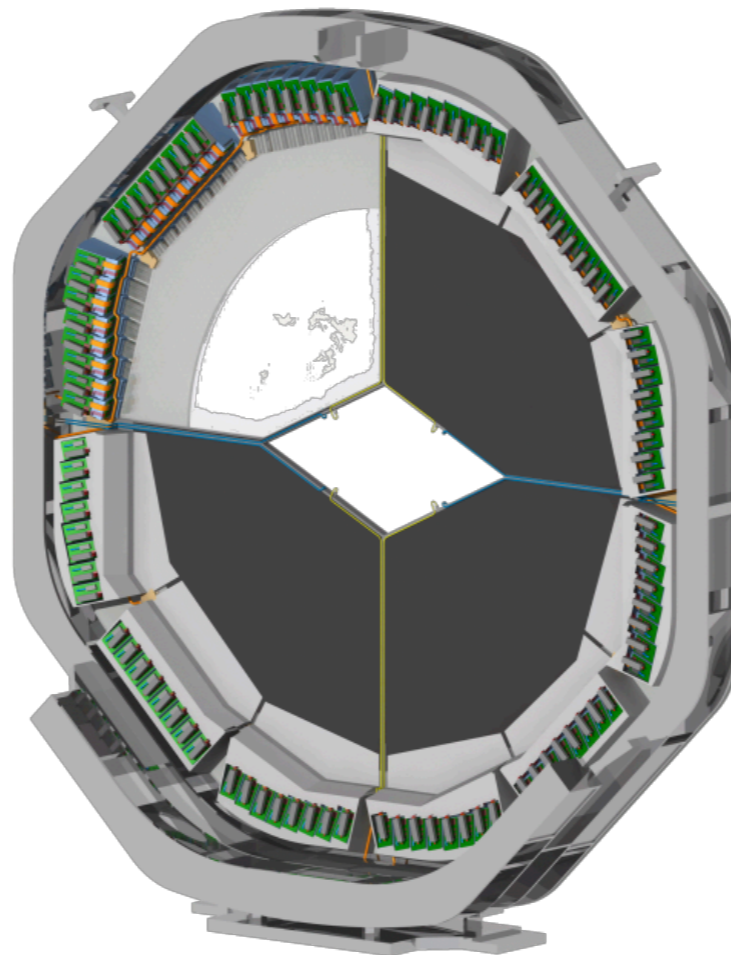


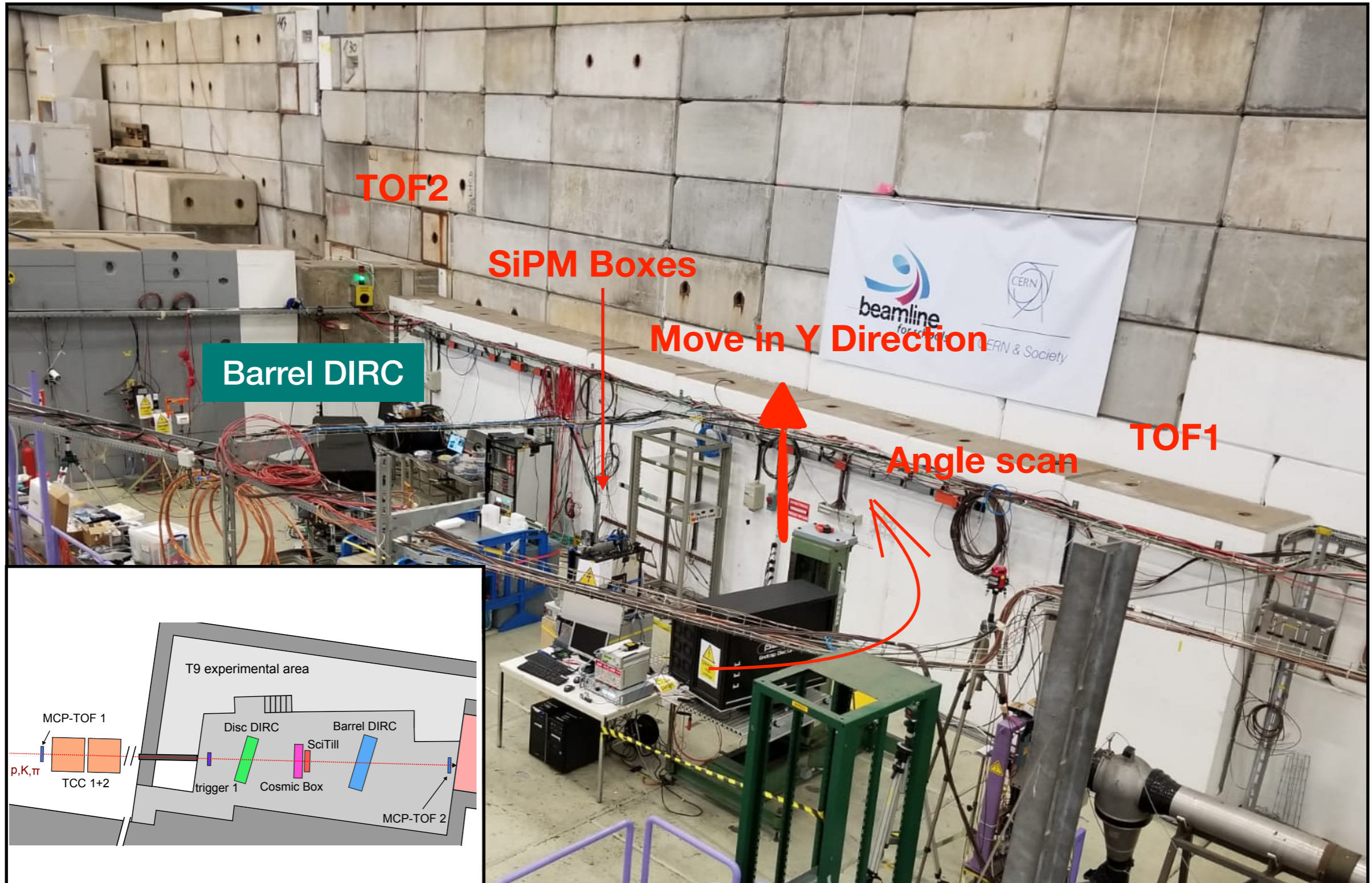
Preliminary Results of CERN Testbeam 2018 for Endcap DISC DIRC Prototype



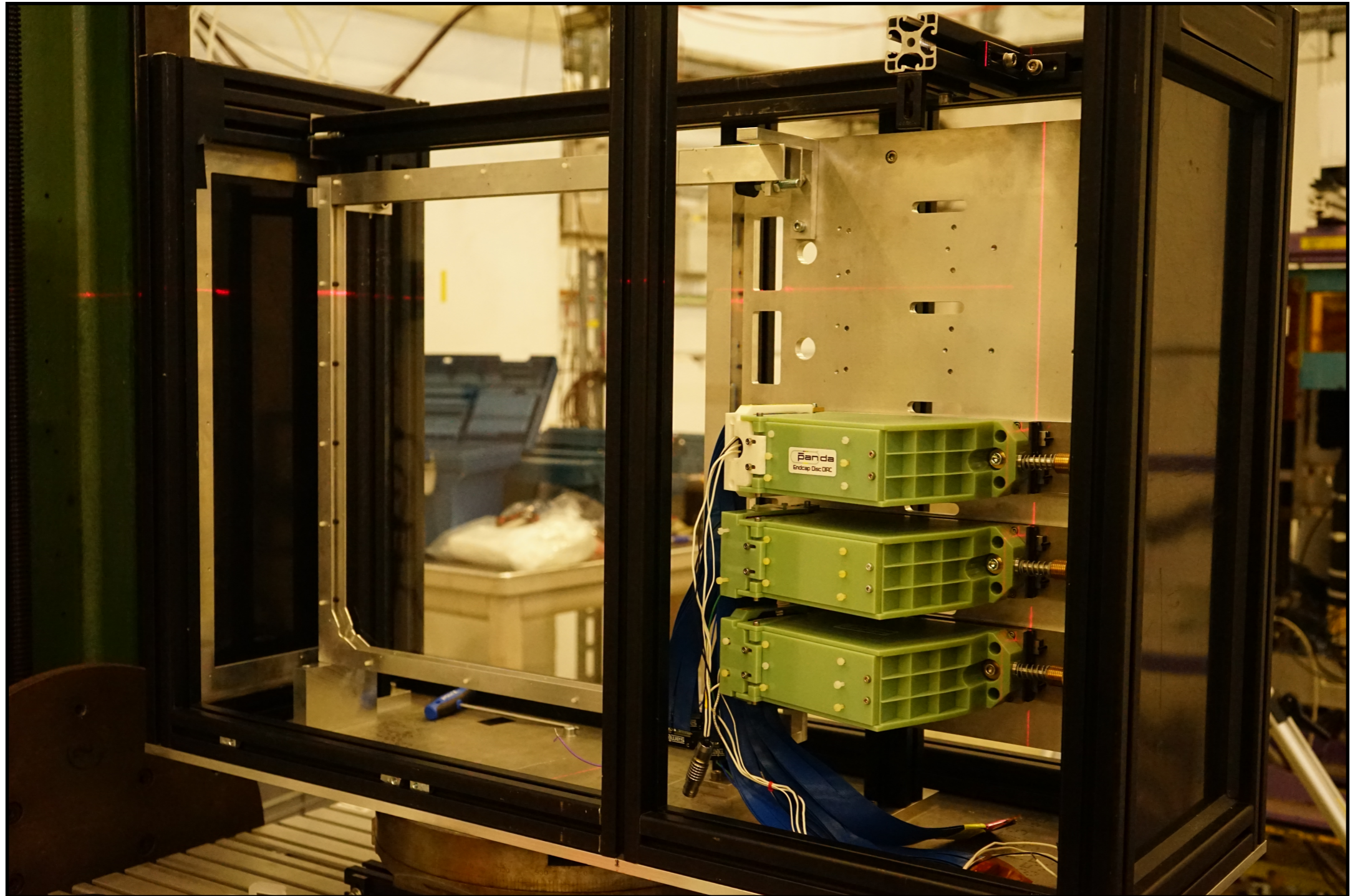
Simon Bodenschatz, Lisa Brück, Michael Düren, Erik Etzelmüller, Klaus Föhl, Avetik Hayrapetyan, Jan Hofmann, Sophie Kegel, İlknur Köseoğlu, Jhonatan Pereira de Lira, Mustafa Schmidt, Marc Strickert

PANDA CM 18/3 – PID-Cherenkov - 2018/11/06

Testbeam 2018



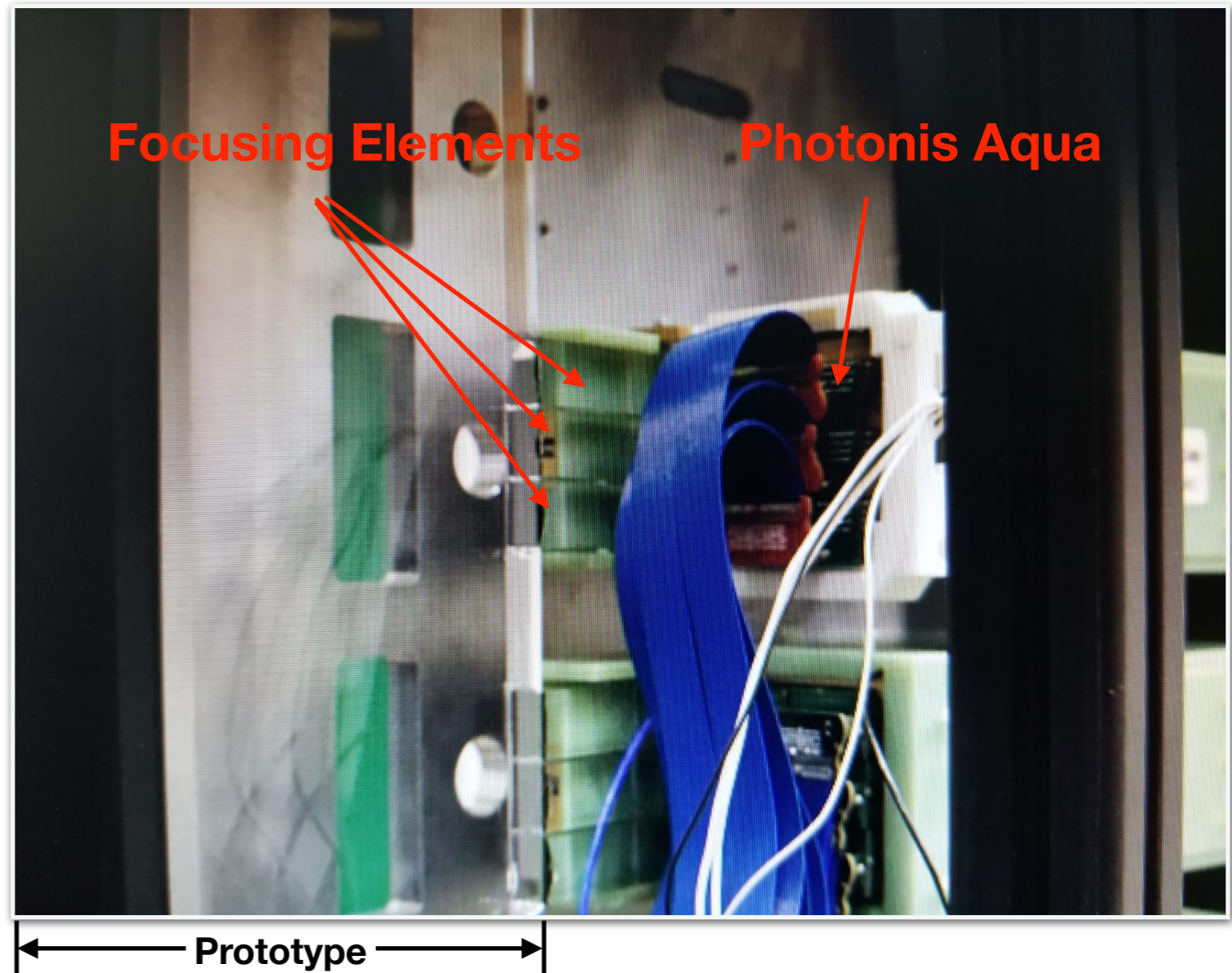
EDD Prototype



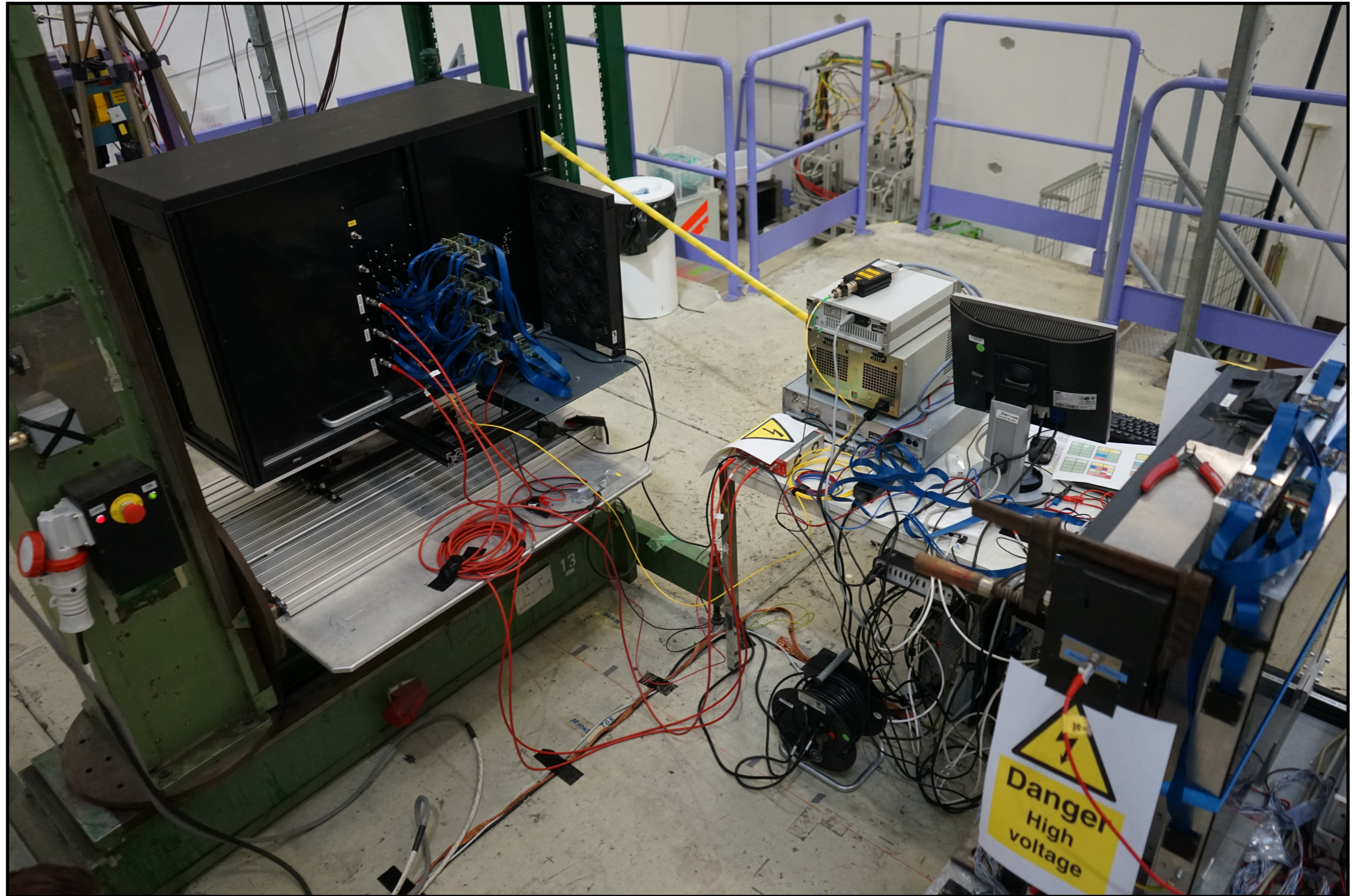
EDD Prototype-FEE connection from inside of the black box

EDD-Prototype

- 9 Focusing Elements (FEL)
- 3 Read-out Modules (ROM)
- 3 Photosensors (MCP-PMTs)
 - Photonis Aqua
 - 3 Rows, 288 pixels
 - Hamamatsu
 - 6 Rows, 384 pixels
 - Photonis 2mm
 - 3 Rows, 288 pixels
- In total 960 connected channels



EDD Prototype



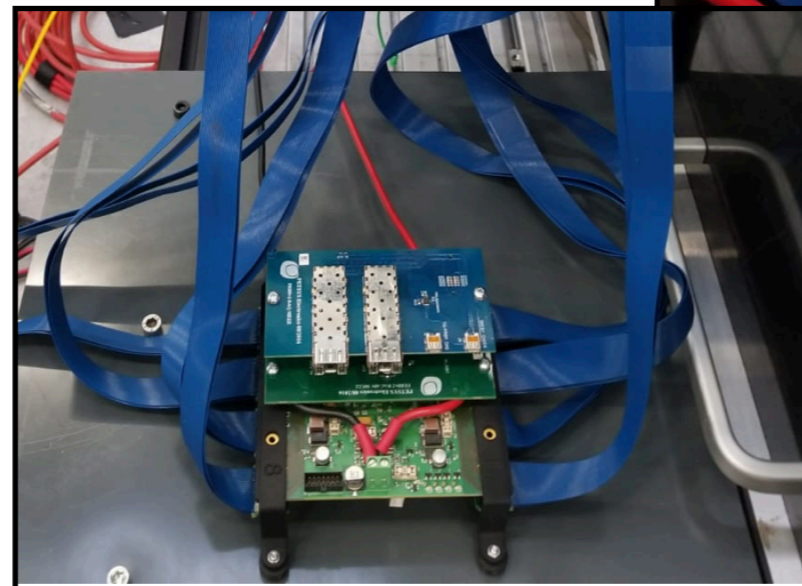
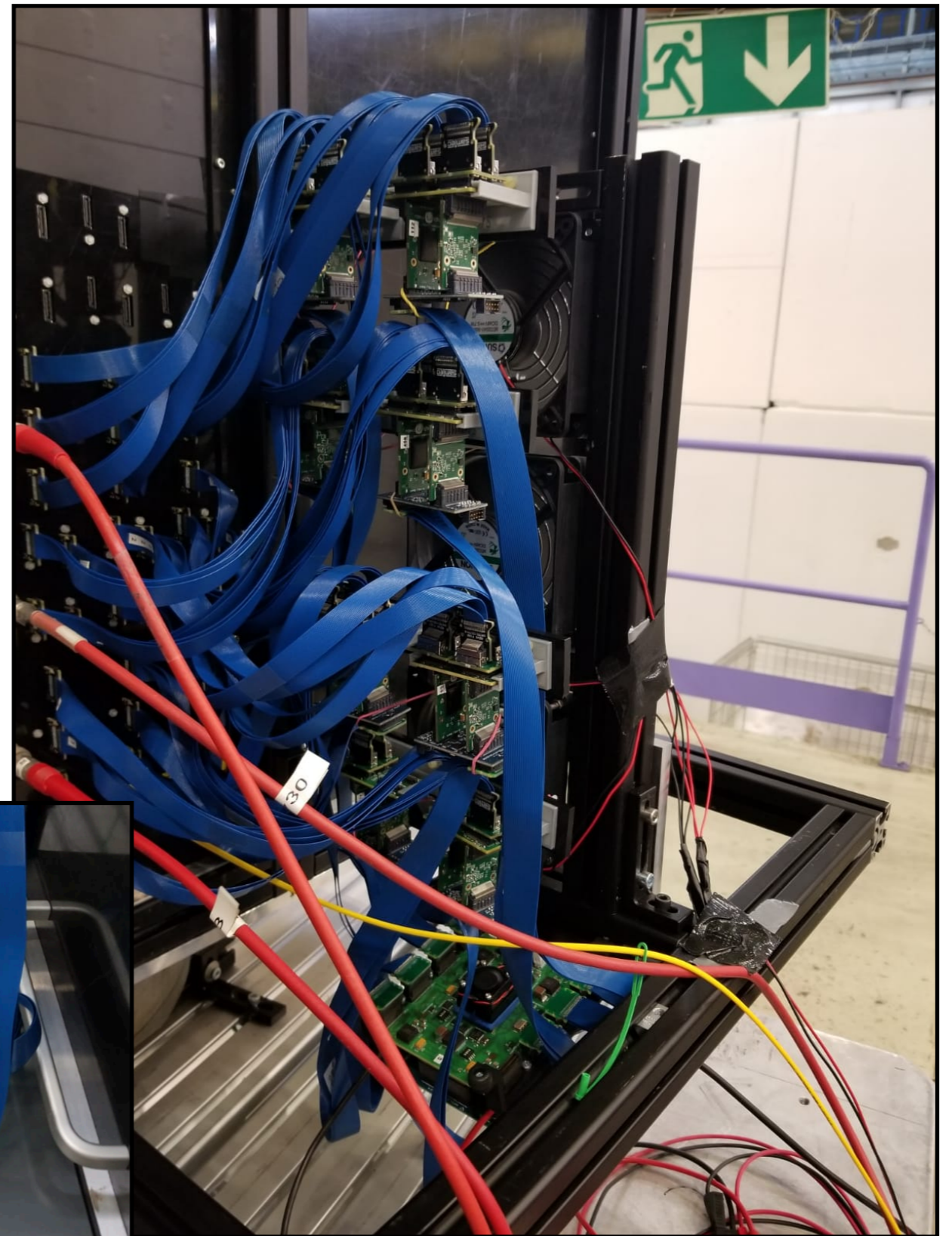
Prototype-FEE connection from outside of the black box

Front-end Electronics

- 18 ASICs
 - 15 ASICs are connected to one D-Board (EDD Prototype)
 - 3 ASICs are connected to second D-Board (SiPMs, MCP-TOFs, Laser)

First results are obtained from Photonis Aqua.

- 4 and half ASICs, (288 Channels) are connected to Photonis Aqua.

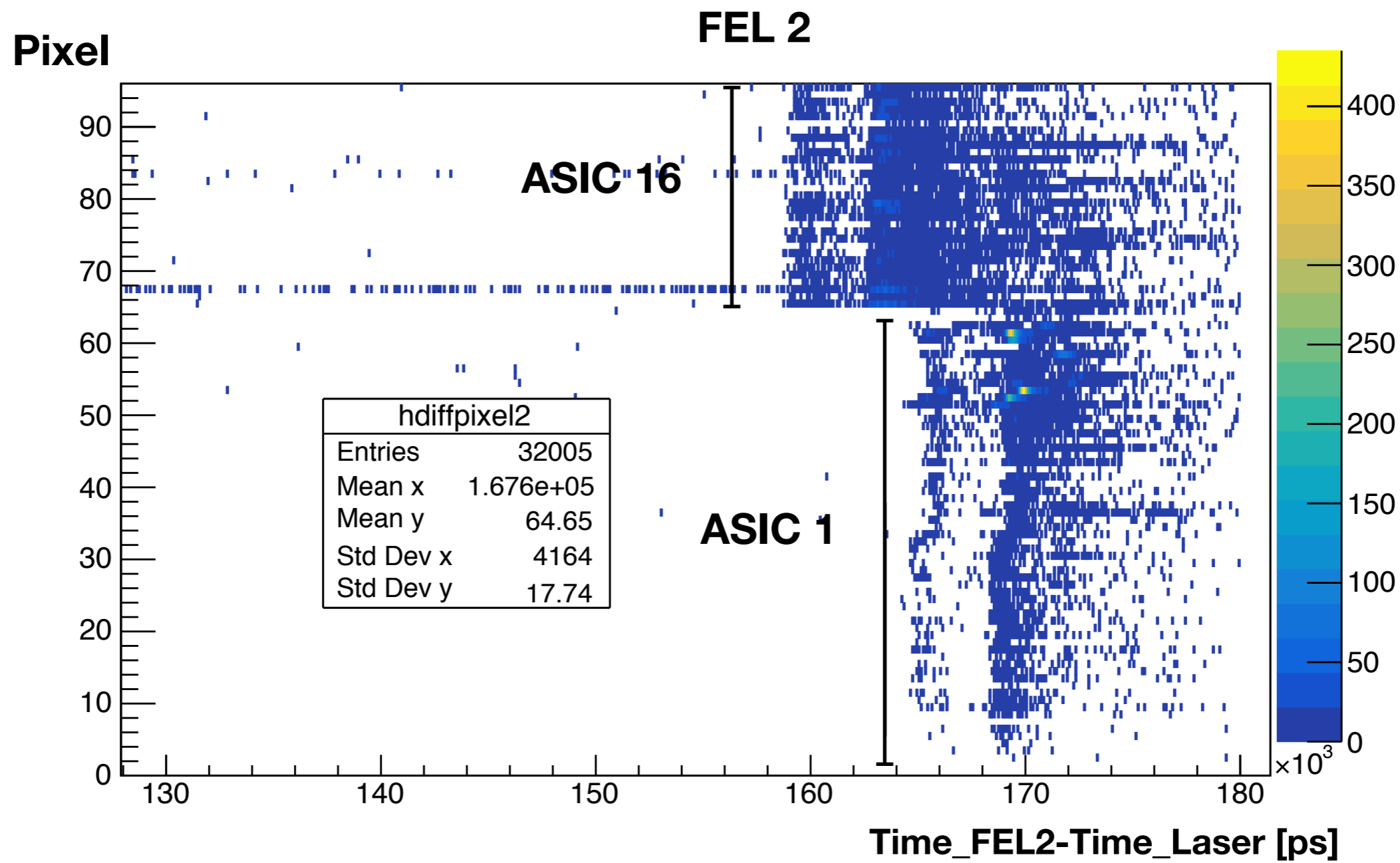


Offline analysis

- Mapping between pixels of photonis aqua and ASIC channels
- Time difference between laser and pixels of photonis aqua
 - Time Difference between ASICs
 - All MCP-PMTs are connected to ASICs with identical cables
- Equalization of data
- Y Scan, between 5mm to 379mm, step size 17mm
 - $p = 10 \text{ GeV}/c$
- Angle Scan, 3° - 18° with step size 1°
 - $p = 4 \text{ GeV}/c$
- Current analysis only includes if events are between TOF1 & TOF2 time interval

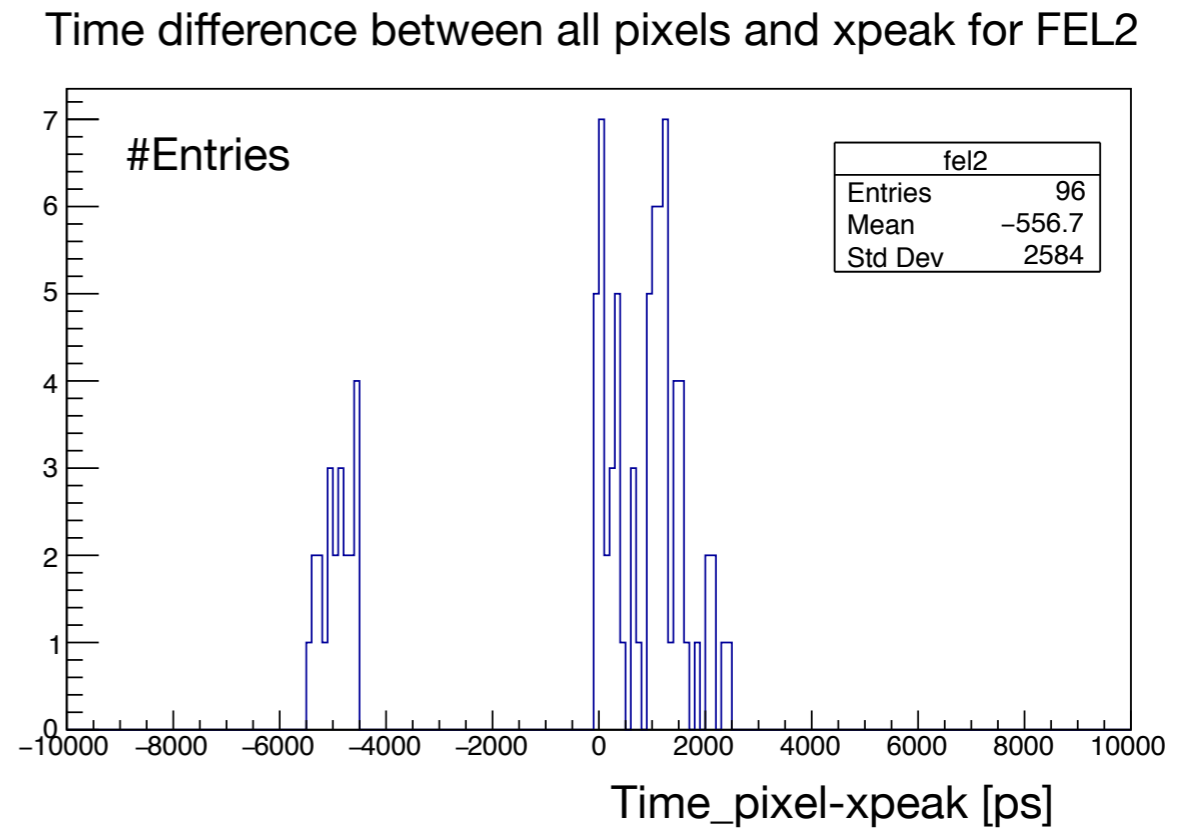
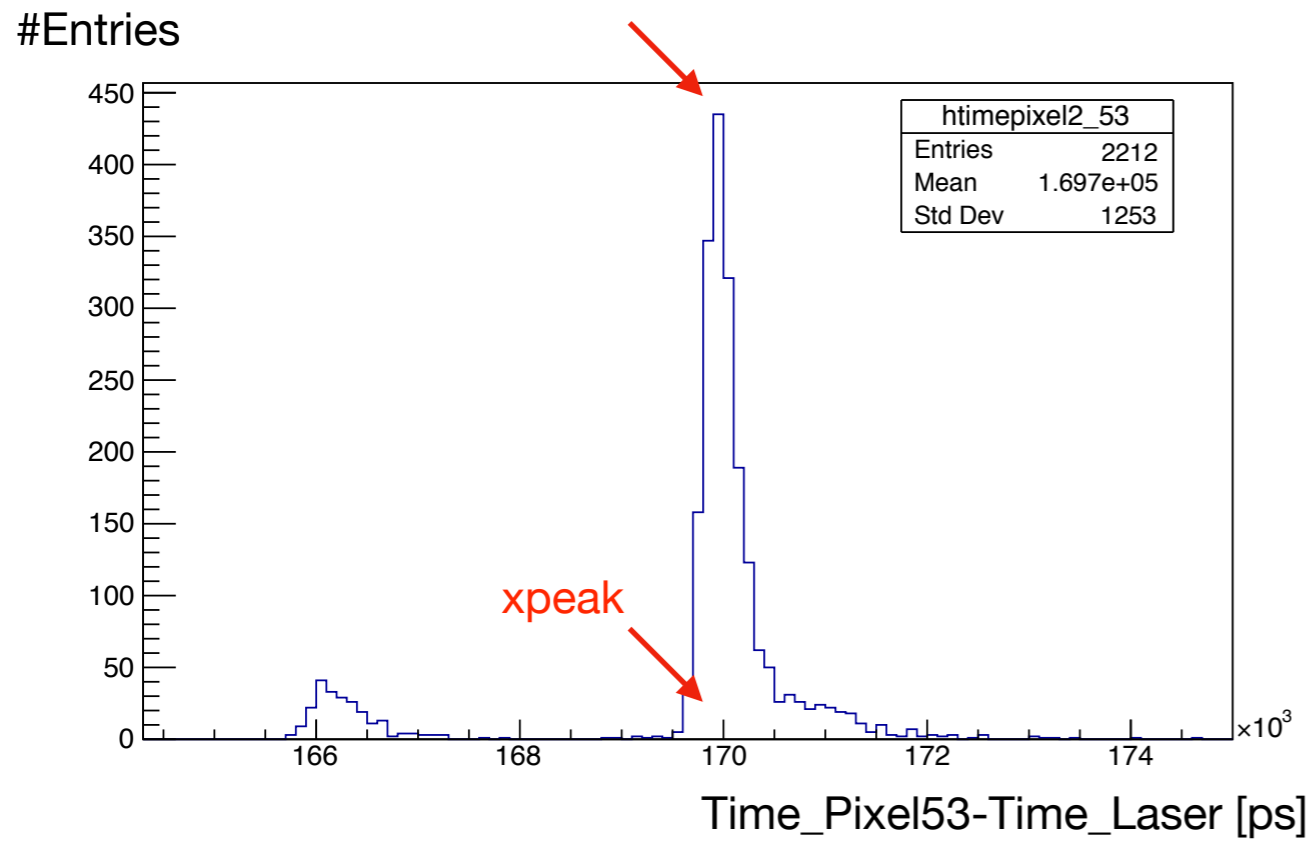
Laser trigger & photonis aqua for 3 FELs

- Each focusing element (FEL) is connected to two different ASICs



Equalization of data

- Pixel 53 has the largest amount of events
- xpeak is the reference time

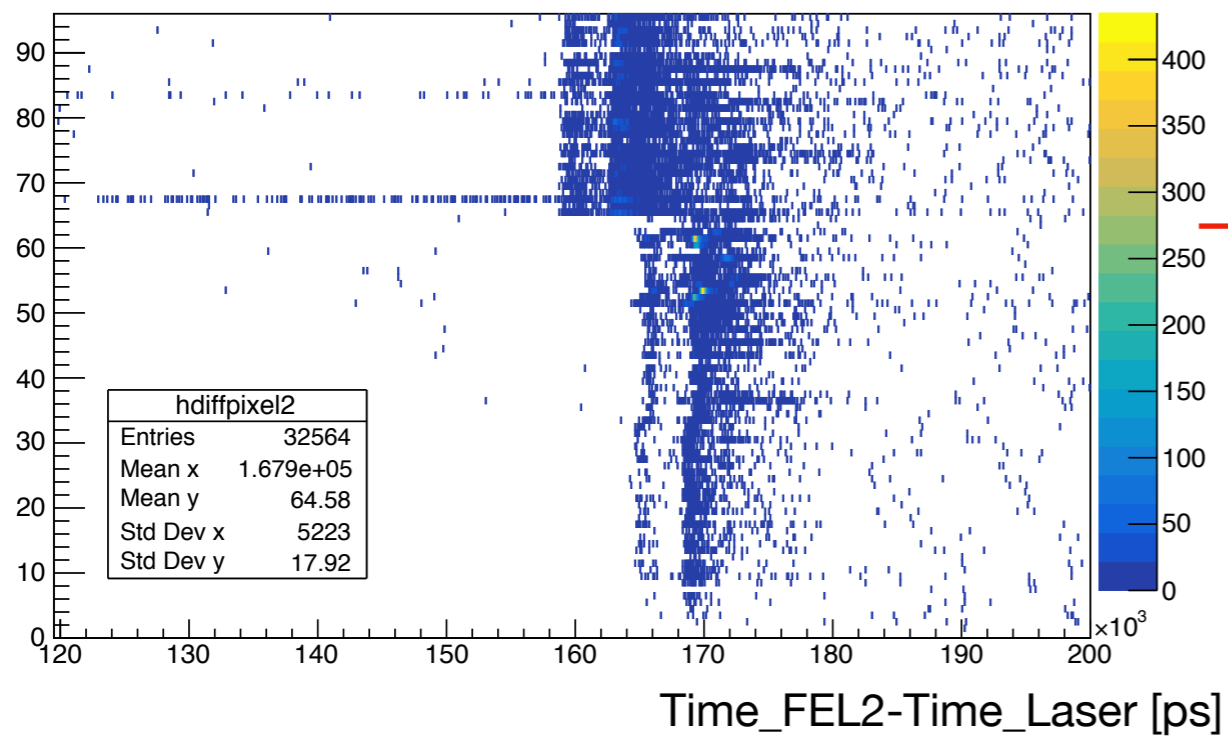


Equalization of FEL2 data

Before equalization

FEL2

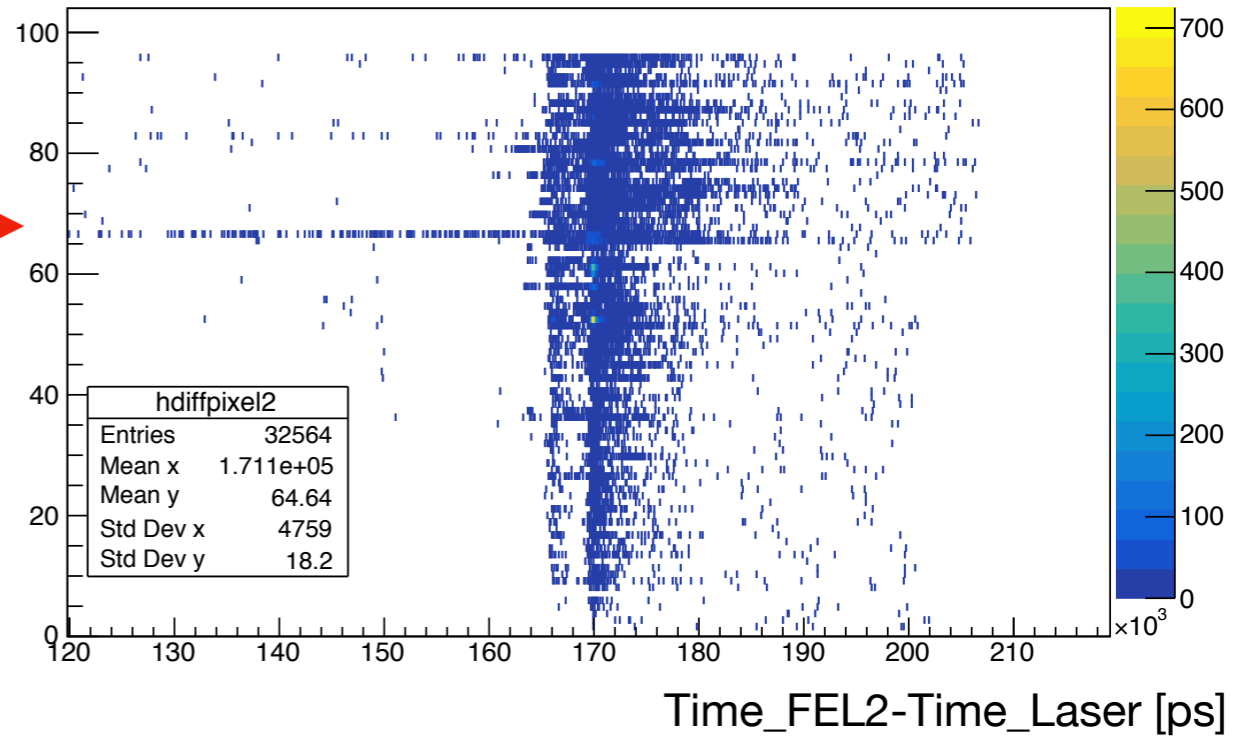
Pixel



After equalization

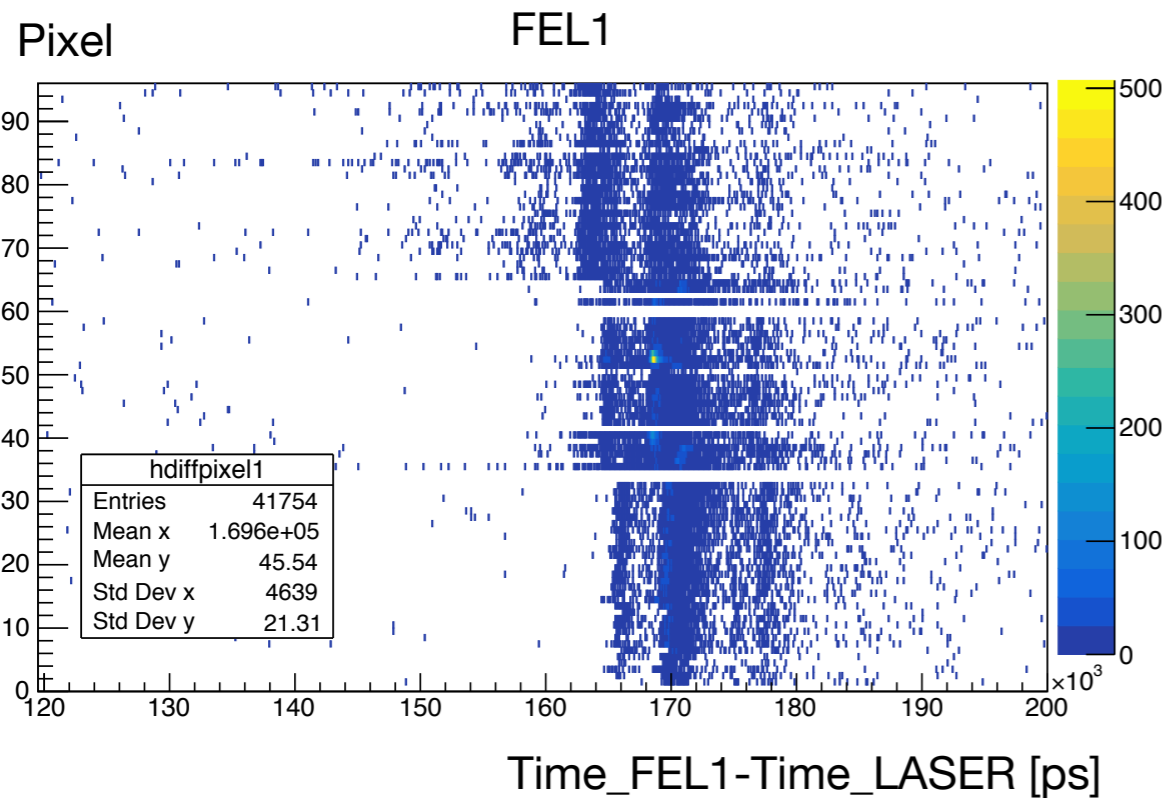
FEL2

Pixel

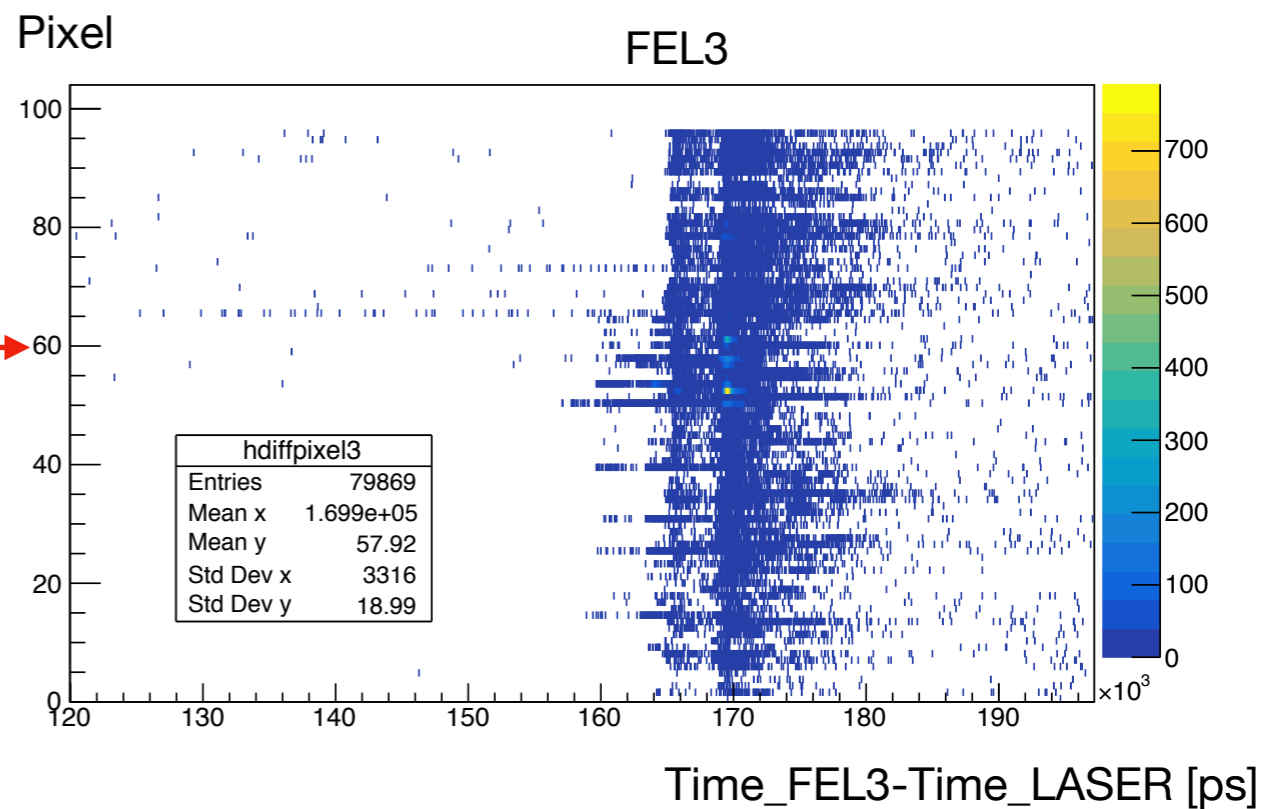
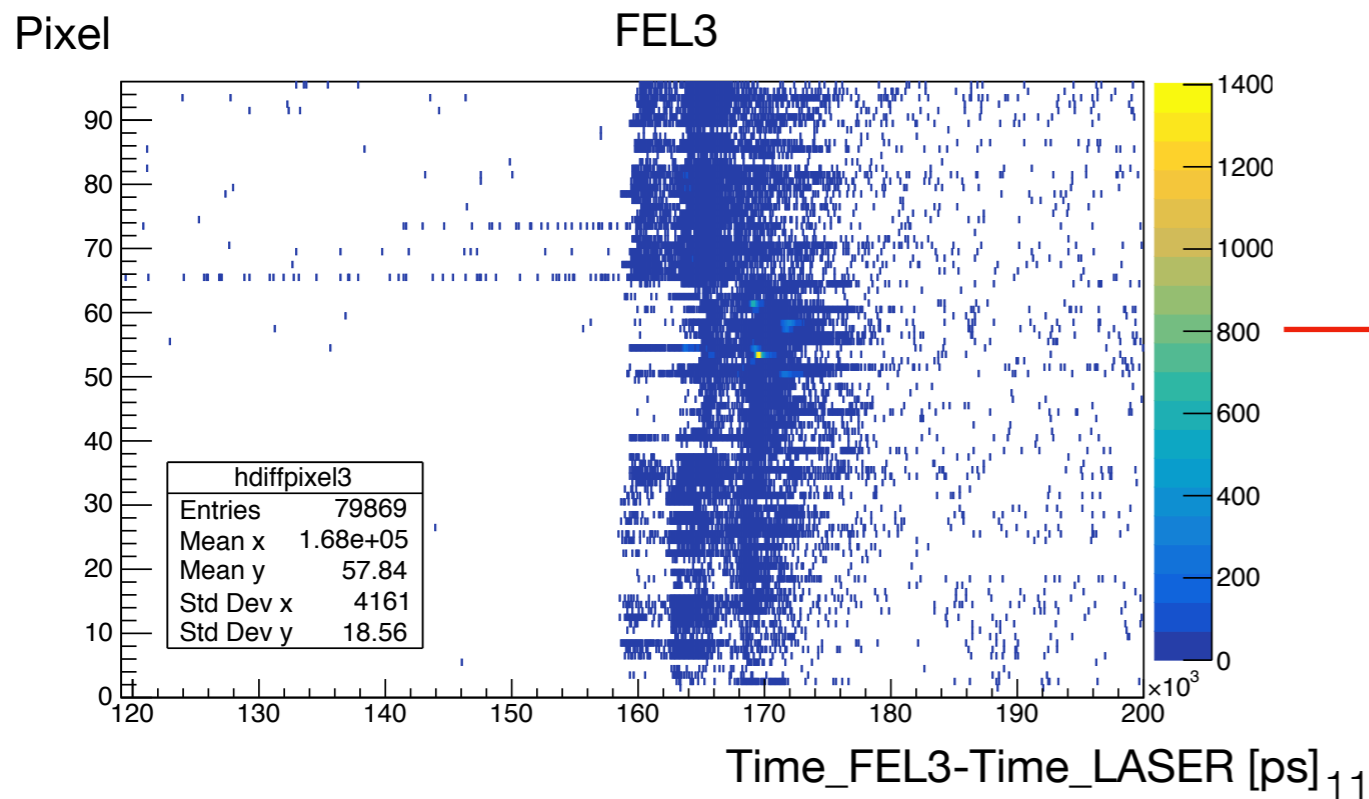
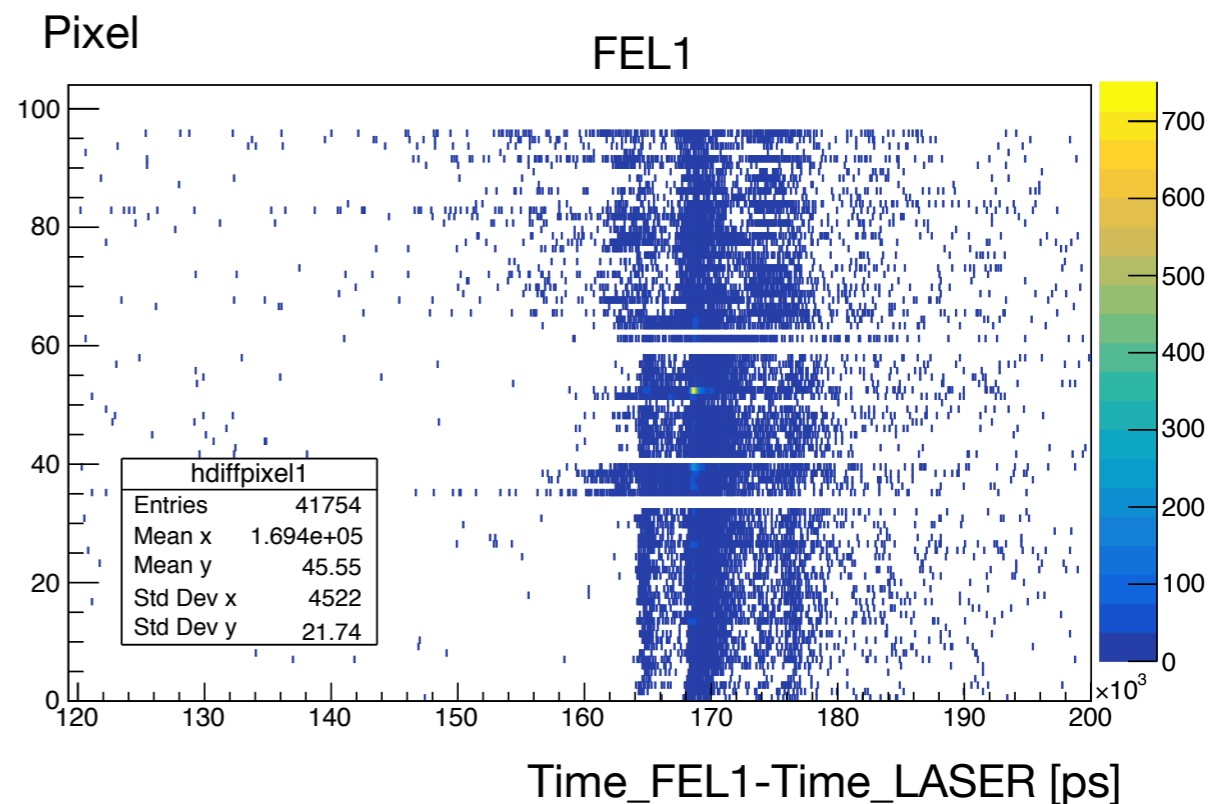


Equalization for FEL1 & FEL3 data

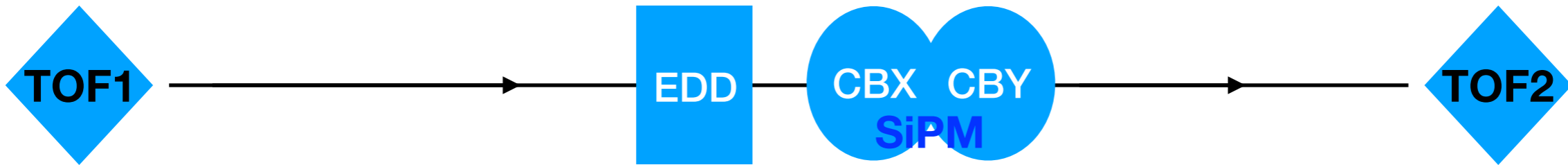
Before equalization



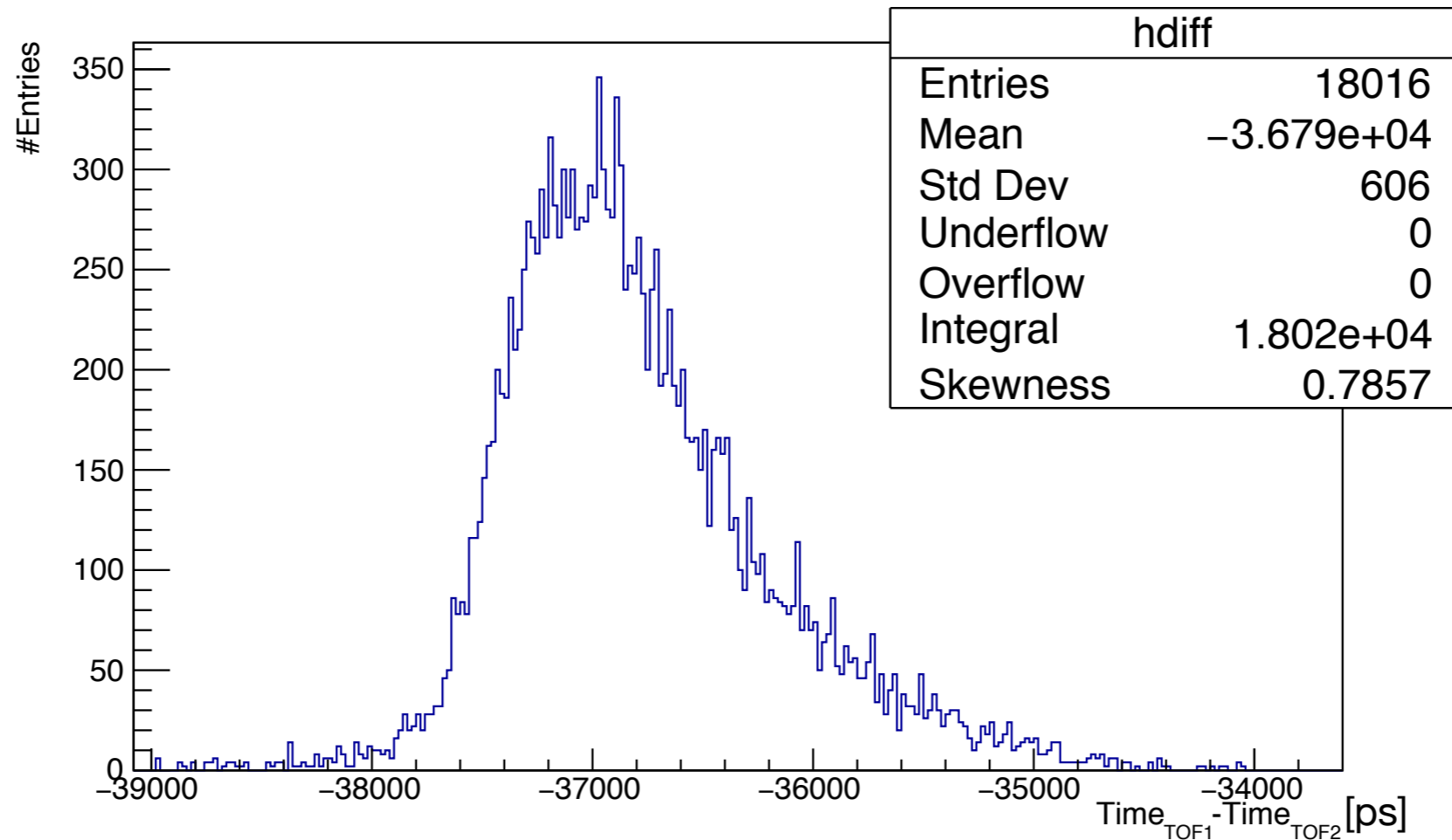
After equalization



Trigger selection



Time Difference between TOF1 and TOF2



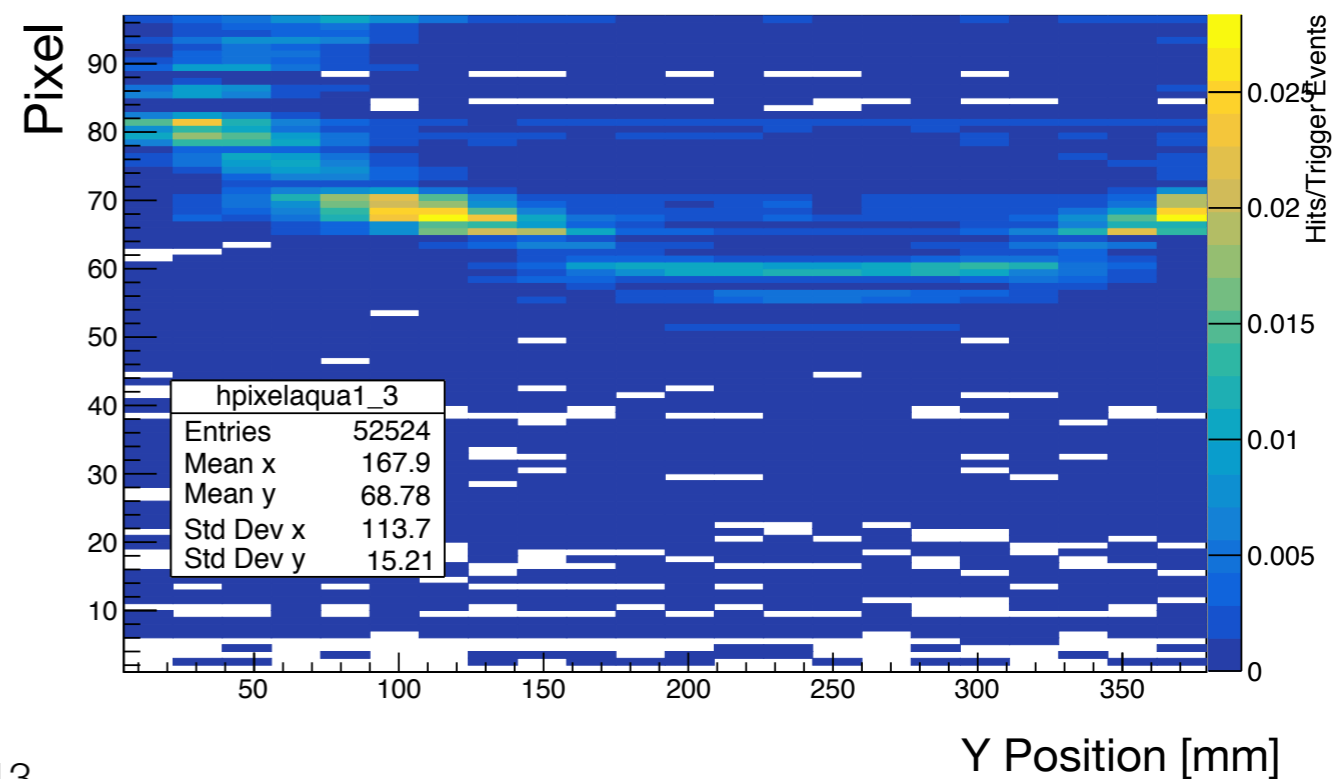
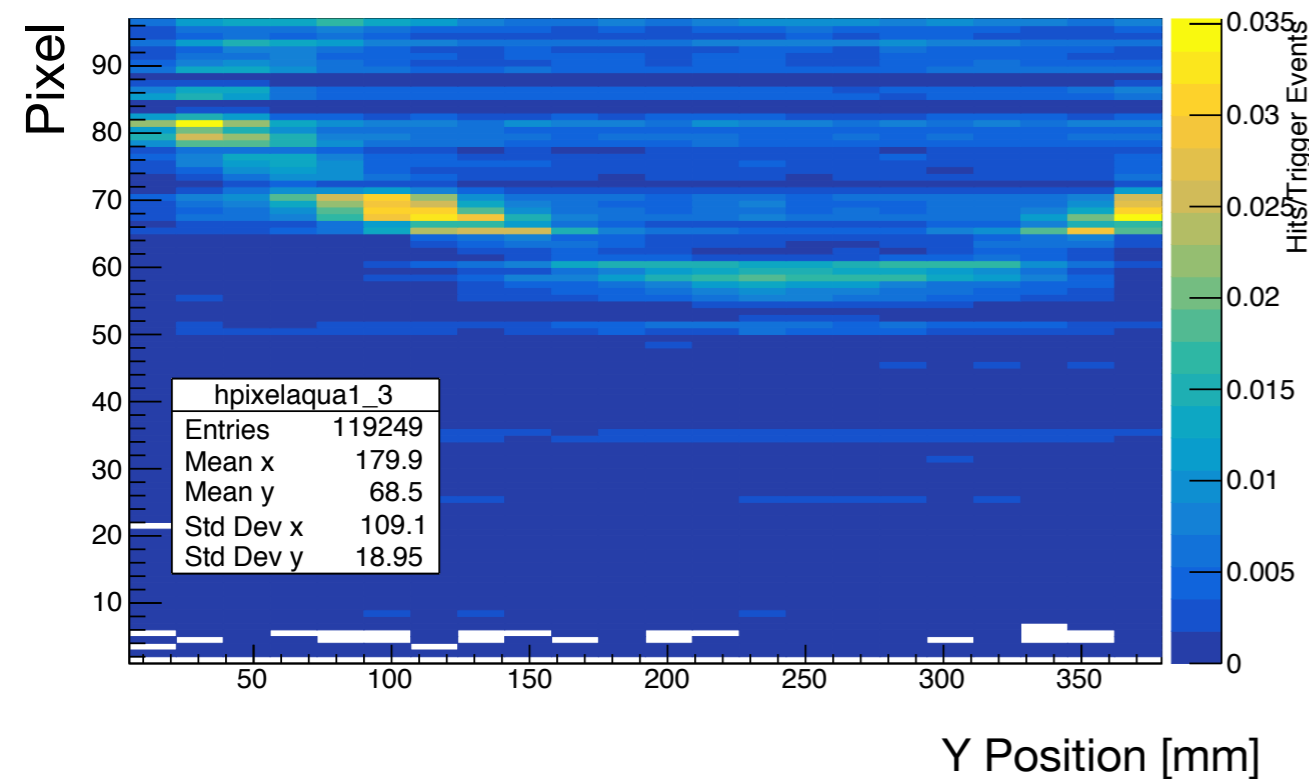
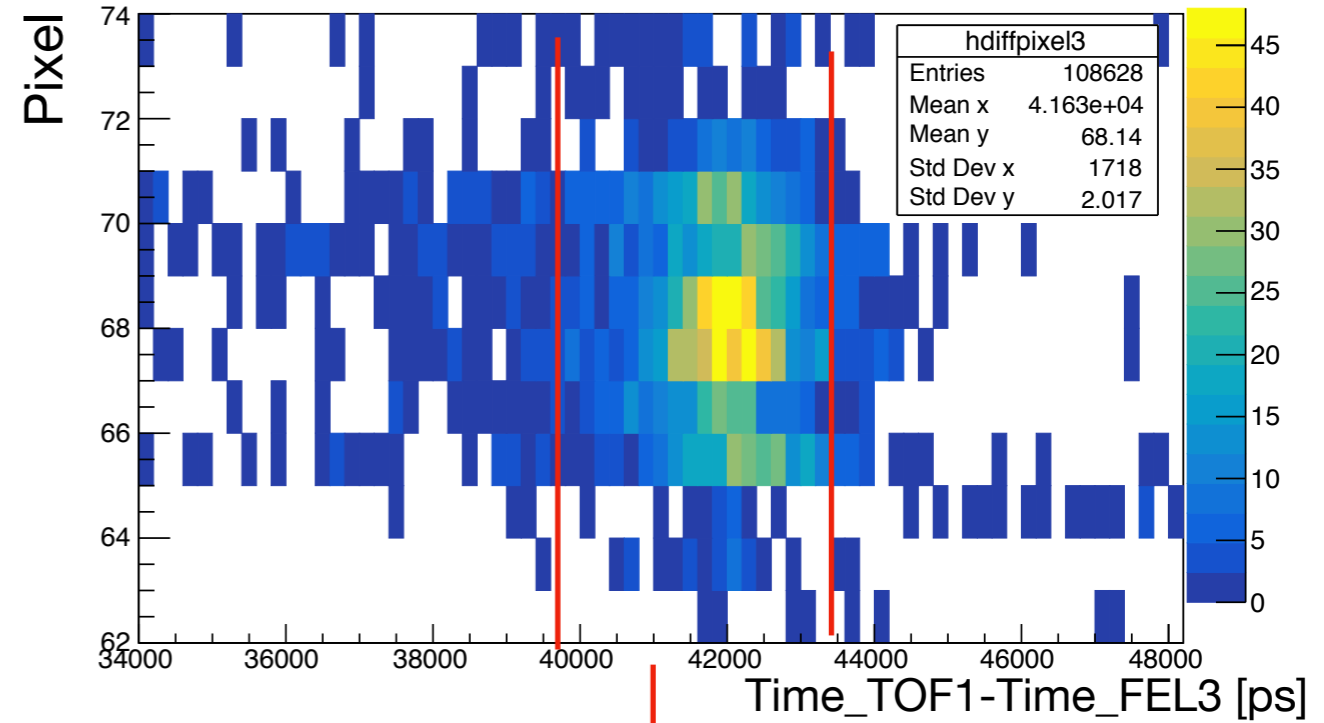
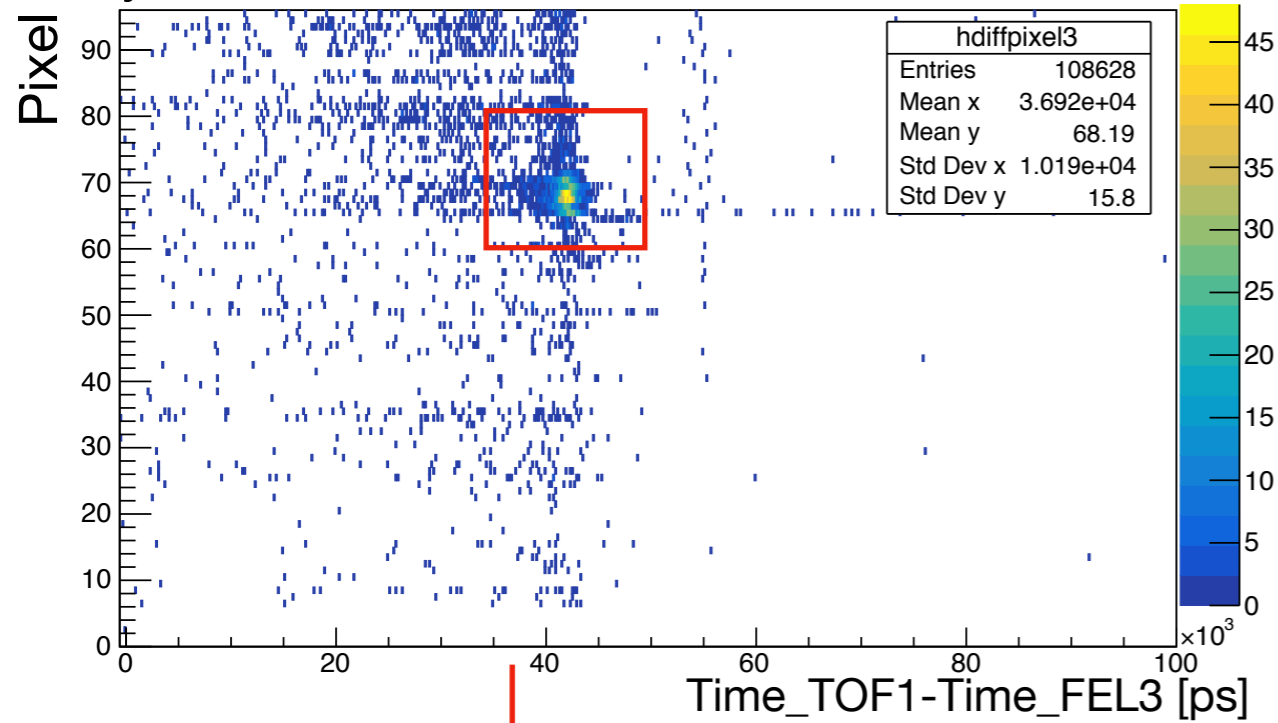
- Time Interval for Triggers is between -34ns to -39ns was selected
- $p = 10\text{GeV}/c$

Equalized data for FEL3

- 39ns < Time_TOF1-Time_TOF2 < -34ns

Time Cut: 40ns < Time_TOF1-Time_FEL2 < 44ns

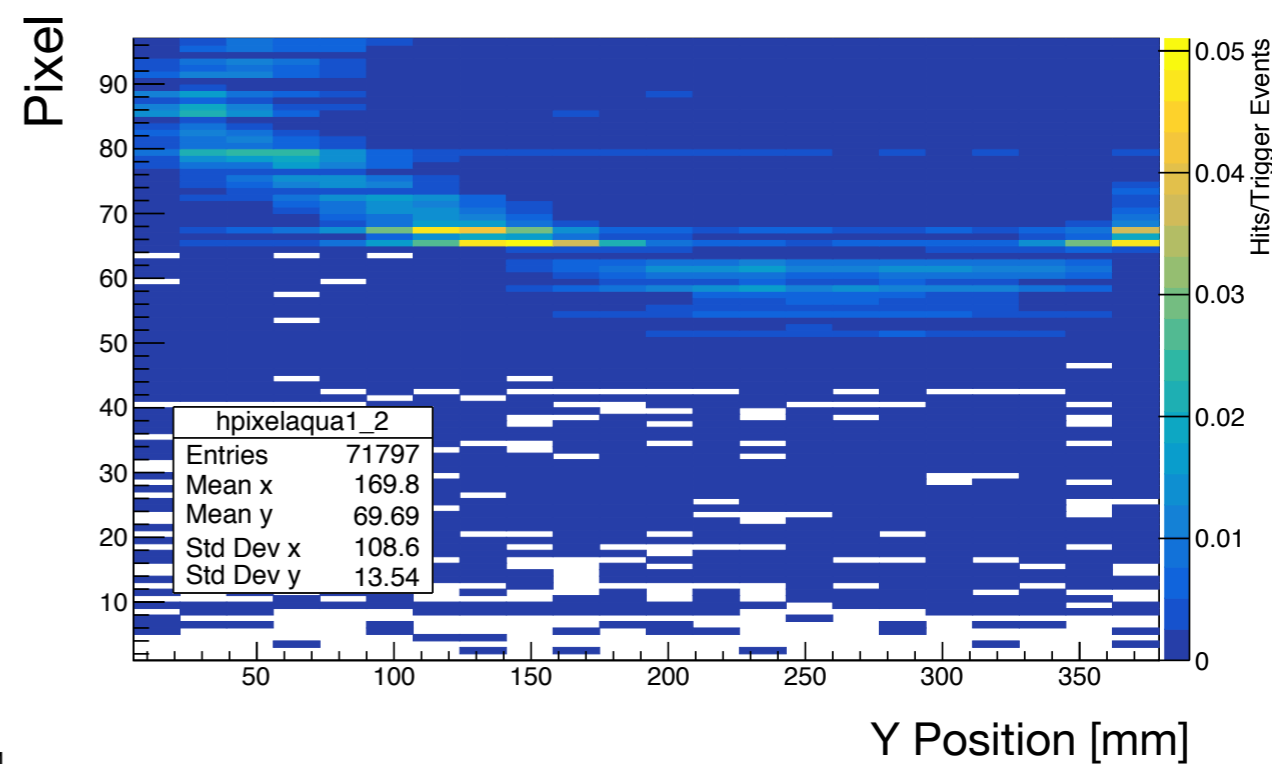
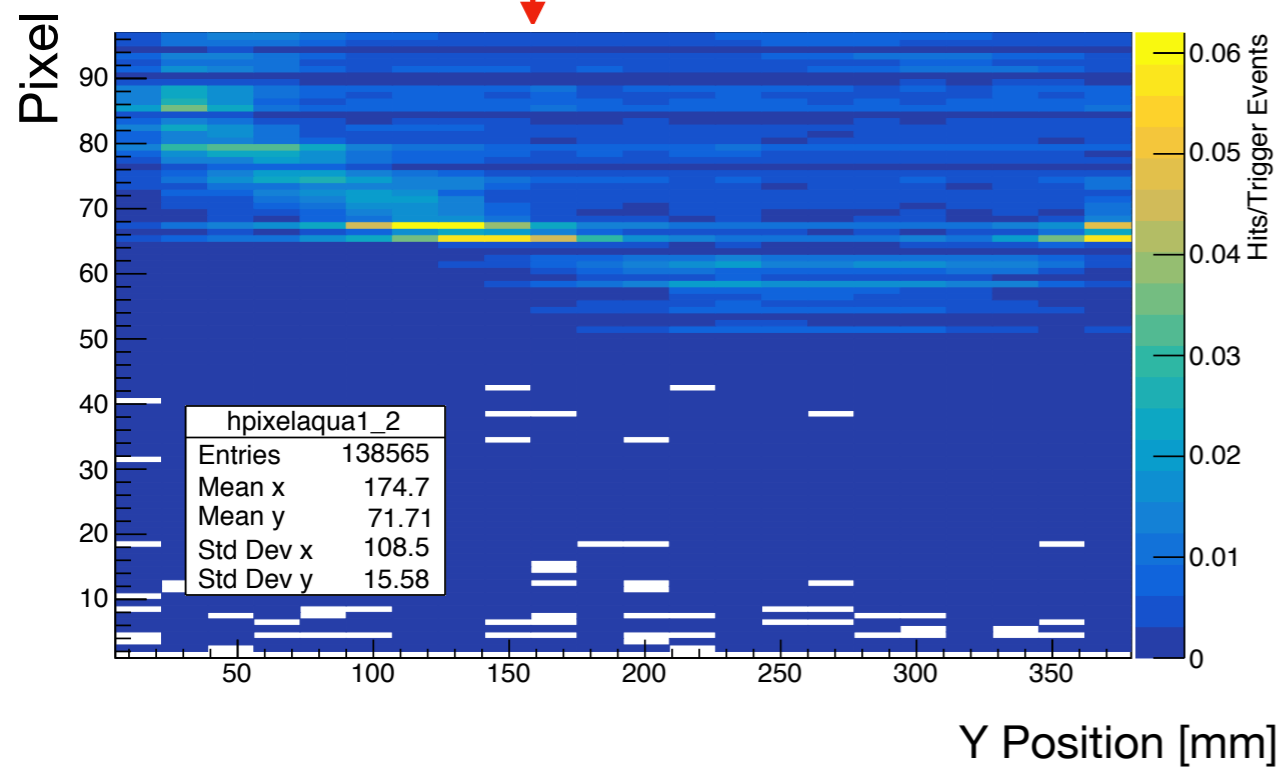
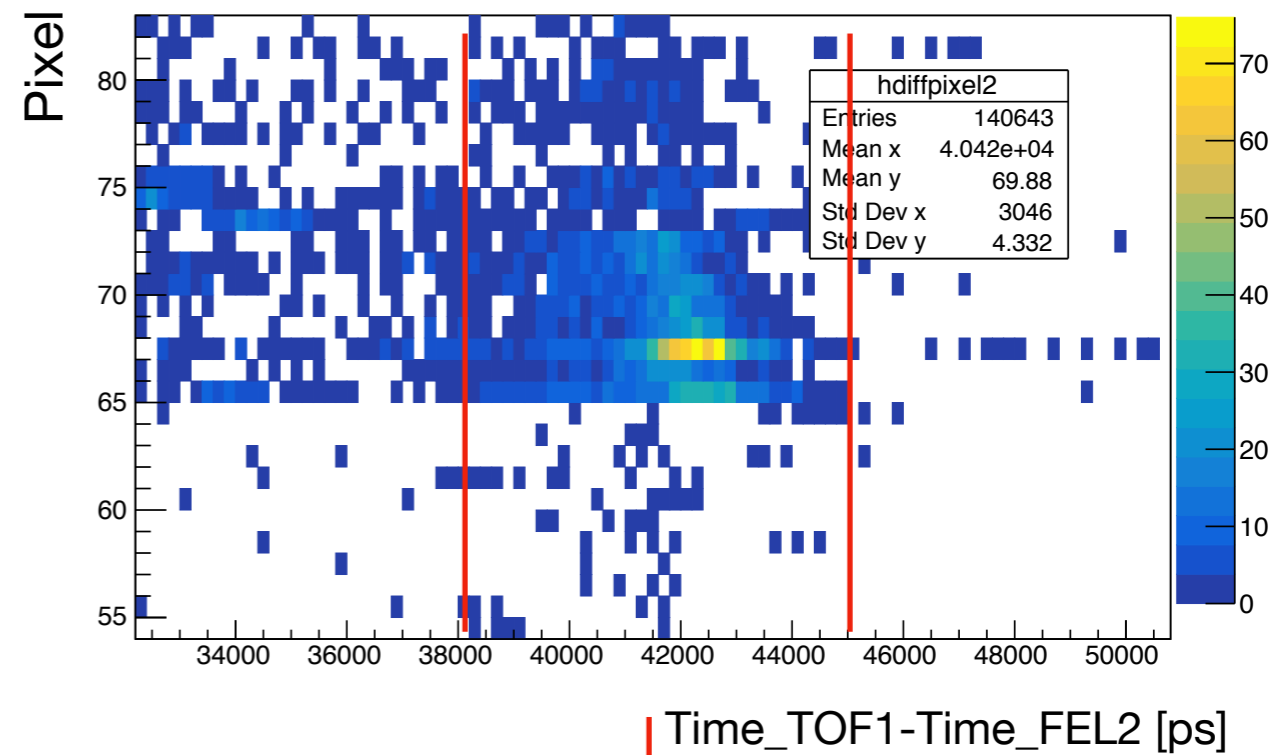
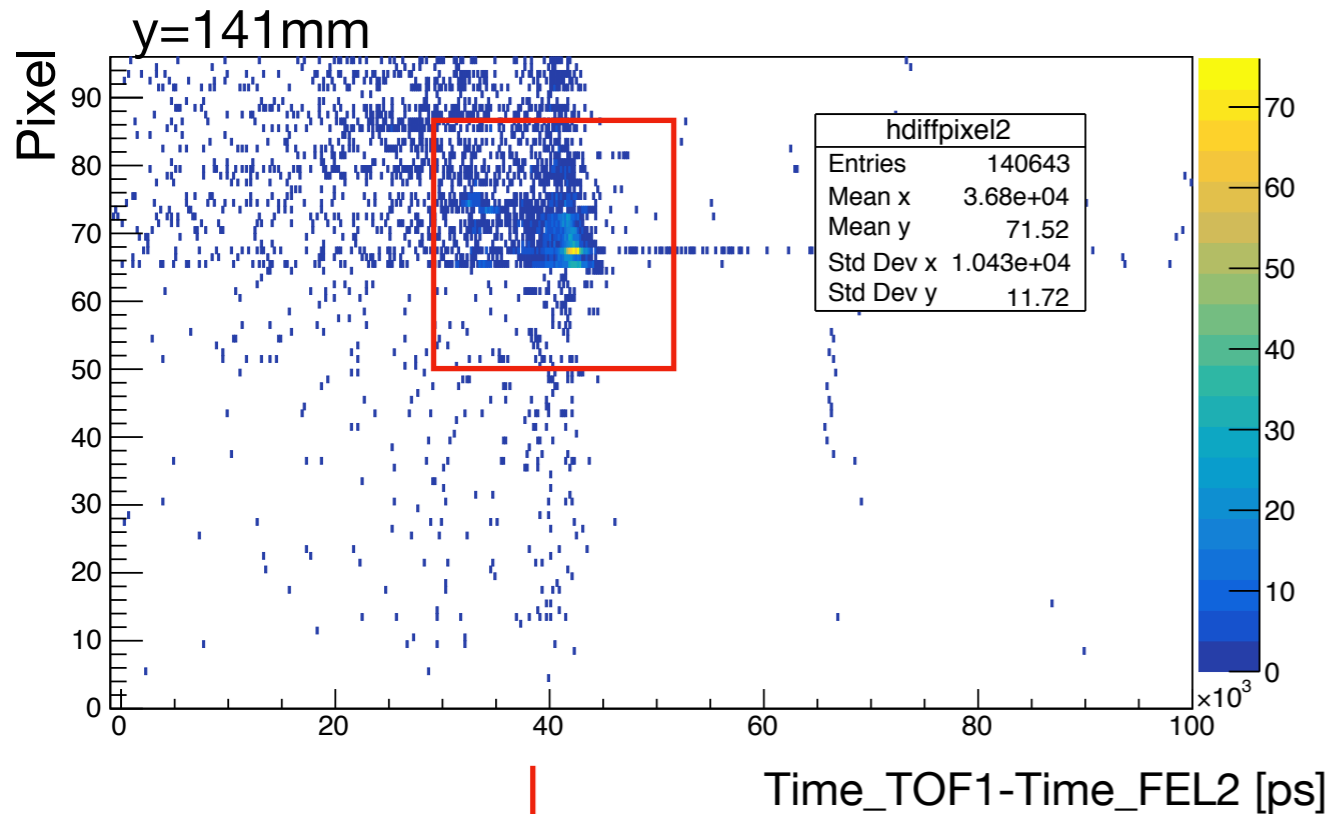
y=141mm



Equalized data for FEL2

- 39ns < Time_TOF1-Time_TOF2 < -34ns

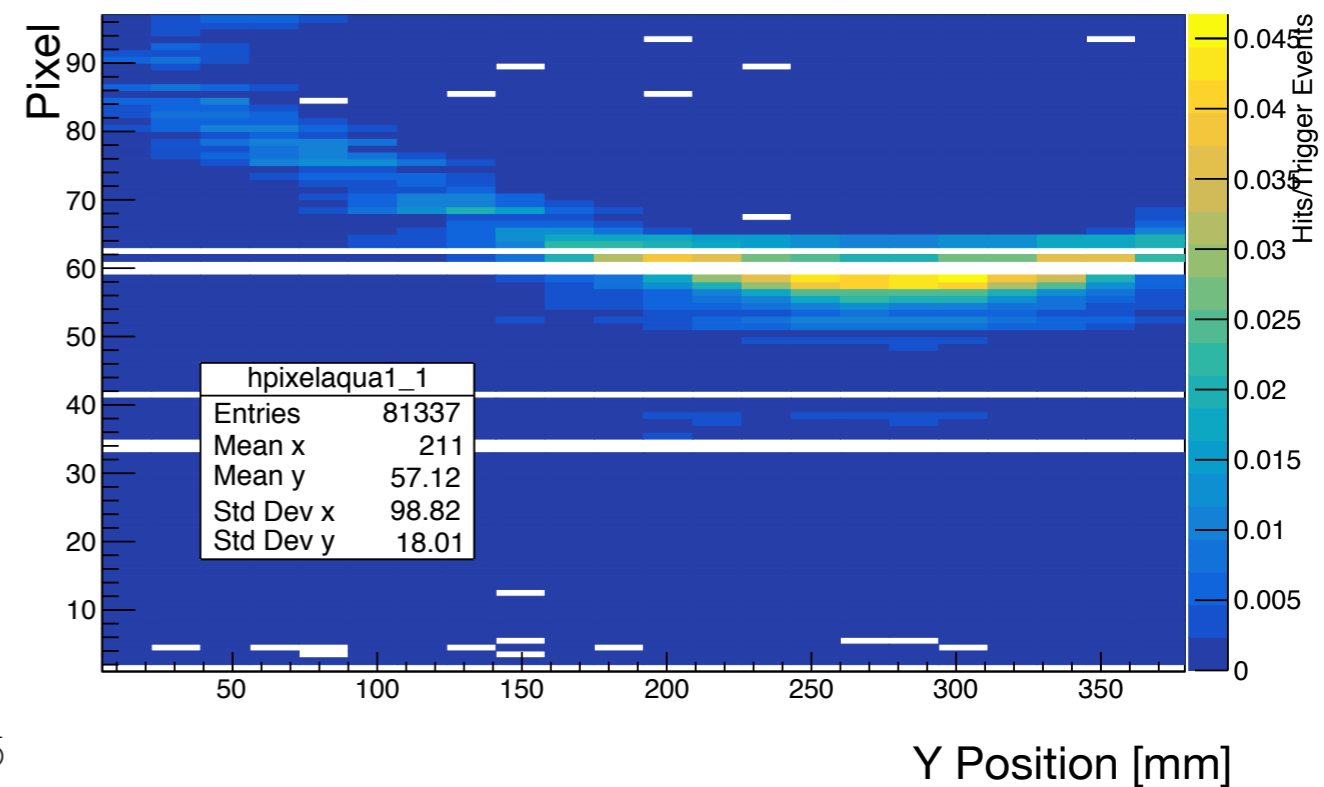
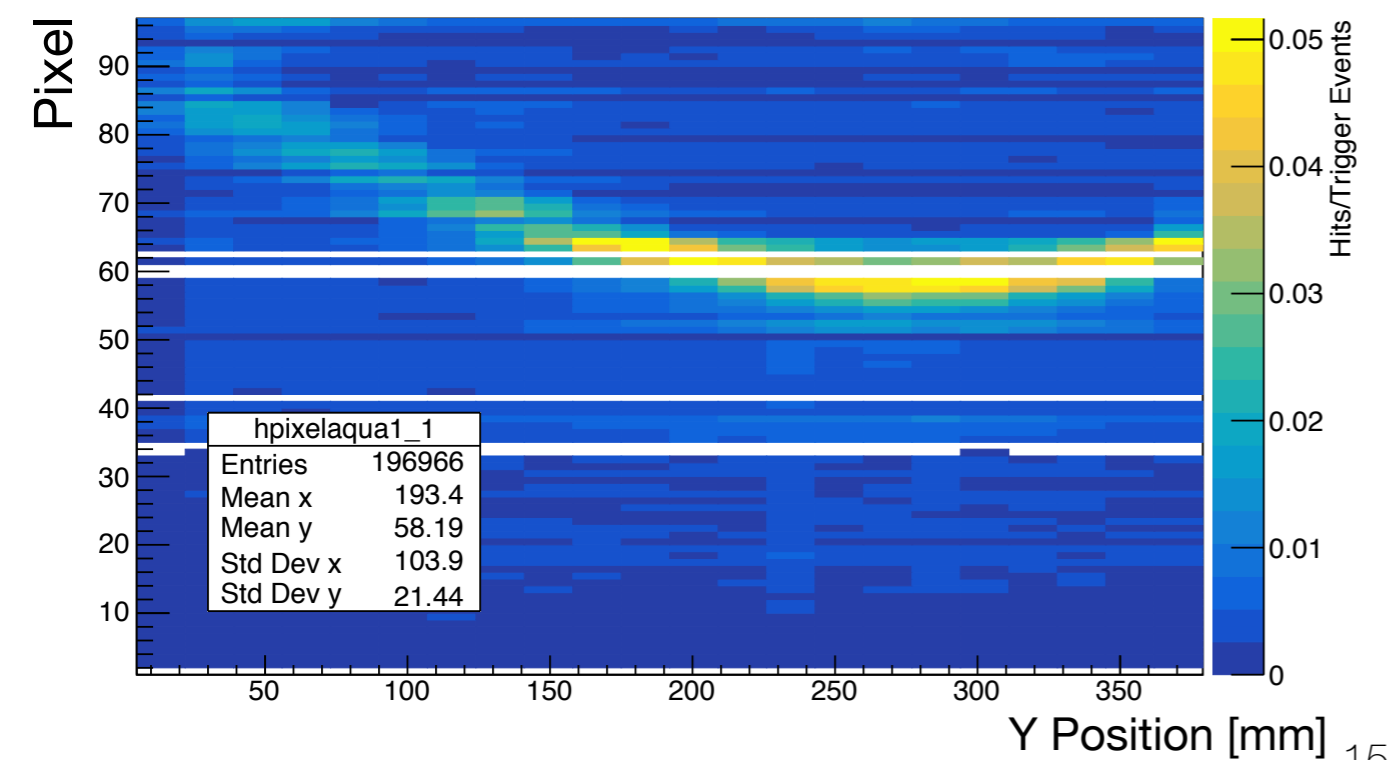
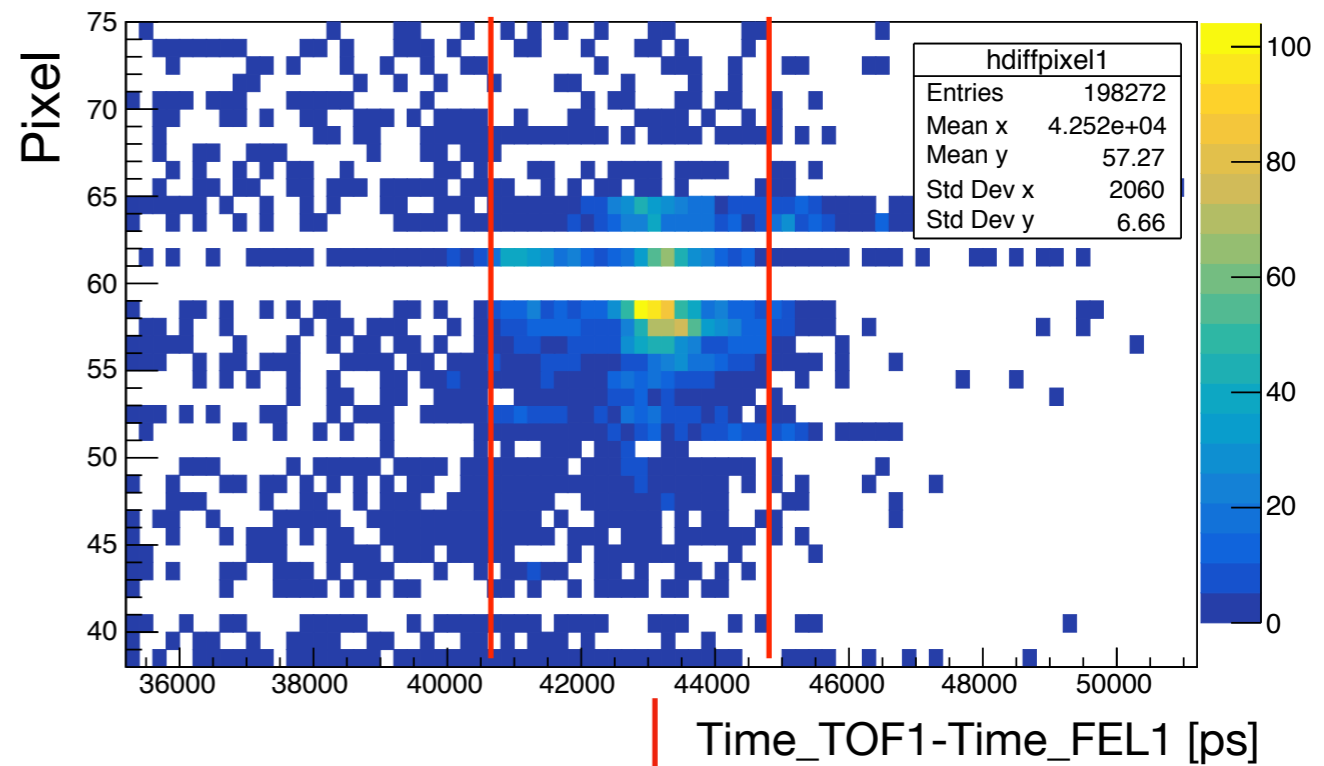
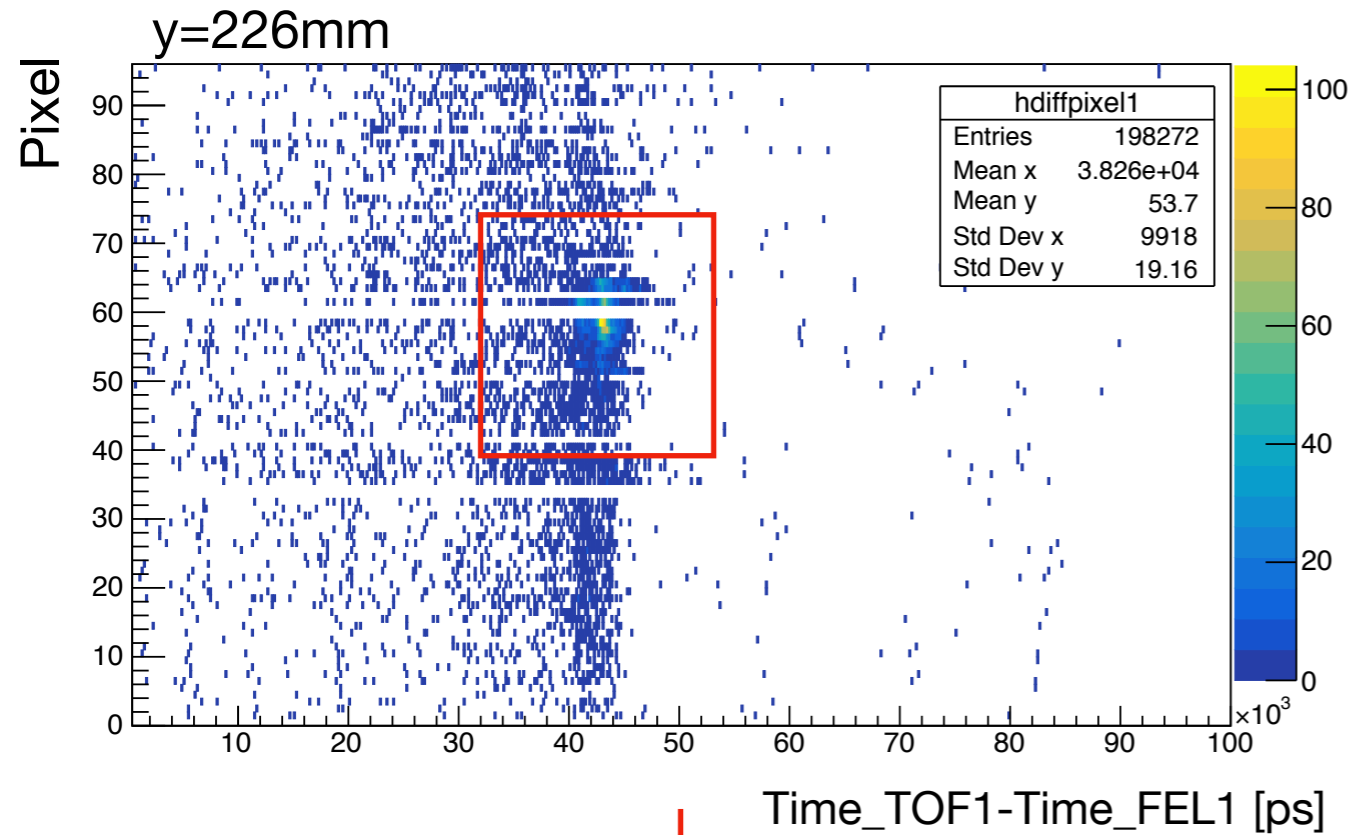
Time Cut: 38ns < Time_TOF1-Time_FEL2 < 45ns



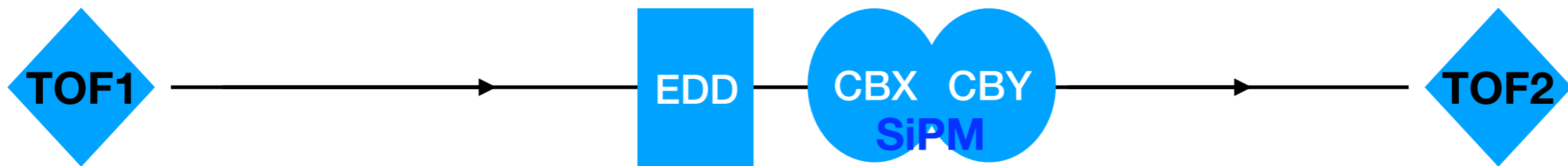
Equalized data for FEL1

- 39ns < Time_TOF1-Time_TOF2 < -34ns

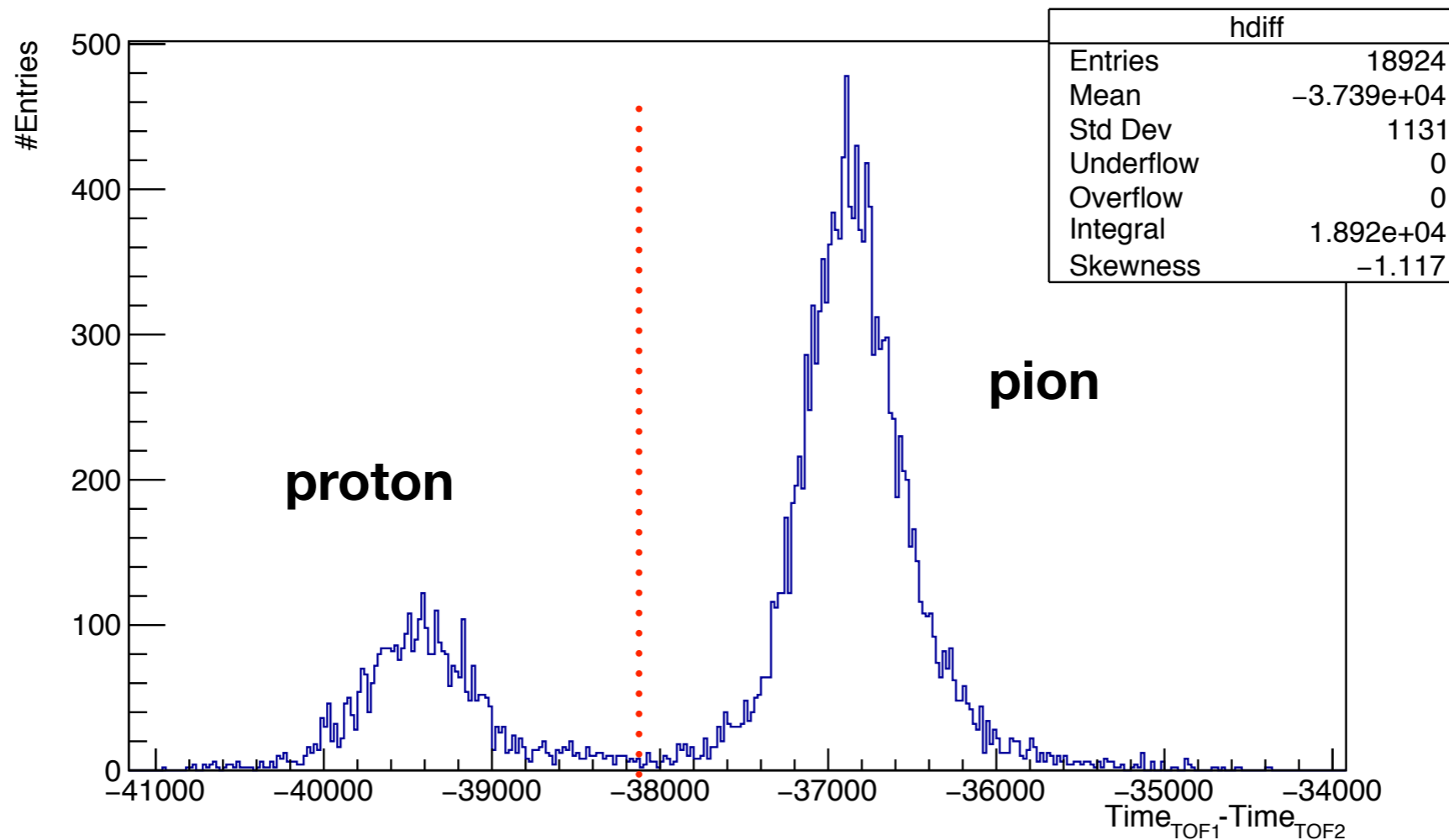
Time Cut: 41ns < Time_TOF1-Time_FEL1 < 45ns



Trigger selection



Time Difference between TOF1 and TOF2

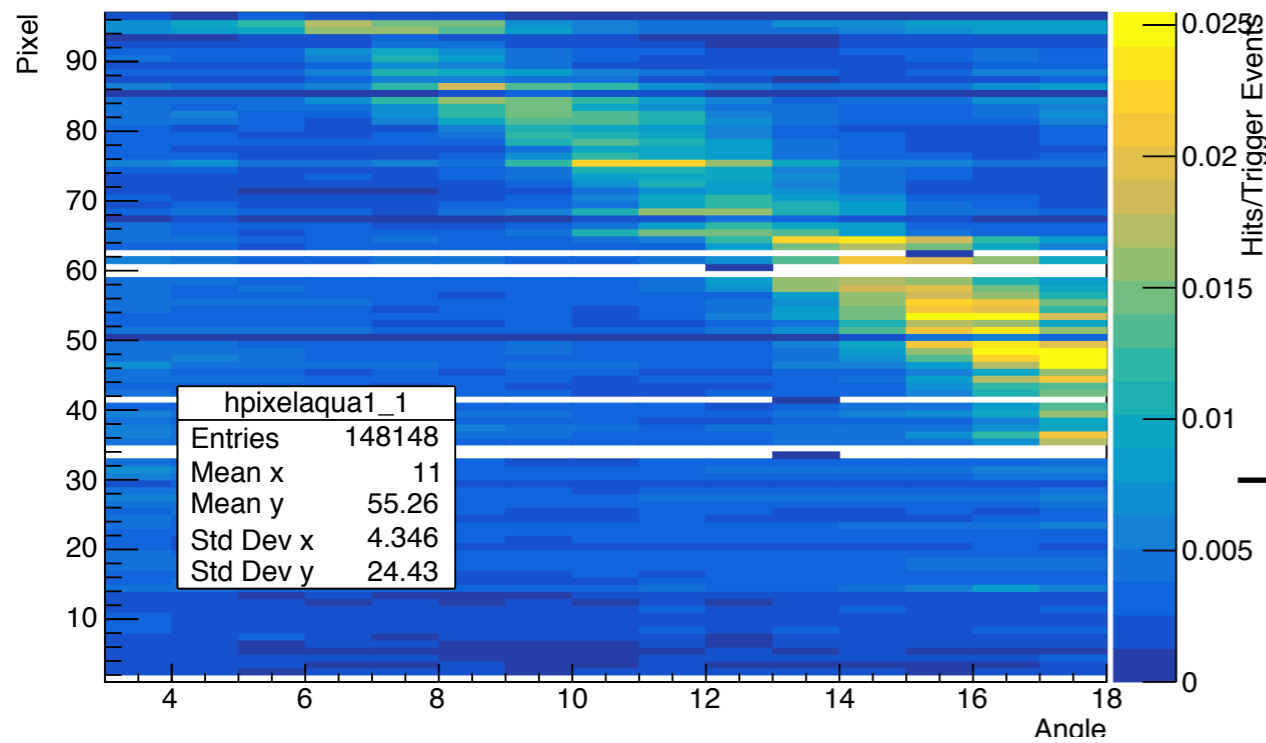


- pion: $-38\text{ns} < \text{Time_TOF1} - \text{Time_TOF2} < -34\text{ns}$
- proton: $-41\text{ns} < \text{Time_TOF1} - \text{Time_TOF2} < -38\text{ns}$
- $p = 4\text{GeV}/c$

Preliminary results of angle scan for pion

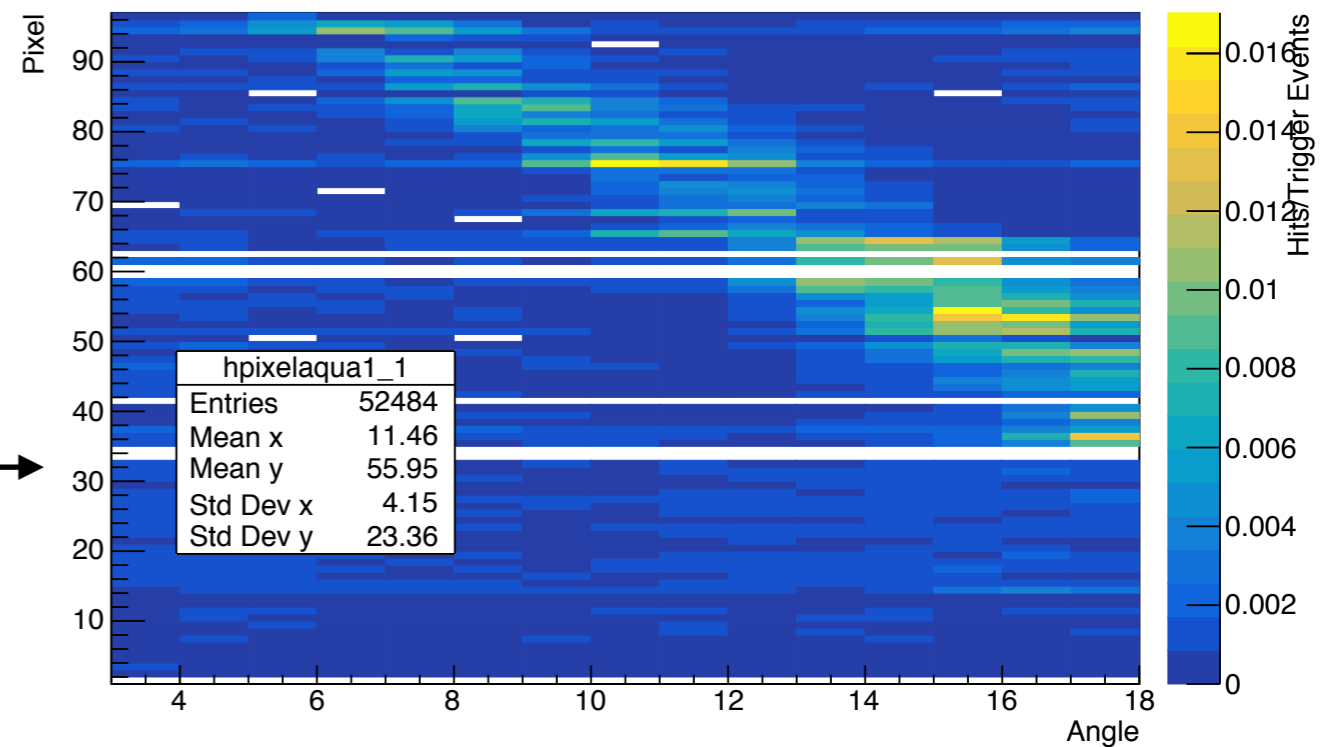
- 38ns < Time_TOF1-Time_TOF2 < -34ns

FEL1

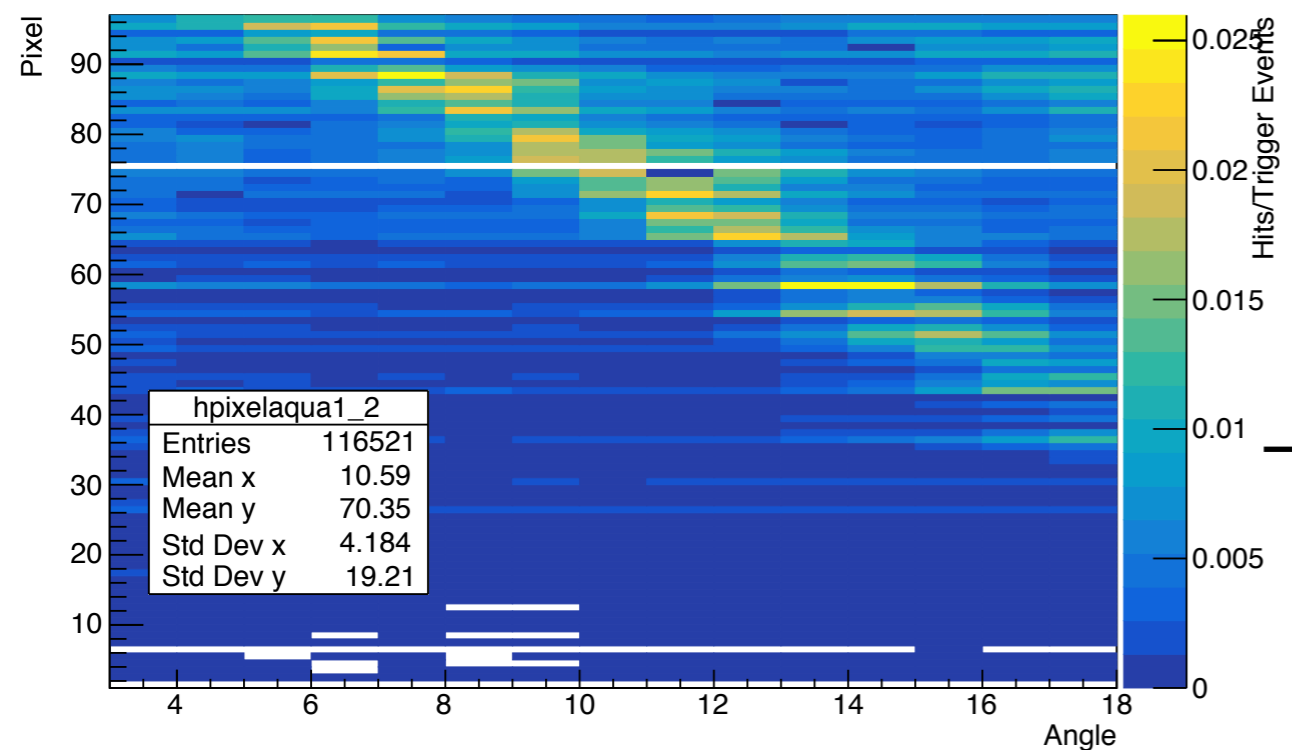


Time Cut: 41ns < Time_TOF1-Time_FEL1 < 45ns

FEL1

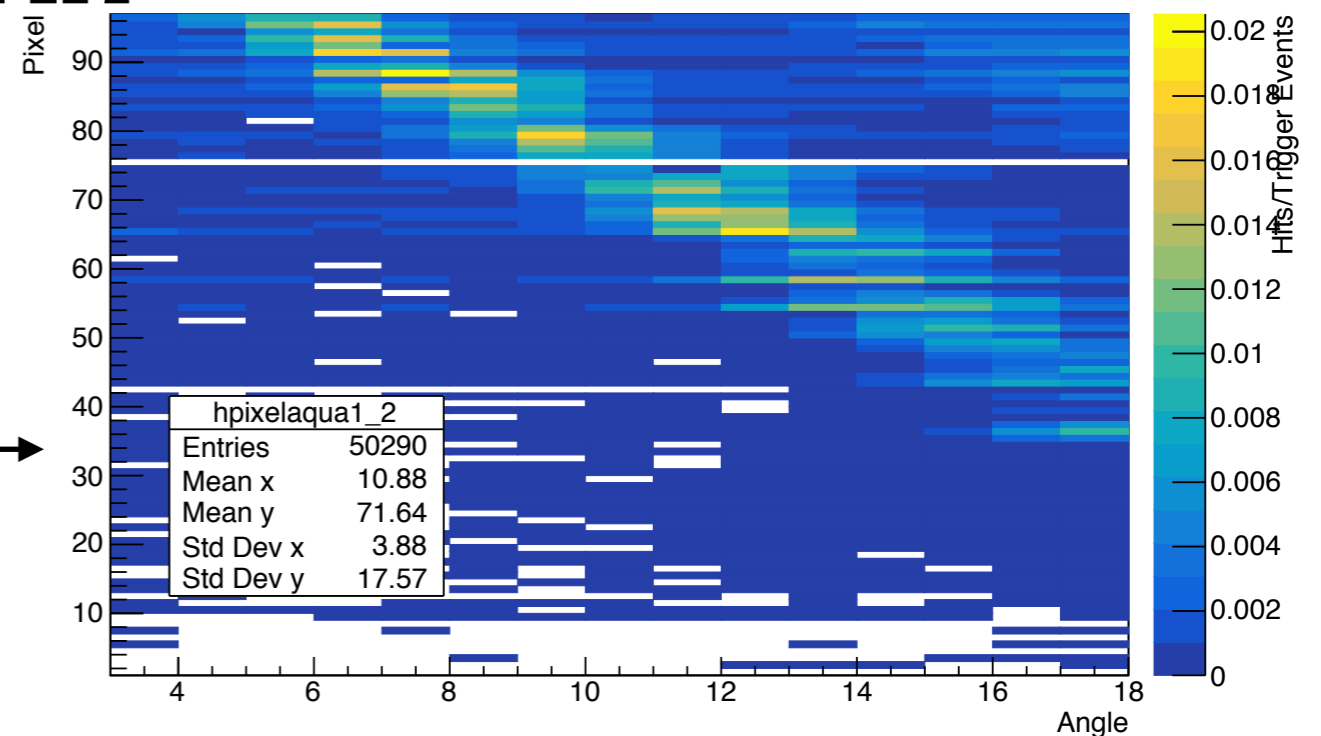


FEL 2



Time Cut: 41ns < Time_TOF1-Time_FEL2 < 45ns

FEL 2

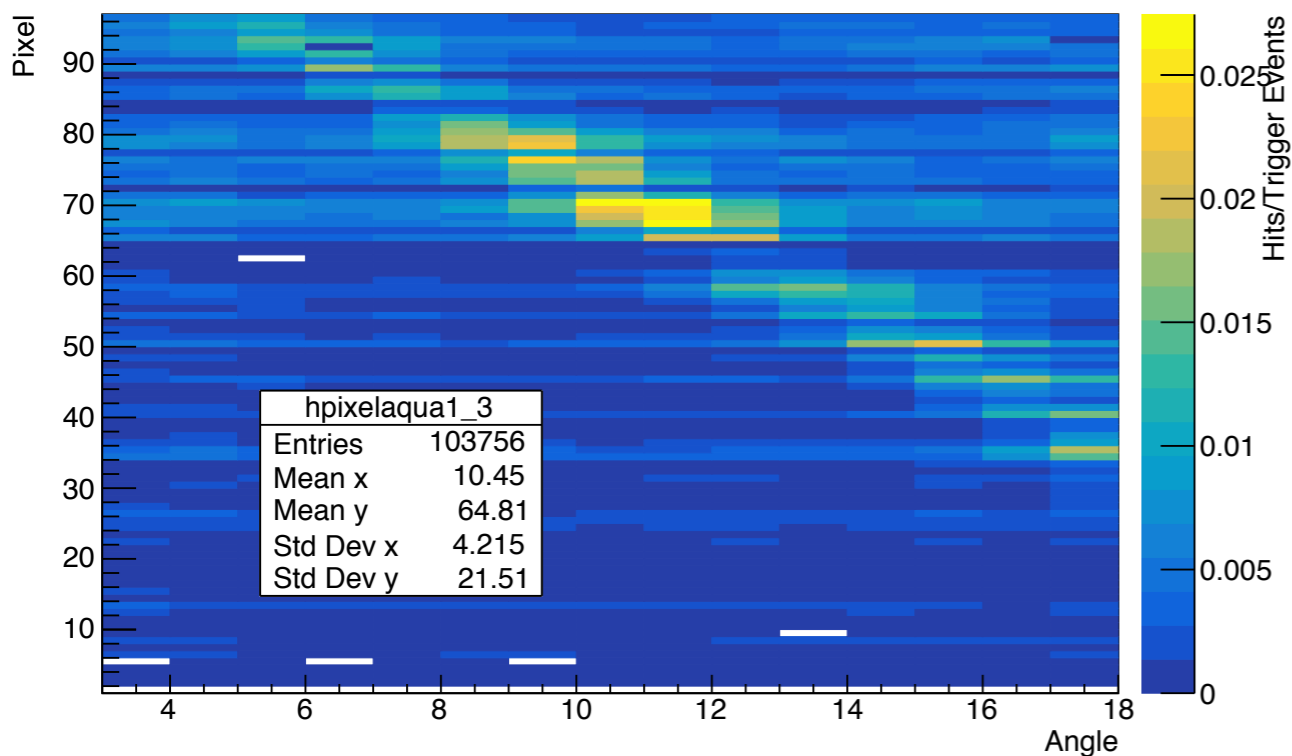


Preliminary results of angle scan for pion

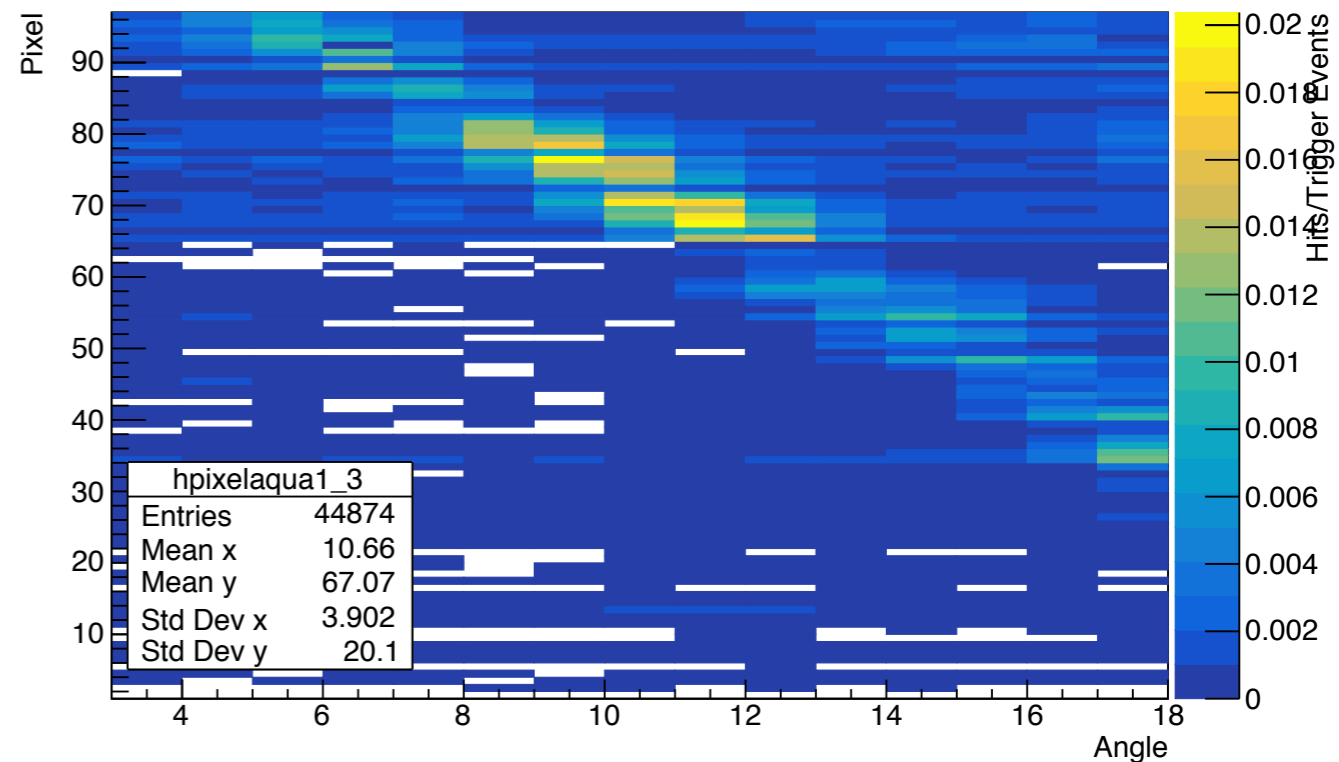
- $-38\text{ns} < \text{Time_TOF1} - \text{Time_TOF2} < -34\text{ns}$

Time Cut: $41\text{ns} < \text{Time_TOF1} - \text{Time_FEL3} < 45\text{ns}$

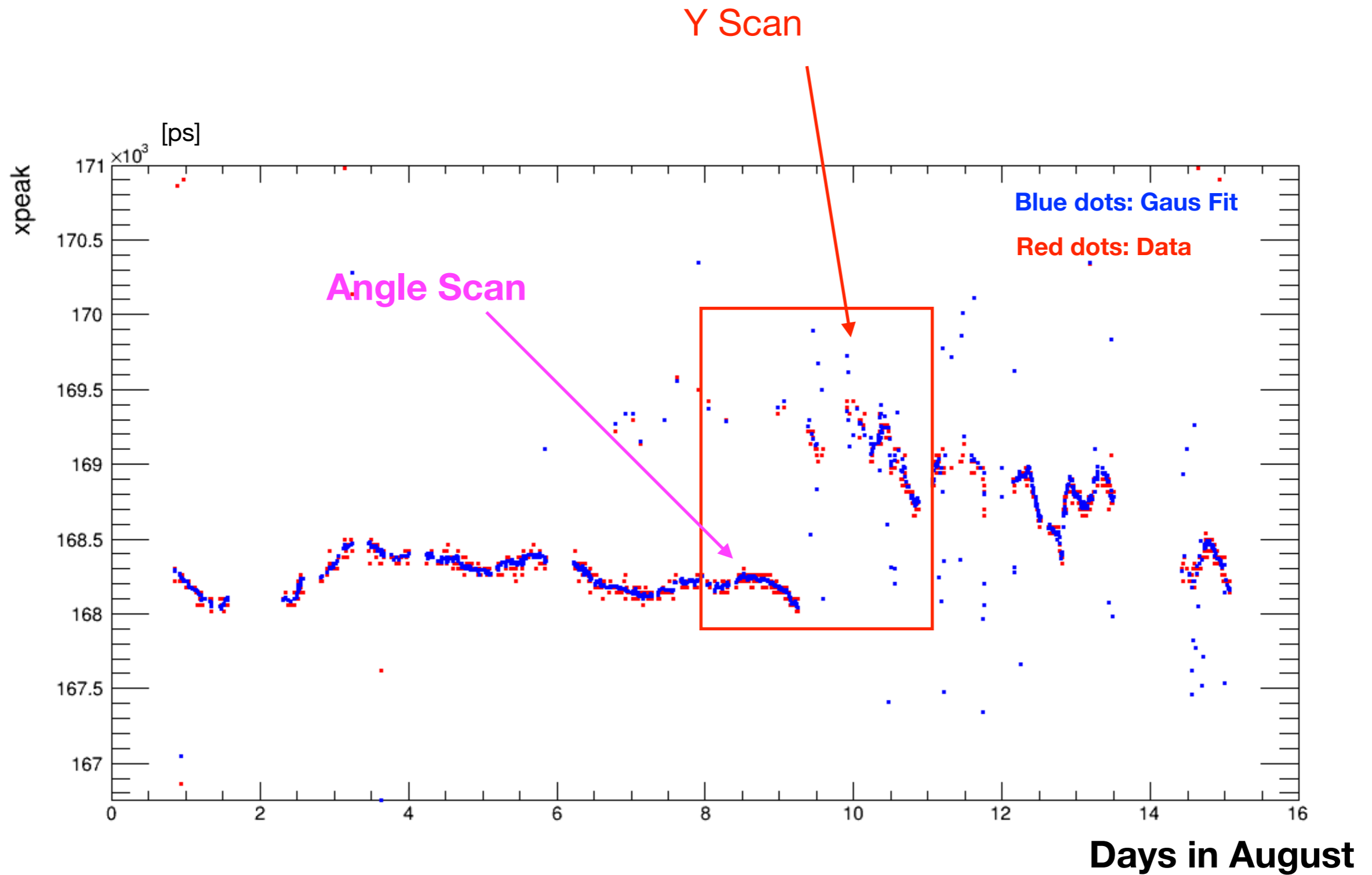
FEL 3



FEL 3



Channel 53 peak behavior during the days



Preliminary analysis

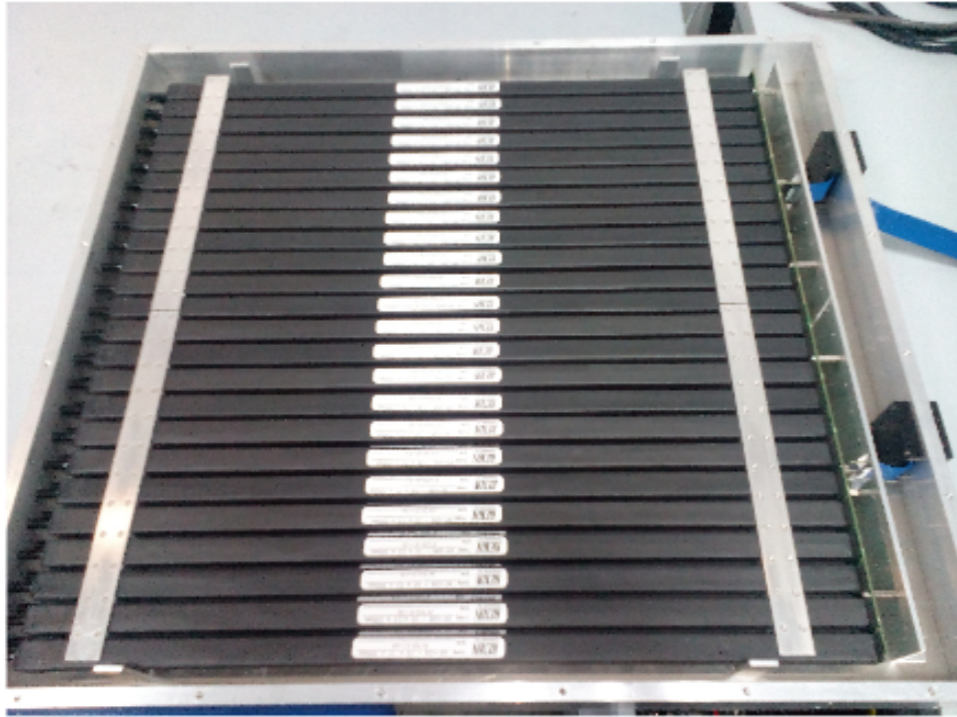
- Equalization is done
- Missing Channels are identified.
- MCP-TOFs are used as triggers for
 - $p = 10 \text{ GeV}/c$ $-39\text{ns} < \text{TOF1} - \text{TOF2} < -34\text{ns}$
 - $p = 4 \text{ GeV}/c$ $-38\text{ns} < \text{TOF1} - \text{TOF2} < -34\text{ns}$ for pion
 $-41\text{ns} < \text{TOF1} - \text{TOF2} < -38\text{ns}$ for proton
- Proper time cuts to reduce the background

Future plans about analysis

- MCP-TOF1 and SiPM boxes will be used as triggers
- Reconstruct Cherenkov angle
- SiPM boxes will be used to
 - Eliminate background with spatial cut
 - Improve Cherenkov angle resolution
- All steps will be repeated for also Hamamatsu & Photonis 2mm
- Time walk correction

Thank you.

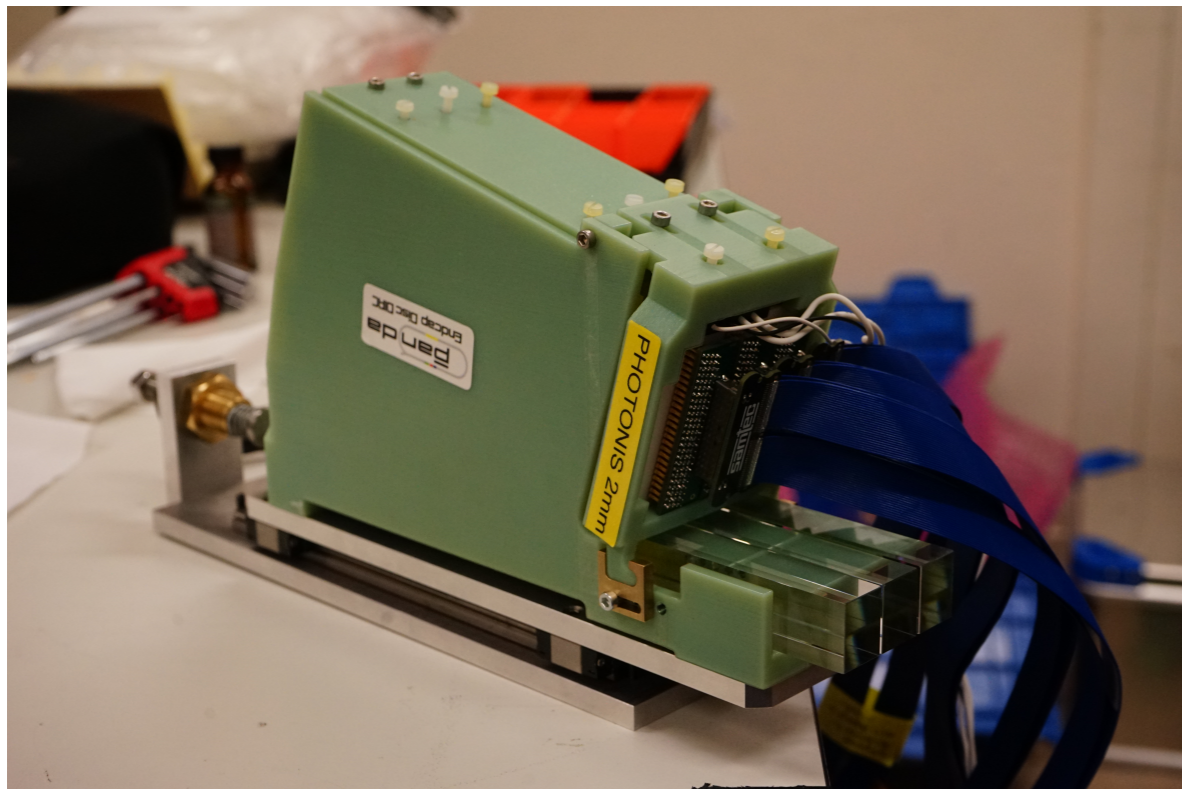
Backup



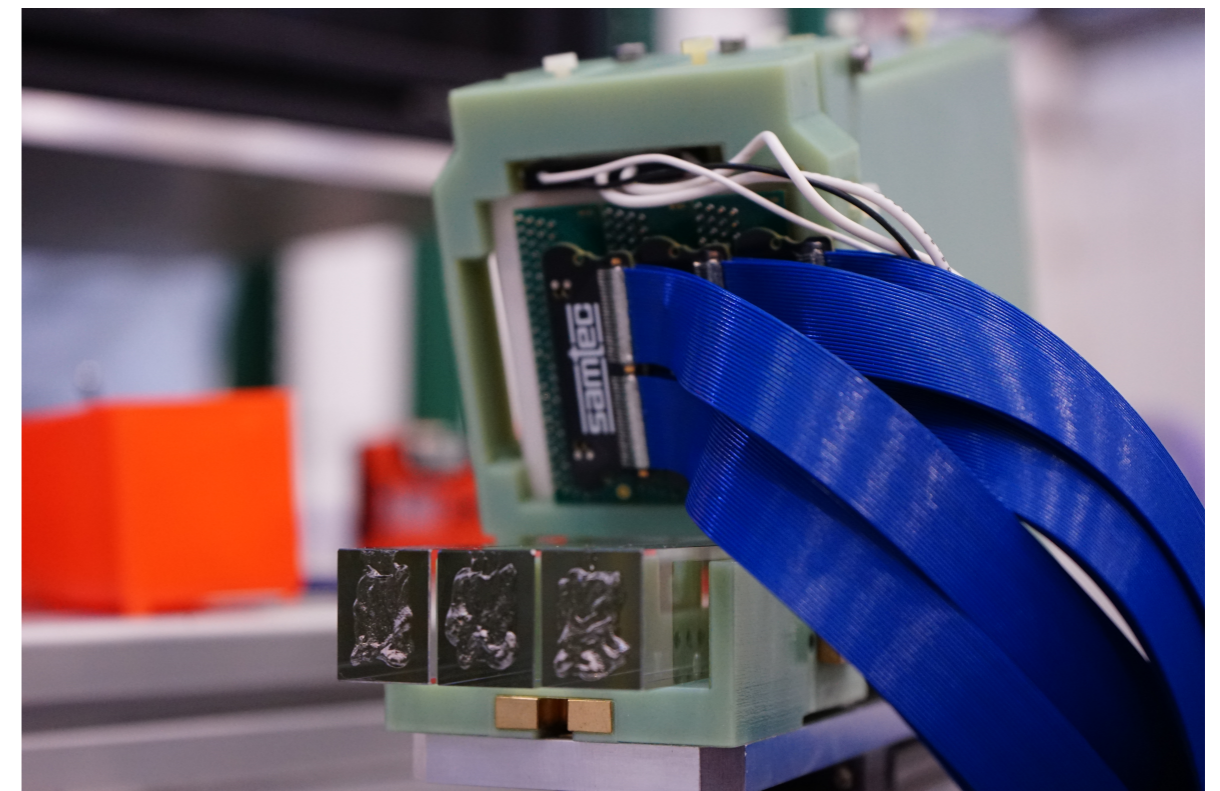
SiPM bars



Photonis Aqua



Photonis 2mm



Photonis 2mm