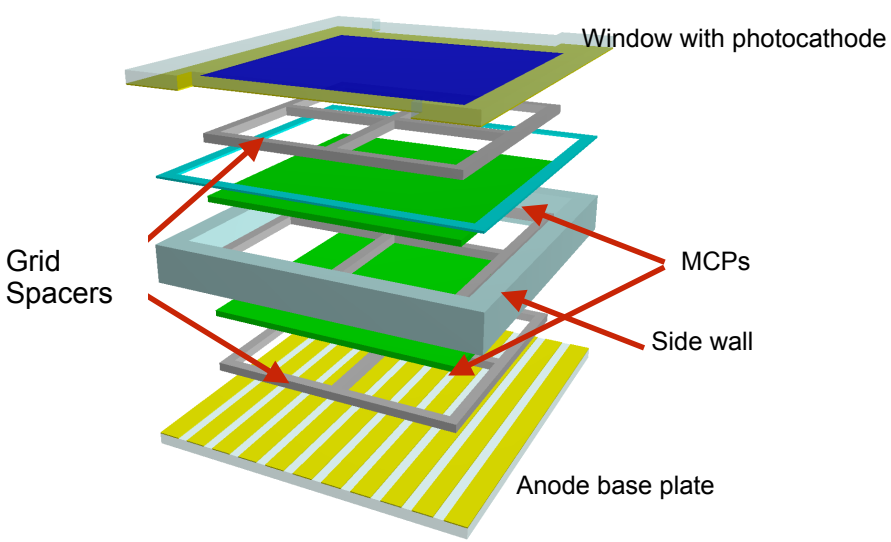
- The CERN beam momentum acceptance is ±5%. Improved tracking can reduce this beam momentum uncertainty to a few percent.
- CERN can provide 3 XBPF 200 x 200 mm, scintillating fiber (1 mm) beam profile monitors. New electronics needed to use these as a spectrometer.
- Fermilab has multi-wire proportional chambers (MWPCs) with X-Y sense plane readout, approximately 128 mm x 128 mm, readily available that can be used in addition to the XBPF. Chambers add 0.002 nuclear collision lengths and 0.007 radiation lengths. These chambers have a long history, so installation, integration and commissioning should be straightforward.

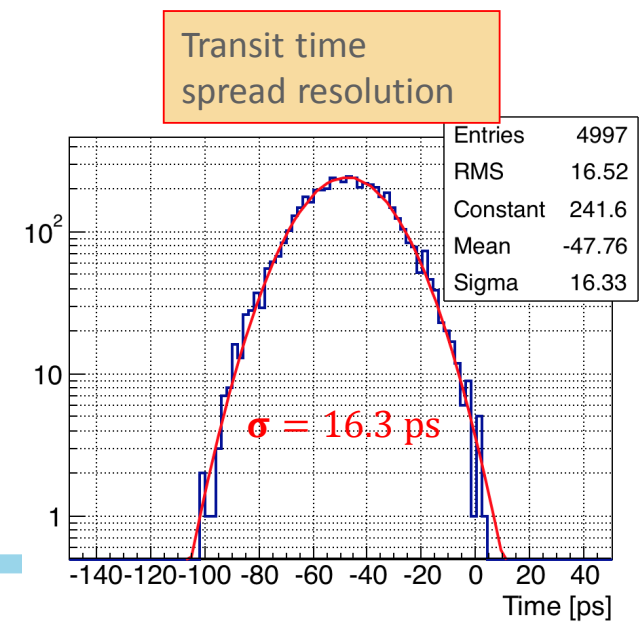


# Beam Particle ID

- Our understanding was that CERN will provide one gas Ckov threshold detector per beam line.
- For lower momenta, we are considering a ToF system that would utilize ANL 6 x 6 $cm^2$ large-area picosecond photodetectors (LAPPDs). The MCP-based devices are capable of < 20 ps resolution with gains of $10^6$-$10^7$. We have a verbal commitment from ANL to provide two for tests later this summer. Note: electronics need to be procured, tested, integrated, etc.
- Still waiting on detailed description of materials, but I am pretty sure the thickness is < 1 cm of borosilicate glass (2.23 g/$cm^3$) + thin PCB that it is mounted on.




6x6 $cm^2$ 'small tile' blowout