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# Penn Light Barrier: Black Sheet



Two layers, black plastic and black cloth, wrapped and tucked around the detector

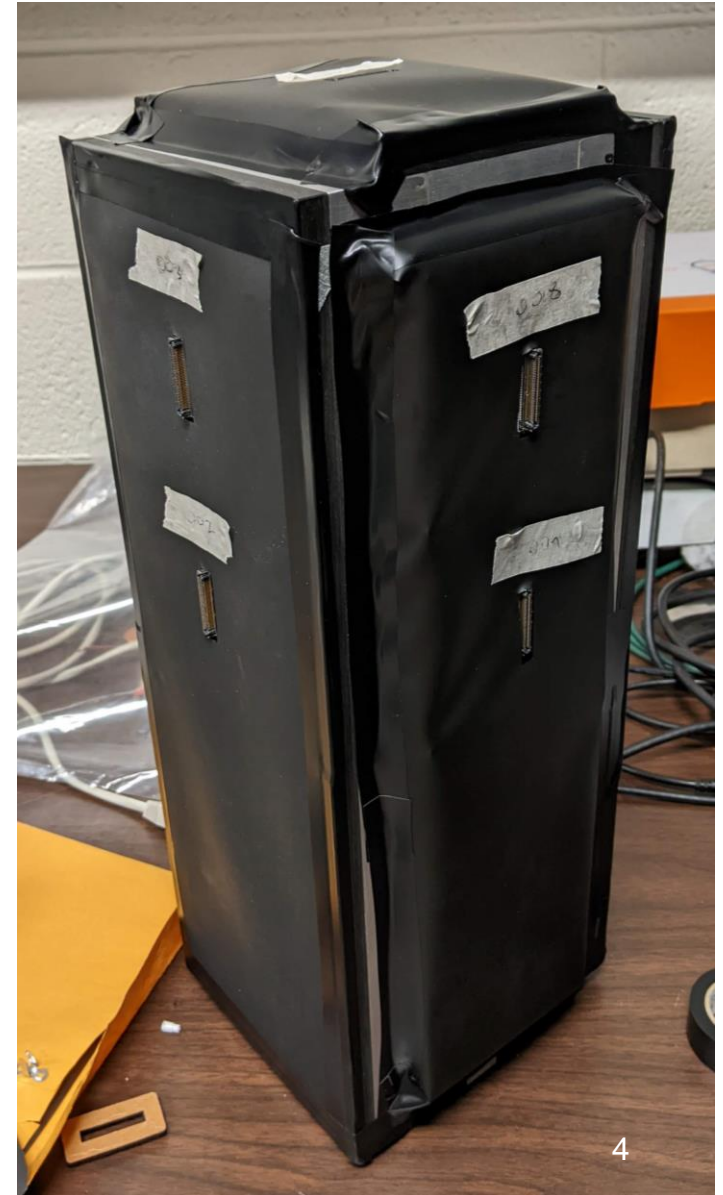
# Applying the Light Barrier

- Initially tried to attach the polyester to the detector using black RTV
  - Takes a long time to bond, very messy



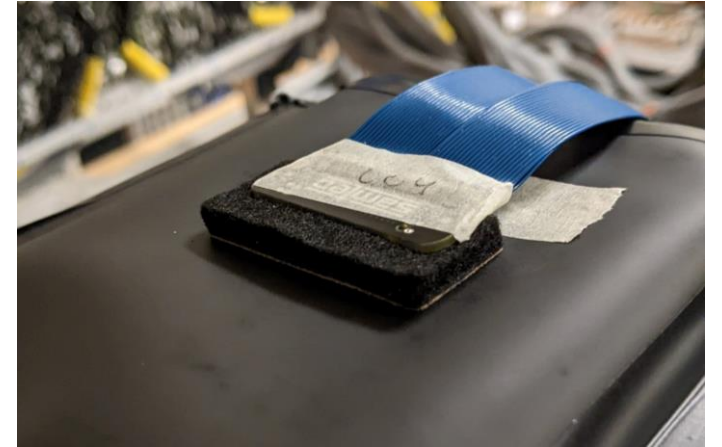
# Applying the Light Barrier

- Gave up on RTV, switched to electrical tape
- Pros:
  - Much easier to apply and change as necessary
  - Tape can cover any remaining exposed area
- Cons:
  - Might not have sufficient bond strength for the long-term
    - May need to use both electrical tape (for easy mounting) and RTV (for a long-lasting bond) for the finalized light barrier
  - Had some problems with the light barrier not lying flat → need more edge material for mounting



# Applying the Light Barrier

- Felt rings did not appear to affect detector performance (no new dead/hot channels, no difference in dark rate observed)
- Some difficulty when plugging in Samtec cables
  - No compression issues, but difficult to align cable with PCB connector (blind plug)
- Did not use sticky-backing (wanted to be able to easily take them on and off)



# Test Overview

## 10 Test Configurations:

Run #	Room Lights	Polyester Sheet	Felt Rings	Penn Light Barrier
202 (206)	On (Off)	Off	Off	Off
211 (212)	On (Off)	On	Off	Off
215 (216)	On (Off)	On	Off	On
219 (220)	On (Off)	On	On	Off
221 (223)	On (Off)	Off	Off	On

No Light Barrier

Polyester Only

Polyester +  
Black Sheet












Polyester + Felt

Black Sheet Only

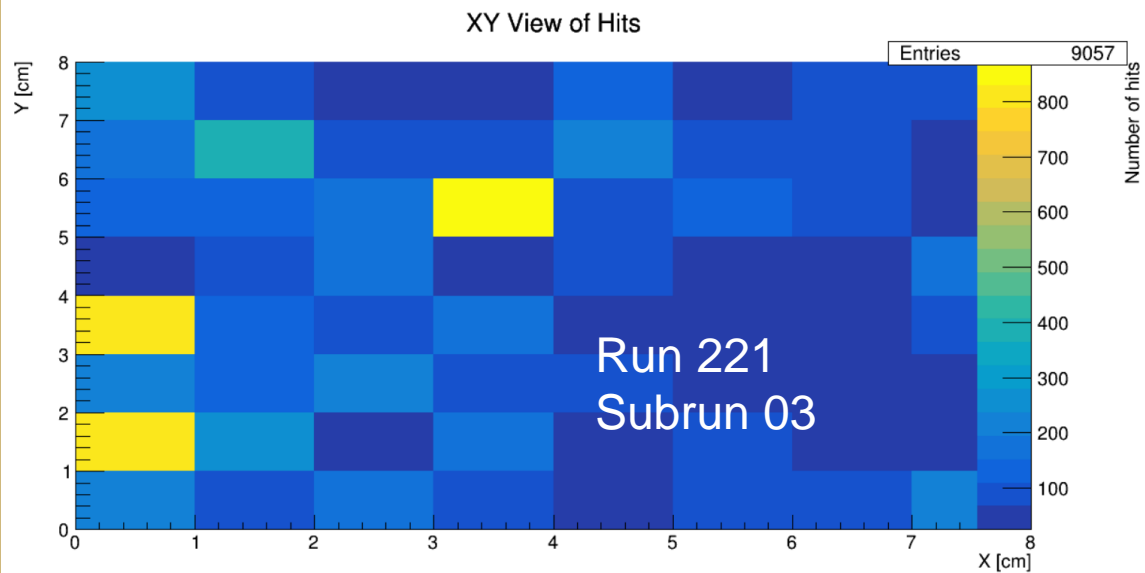
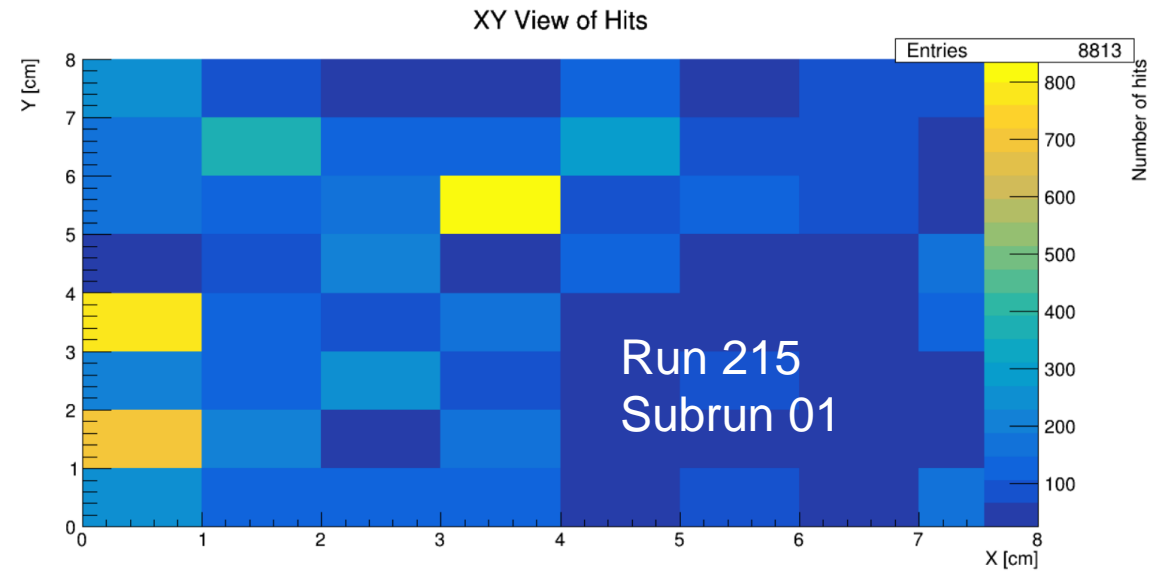
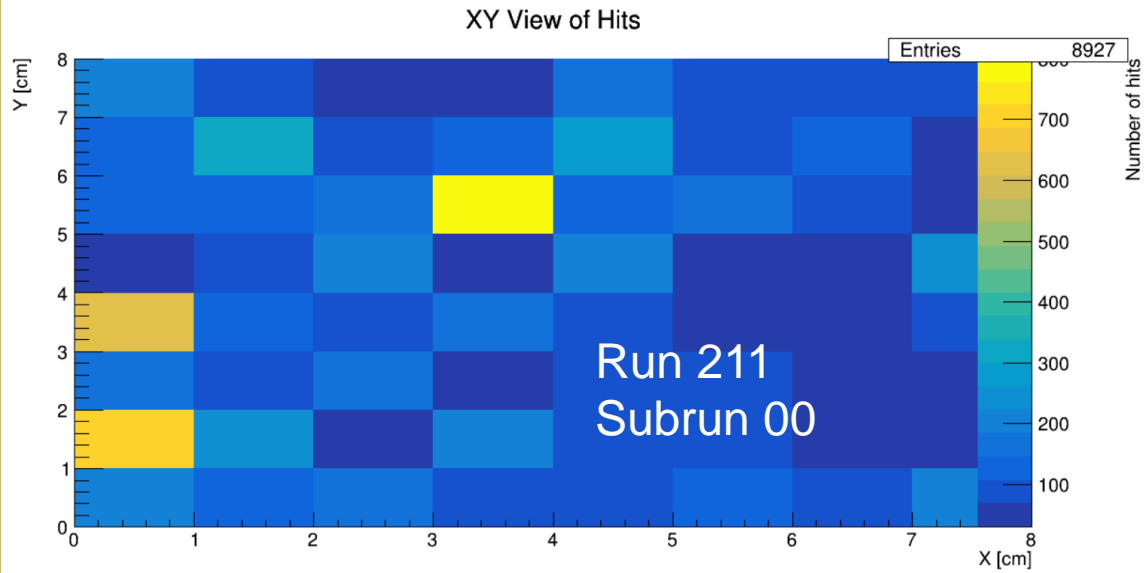
\*\* Room lights off ≠ completely dark in the room.  
Some light from computer monitors (needed to be on to  
check for data collection errors) and from readout crates \*\*

# Test Overview

- Every test configuration: 6 sub-runs, 1 minute each
  - Output is a DAQ file, must be unpacked into ROOT format
  - Raw ROOT output is calibrated based on detector gain values
  - Calibrated data can be reconstructed into XY, YZ, and XZ hit information in the detector
    - Main analysis is based on the hit counts seen for each light barrier configuration

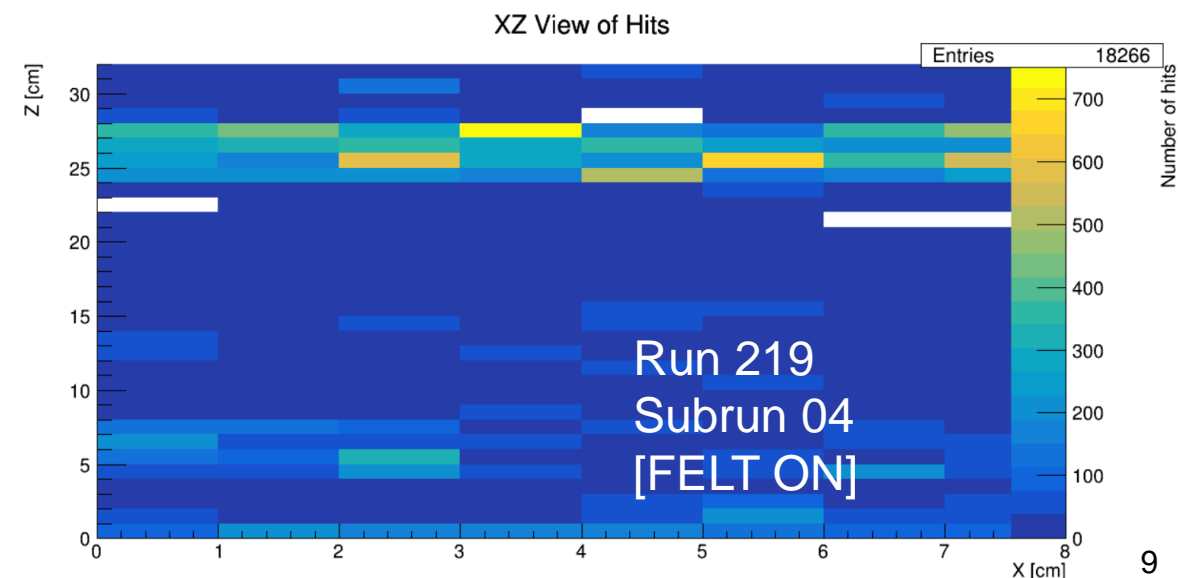
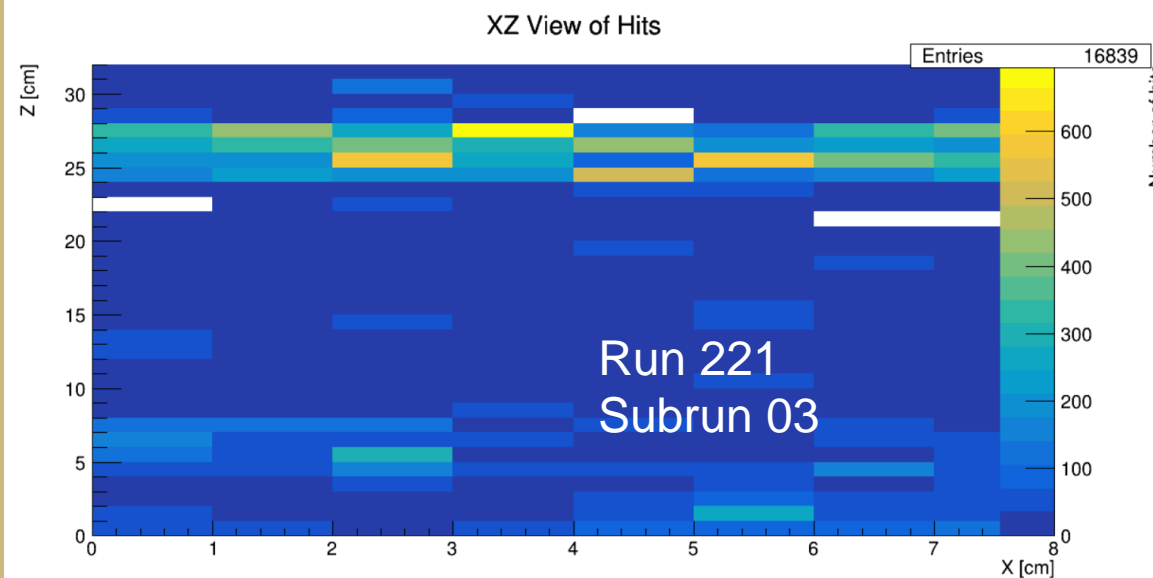
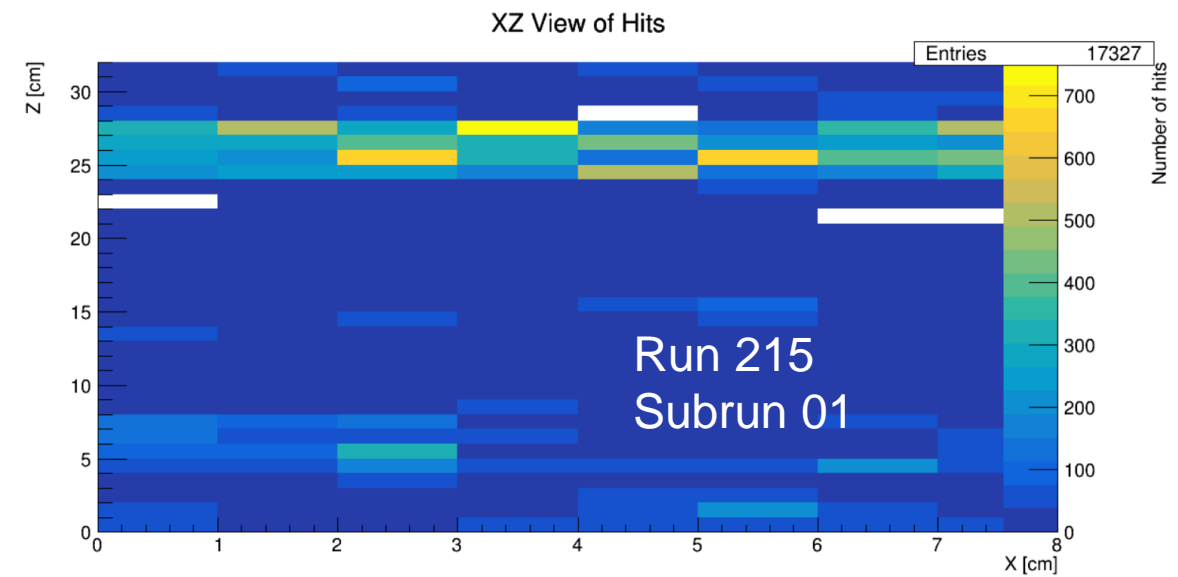
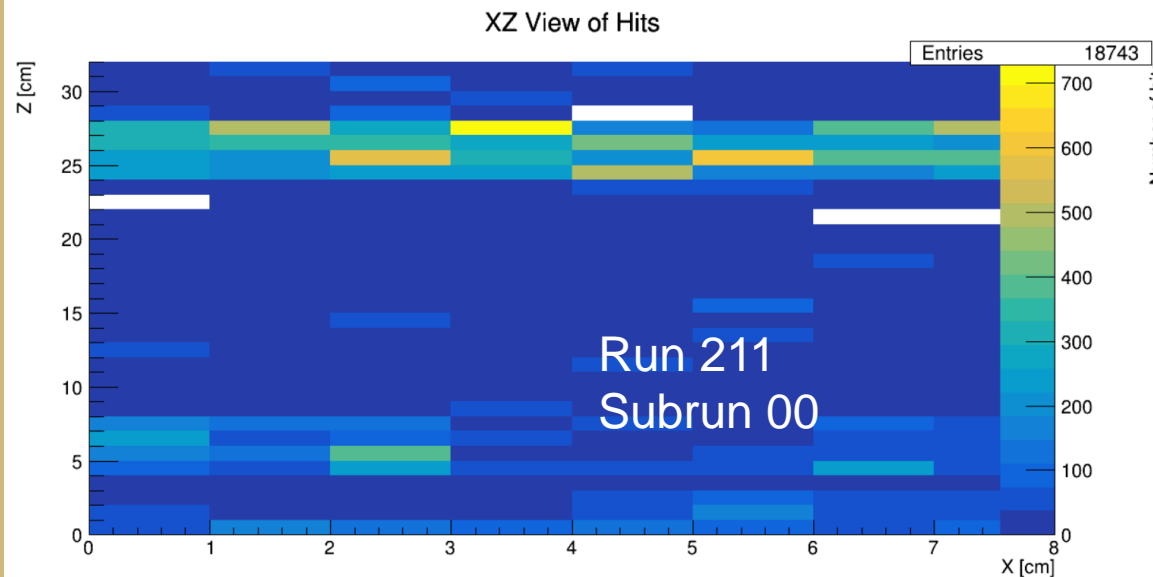
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# XY Hit View – Consistent Hot Channels

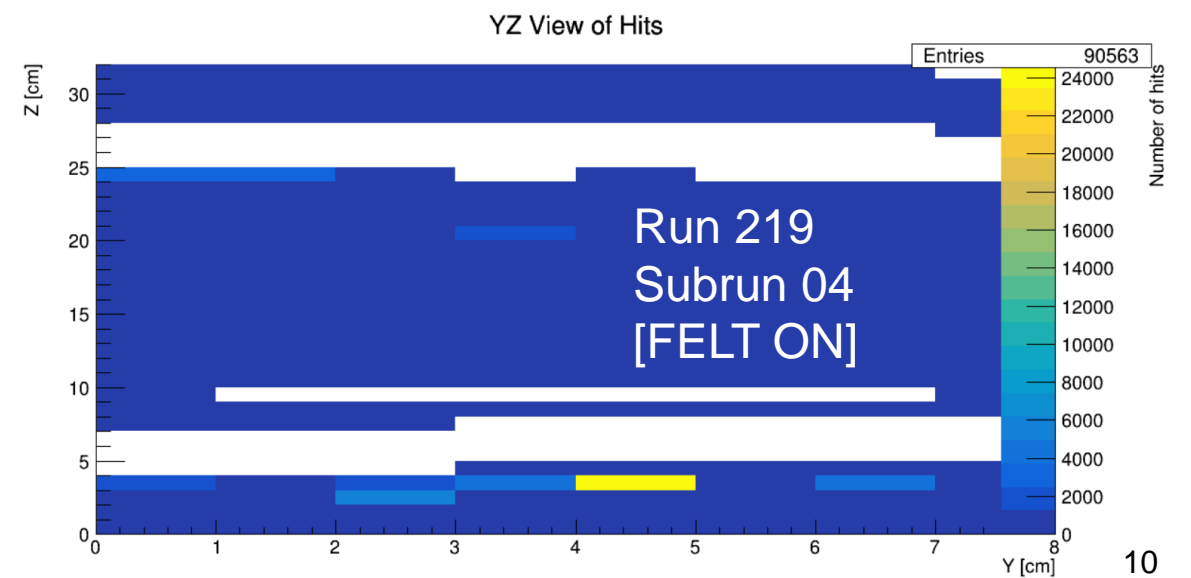
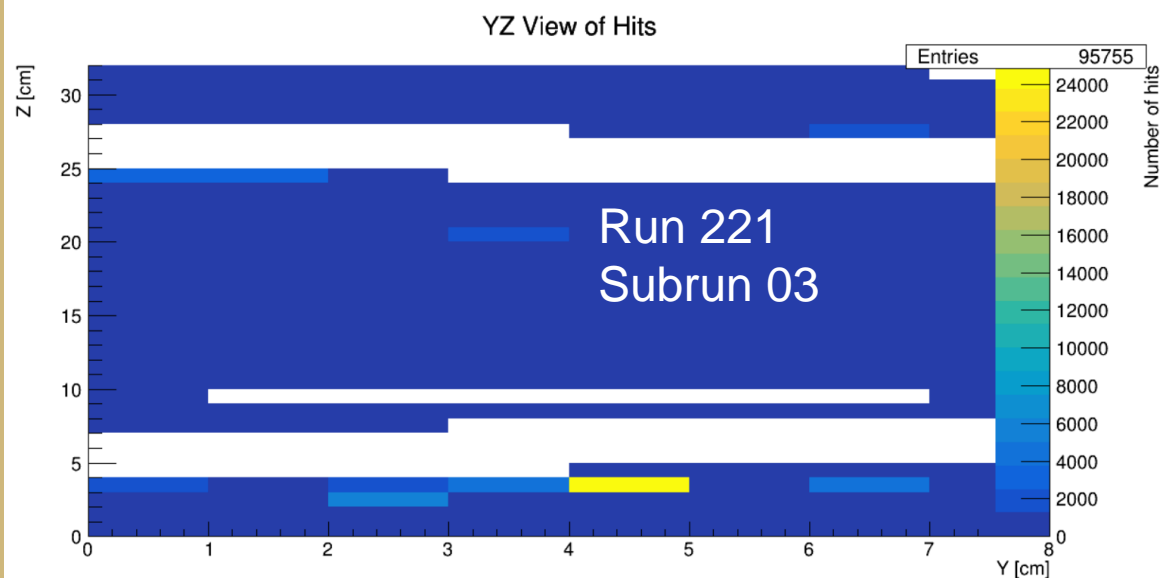
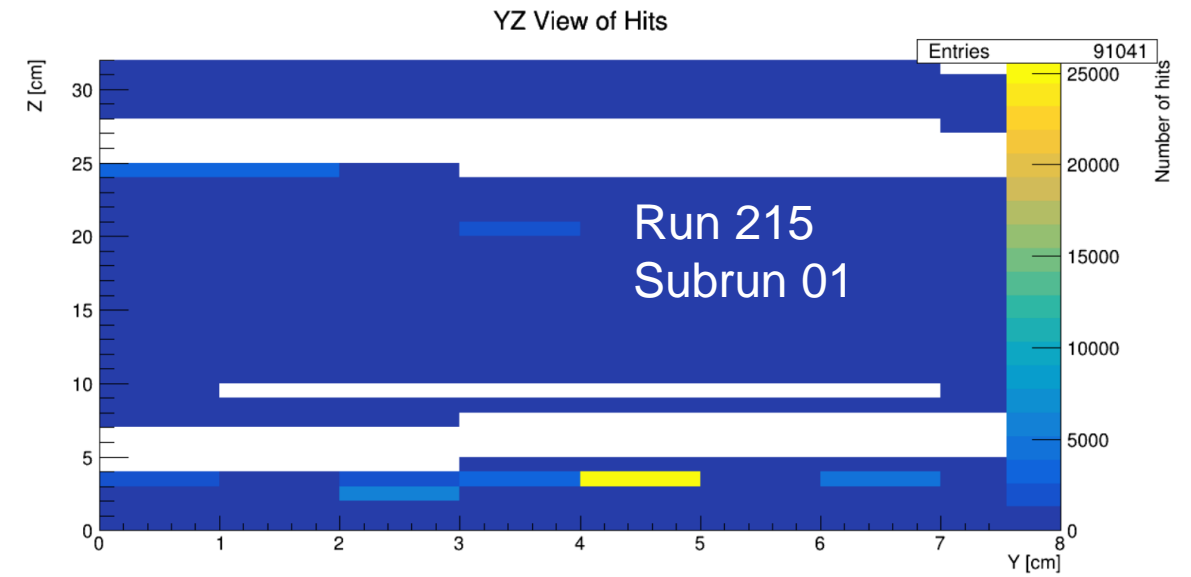
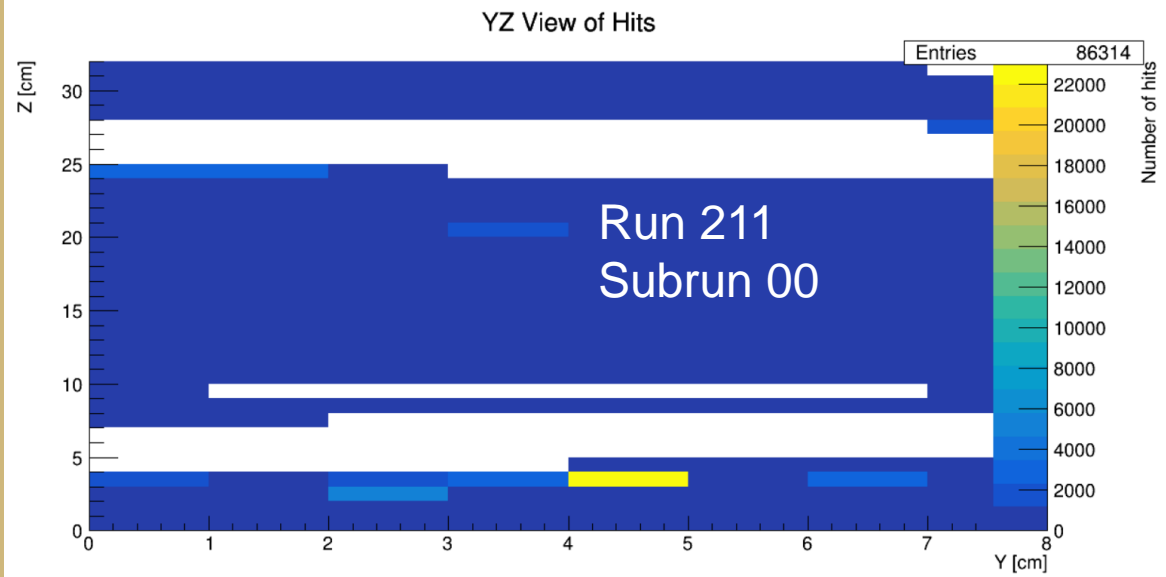




# XZ Hit View – Consistent Hot/Dead Channels



# YZ Hit View – Consistent Hot/Dead Channels



# Test Results

Configuration	Total Hit Count
Polyester Only, Lights On	113000 ± 1300
Polyester Only, Lights Off	113000 ± 3400
Polyester + Black Sheet, Lights On	116200 ± 700
Polyester + Black Sheet, Lights Off	114000 ± 1400
Polyester + Felt Rings, Lights On	118000 ± 1800
Polyester + Felt Rings, Lights Off	114000 ± 2000
Black Sheet Only, Lights On	122000 ± 2600
Black Sheet Only, Lights Off	120000 ± 4000

May want to see if removing hot channels reveals any significant differences

- Totals averaged across 6 subruns
- Data runs with no light shield could not be analyzed
  - data overloads the DAQ and cannot be unpacked
- **Hit rates between the different light barrier configurations are consistent**

# Conclusions

- Light barrier works (at least as well as the UPenn black sheet)
  - Turning off hot channels may be necessary to see nuances
- Variations between trials are likely due to electronics / lab conditions (e.g., dead channels coming online for some runs)
- Felt rings do not appear to inhibit detector performance, but also do not appear to enhance light barrier performance

- Do we need felt / EPDM rings at all?
  - Trying to get EPDM samples still (did not arrive in time to test at UPenn)
  - In contact with several EPDM suppliers; cost for 900 EPDM rings would be ~\$500 from all sources
- Opacity of black MPPC-PCBs is still unknown
  - Could not get a working board from LSU to test
- Is electrical tape (or black Kapton tape, etc) a suitable alternative to RTV for mounting? (could also use both)

# Photo with the Penn group

