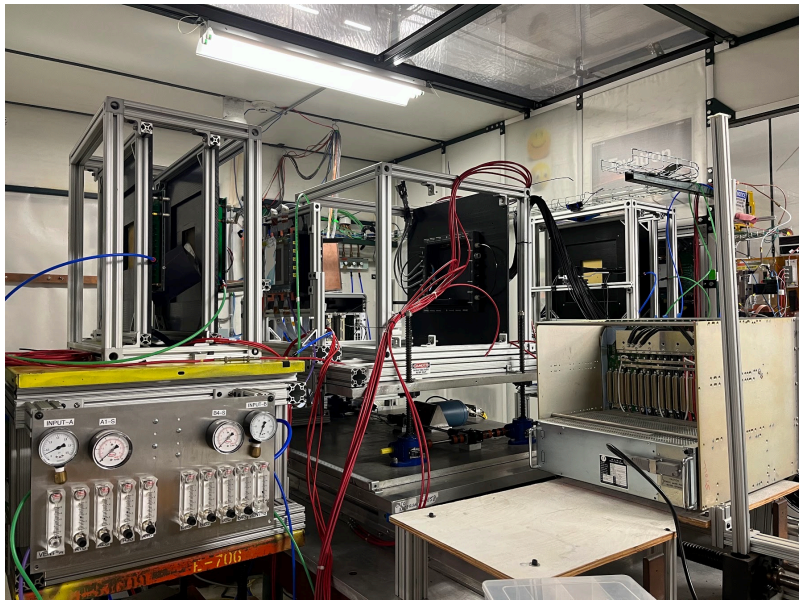
Overview

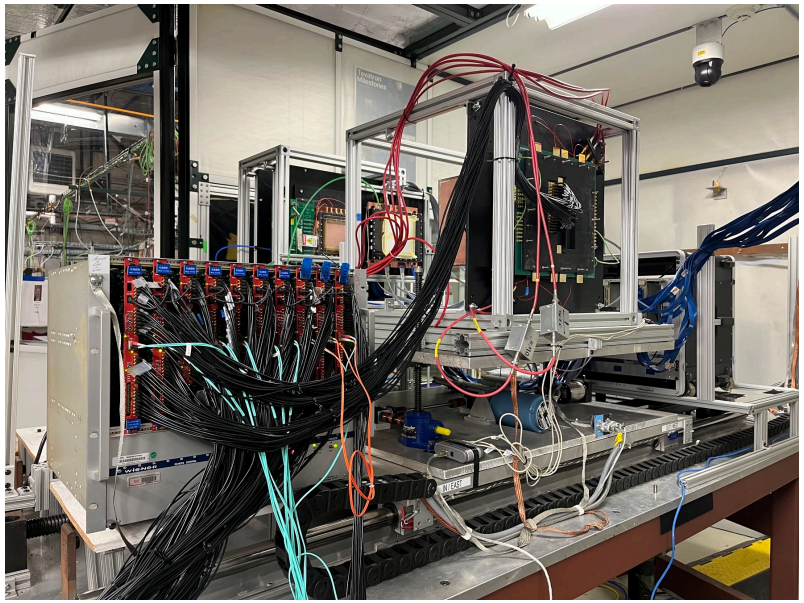
- June 13-26, 2022; initially day shift, main users
  - At Fermilab: Bob & Martin (first week), Sanghwa, Junqi, Mark, Ali (second week)
  - Close to Fermilab: Alexander
  - Remotely: Craig, Deb

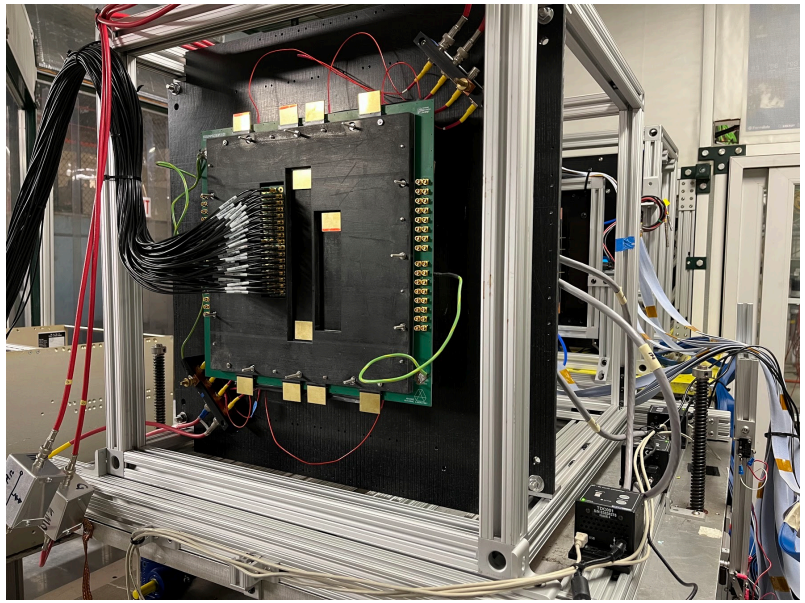
- First week: commissioning
  - Tracker, trigger, NIM logic, DAQ, computing, etc.
  - LAPPD tile 126 (full glass, 20μm pores MCPs) & old L01e board (8x8 field of 6mm square pixels)

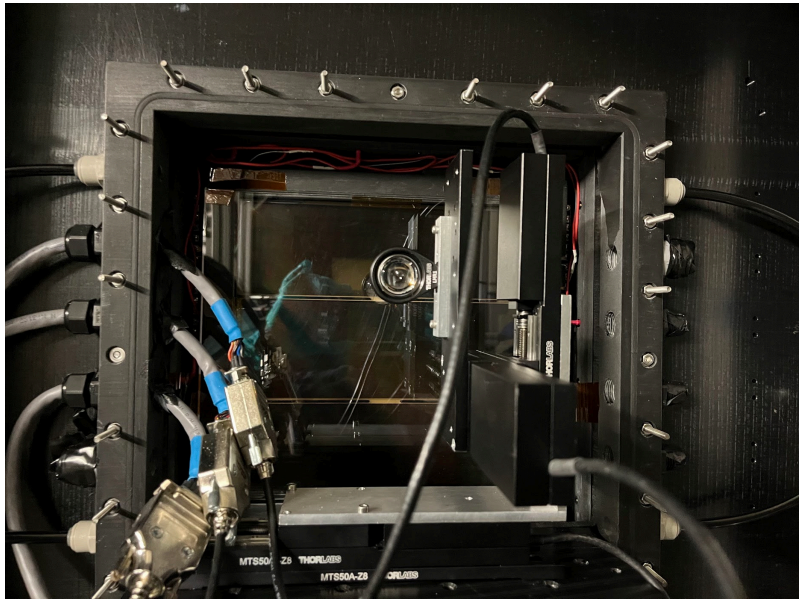
- Second week: the actual measurement program
  - LAPPD tile 136 arrived (full glass, 10μm pore MCPs)
  - Switched to the new L03c board (320 4mm square pixels in a “circular band” configuration)
  - Timing (direct beam) and imaging (aspheric lens)

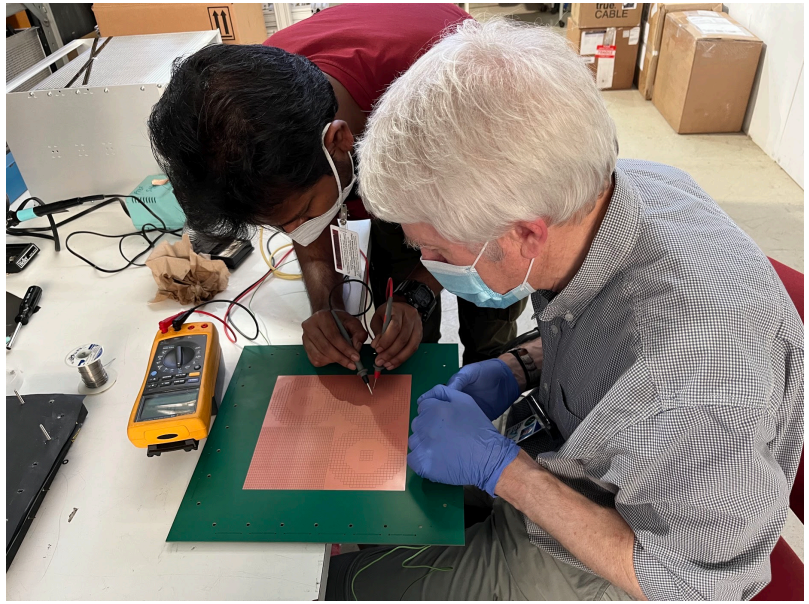
Picture gallery

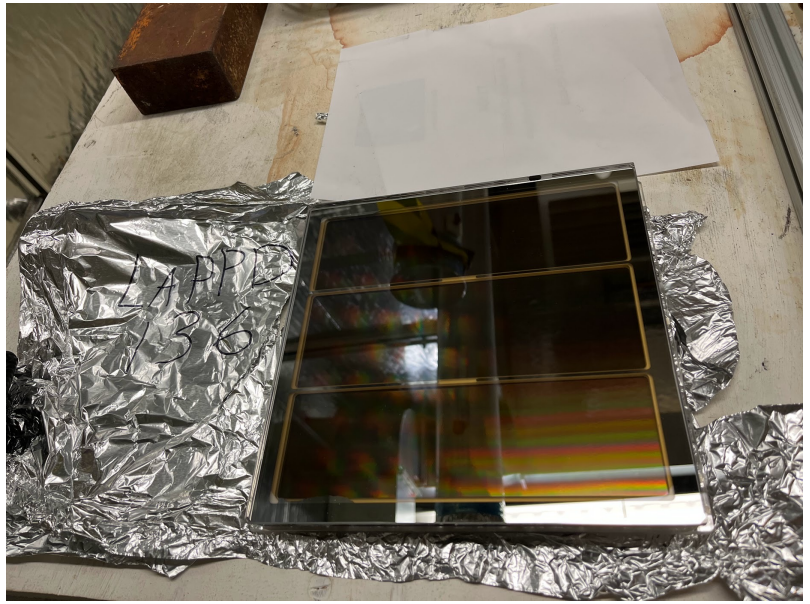




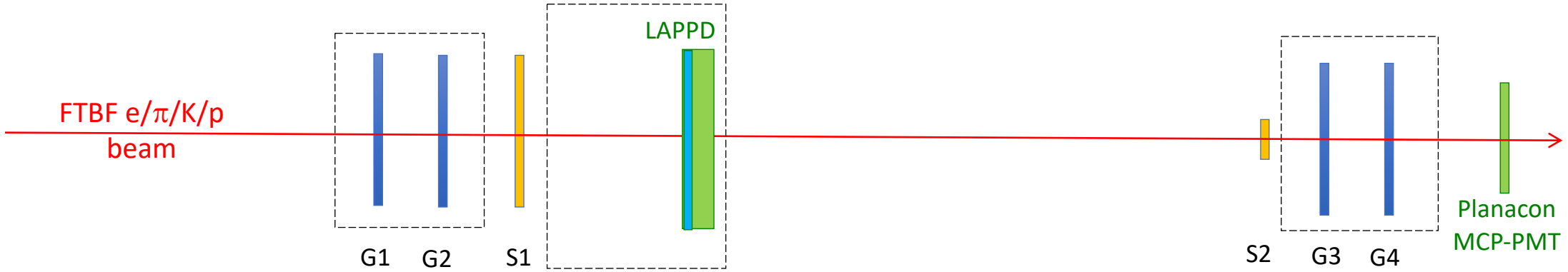




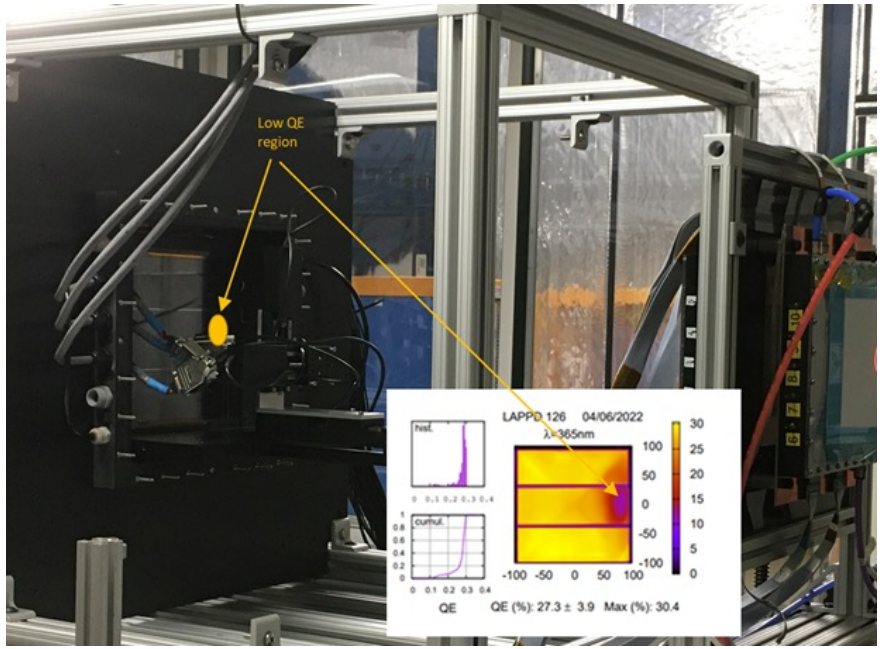




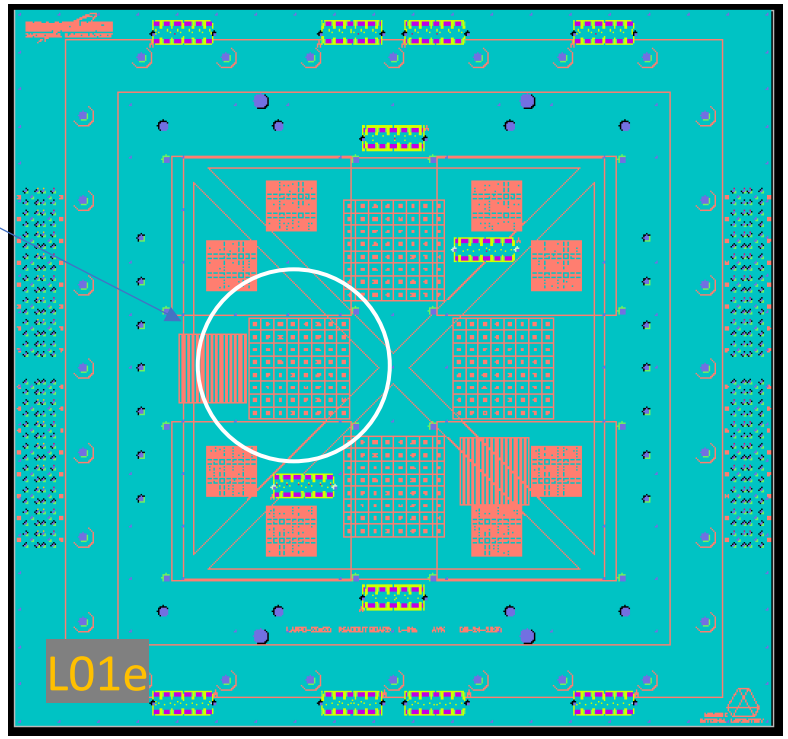
First week: commissioning



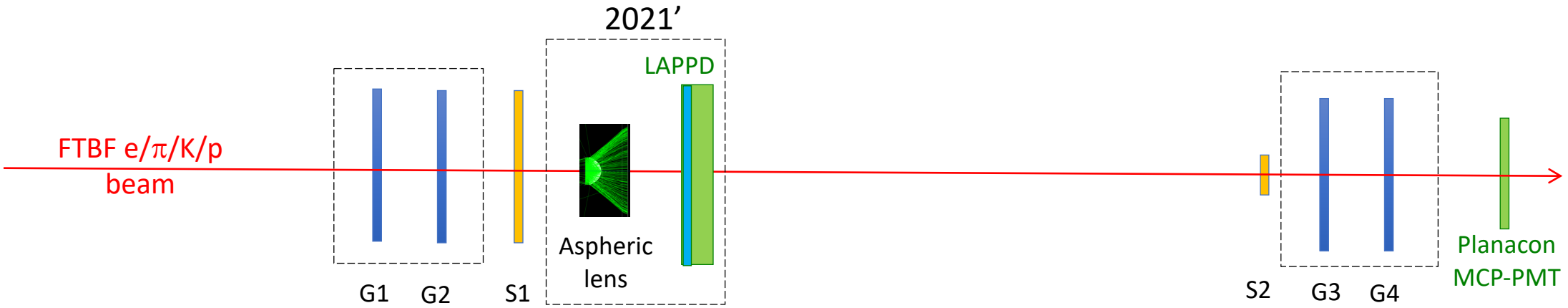
Use photons produced in the LAPPD window



- 20 μm MCP pore LAPPD tile 126
- 8x8 pixel field (6mm square pads) on L01e board
- Tracker and V1742 digitizers are shown to work in sync
- LAPPD clustering code resurrected



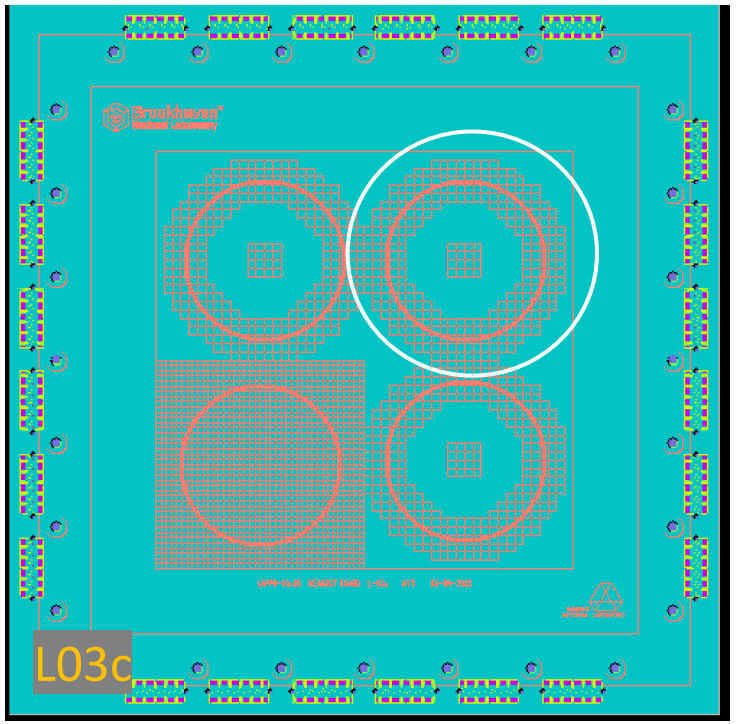
Monday, June 20



Aspheric lens in “unfavorable” configuration

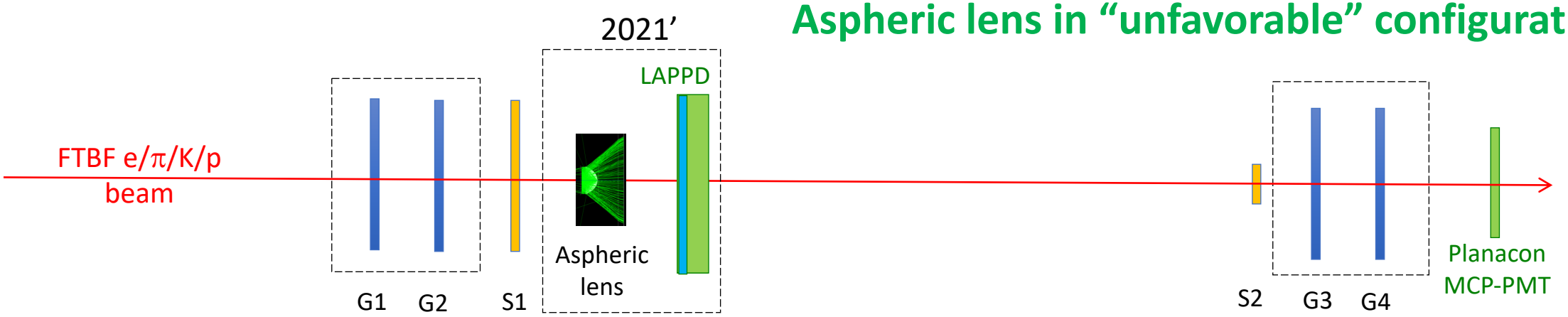
- Continue with tile 126 till Wednesday
- Identify single photon clusters produced by the aspheric lens

- 10 μm LAPPD tile 136 (full glass body) sent out by Incom yesterday …
- … and Mark is coming back to Fermilab tomorrow



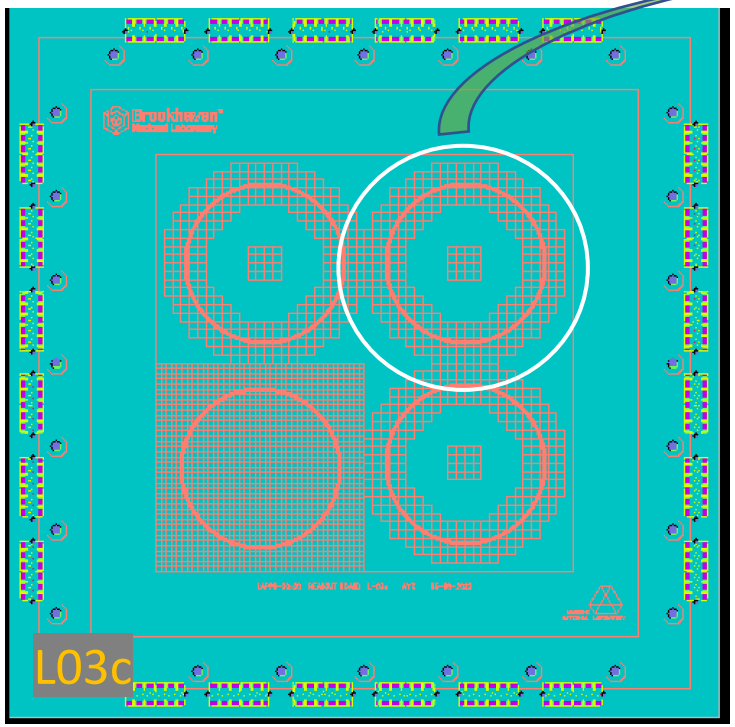
Tuesday, June 21

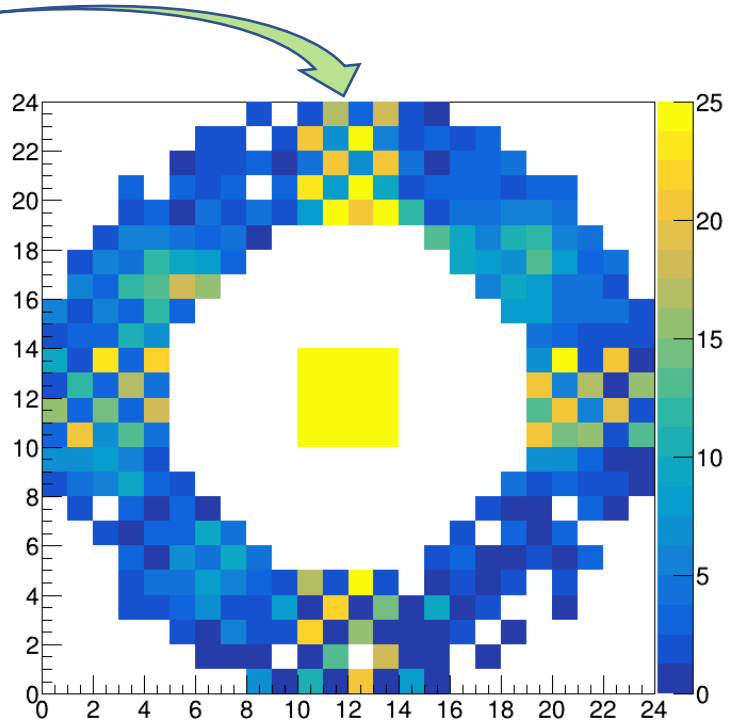
Aspheric lens in “unfavorable” configuration



- Issues with a cross talk in the L03c board: the signal produced by a passing particle in the LAPPD window is simply too strong …
- … and a few % trace-to-trace cross-talk matters

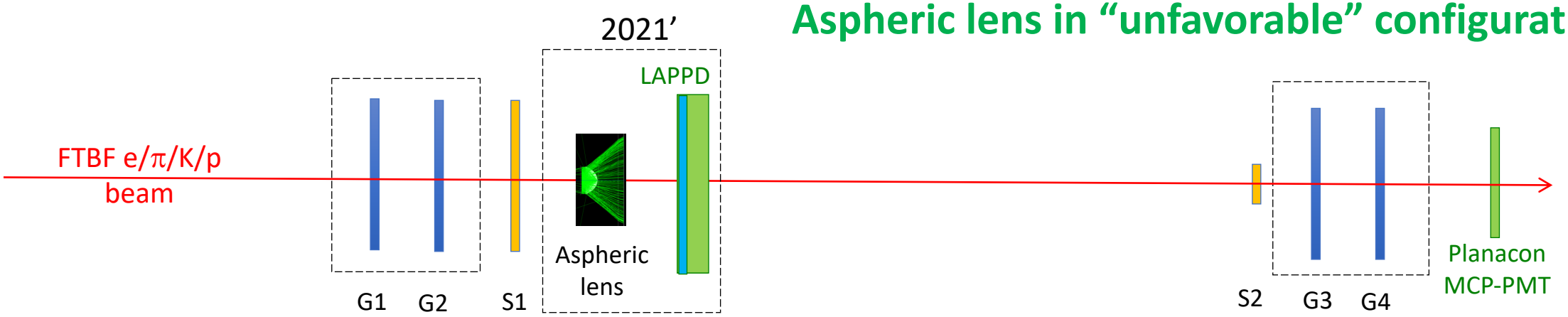
When replacing the LAPPD, need to ground the central area





Wednesday, June 22

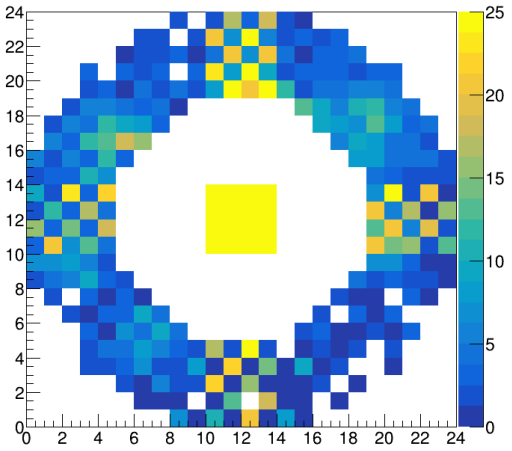
Aspheric lens in “unfavorable” configuration

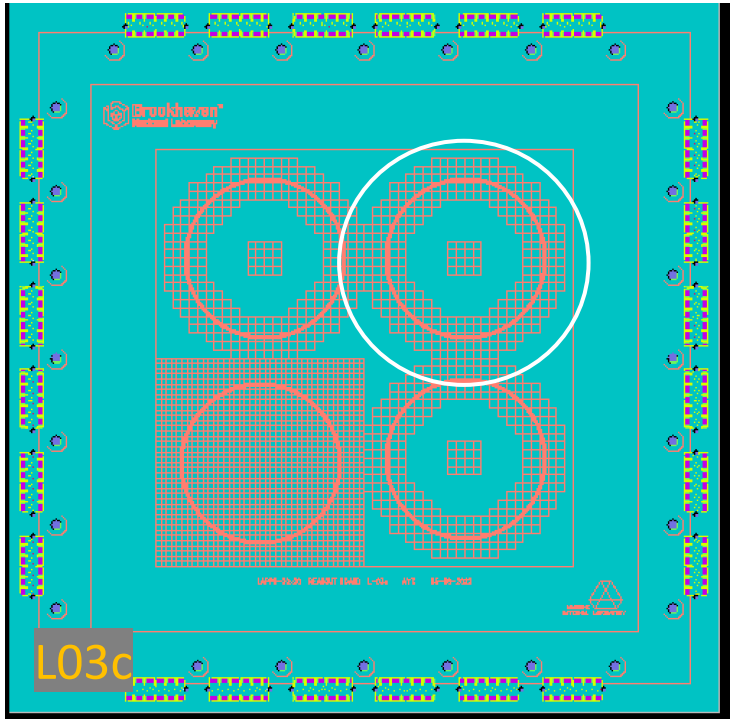


- Mark, Sanghwa and Ali installed and HV conditioned the new tile 136
- Along the way shortened to ground the central 4x4 pixel area, as agreed upon during the meeting yesterday

- Signal amplitudes are somewhat low
- Replaced the failing XYZ stage controllers by the new ones with a display; use in a manual mode
- DAQ misbehaves in a number of ways; remotely controlled power strip for the VME crate installed

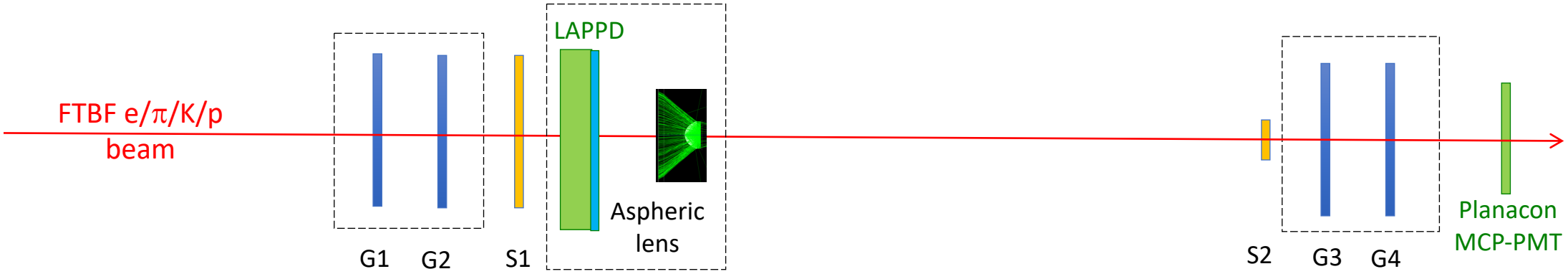
- Yet a Z-scan with the lens is being taken by Sanghwa



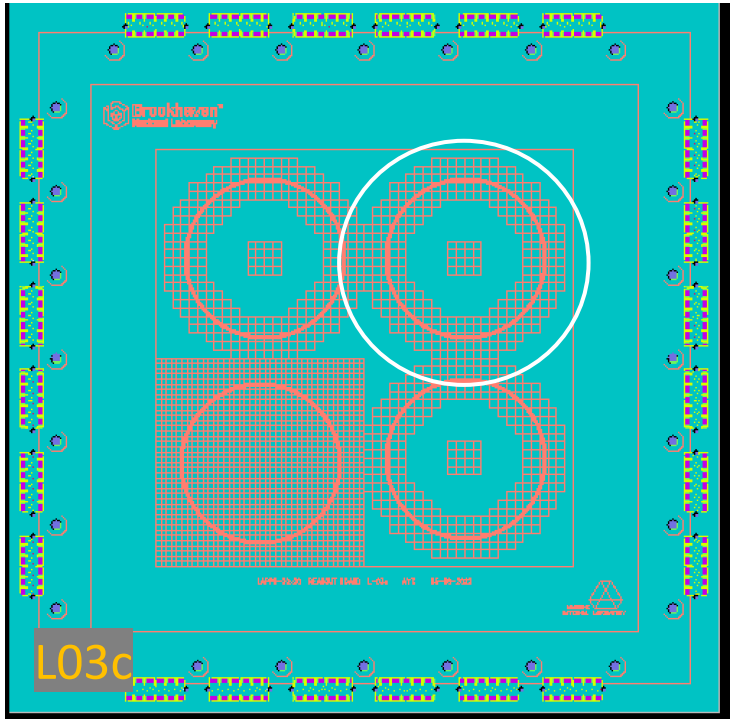


Thursday, June 23

Aspheric lens in a “favorable” configuration

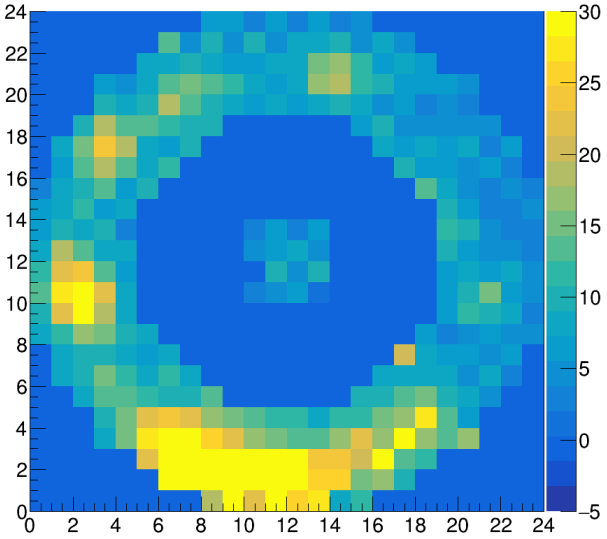
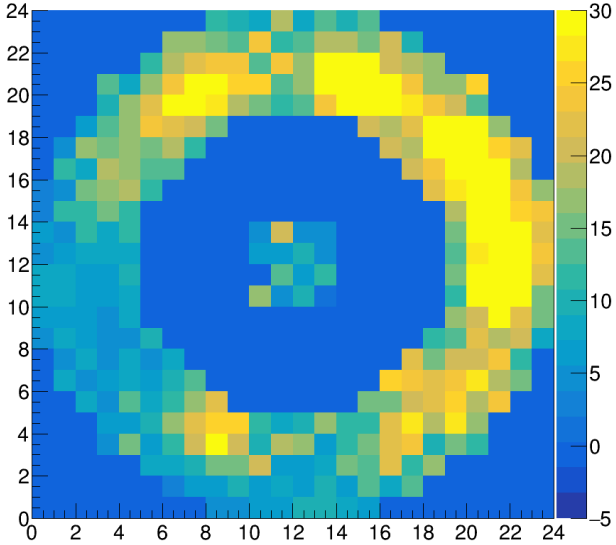
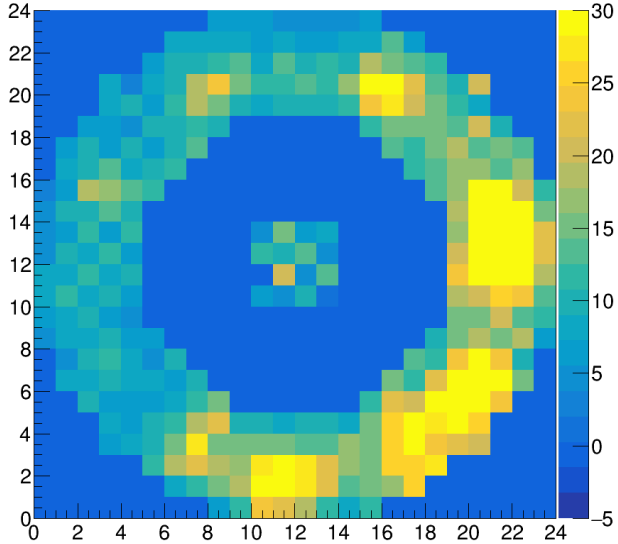
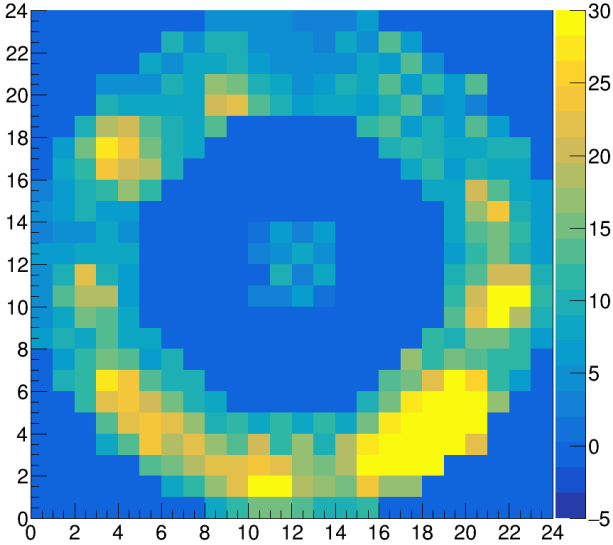
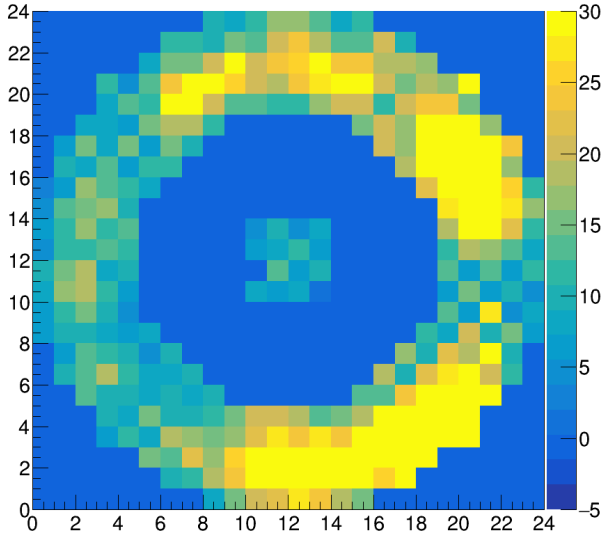
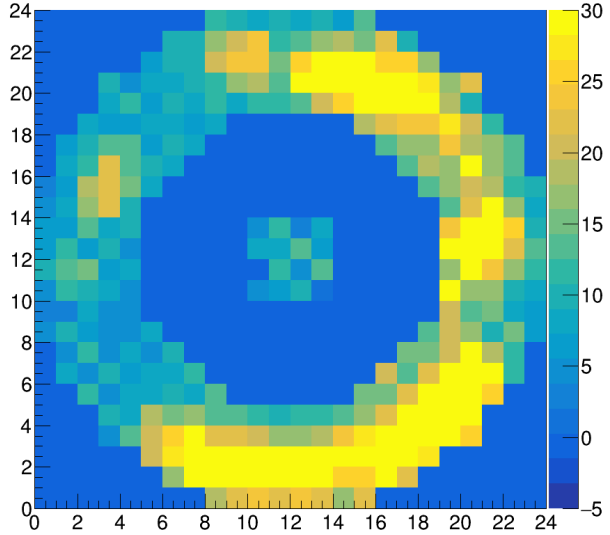
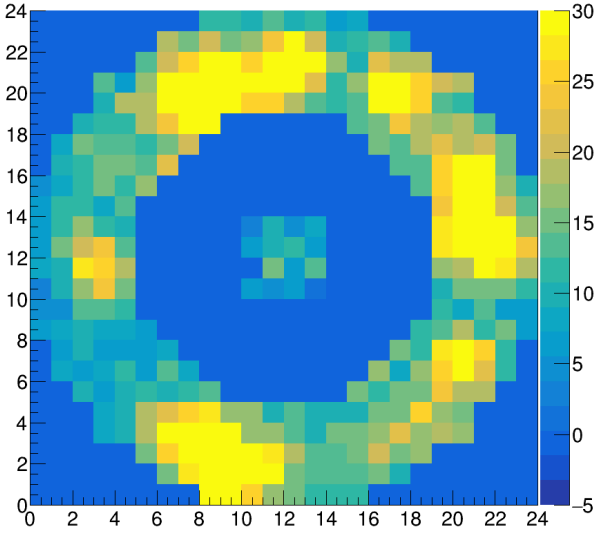
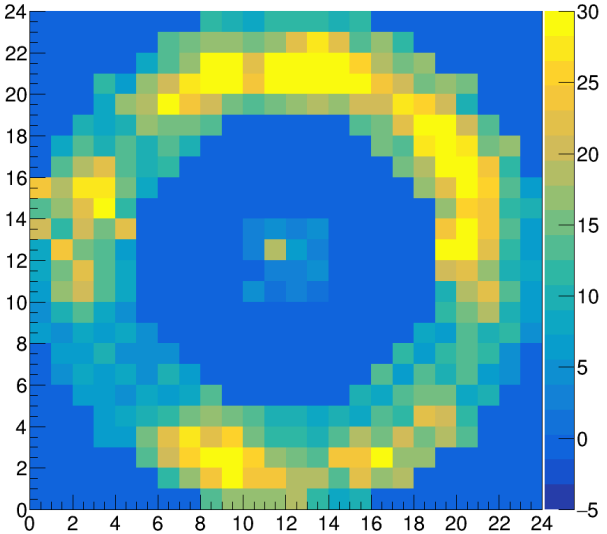


- It turned out that the lens in a “direct” configuration produces a long tail in a radial distance distribution, which can only be fixed by screening half of it (that’s why people used to suffer in similar configurations)
- Since LAPPD was not conditioned to take quality timing data (photocathode voltage too low), considered to rotate the setup



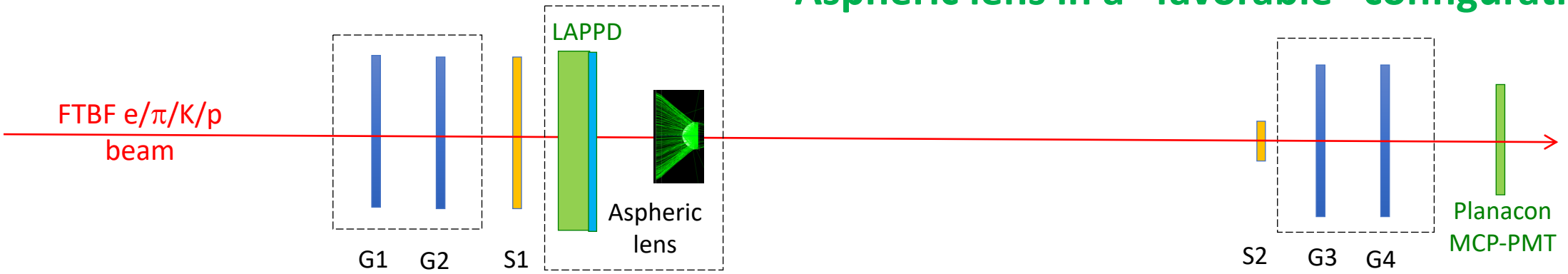
- By the time we re-started the Z-scans, linac went down
- CaF_2 radiators were not delivered to Fermilab yesterday

Image gallery (aspheric lens; no acrylic filter)

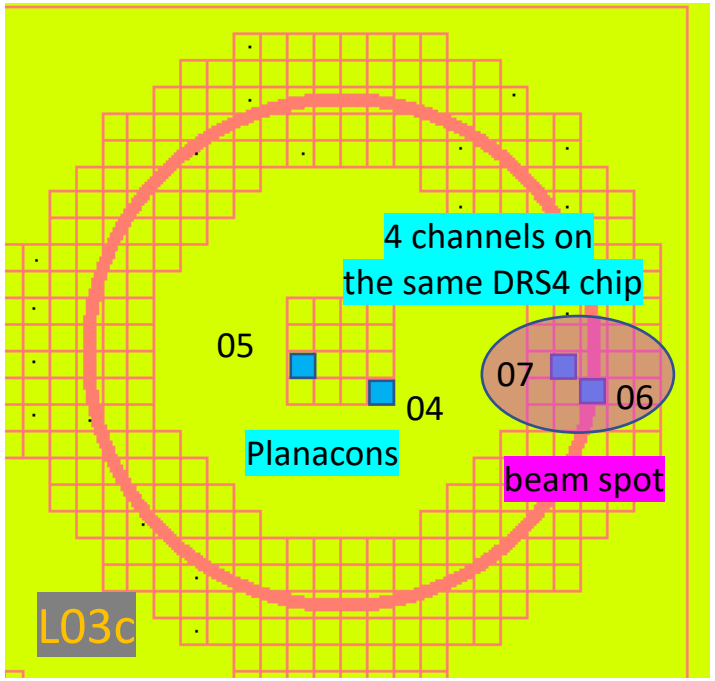









Friday, June 24

Aspheric lens in a “favorable” configuration

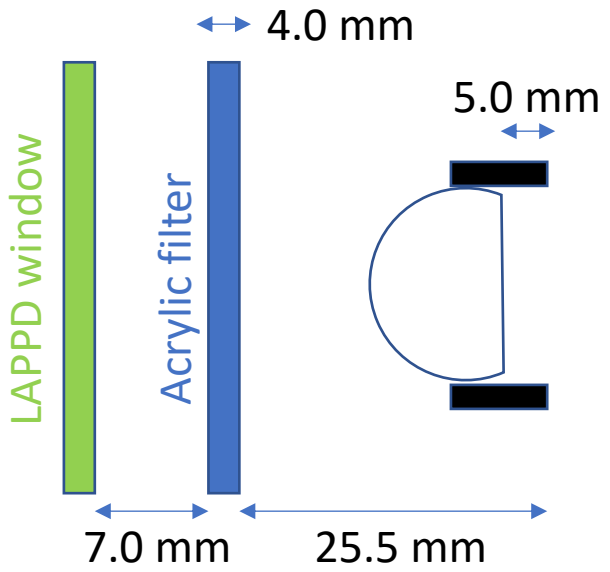


- Imaging part of the program:
  - Observed blurred, asymmetric, but well-populated rings produced by the aspheric lens
  - Installed the acrylic filter, at an expected cost of ~80% p.e. yield loss
  - Since then, cannot see a convincing ring picture any longer

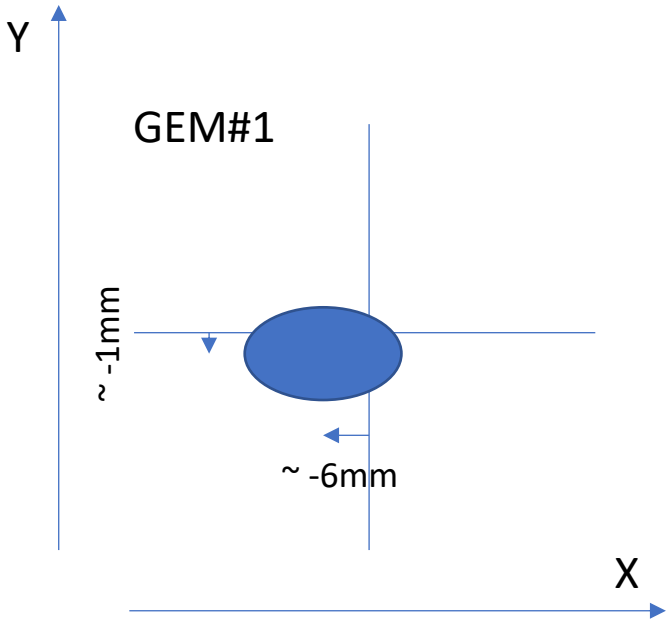


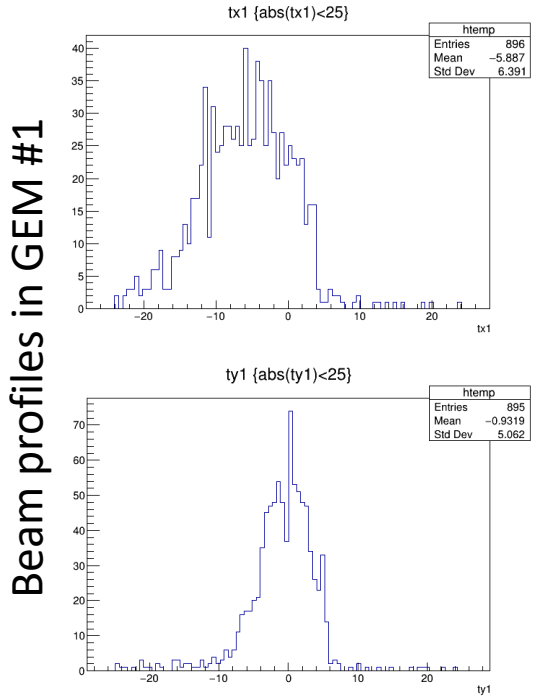
- Timing part of the program (p.e.’s from the LAPPD window):
  - CaF_2 radiators arrived and were installed on both Argonne Planacons
  - After re-alignment observe few hundred mV signals on a “good” Planacon
  - “Procedural” residuals between channels 06 & 07 σ ~30ps
  - Relative timing [06 -> 04] to the working Planacon only σ > 120ps
  - The second Planacon shows very poor performance

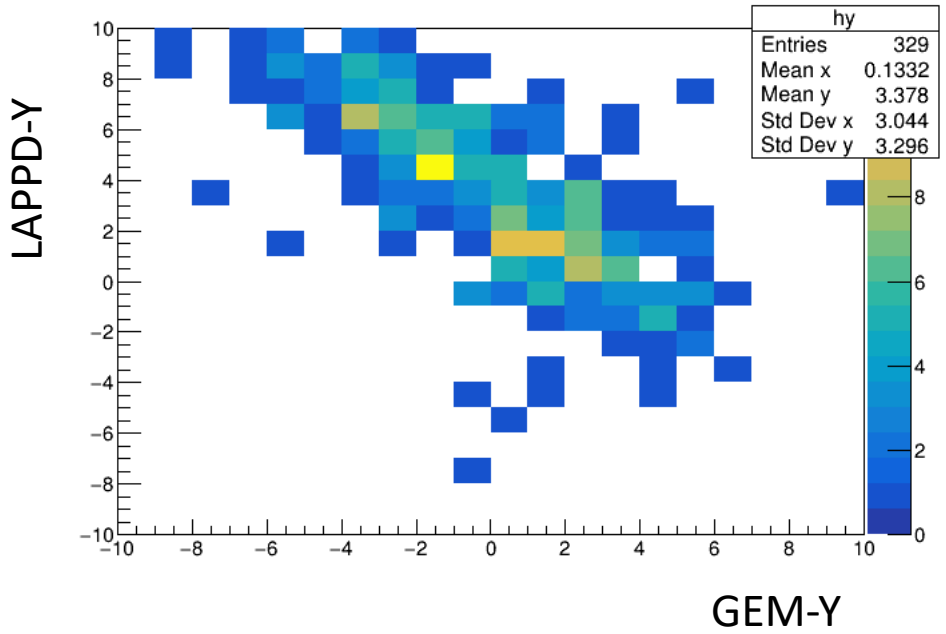
Saturday, June 25



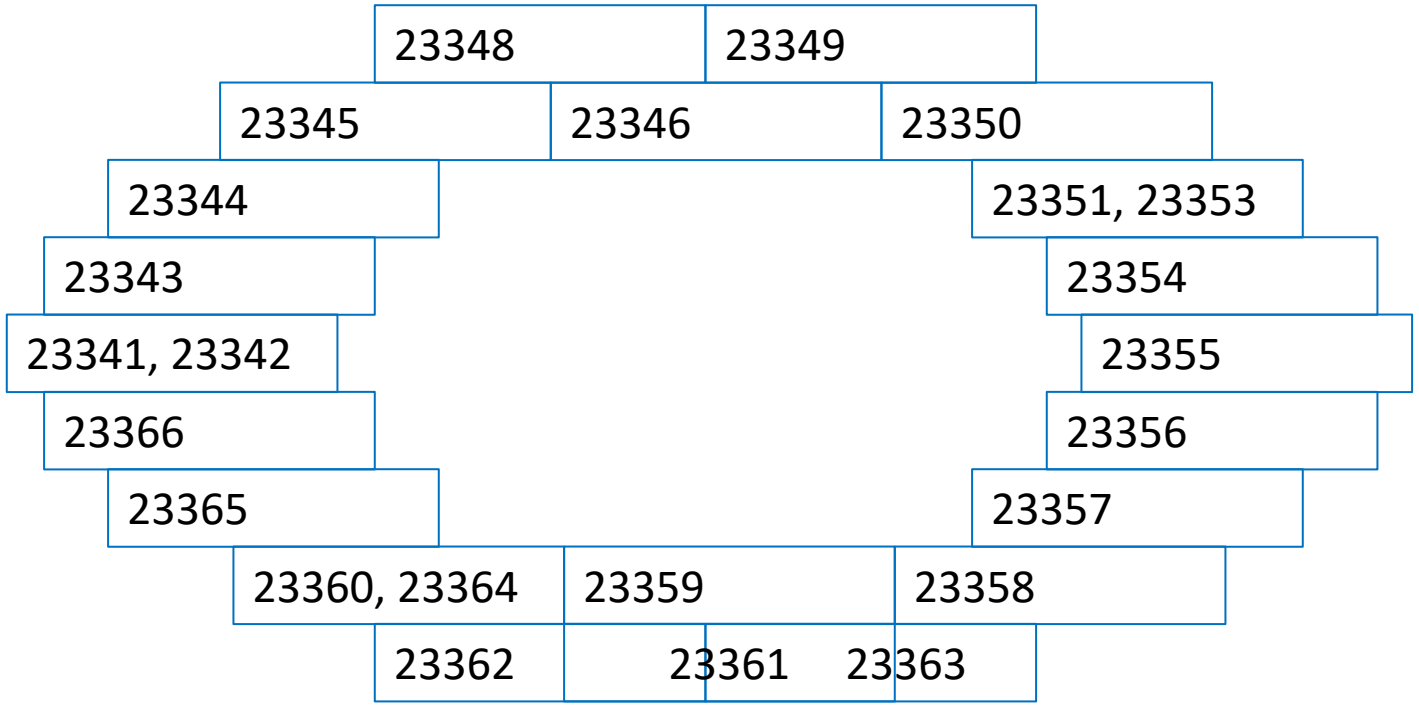
Distance	Shift	Ring radius	Radial resolution
24.5 mm	0	~32.9 mm	~660 μm
27.0 mm	+2.5 mm	~34.9 mm	~350 μm
29.5 mm	+ 5.0 mm	~37.0 mm	~180 μm
31.0 mm	+6.5 mm	~38.2 mm	~125 μm
31.9 mm	+7.4 mm	~38.9 mm	~130 μm

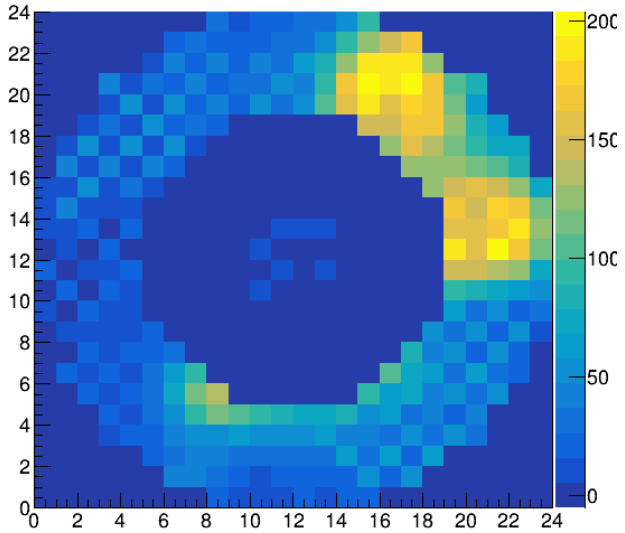


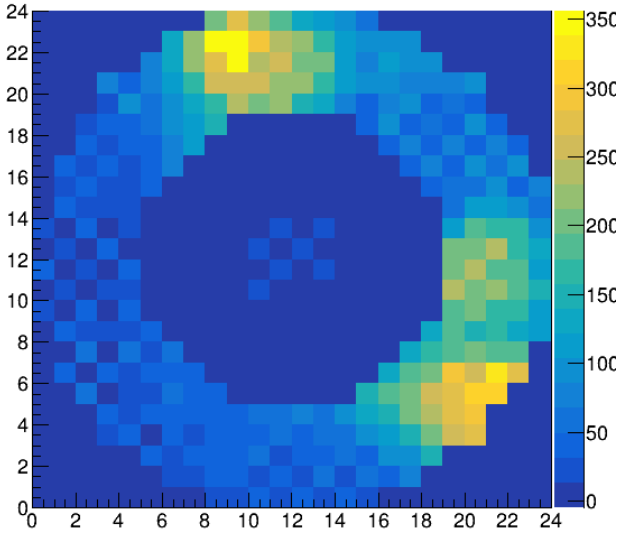




Sunday, June 26



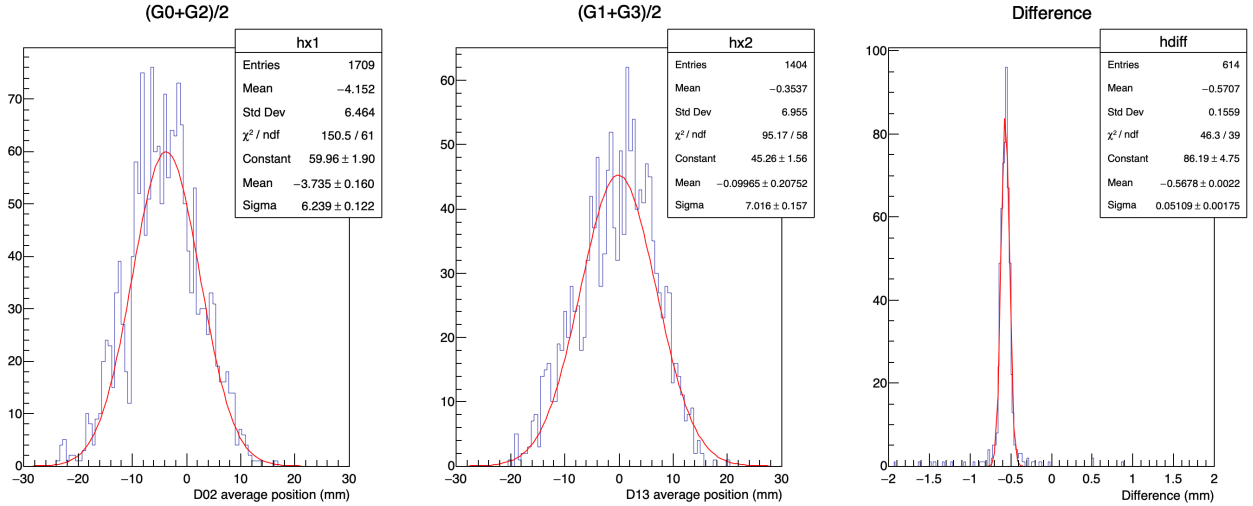




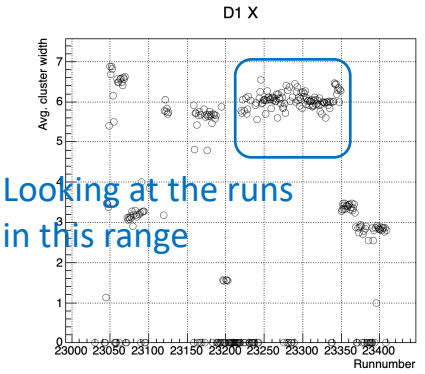
- Considered to spend half a day on a full “direct beam hit” scan along the pad ring circumference:
  - Ultimate in situ channel-to-channel delay calibration
  - Small but valuable statistics on two-particle events (no Planacon reference needed)

Reference tracker resolution

Example run 23251

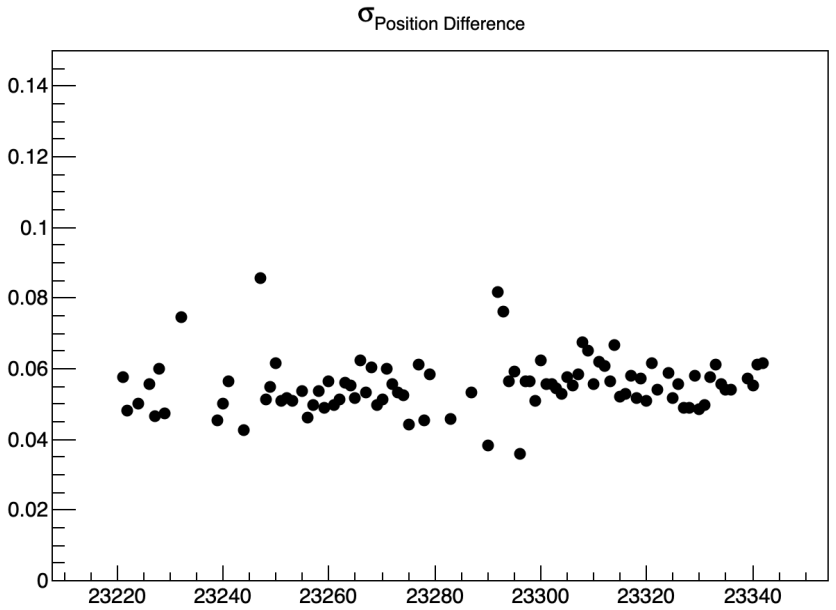


- Position differences: a Gaussian fit to the data shows a resolution of ~50-60 um.

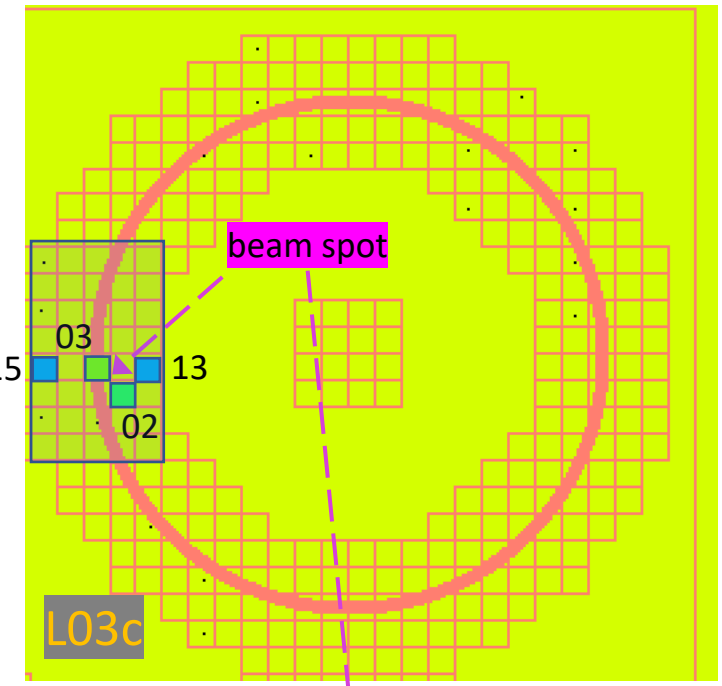


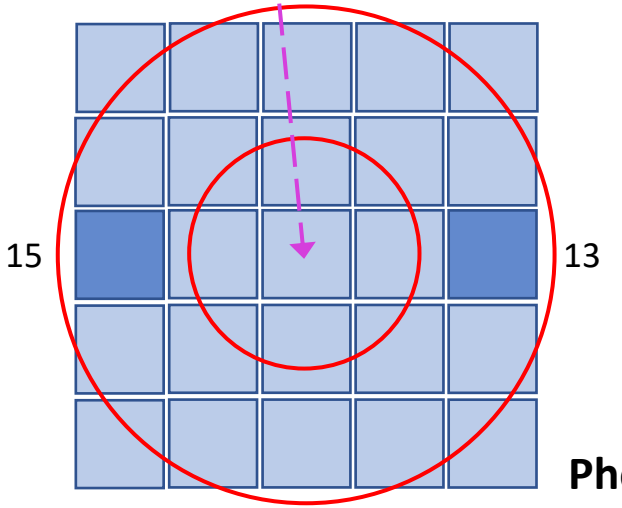
Looking at the runs in this range

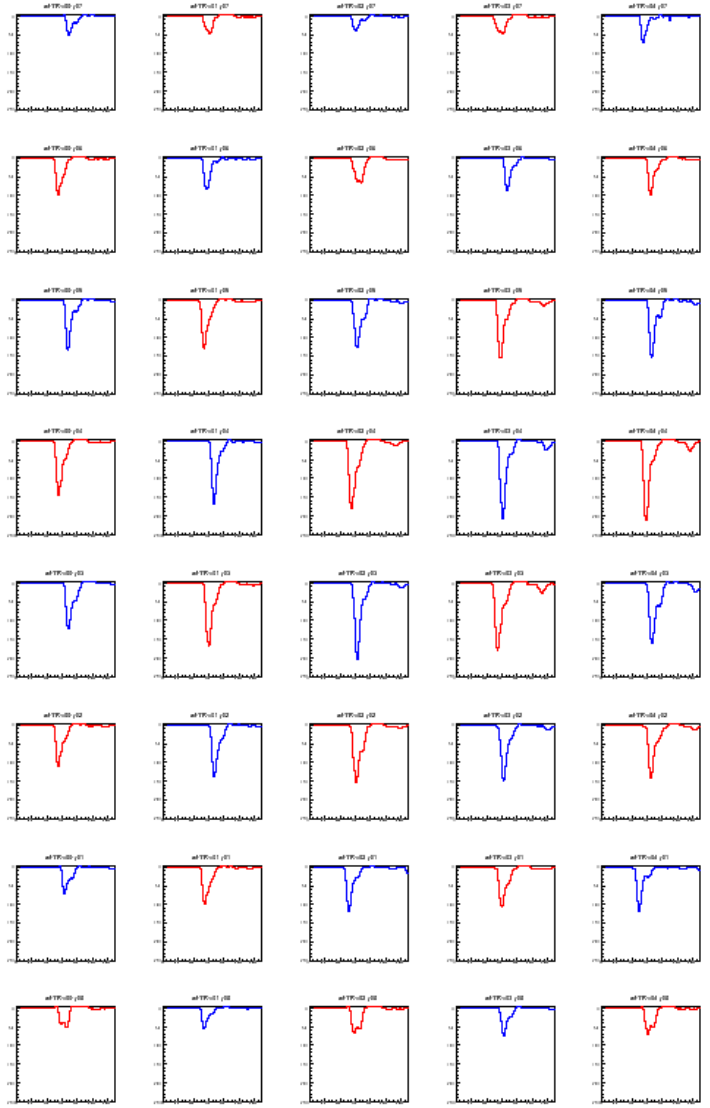
Cuts applied:
Cluster width:
wx0 >= 3 && wx0 <= 7
wx2 >= 3 && wx2 <= 6
wx1 >= 3 && wx1 <= 6
wx3 >= 3 && wx3 <= 6
amplitude > 500 for all planes



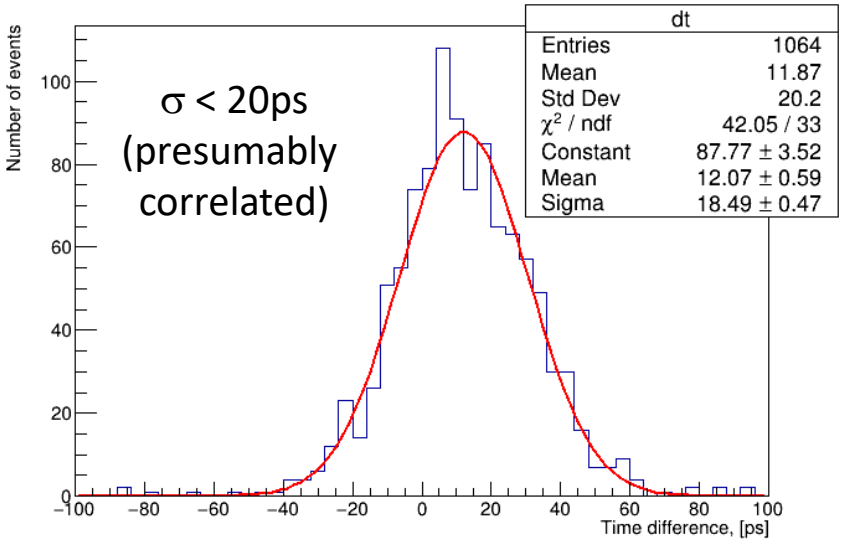
Hints for timing resolution in a multi-photon mode



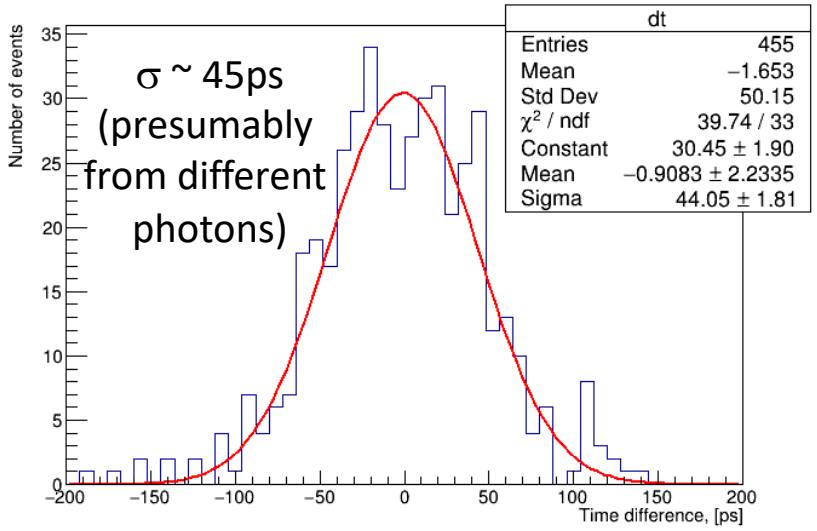




Photons can only hit the photocathode in a radial band ~[5.3 .. 12.0] mm



DRS4 chip#0: time(ch#03) – time(ch#02)



DRS4 chip#1: time(ch#15) – time(ch#13)

Other materials & discussion

- Google doc link with the data file description
- elog on our FTBF PC also has useful information
- Ali: alignment file?

- Data analysis: volunteers wanted!

- Strictly speaking, *none* of the planned measurements was performed
- What (and when) should we focus on next?