HRPPD B-field studies campaign at BNL

Alexander Kiselev

ePIC pfRICH DSC meeting, December 4, 2025

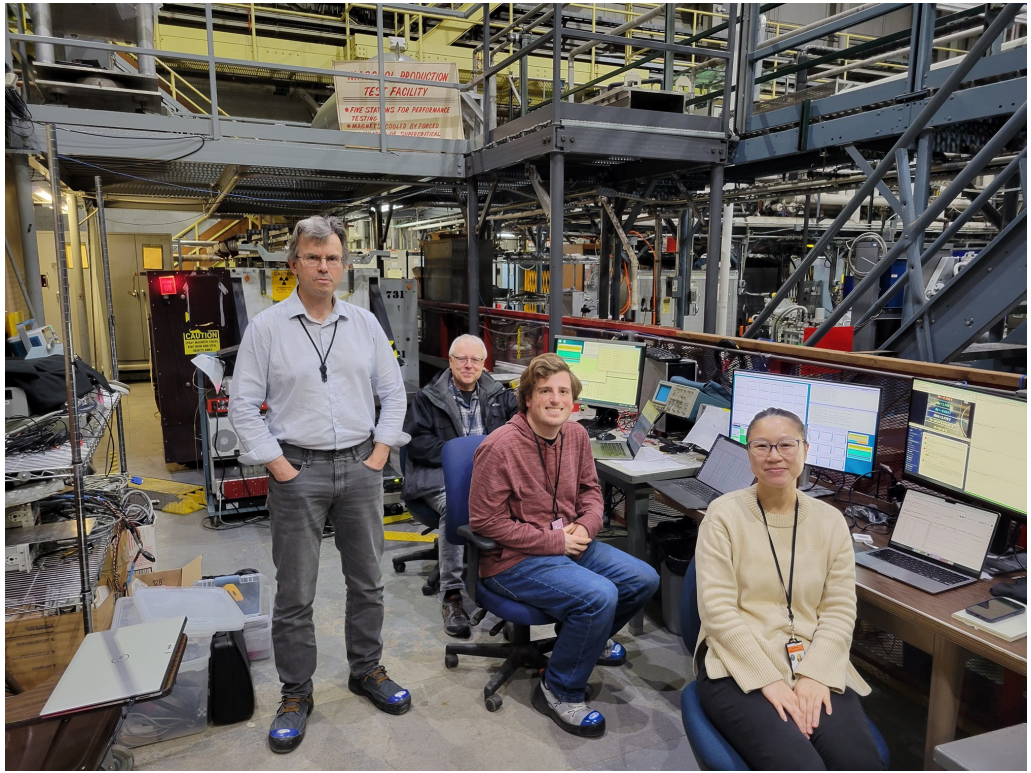
Objectives, dates, location

- Verify that HRPPDs can work in a magnetic field of a magnitude and orientation of what they will be at the pfRICH sensor plane location in ePIC
  - Up to ~1.3T field and up to 13 degrees field-to-HRPPD-window-normal angles
- Perform a systematic study in a {HV, B-field, orientation angle} parameter space
  - Collect material worth of a publication
- November 17-26 @ a Superconducting Magnet Division at BNL

Facility & experimental area

Superconducting Magnet Division (SMD) at BNL

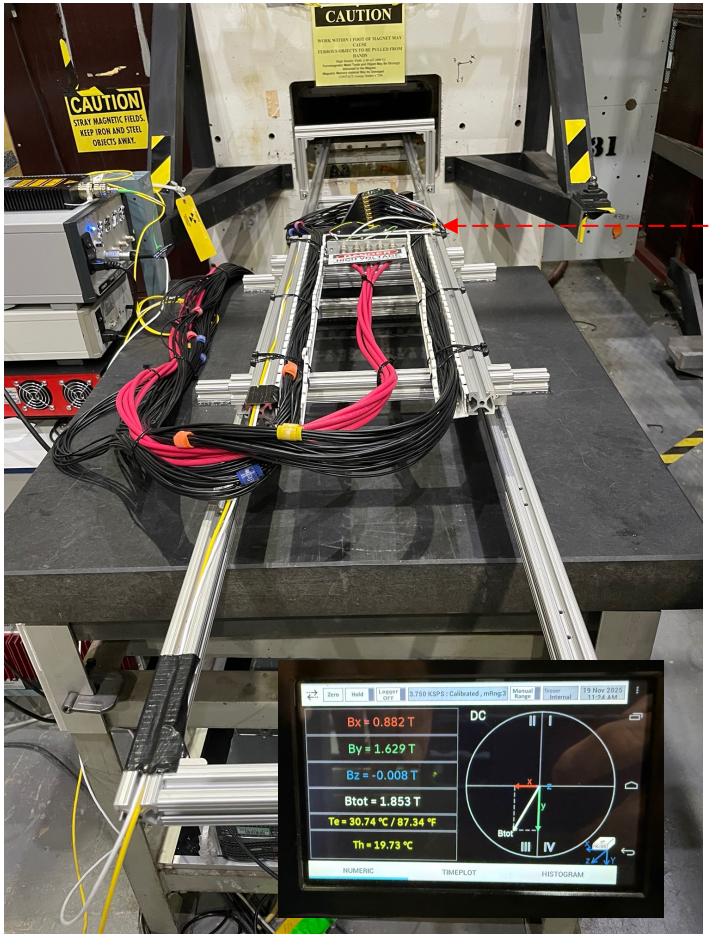
Team

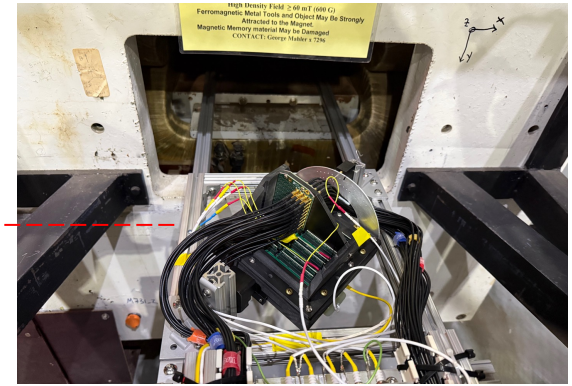


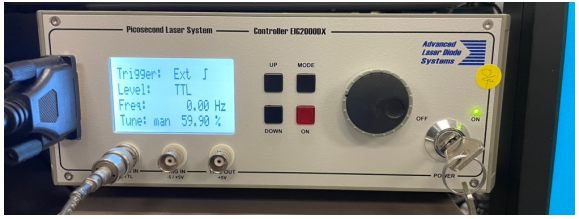
Alexander
Andrew
Bob
Brian
Craig
Jihee
Mark (from Incom)
Martin
Ping
Yifan

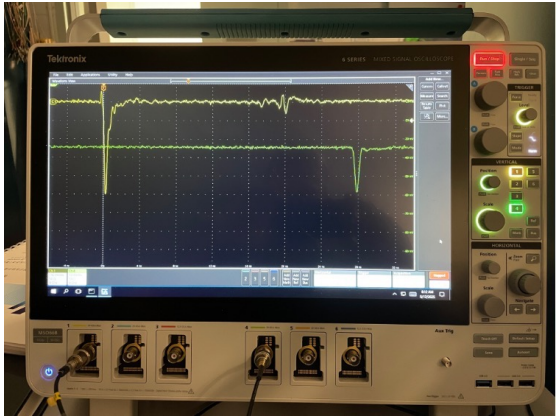
No picture with all people present ☹ (one more reason to come back)

Experimental setup pictures

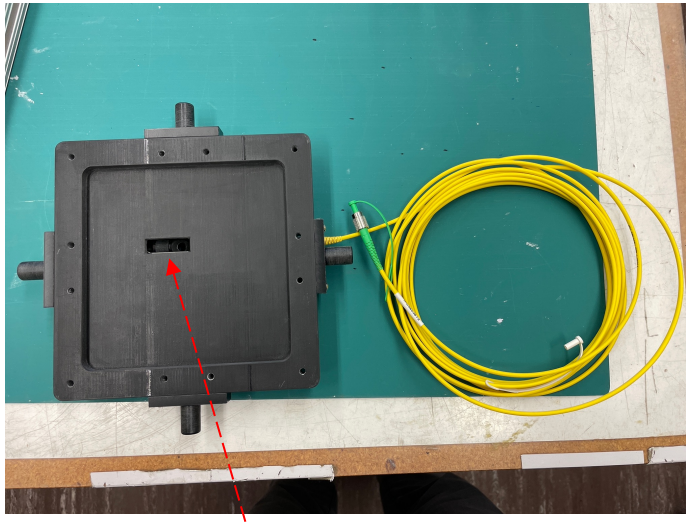




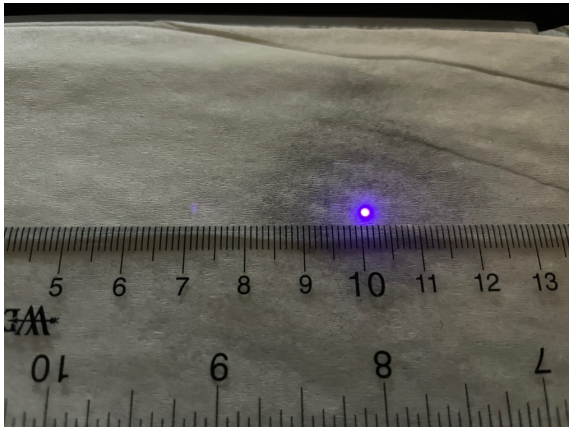


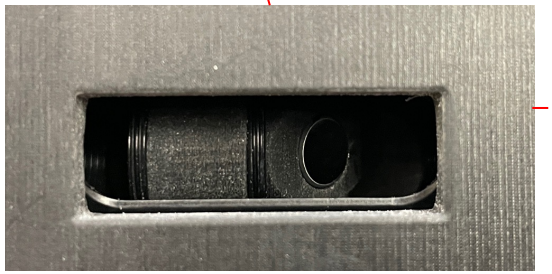


Optical configuration details

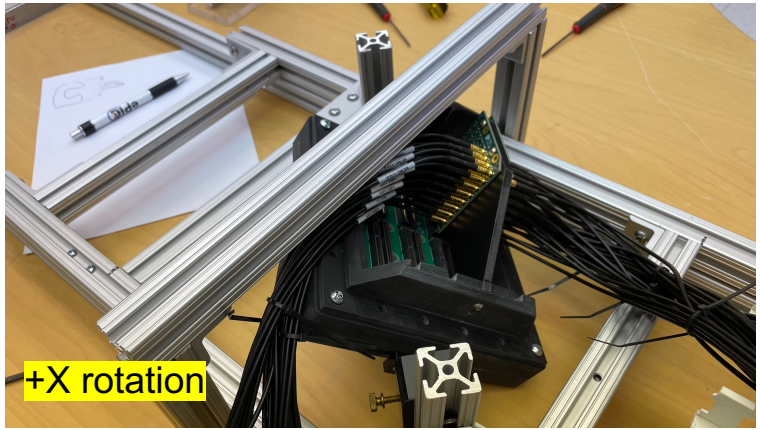


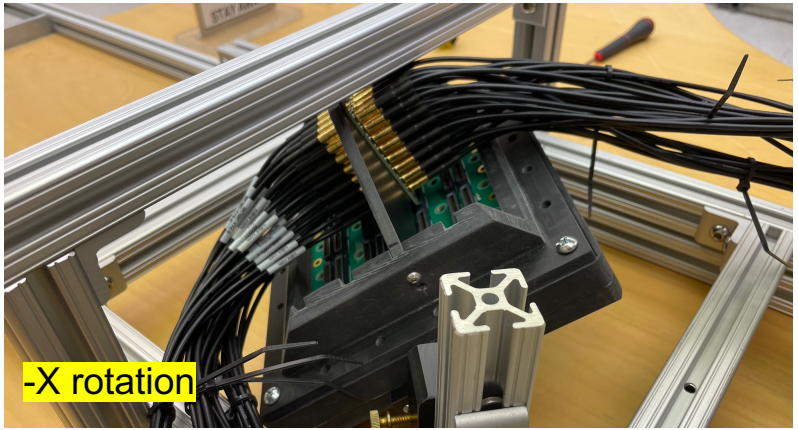
- Use F=20mm plano-convex lens in a 2F-2F configuration
- OD4 filter, diaphragm fully open
- At a 40% laser tune get 5-7 % useful events
- Beam spot size ~1.5mm diameter

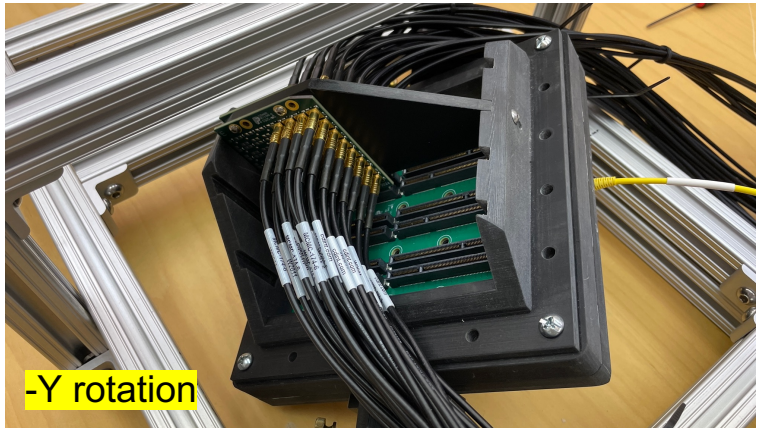


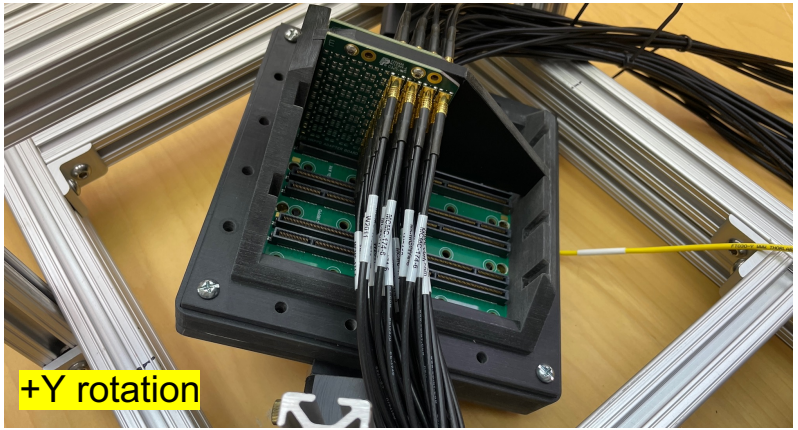


Configurations: XY rotation axes, up to +/-35^0 tilts

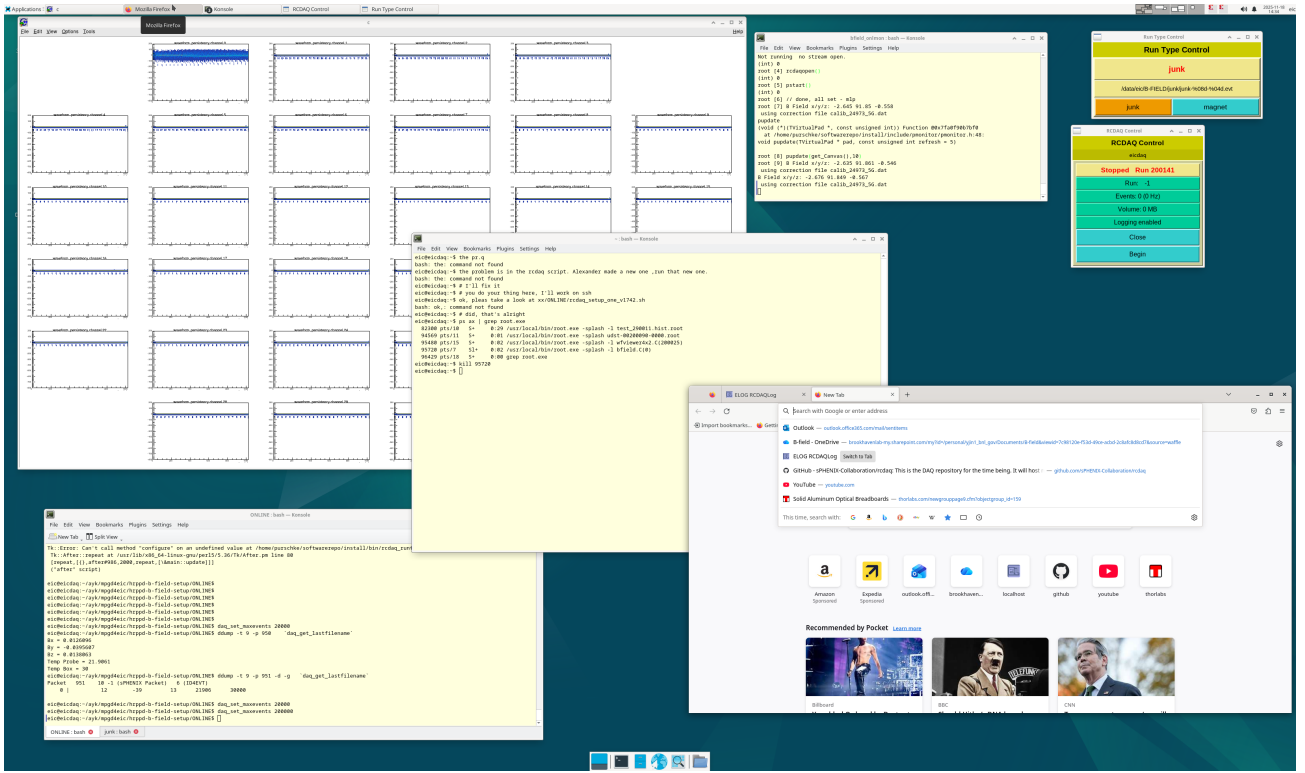








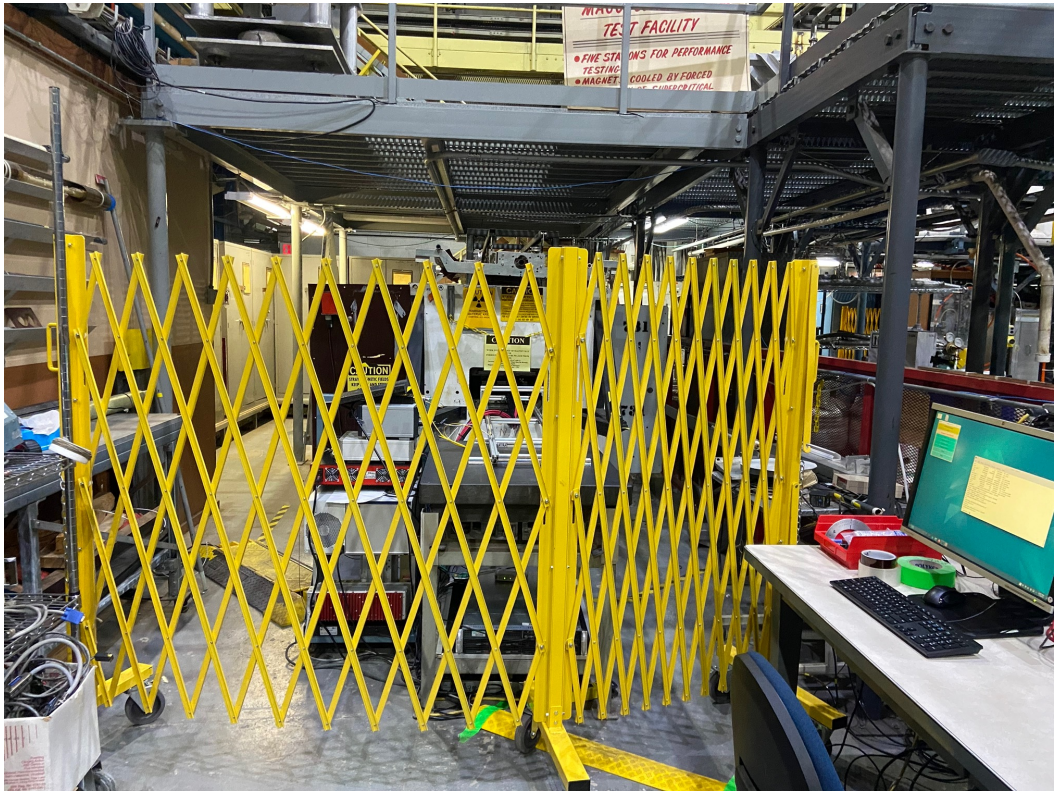
Data taking & online monitoring



- RCDAQ data acquisition, VNC, elog, express online data quality analysis, etc
- Fully automated data taking (except for ramping magnet up and down)

Results, status and plans

- Collected >5 TB of data (yes, these DRS4 waveforms take a lot of space!)
- Performed detailed scans in a {HV, B-field, tilt angle} parameter space: >1000 files
- Data quality ongoing
- By the end of next week should have a first assessment ready
- Then decide whether to come back now or wait till next occasion
- The equipment is still installed in the experimental area



Objectives to return to SMD for ~2 more days

Either during a week of December 15 or December 22 or in February

- Re-measure part of the taken data
  - Like +/- 12.5 degree runs in X-orientation taken on Wednesday (~17% useful events fraction, God knows why)
- Bring a femtosecond laser this time

- Take (a fraction of) data with an opposite B-field polarity
- Consider extending the parameter space based on the preliminary findings
- Consider modifying the optical assembly
  - Adjust beam spot diameter, fix this screw on the PiLas laser head (and install another OD3-OD4 filter)
- Establish a better connection between PiLas / Elmo / DRS4 / scope data
- Repeat some measurement around the neighboring HRPPD pads