Online monitoring software
for HRPPD / pfRICH beam tests

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Beam test at Fermilab in May 2024: week #1

FTBF 120 GeV proton beam

Photonis PF-16 MCP-PMT | G1 G2 | S1 | Aspheric lens / HRPPD | S2 | G3 G4 | Hamamatsu R3809U-50 MCP-PMT

eRD110
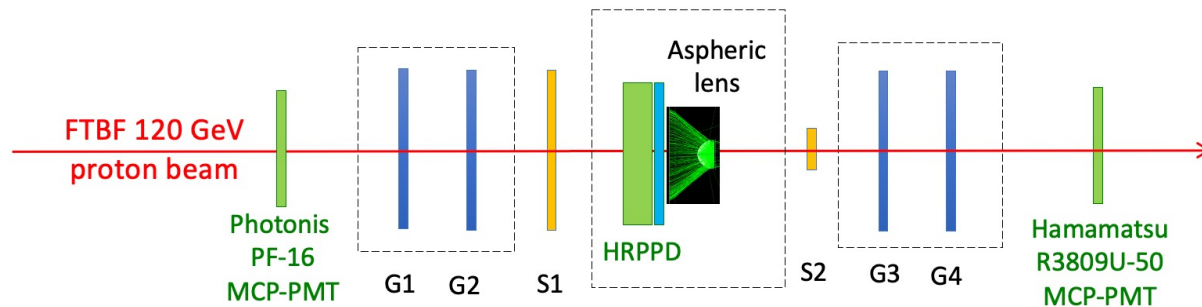
➢ Use well-established technique and equipment, in a bare minimum setup with a single HRPPD

  ➢ GEM tracker (G1 .. G4), scintillators (S1, S2) & reference MCP PMTs

  ➢ High performance scope & 512 channels of V1742 DRS4 electronics
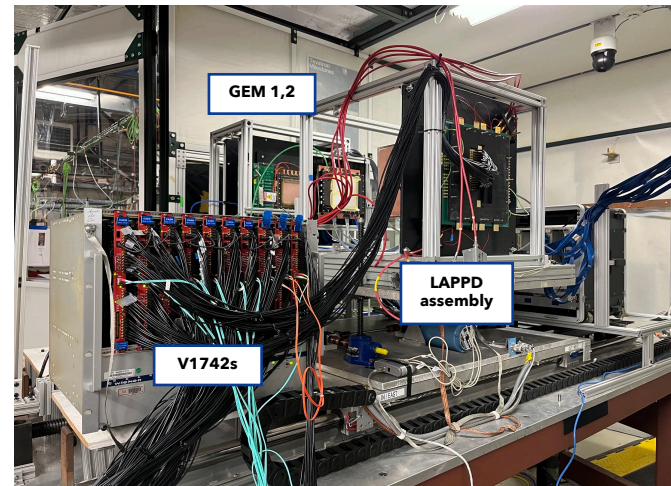
  ➢ [Passive HRPPD interface board with MCX connectivity]

➢ **Main objectives**:

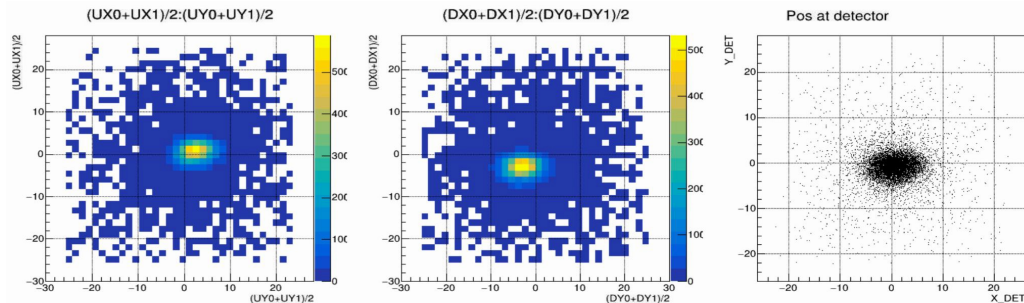 ➢ First beam test experience with the new EIC HRPPDs:

    ➢ Excitation of a single sensor by multiple coherent single photons (hpDIRC)

    ➢ Performance in a mixed single- and multi-photon environment (pfRICH)

  ➢ A direct assessment of HRPPD timing performance
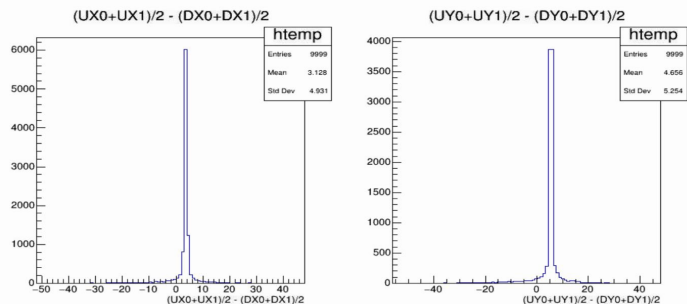
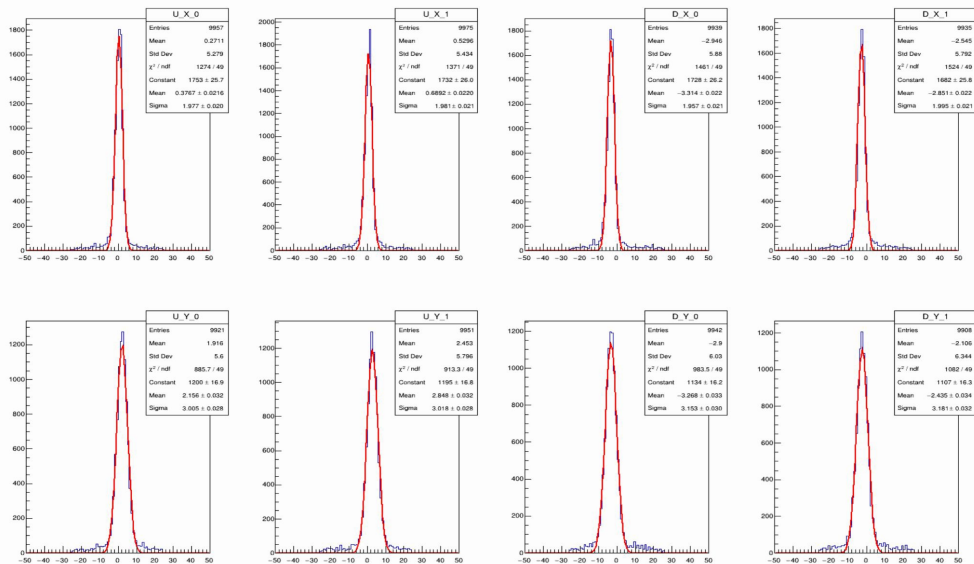# GEM reference tracker monitoring scripts

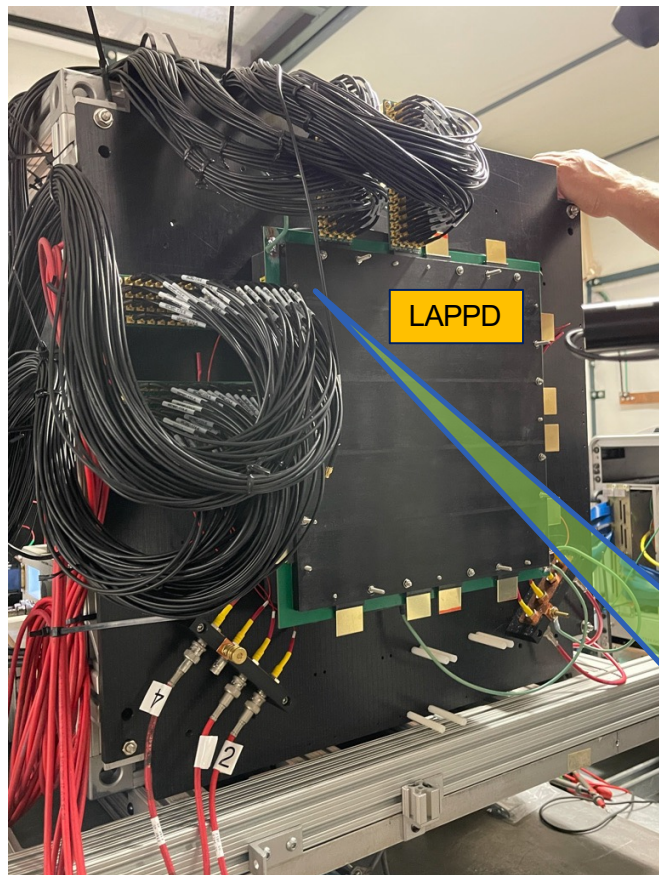See the script [here](#)

Strip maps in four XY-chambers

XY-position at the detector location

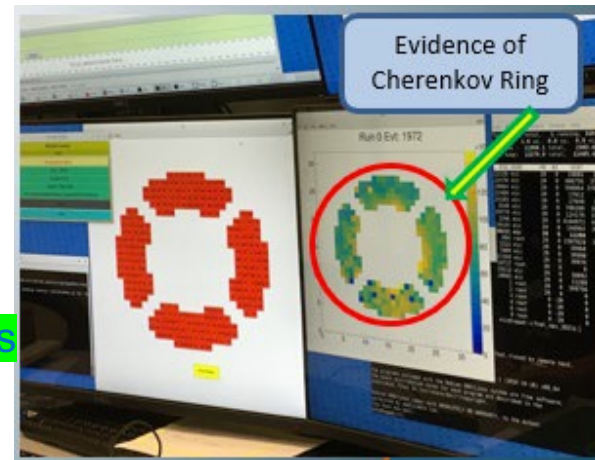Good news: we can pretty much recycle the existing codes
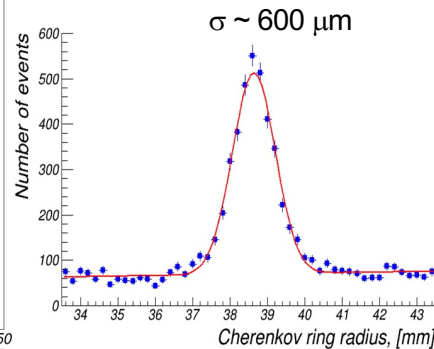
3

2021 setup and Cherenkov ring visualization

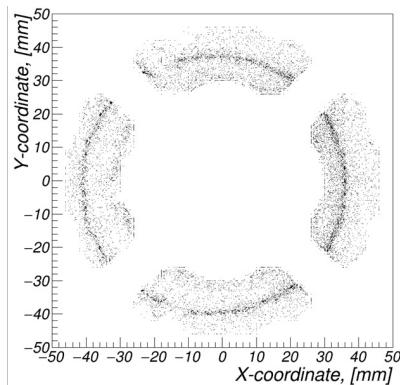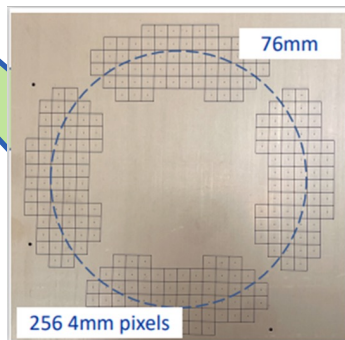LAPPD

Online GitHub links:
script & sources
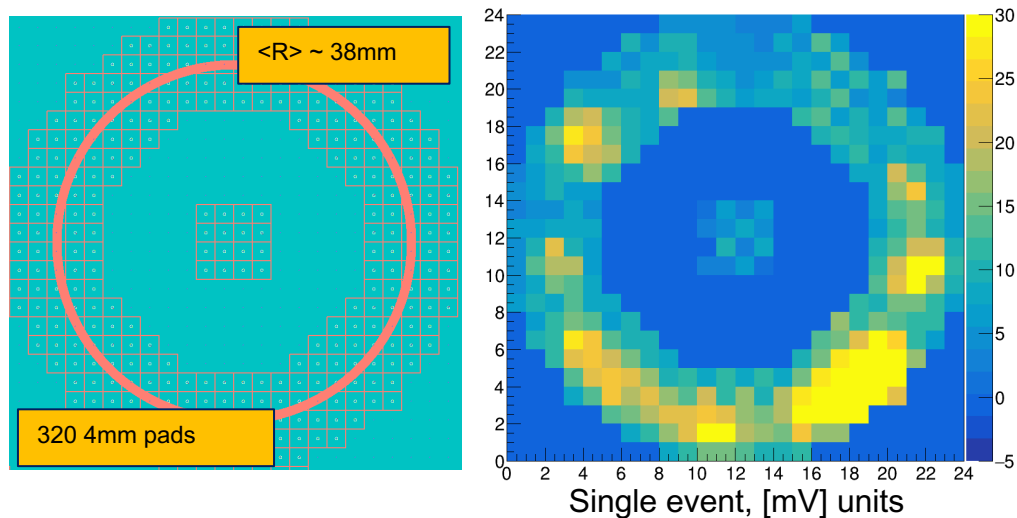
Good news: we can pretty much recycle the existing codes

Evidence of Cherenkov Ring

Pixel pattern & accumulated single photon XY-coordinates (offline)

76mm

256 4mm pixels

σ ~ 600 μm

2022 offline codes, ring fitting, timing, other resources

Aspheric lens as a source of coherent Cherenkov photons, a different pattern

<R> ~ 38mm

320 4mm pads

Single event, [mV] units

Not so good news #1:
we never made an attempt
to write timing-related plots

Not so good news #2:
we never made an attempt
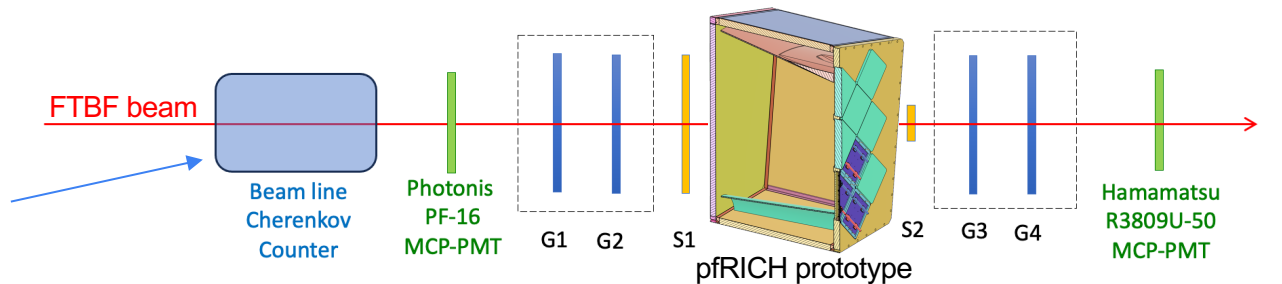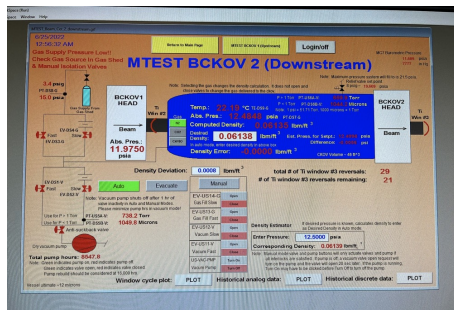to fit the rings

MPGD4EIC software on GitHub: link

Barak's June 2021 presentation: link

Sanghwa's presentation in June 2022: indico link

FNAL-related notes, RCDAQ description, etc: google drive link

Beam test at Fermilab in May 2024: weeks #2-3

➢ Recycle an already debugged "week #1" tracker & reference MCP-PMT setup, except for

  ➢ Make use of a low momentum MT6 hadron beam (and a beam line Cherenkov counter)

  ➢ Install a fully fledged pfRICH prototype (aerogel, mirrors, five HRPPDs as a "sensor plane")

  ➢ Make use of ~5k channels of newly built HGCROC3 ASIC electronics

Requires a discussion: what to recycle and what to write from scratch

➢ **Main deliverable** is a direct simultaneous demonstration of

  ➢ >3σ π/K separation reach up to ~7 GeV/c via aerogel Cherenkov photon imaging

  ➢ HRPPD performance as a t_0 reference sensor for ePIC ToF subsystems

    ➢ <50 ps timing resolution using aerogel Cherenkov photons

    ➢ O(10ps) timing resolution using a sapphire window Cherenkov photon flashes