

MVTX Test Beam at Fermilab

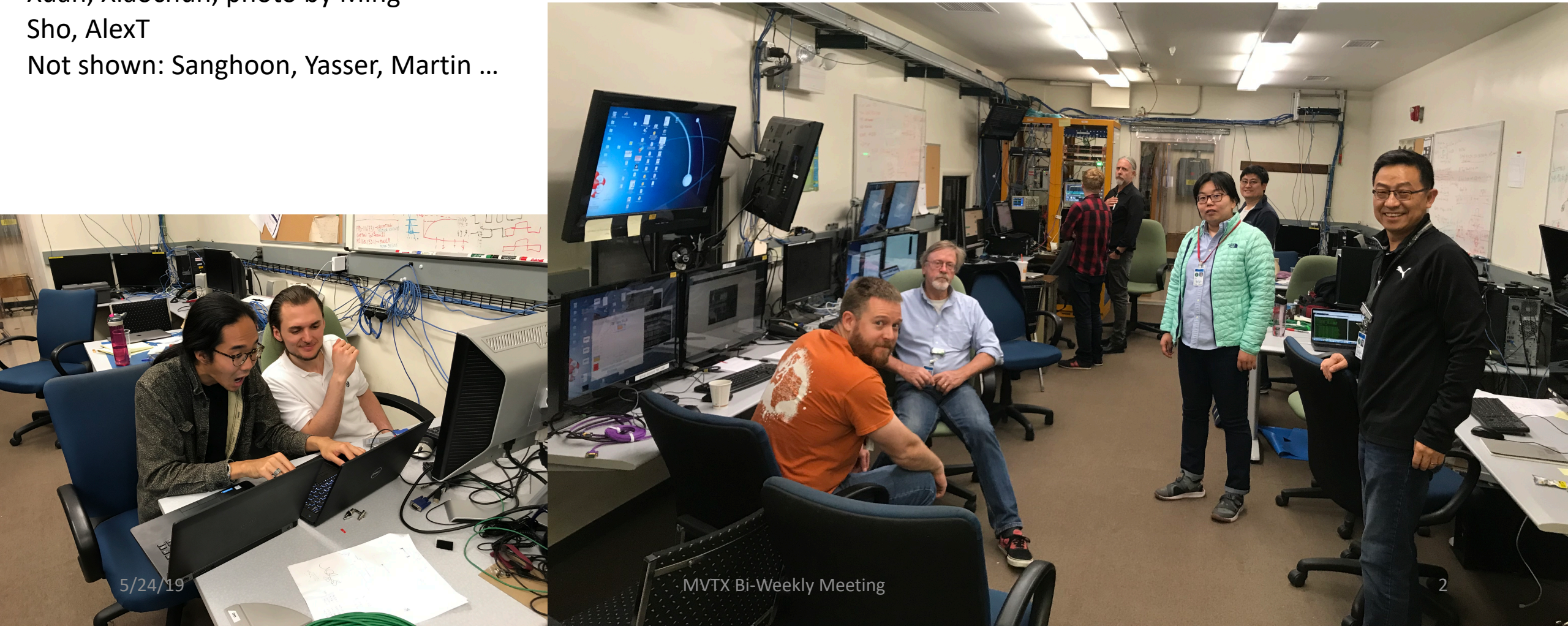
May 20-25, 2019

Cameron, Sho, AlexT, Gerd, Hubert, Xiaochun, Matt, Zongze, Sanghoon,
Yasser, Xuan, Martin, Ming ...

The Team

Data taking shift in the evenings: 7PM – 7AM
Beam: every other Monday – Friday 8:00AM – 8AM

Matt, Hubert, Cameron, Gerd, Zongze,
Xuan, Xiaochun, photo by Ming
Sho, AlexT
Not shown: Sanghoon, Yasser, Martin ...



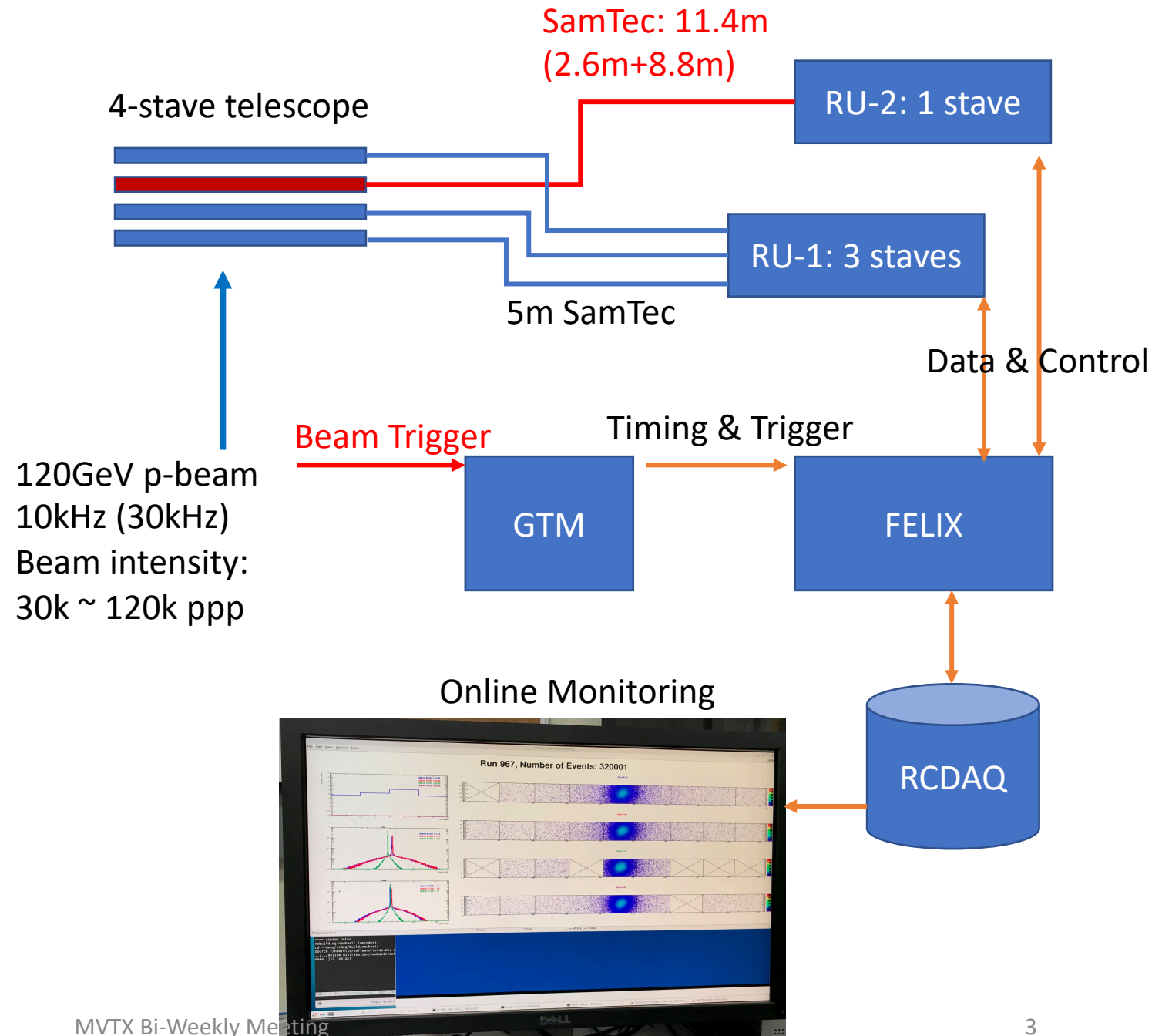
5/24/19

MVTX Bi-Weekly Meeting

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System Setup

- 4 staves
- 2 RUv1.1
- 1 PU
- 1 FELIX
- GTM
- Custom SamTec Cable
- Negative pressured cooling



Preparation: Hand Carry (Air + Train) + FedEx



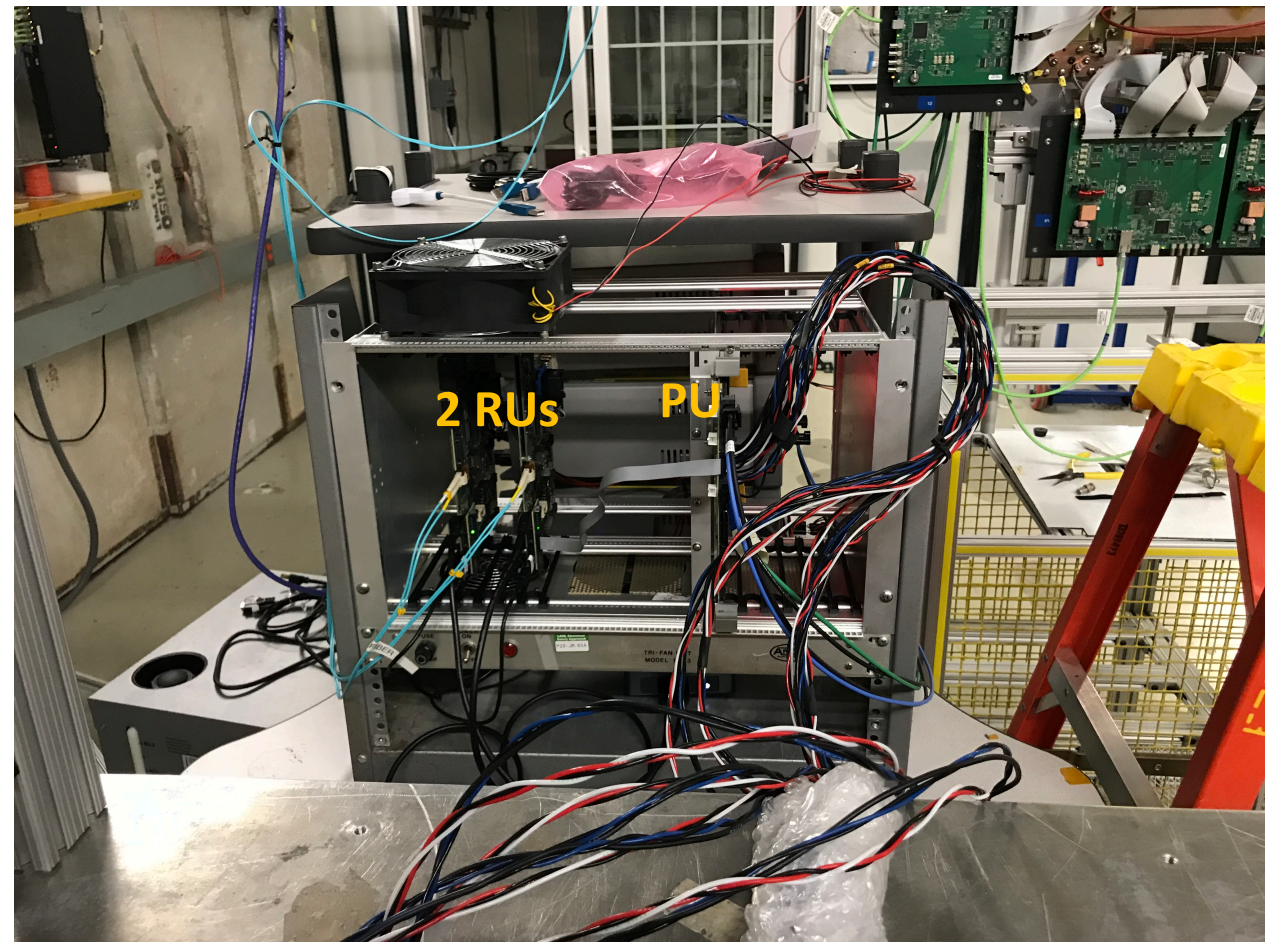
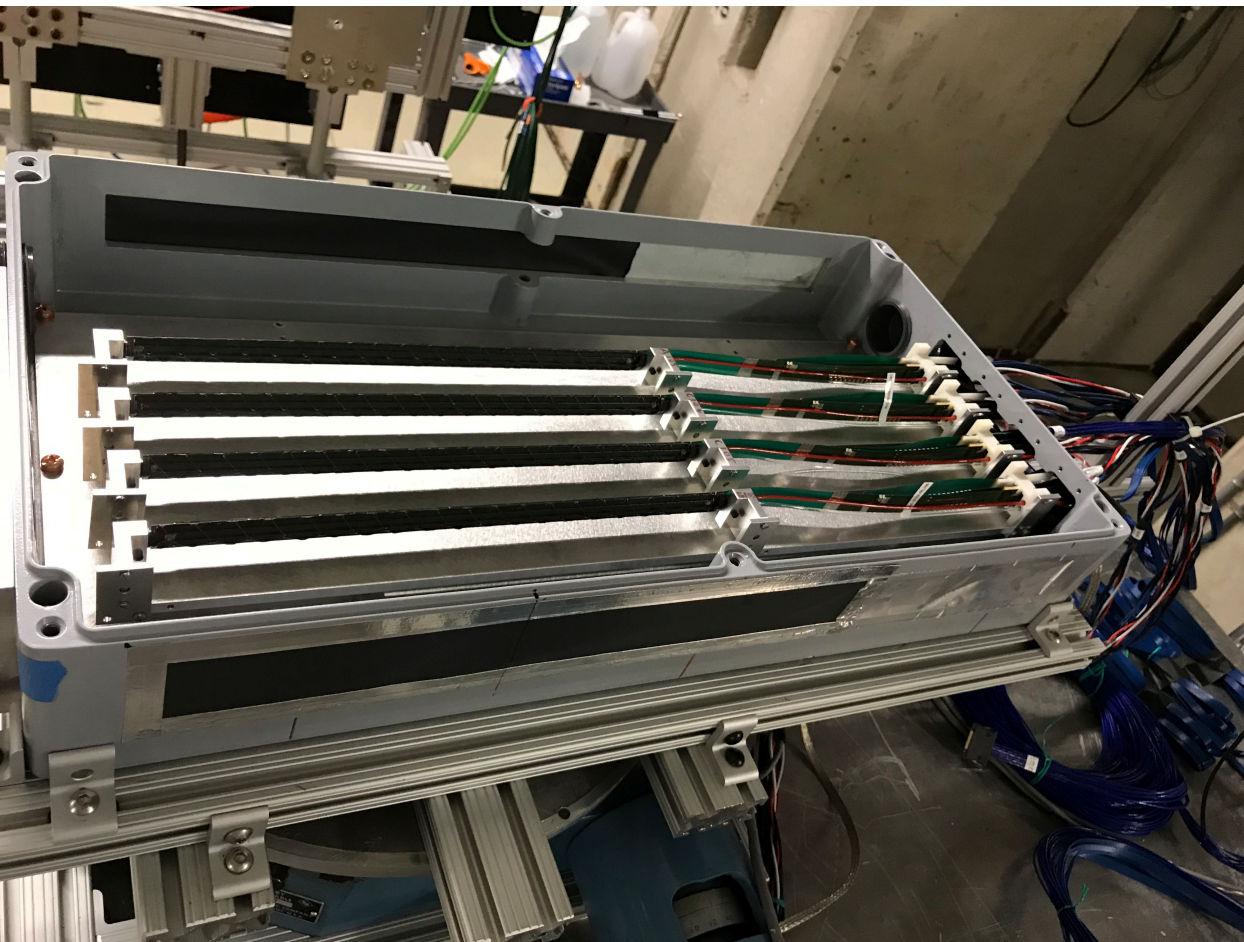
Arrival at Fermilab



Installation



Staves, RUs, PU etc.





4-stave
Telescope

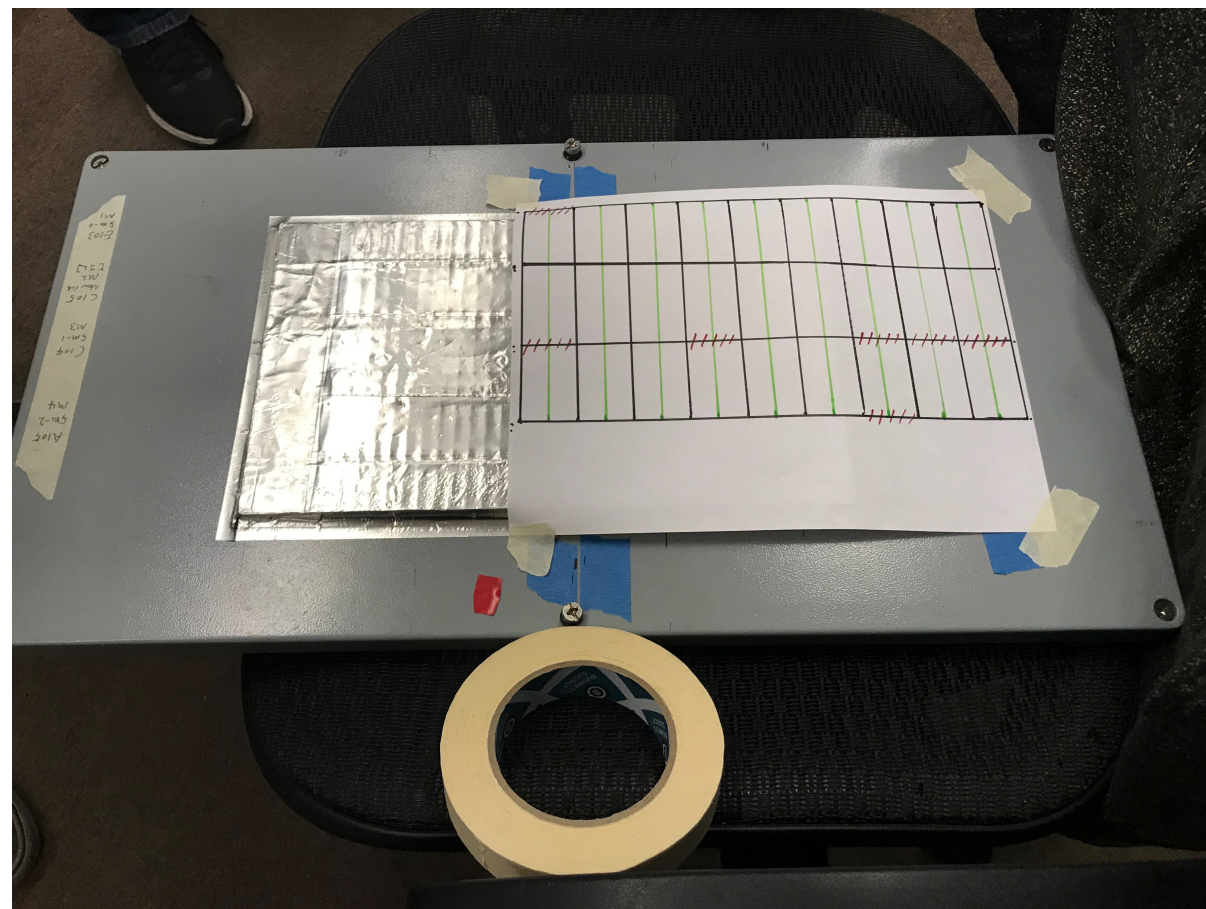
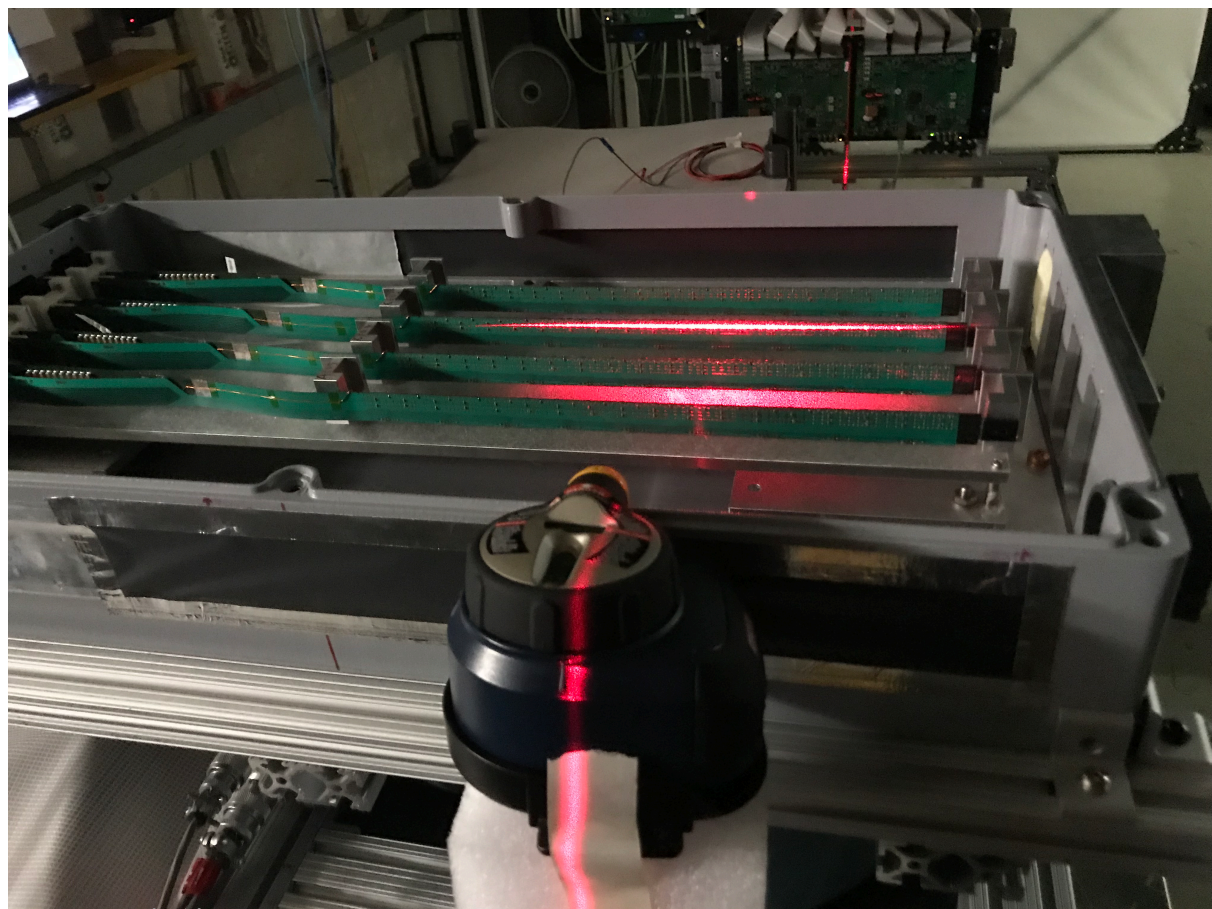
120GeV p-beam

2 RUs,
PU,
PS

Motion Table
(X,Y,Phi)

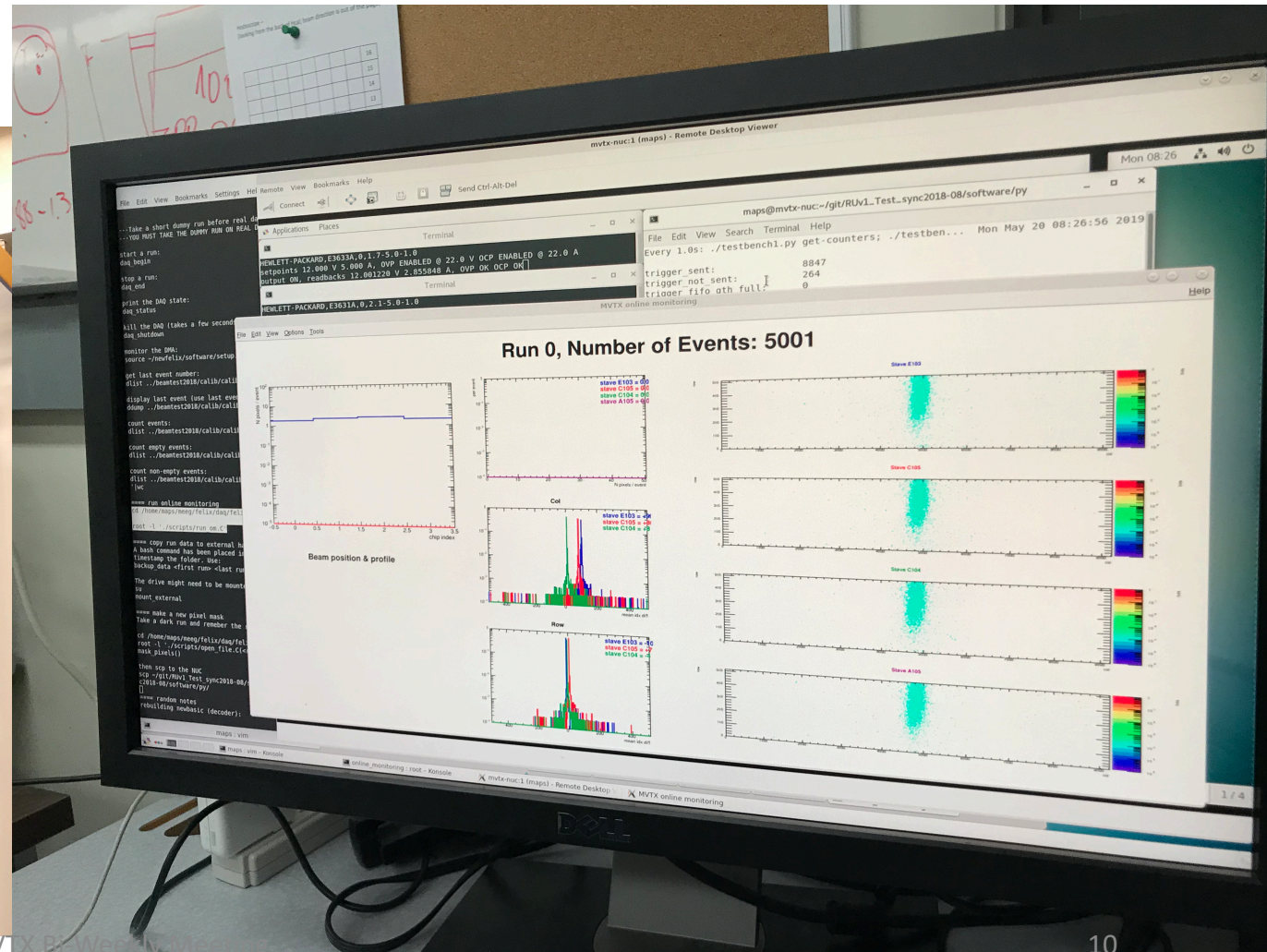
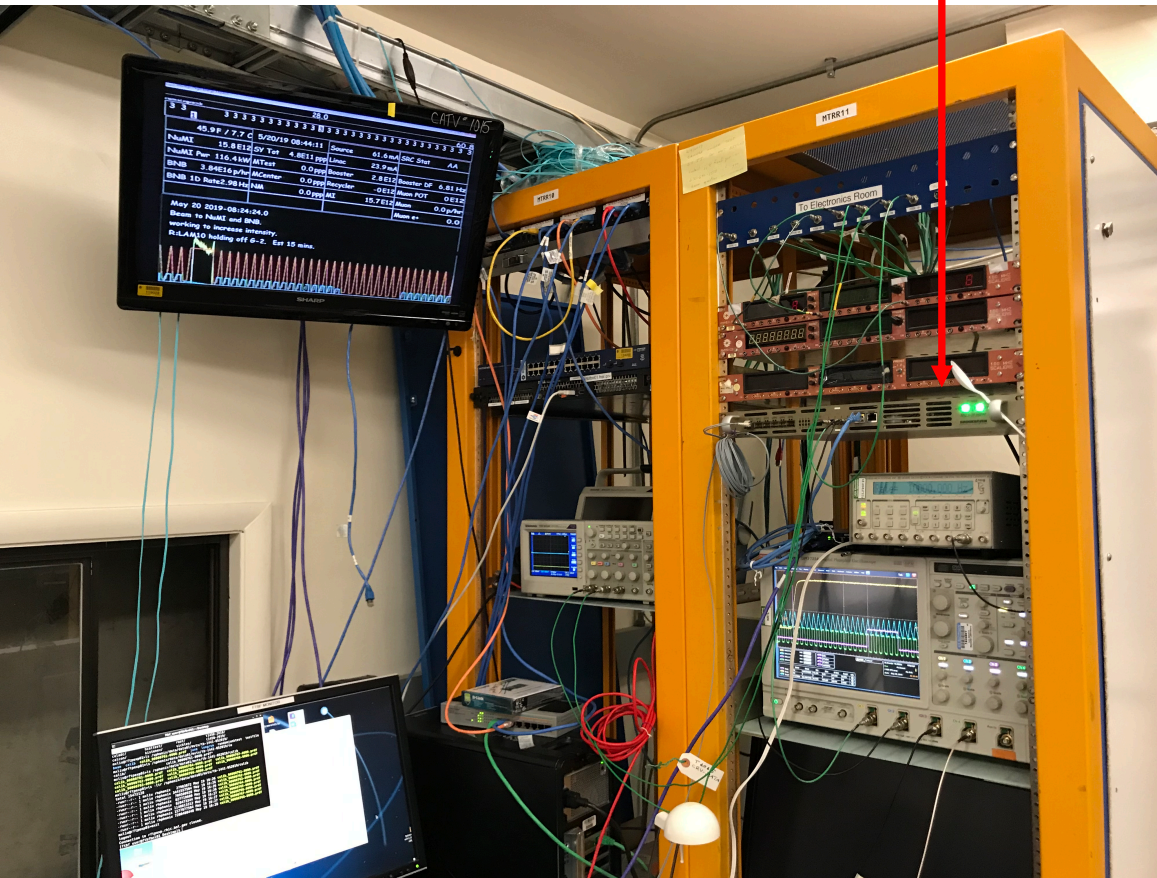
Negative
Pressure Cooling
System

Preparing the system for the beam: 5/19/2019

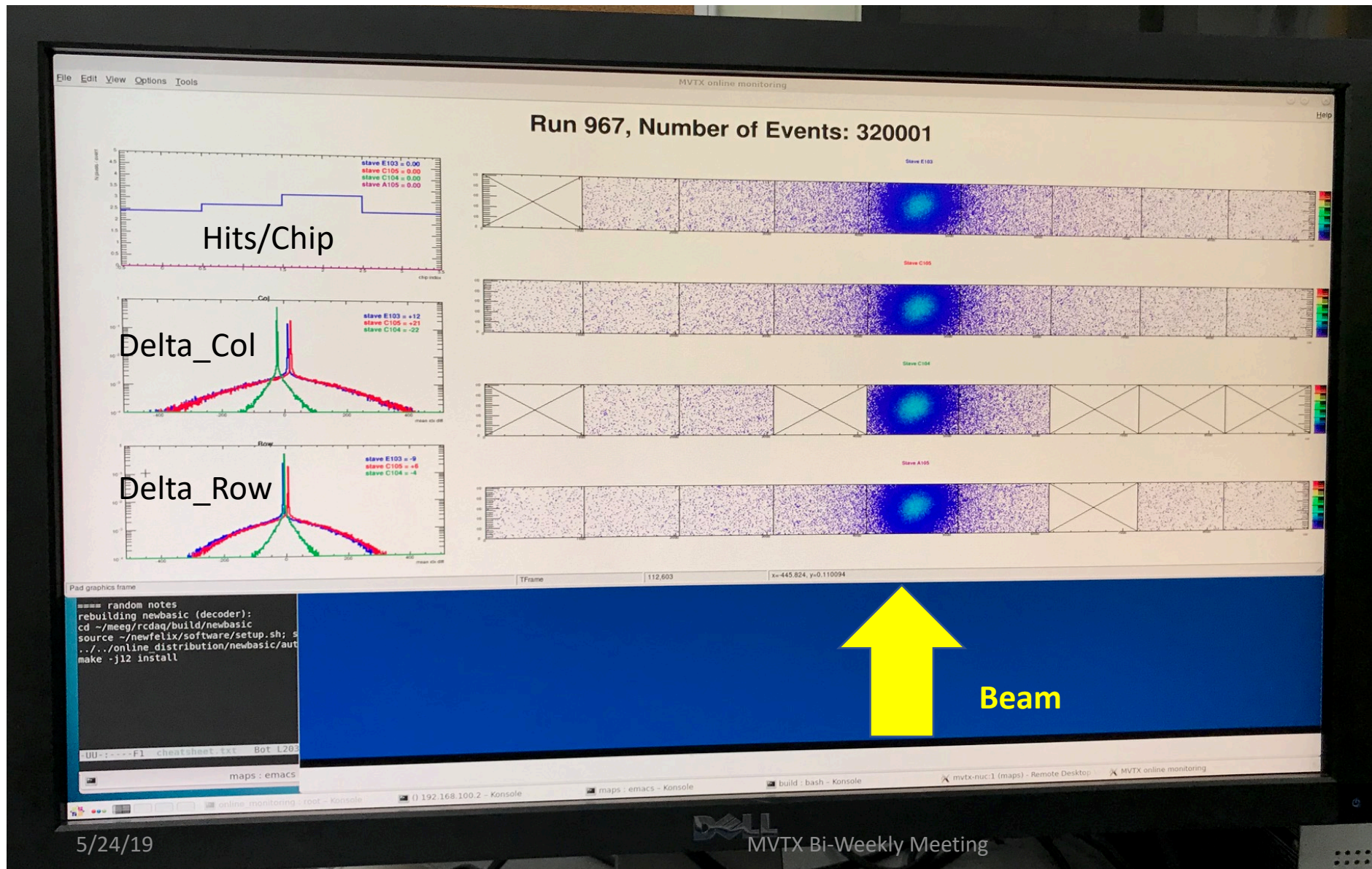


First Collision Signals

sPHENIX GTM

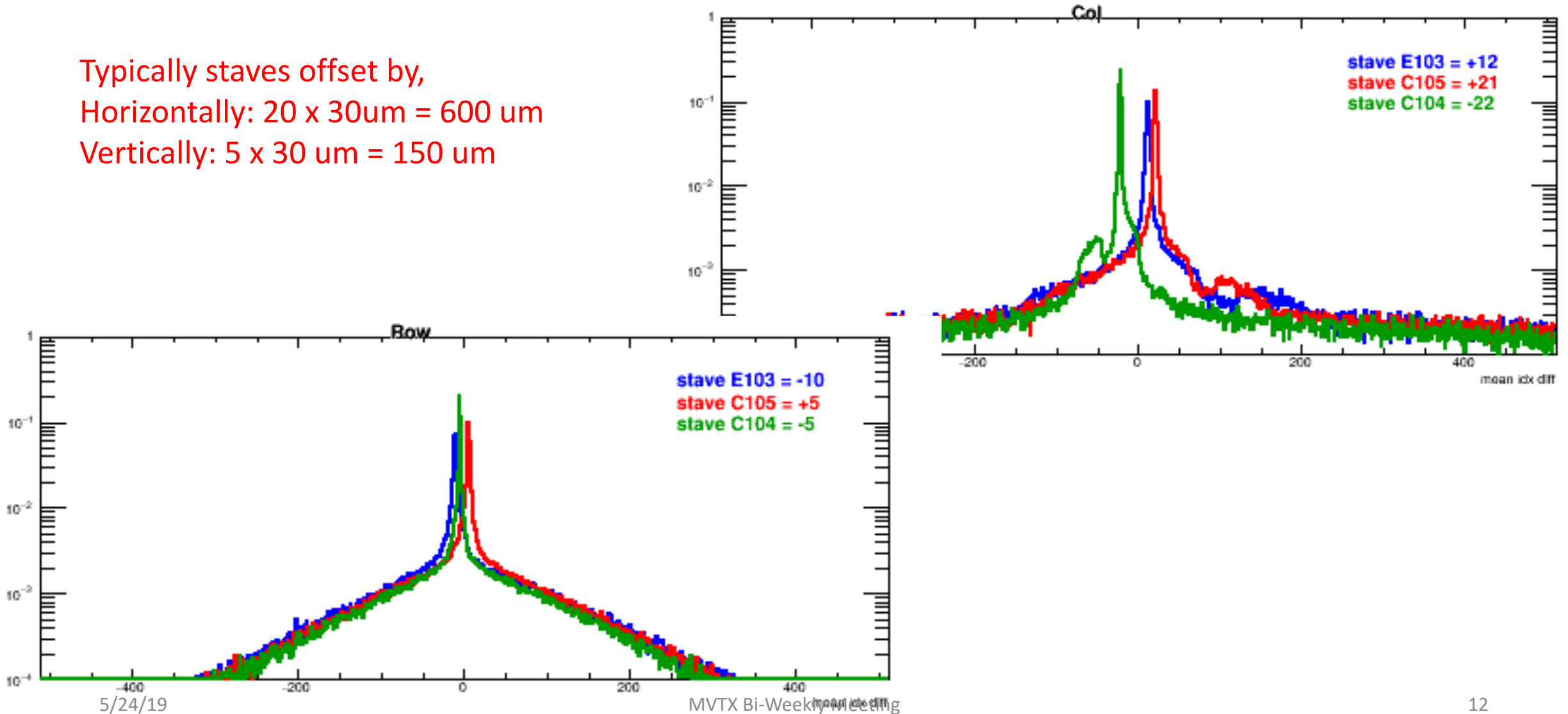


Online Display: 120 GeV protons

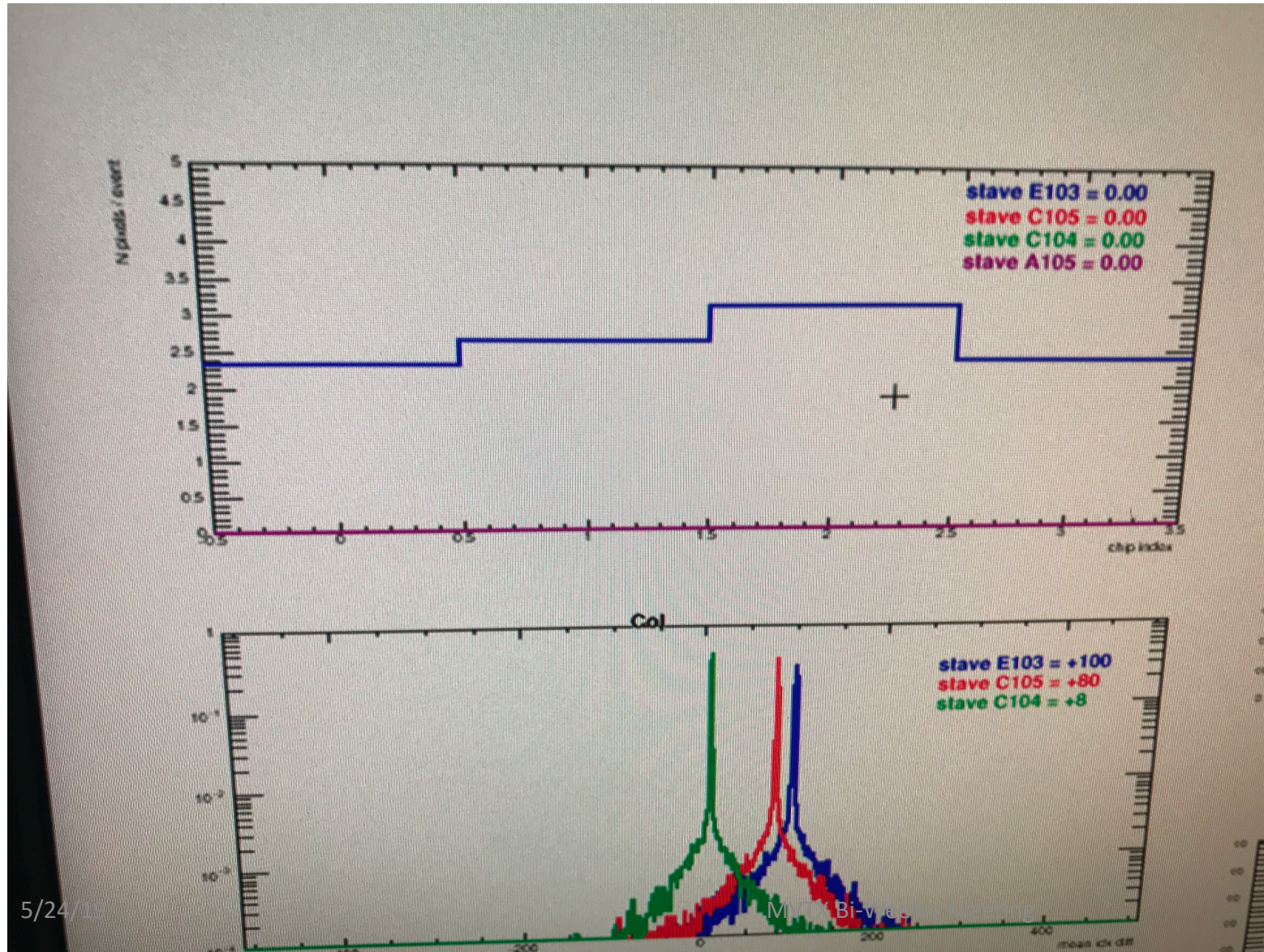


Detector Misalignment Measured (from p + Pb 8" brick data)

Typically staves offset by,
Horizontally: $20 \times 30 \mu\text{m} = 600 \mu\text{m}$
Vertically: $5 \times 30 \mu\text{m} = 150 \mu\text{m}$



“Eyeball Tracking”

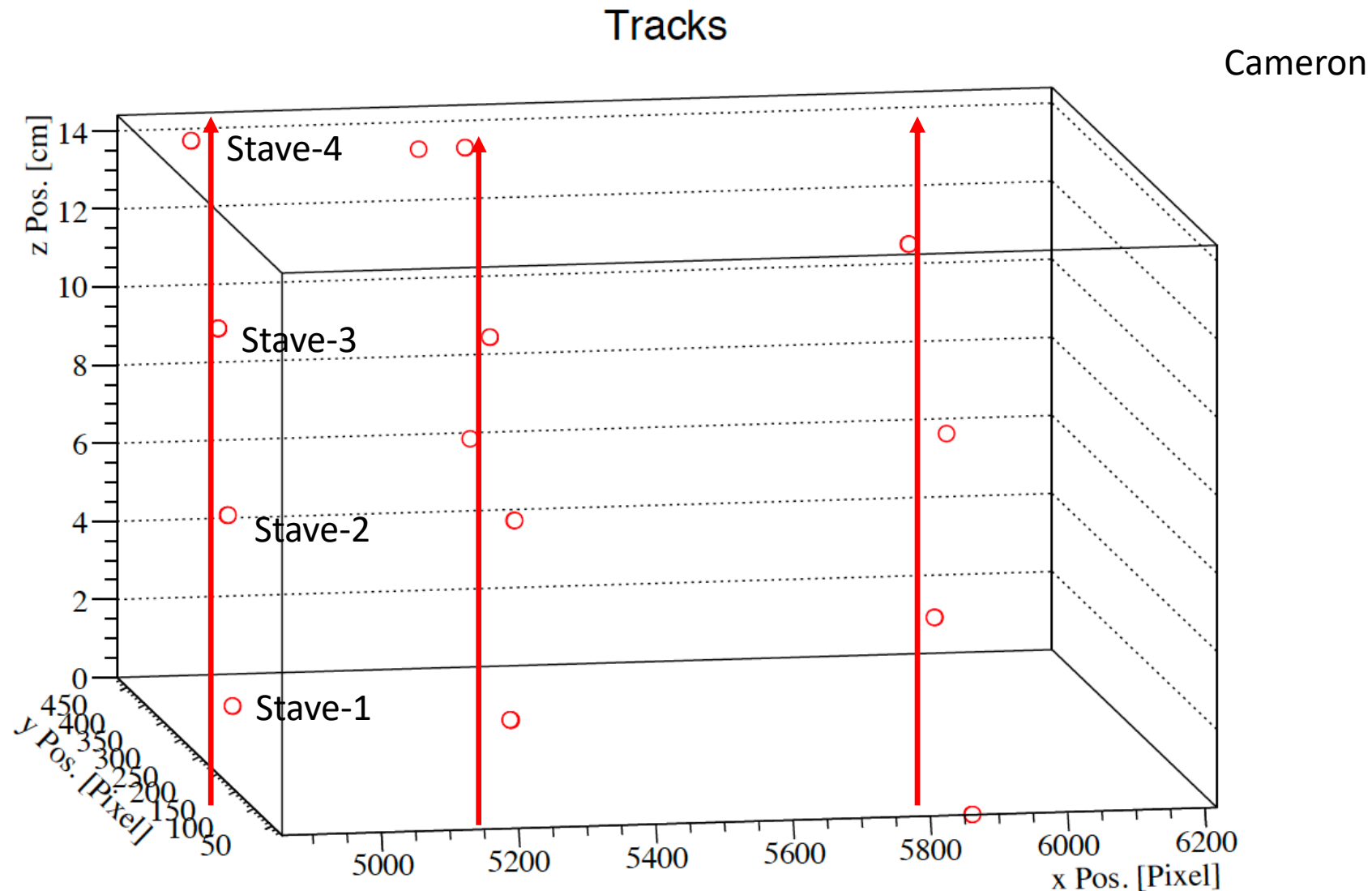


AVG pixel hits / stave: 2~3

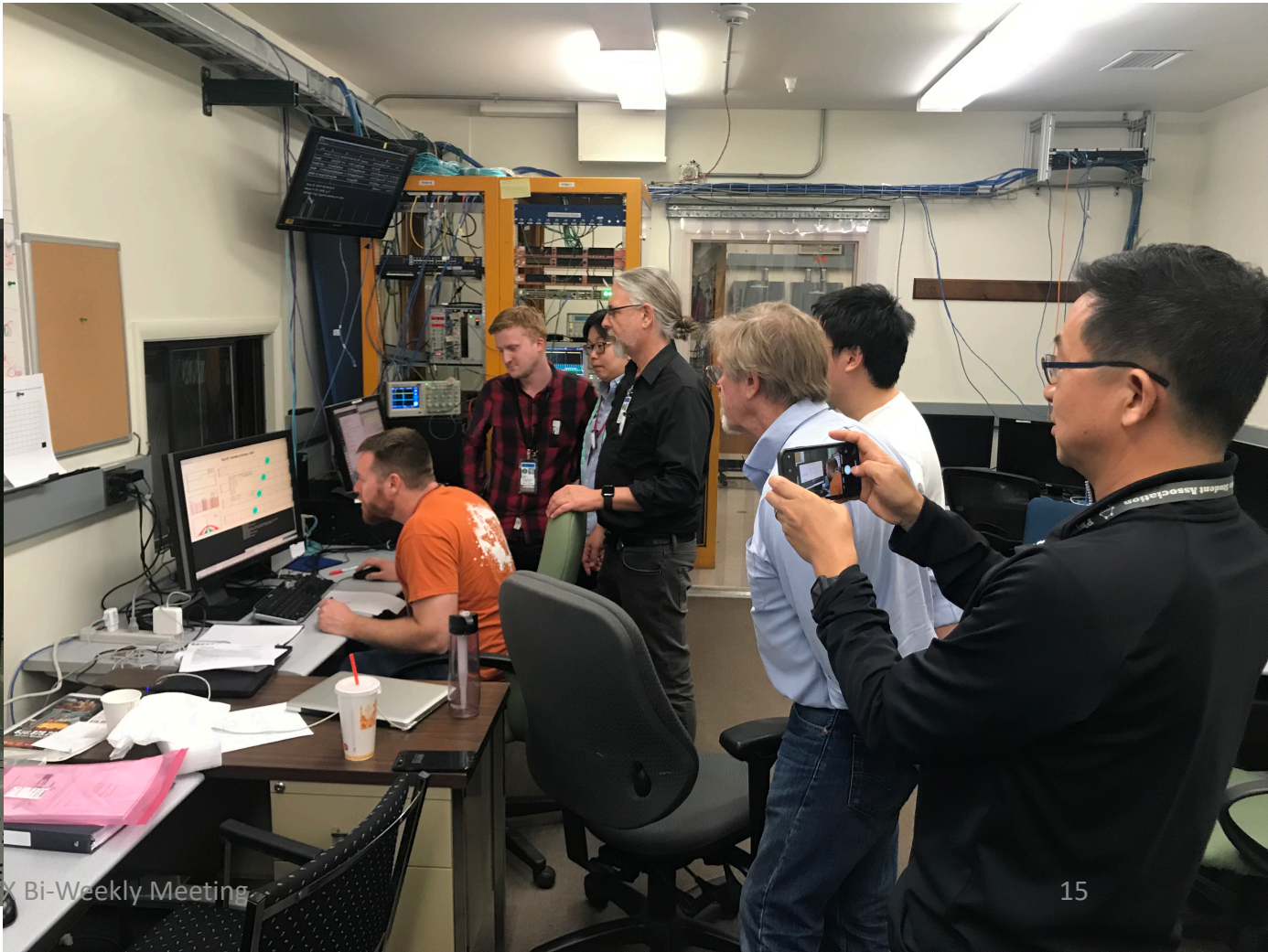
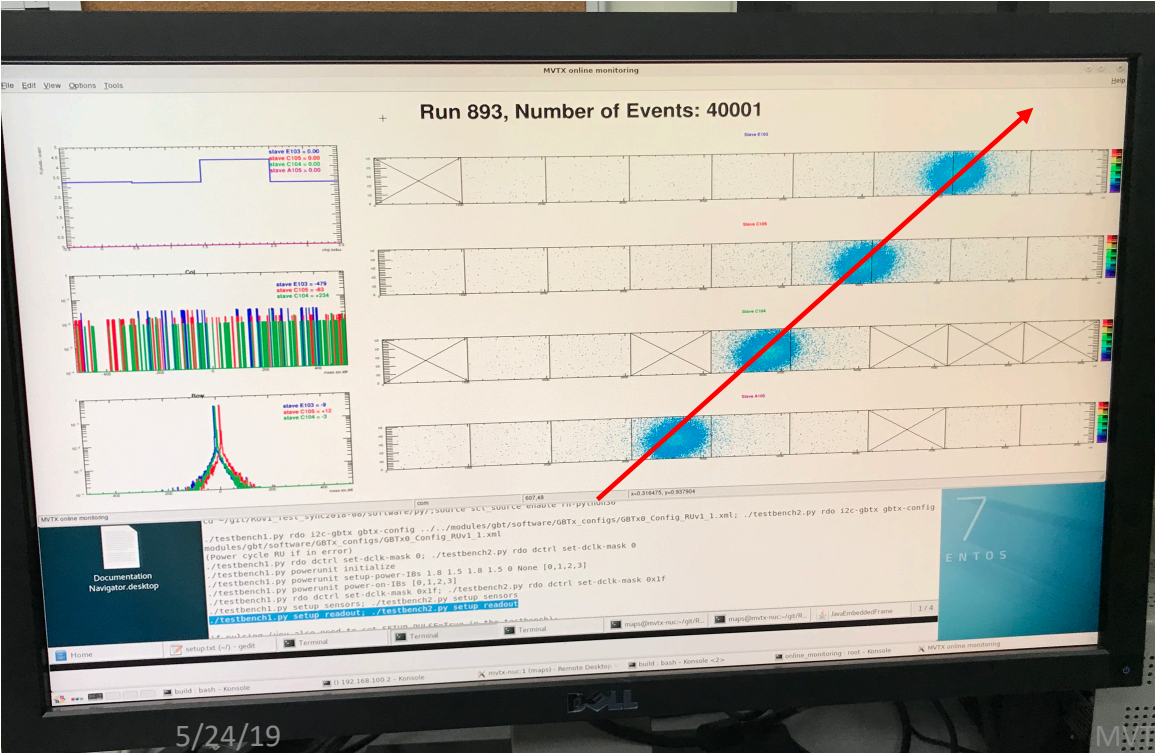
Delta_Col (0-X): X =1,2,3

Sigma_core = 0.55 pixel

3-D event Display: p+Pb collision



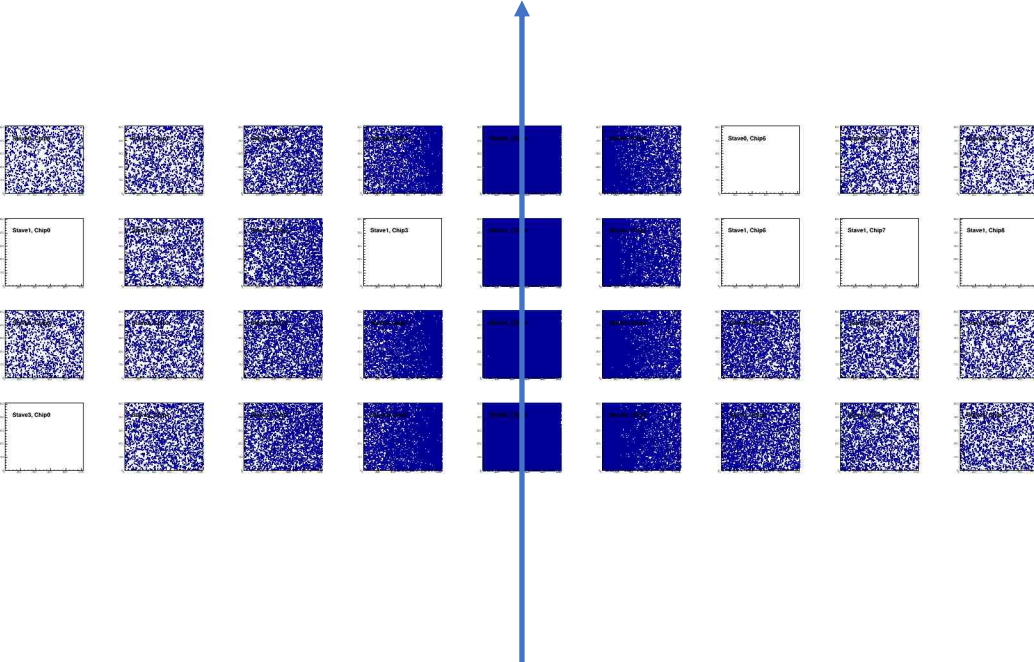
First Rotation – also Confirmed the Geometry



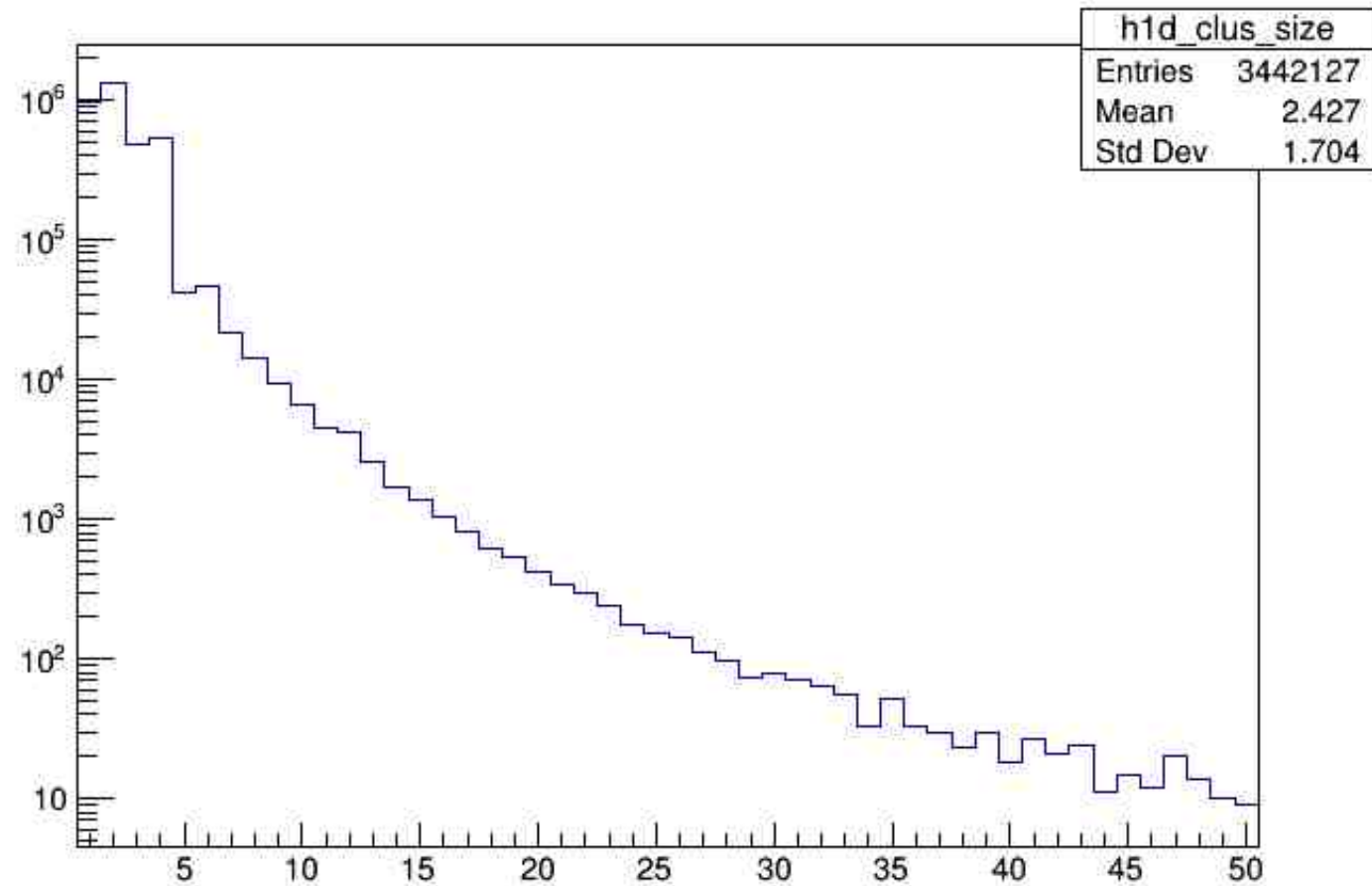
Offline Analysis: Cluster size vs Angle

Run 968, normal angle

Sanghoon

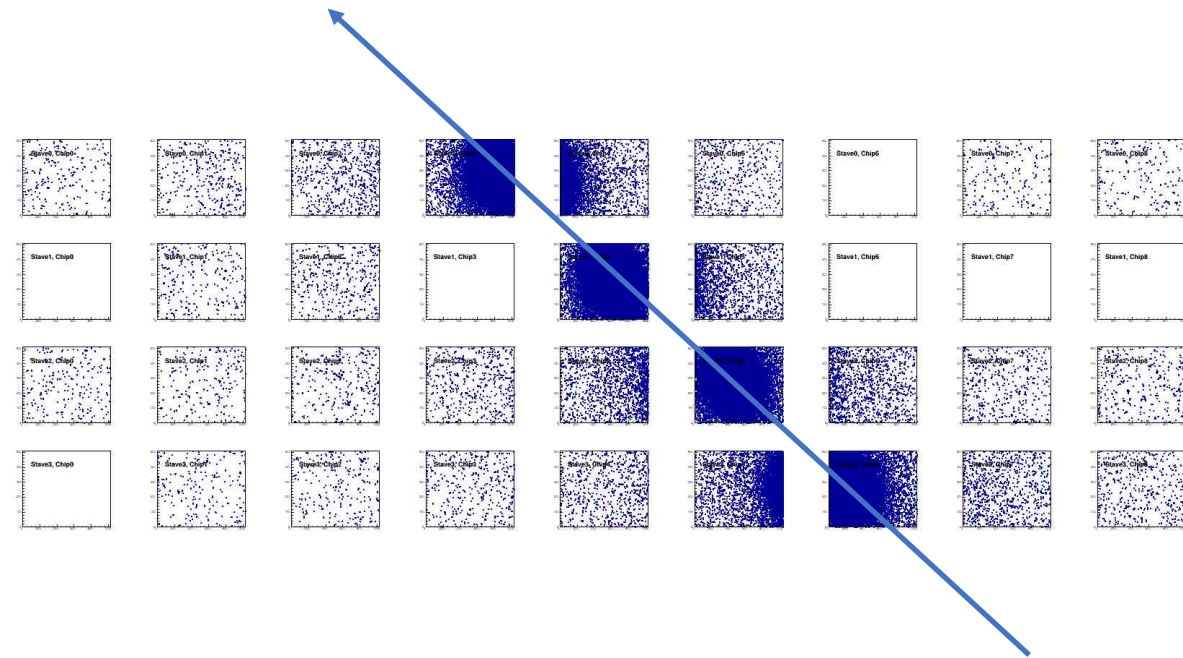


Cluster Size = 2.4

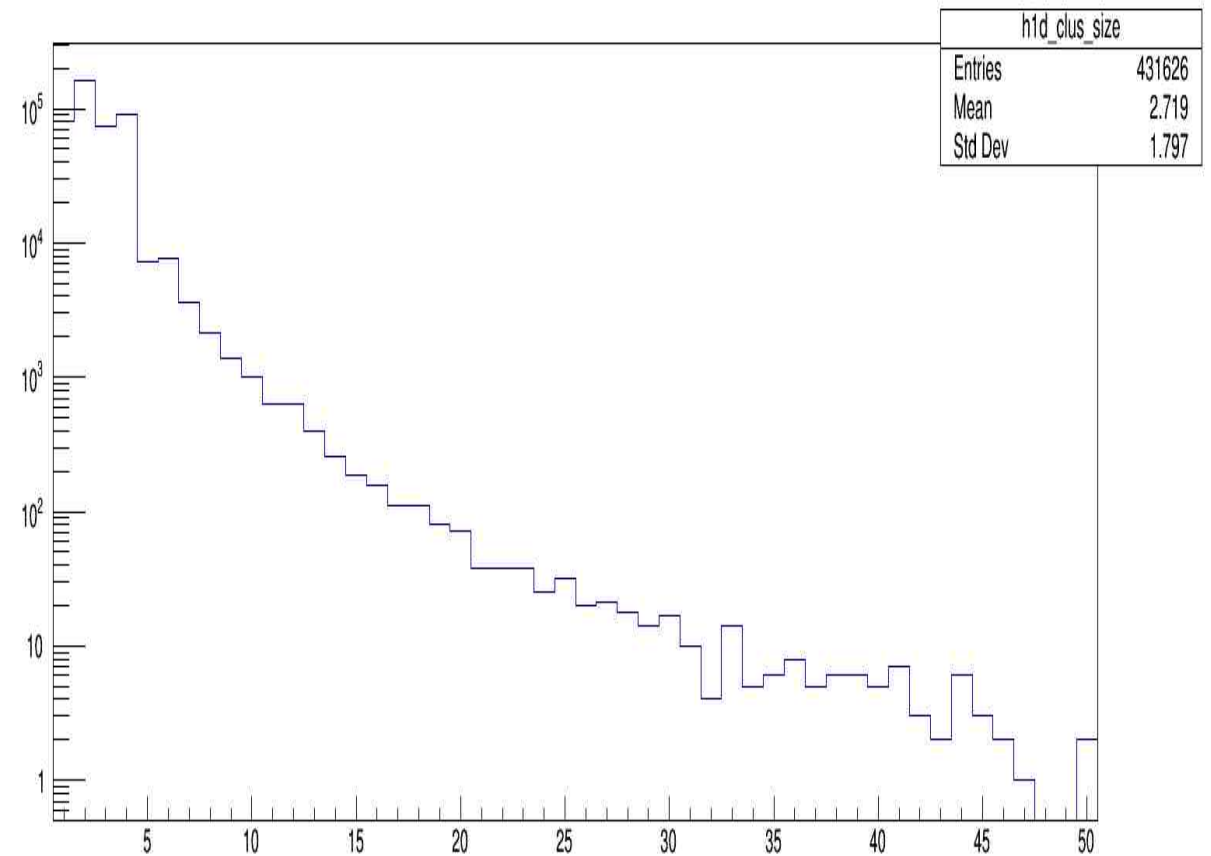


Offline Analysis: Cluster size vs Angle

Run 877, angle – 30 dgr

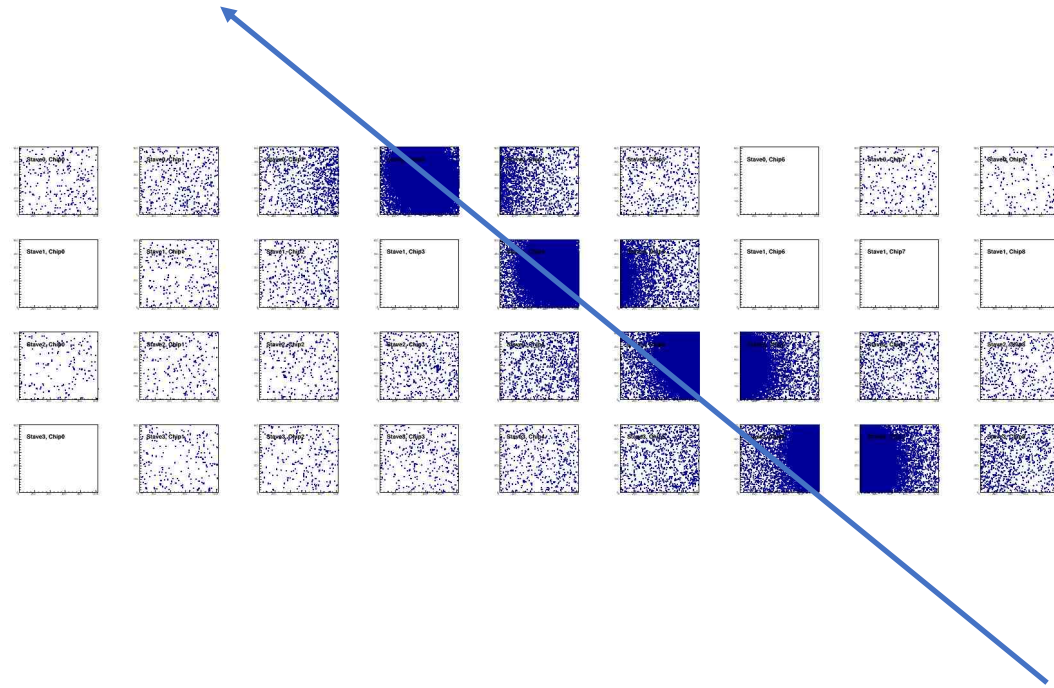


Cluster Size = 2.7

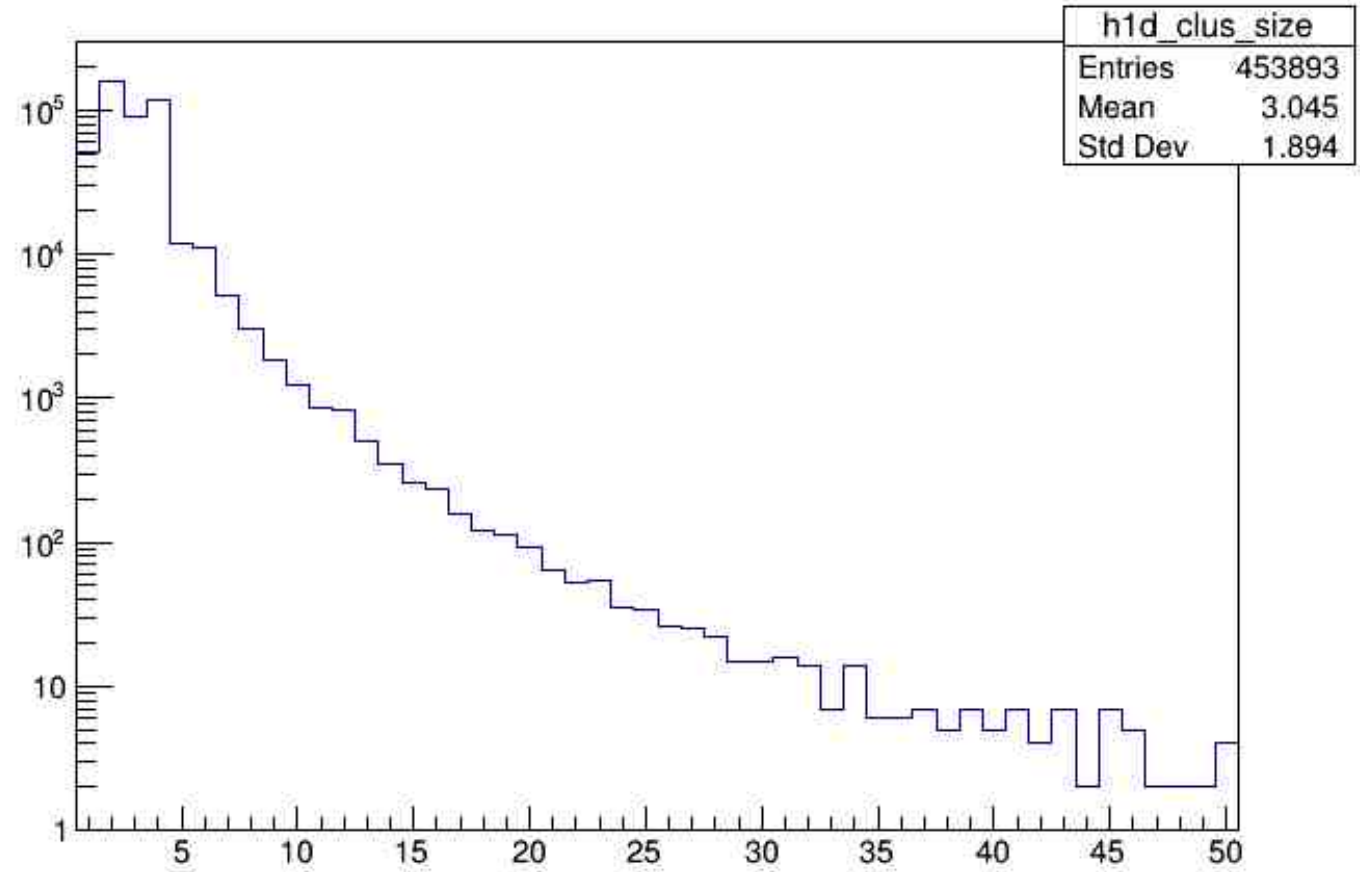


Offline Analysis: Cluster size vs Angle

Run , angle = 40



Cluster Size = 3.0

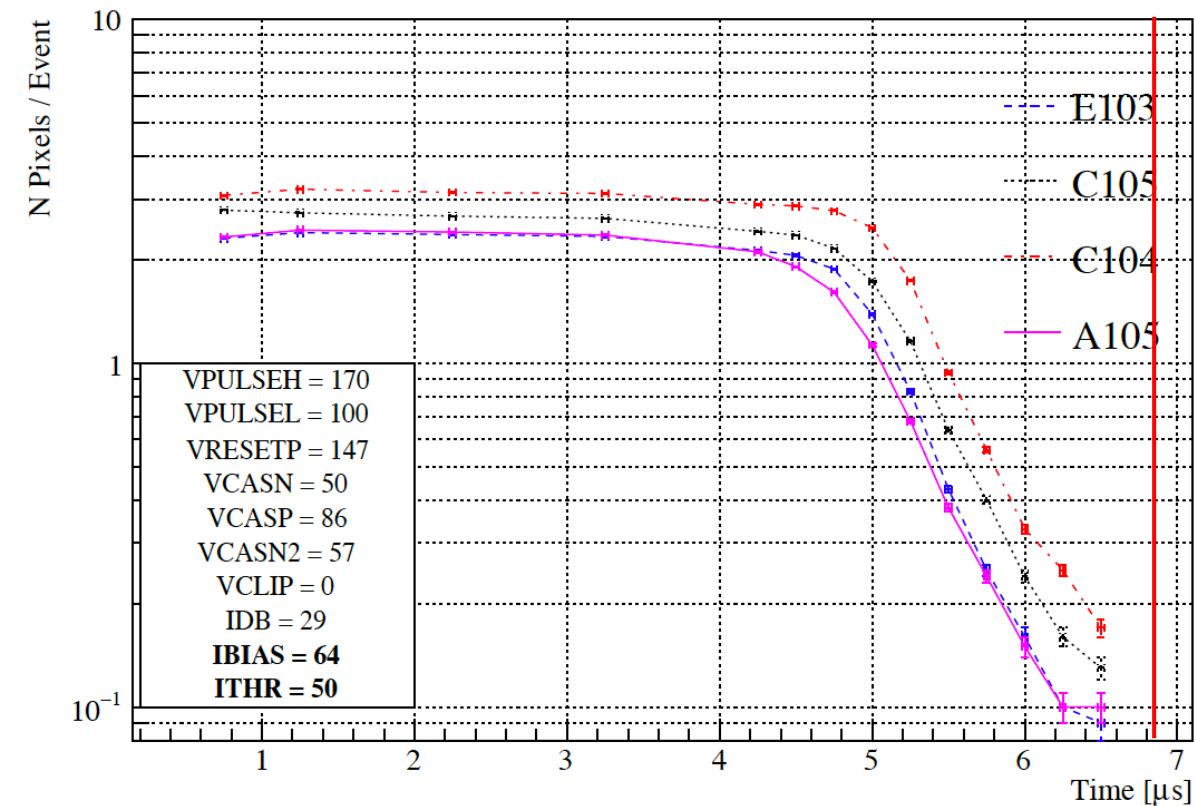


ALPIDE Sensor Study

Cameron, Gerd

“Default Settings”

Strobe Delay



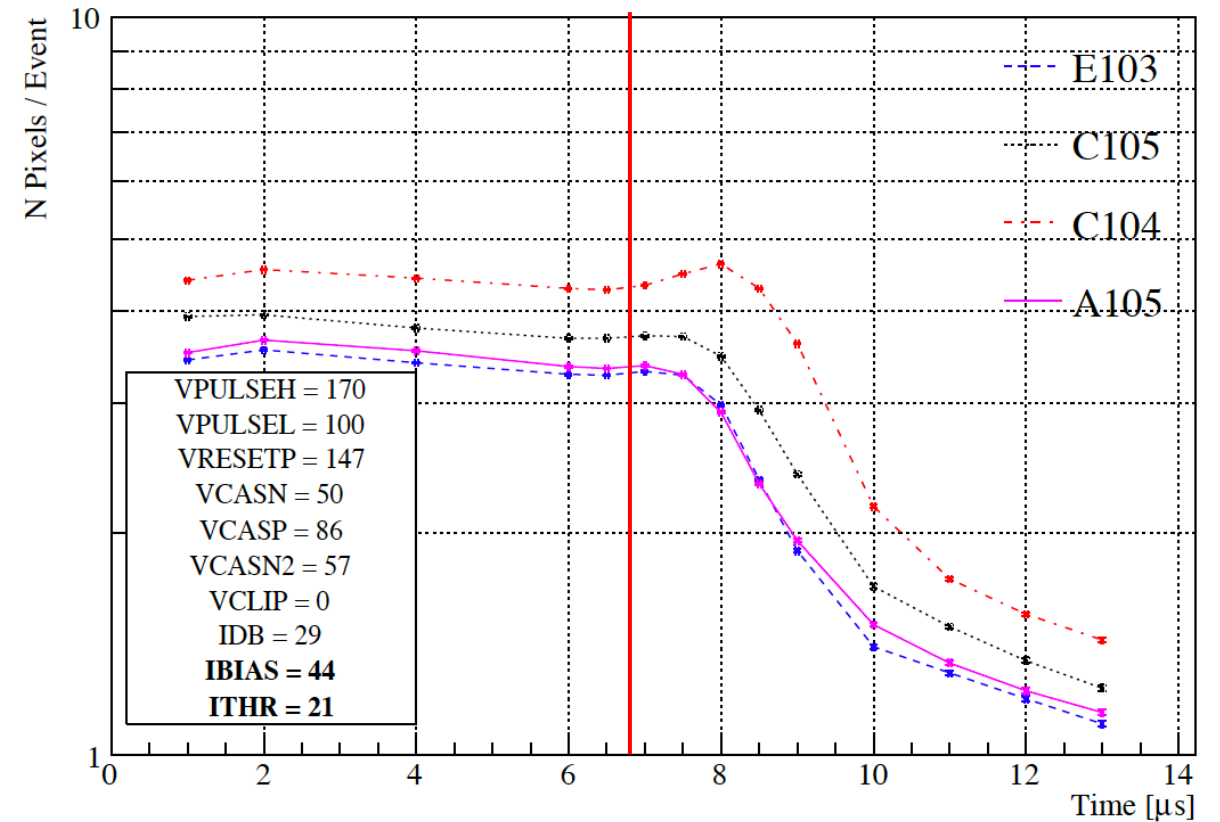
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“Stretched Settings” for sPHENIX trigger

64 cells x 106nS = 6.8uS

Strobe Delay

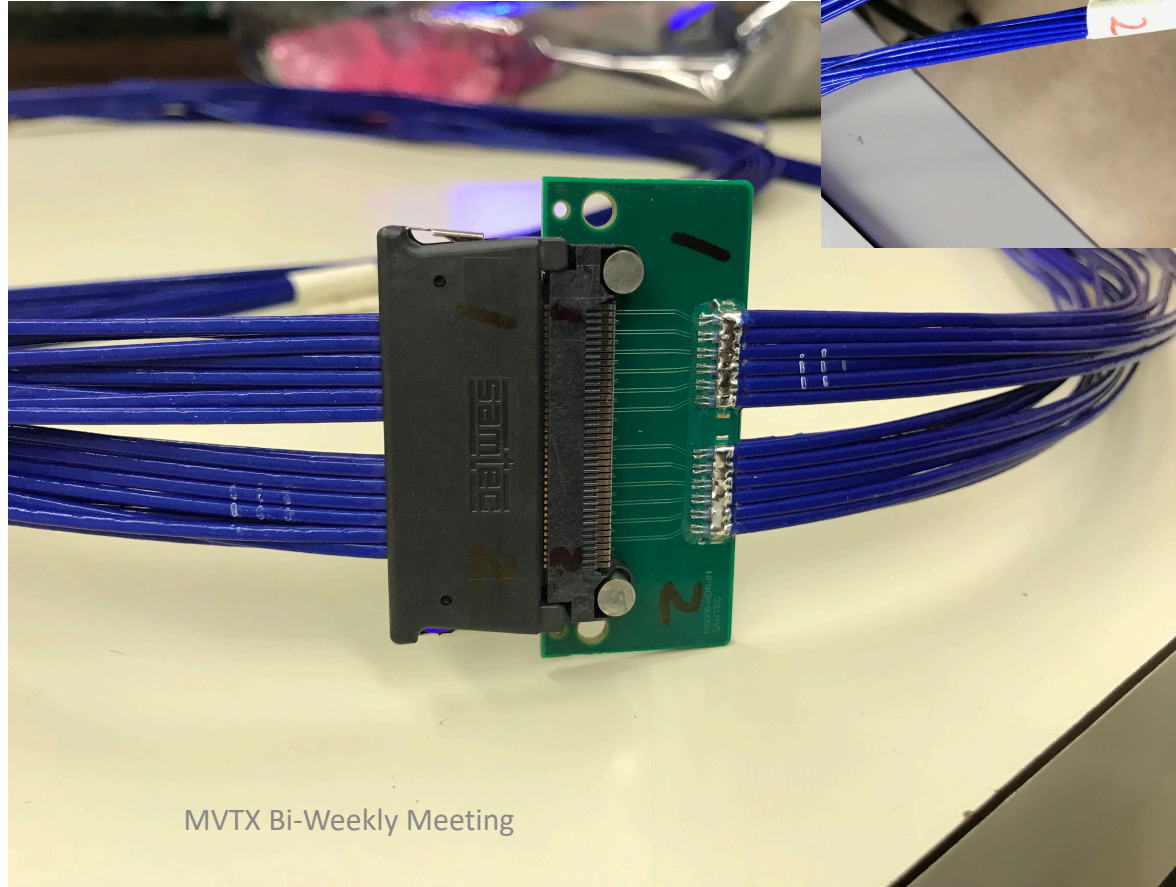


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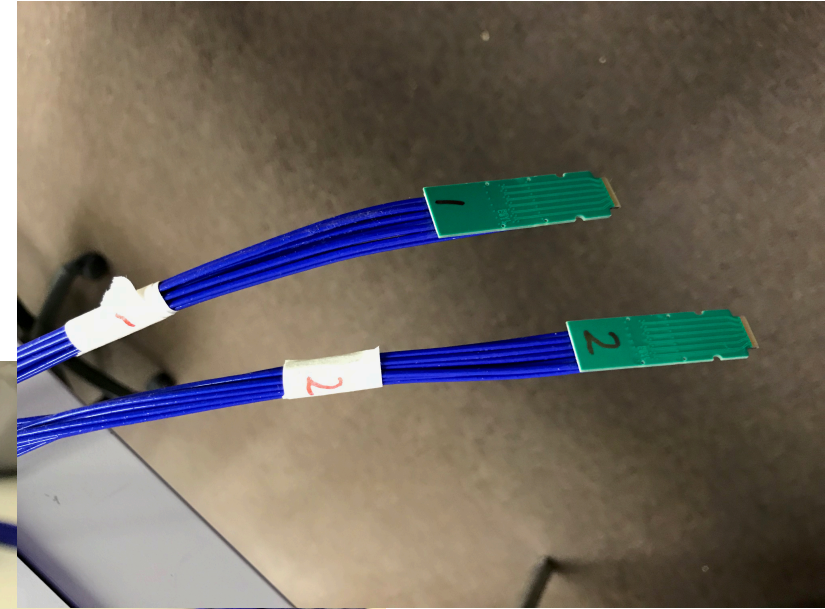
New Long SamTec Cable: $8.8\text{m} + 2.6\text{m} = 11.4\text{m}$
(10m desired; ALICE 8m cables)



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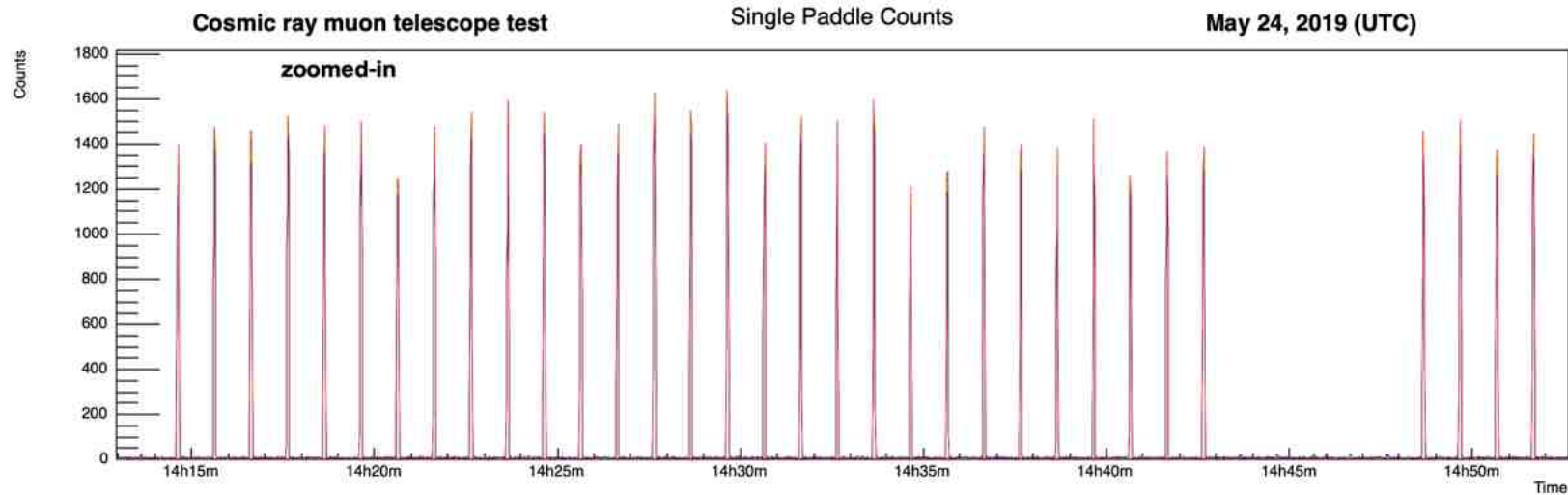


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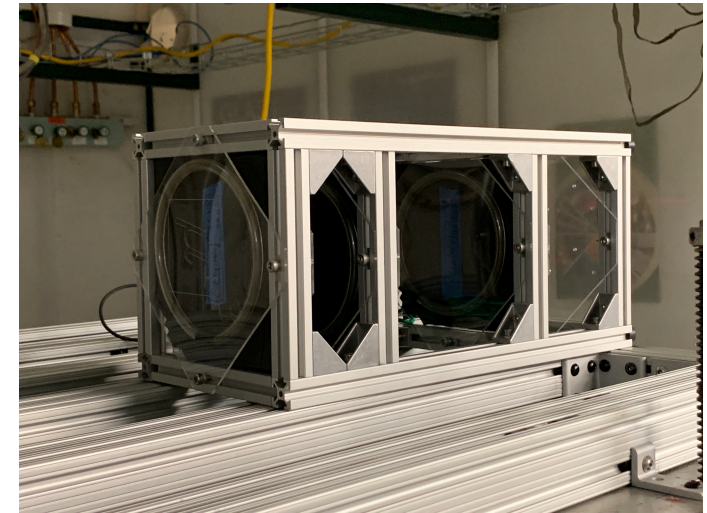
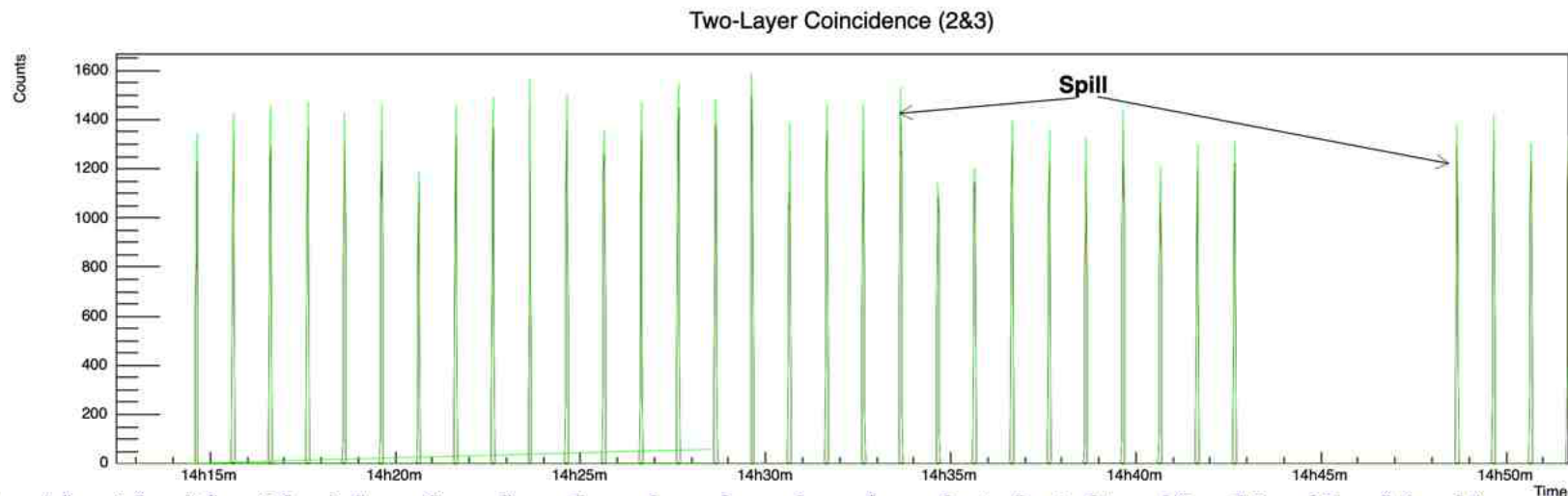


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Beam Structure: 4 sec beam every minute



Spill structure seen by the
GSU “cosmic detector”

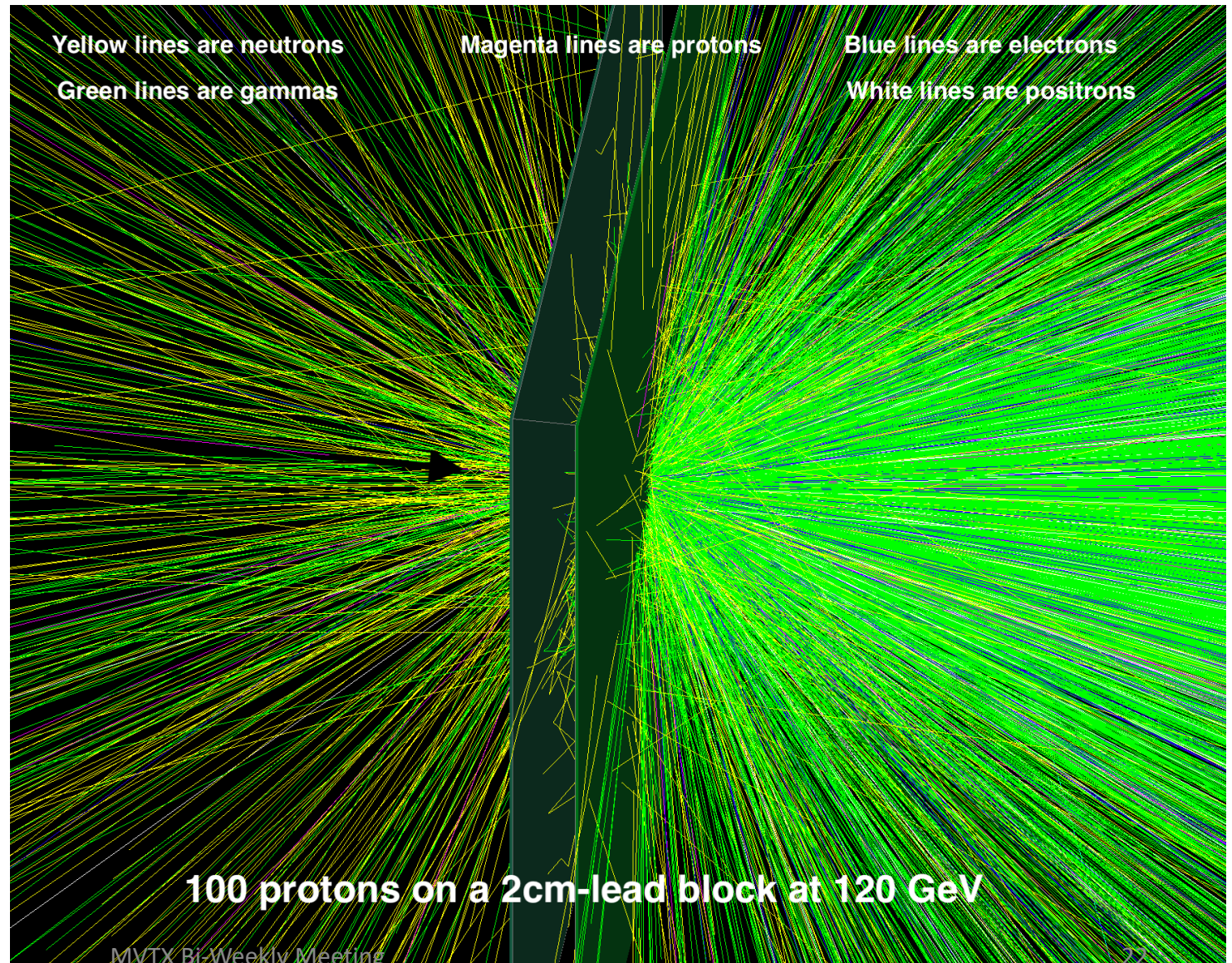


120GeV p + Pb simulation: 100 events

xiaochun

Simulation: 2cm Pb

MVTX TB setup: **20** cm Pb



16	
15	
12	
11	
10	



High Intensity Runs: stretch test

- 10kHz
 - 50K pps, 4 sec
- 25kHz
- 50kHz
- 100kHz: a few errors, 10^{-6} , a few drop events over 1M triggers
 - (400K pps, 4 sec)
- 250kHz: some errors, 10^{-3}
- 300kHz (1.2M pps) reached the TB limit
 - 1.2M pps, 4sec
- New setting (Strobe Frame = 100nS) for 300kHz
 - Error rate: a few 10^{-3}

Triggered mode:

TTL Trigger: 100nS

Strobe frame: $80 \times 25\text{nS} = 2 \text{ uS}$

sPHENIX: $\leq 15\text{kHz}$

Outlook – offline analysis

Wiki page:

https://wiki.bnl.gov/sPHENIX/index.php/Test_beam_in_2019_at_FNAL

- Detector alignment
- Tracking
- High multiplicity events, p+Pb
-

The Team



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