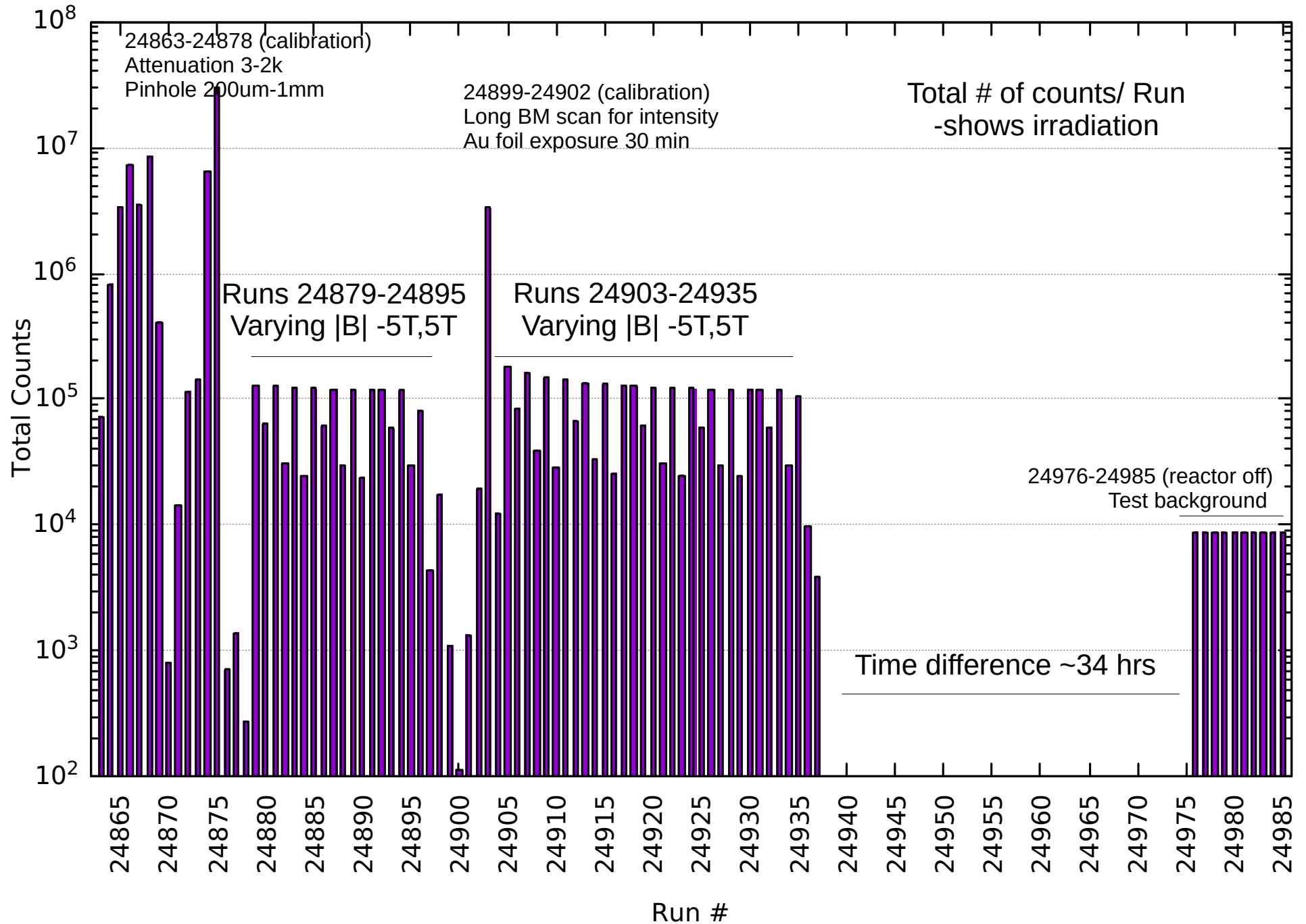


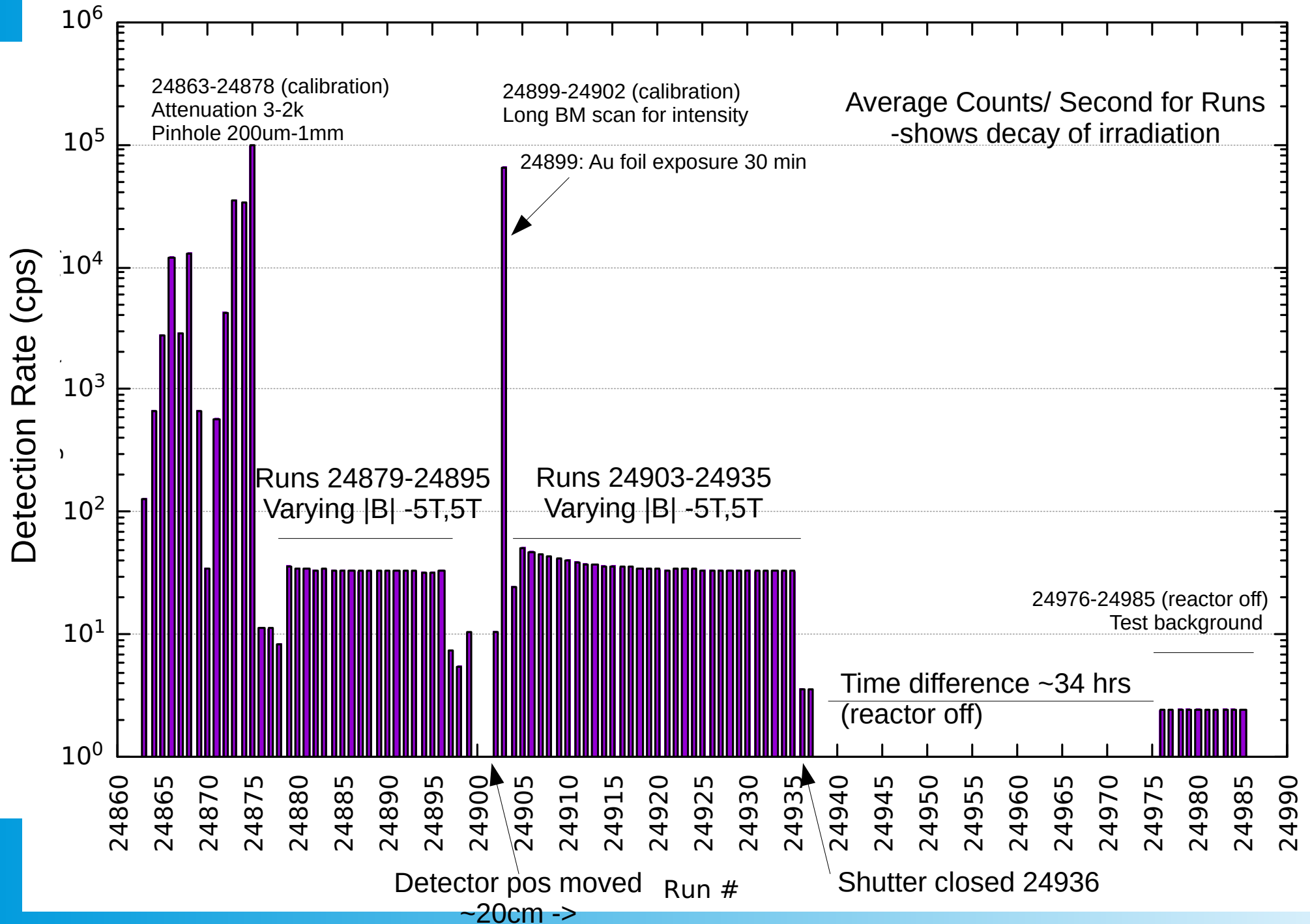
First Look at GPSANS

- Analyzing background from irradiated gpsans
 - Exponential Decay of Detection rate
 - Region of Interest and “glowing”
 - Tube interference

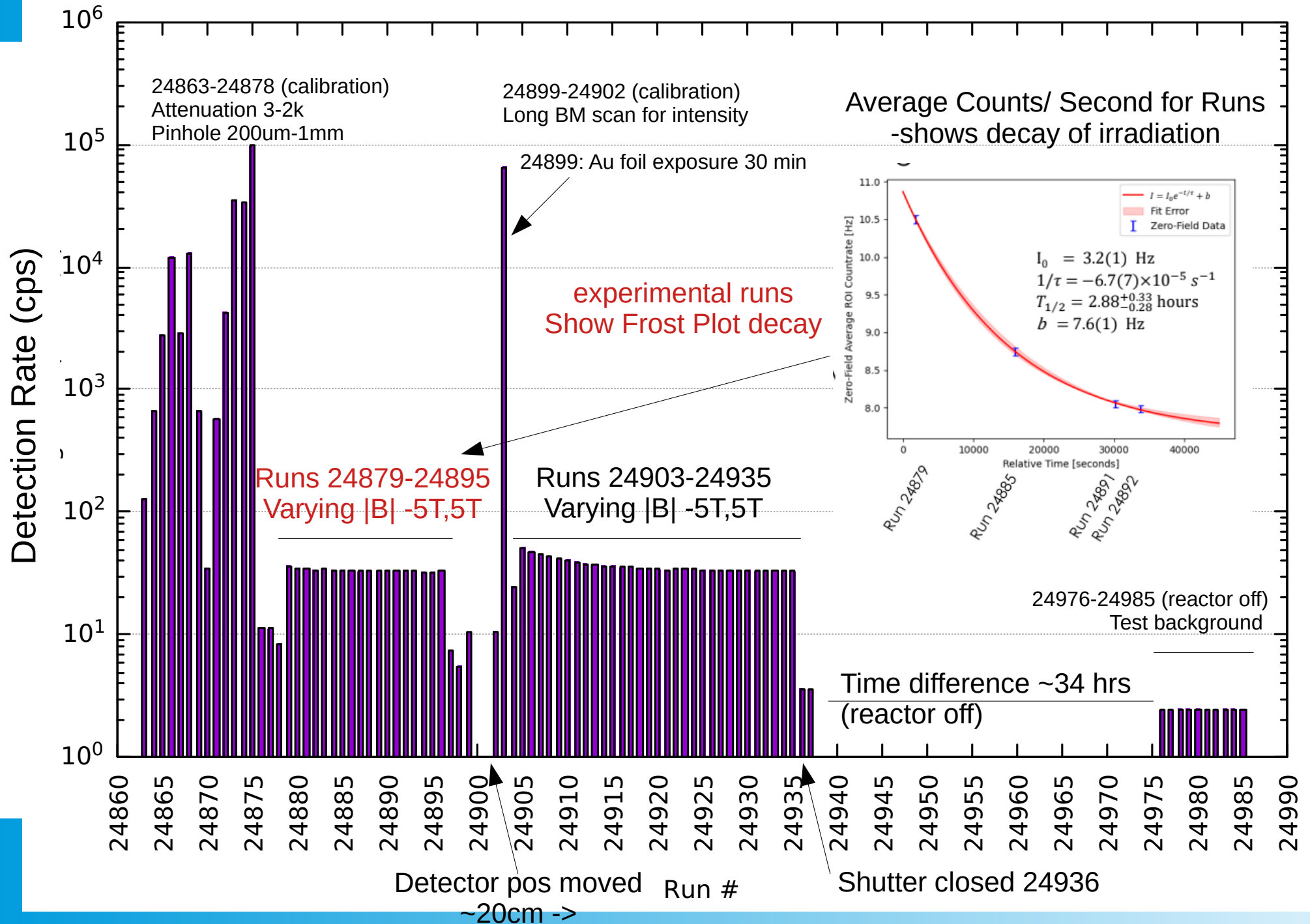
All files from GPSANS June 16-18 2021



All files from GPSANS June 16-18 2021



All files from GPSANS June 16-18 2021



“Glowing” Image

-2d detection histogram of counts colored logarithmically

-x=horizontal position (derived from tube# (0-98 front) (99-196 back))

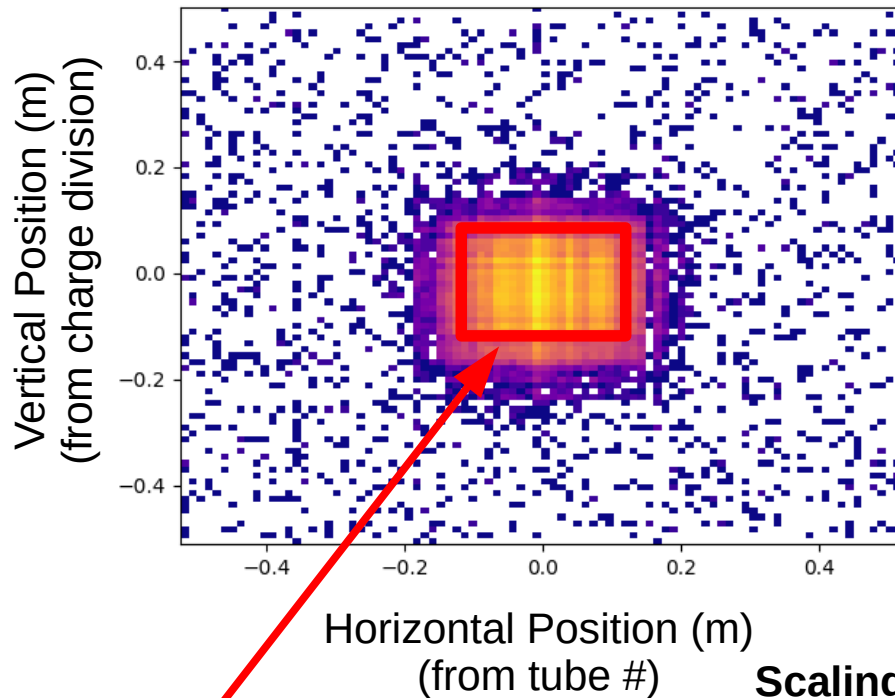
-y=vertical position (derived from Resistive Charge Division)

-color corresponds to total #detections within area for full run

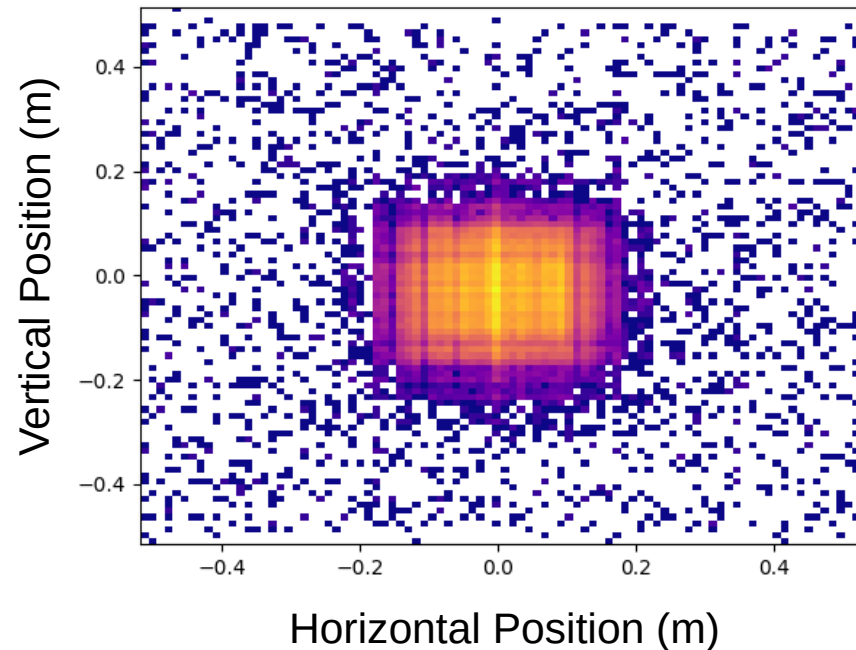
Trial 24864: (calibration)

Attenuation x100k with 2mm aperture

Front Row



Back Row



Scaling:

-Orange region is about $10e3$

-Blue is about 1

-white=0

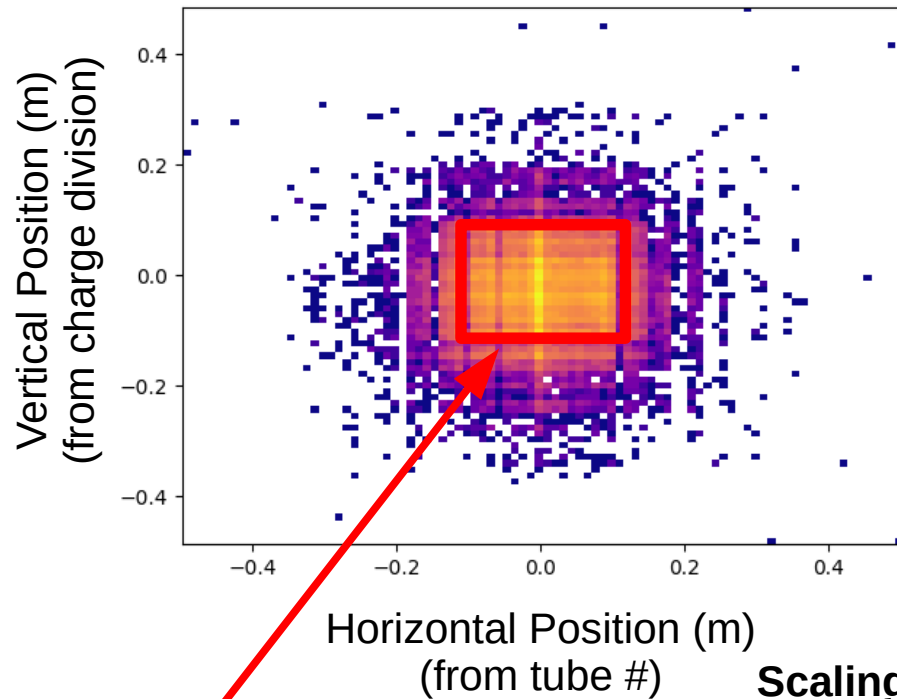
-2d detection histogram of counts colored logarithmically

-z separation = 0.0082m (front row is 0.0082m in front of back row)

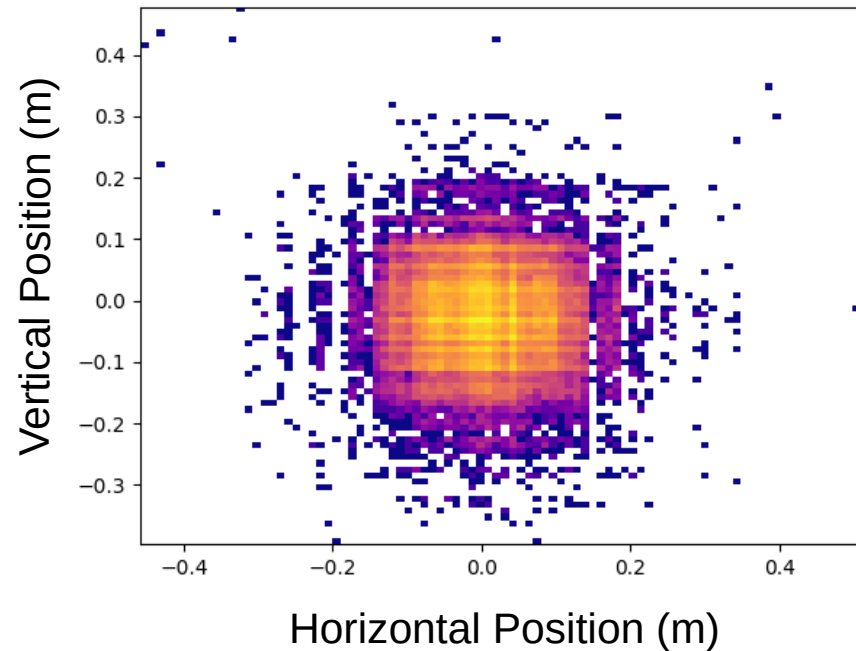
Trial 24873: (calibration)

Attenuation x3 with 200 μ m=0.2mm aperture

Front Row



Back Row



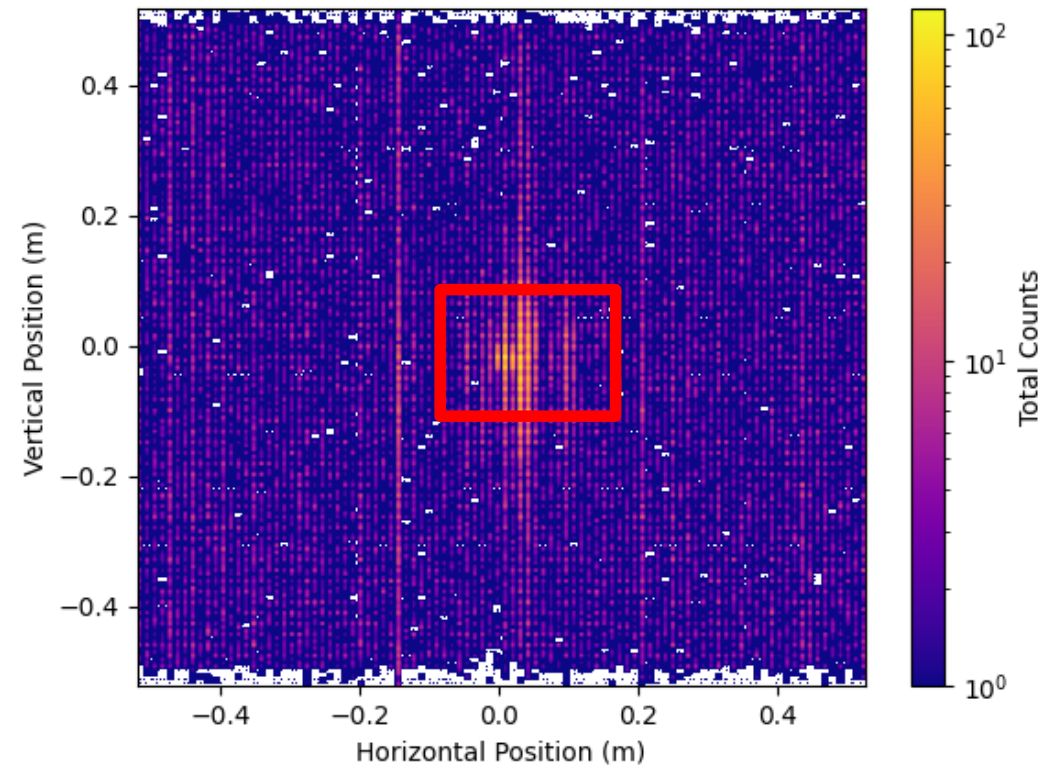
Scaling:

- Orange region is about 10e3
- Blue is about 1
- white=0

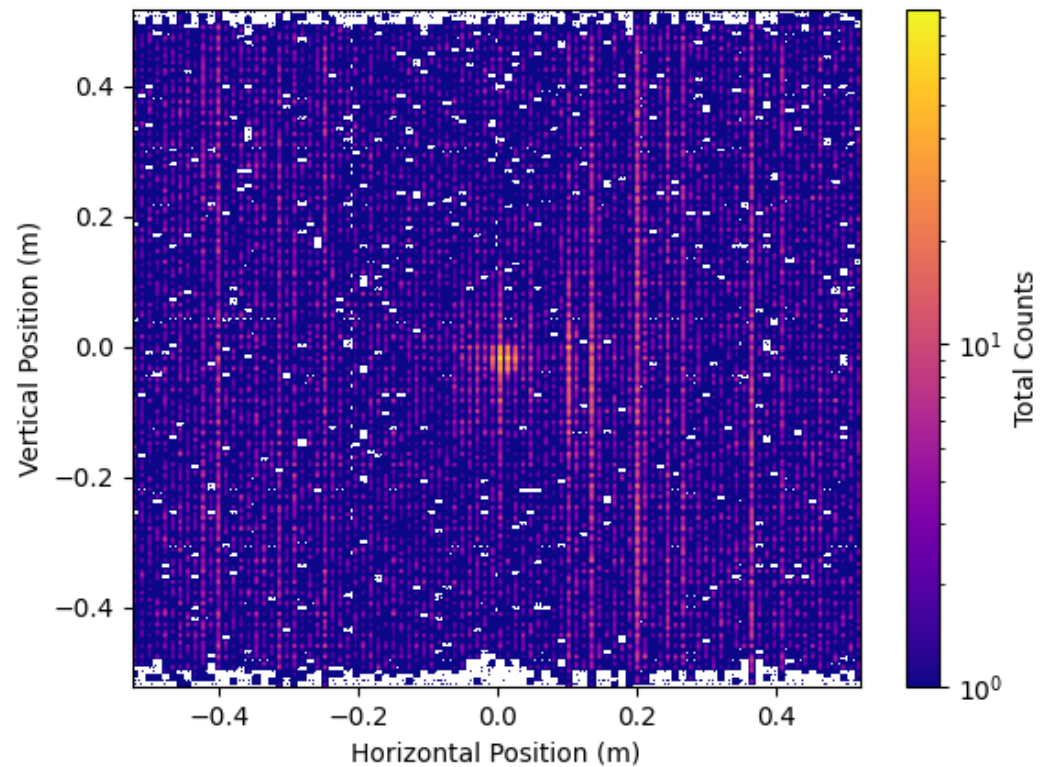
-RoI same as 24864, despite aperture being 1/10th size
-probably because of “glowing” from previous Run

Trial 24879: (1st run of experimental sequence)
Attenuation Open, $|B| = 0$

Front Row



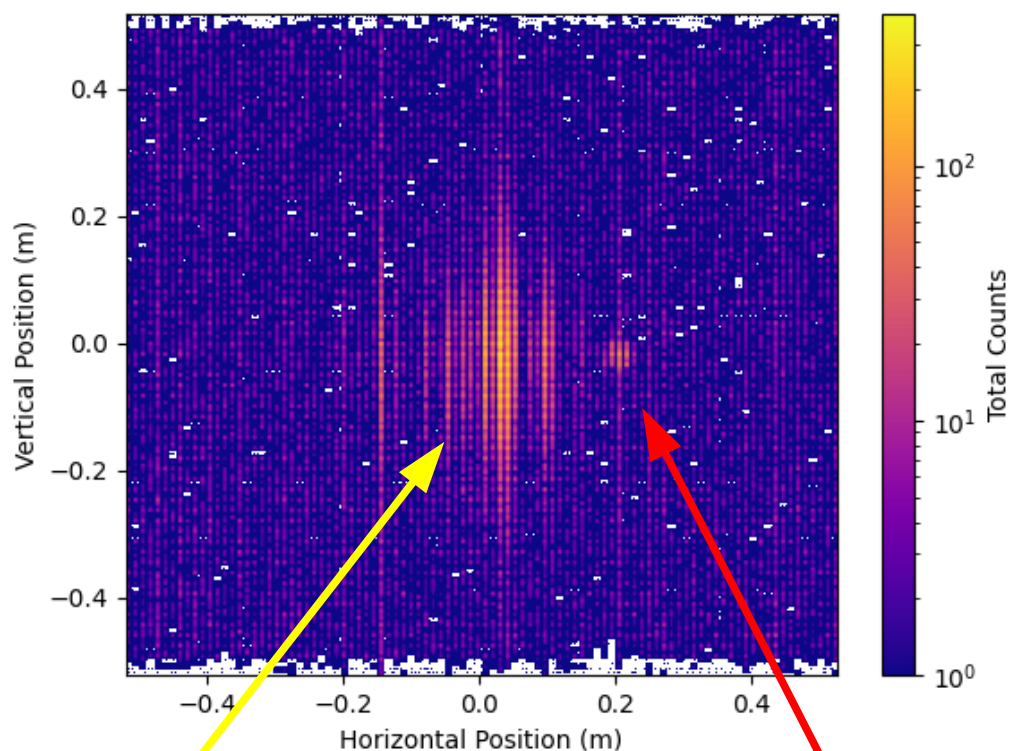
Back Row



- Trials 24879-24898 (1st experimental run) have shared Roi
- Roi for back detector is same as for front

Trial 24907: (3rd run of 2nd experimental sequence) Attenuation Open, $|B| = 5T$

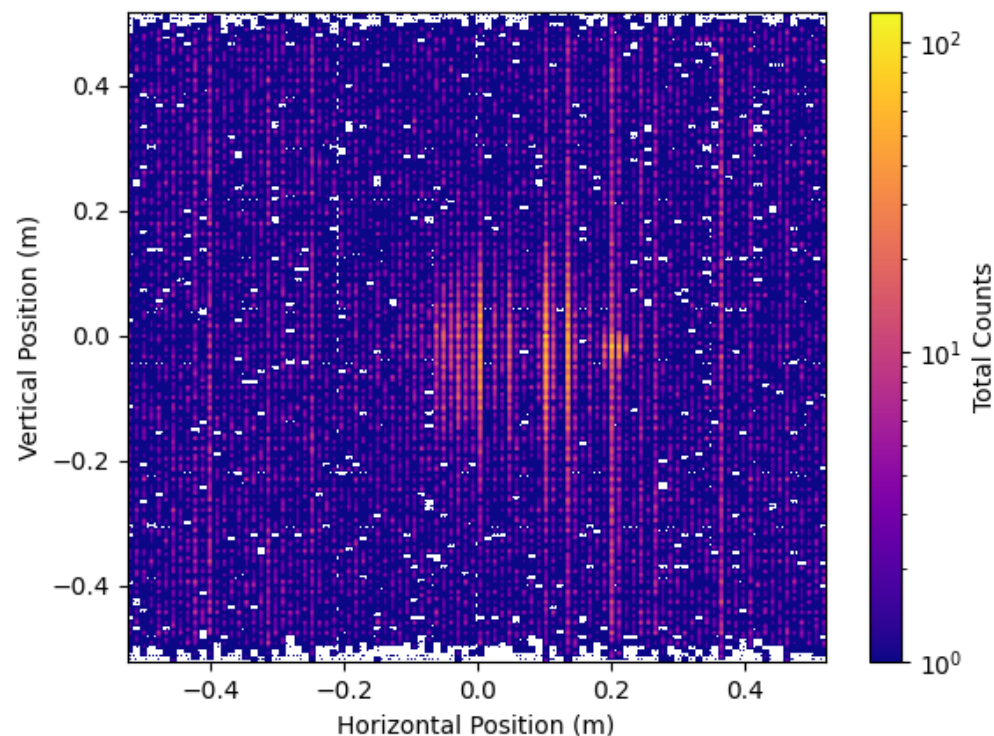
Front Row



“glow” from second calibration sequence(?)

New region of Interest
(~20cm change) – complies with logs

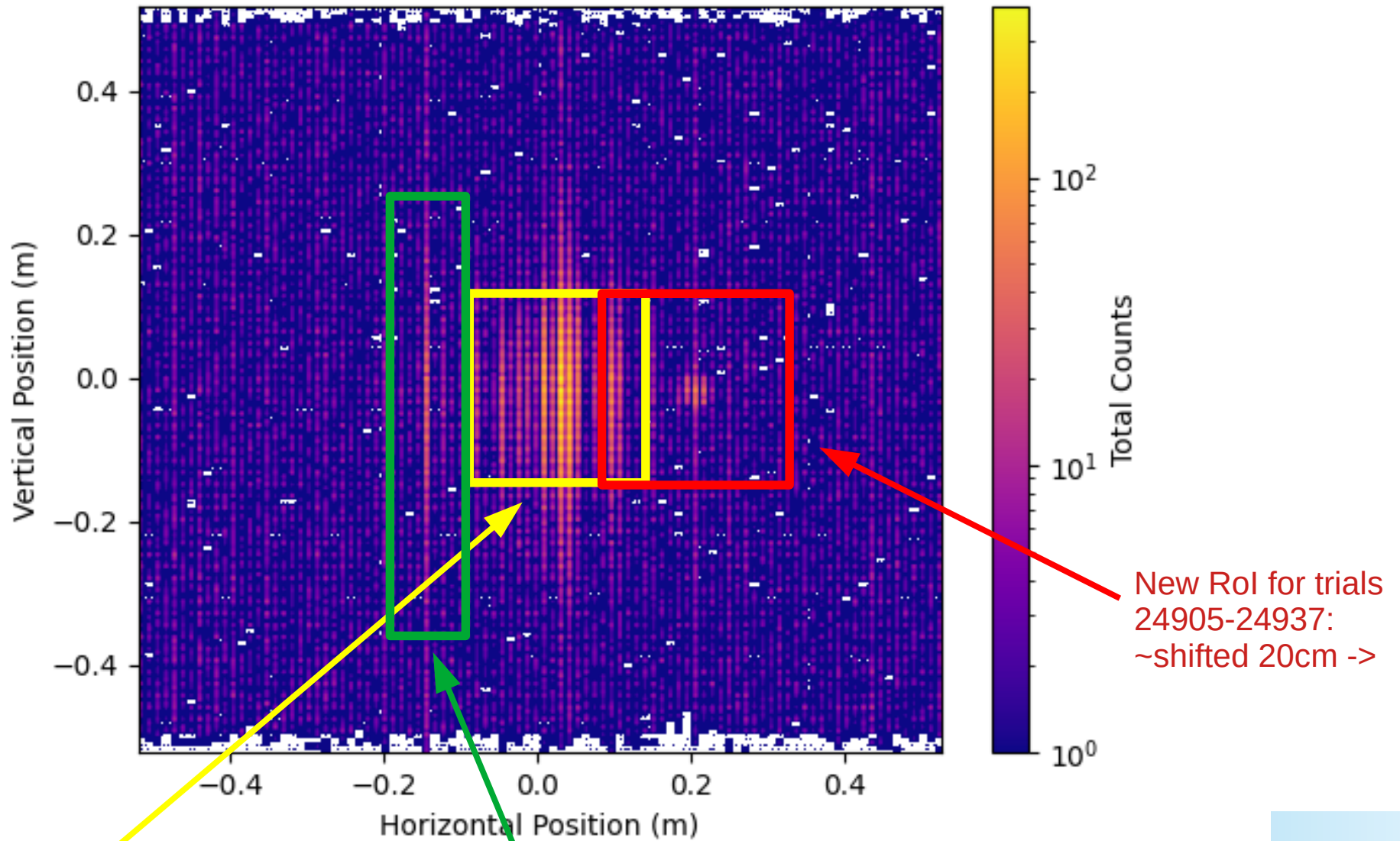
Back Row



- Detector pos moved ~20cm in trial 24903
- Trials 24904-24937 (2nd experimental run) have redefined RoI for beam
- “glowing” region at (0.0,0.0) from second calibration run? (24899-24904)

Trial 24907: (3rd run of 2nd experimental sequence)
Attenuation Open, $|B| = 5T$

Front detector array

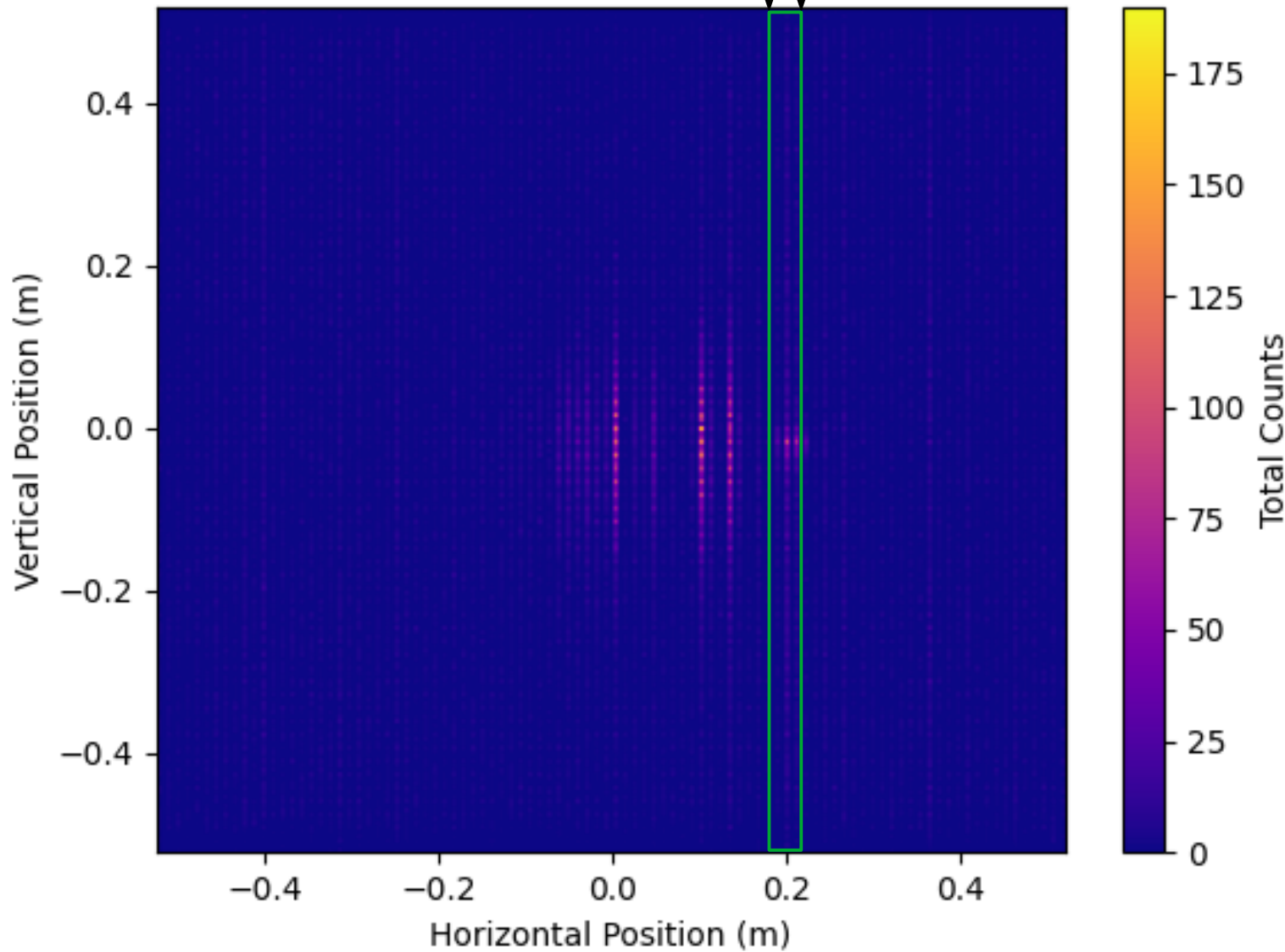


“glowing” image of previous run, vertical bands suggest that detector tubes become irradiated

Tube Interference:

Tubes 127-131

Run 24905, +z (back) array



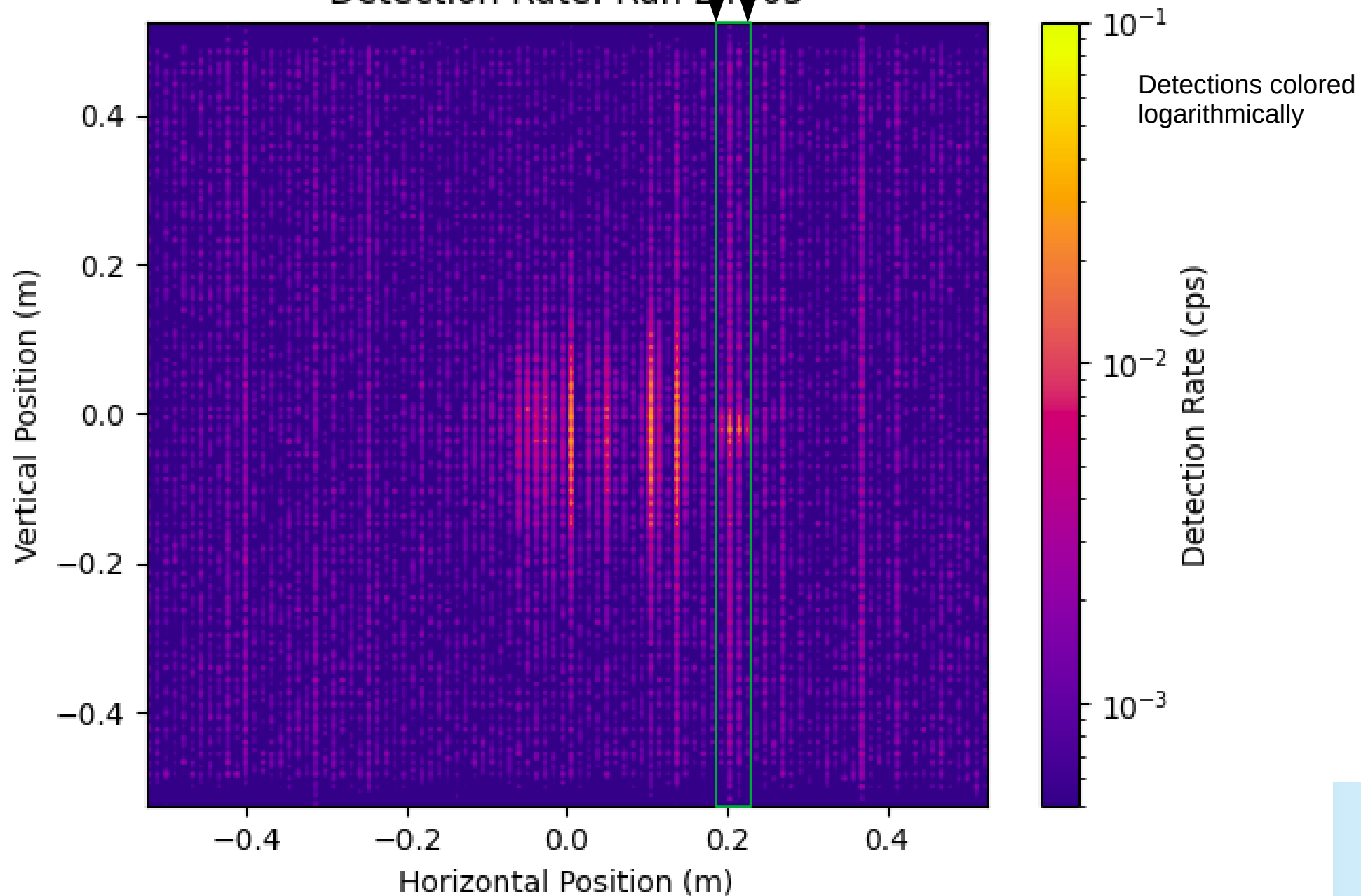
* Linear coloring of counts histogram

“band” between tubes 127-131 visible
- beam hits causing tube to become irradiated, incite more detections along length

Tubes 127-131

Run 24905, +z (back) array

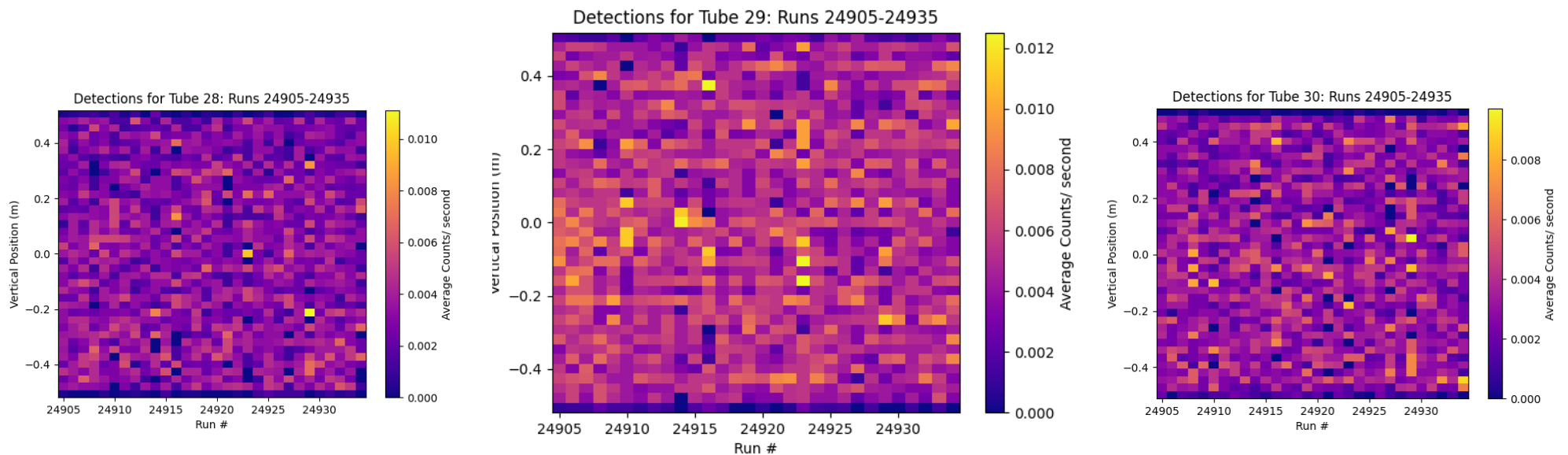
Detection Rate: Run 24905



Tubes 128-131

Plots show Run# by Ypos of detection for all runs in second experimental sequence

These tubes dont show decay because they correspond to where the beam is hitting, so the interference is being reset every run



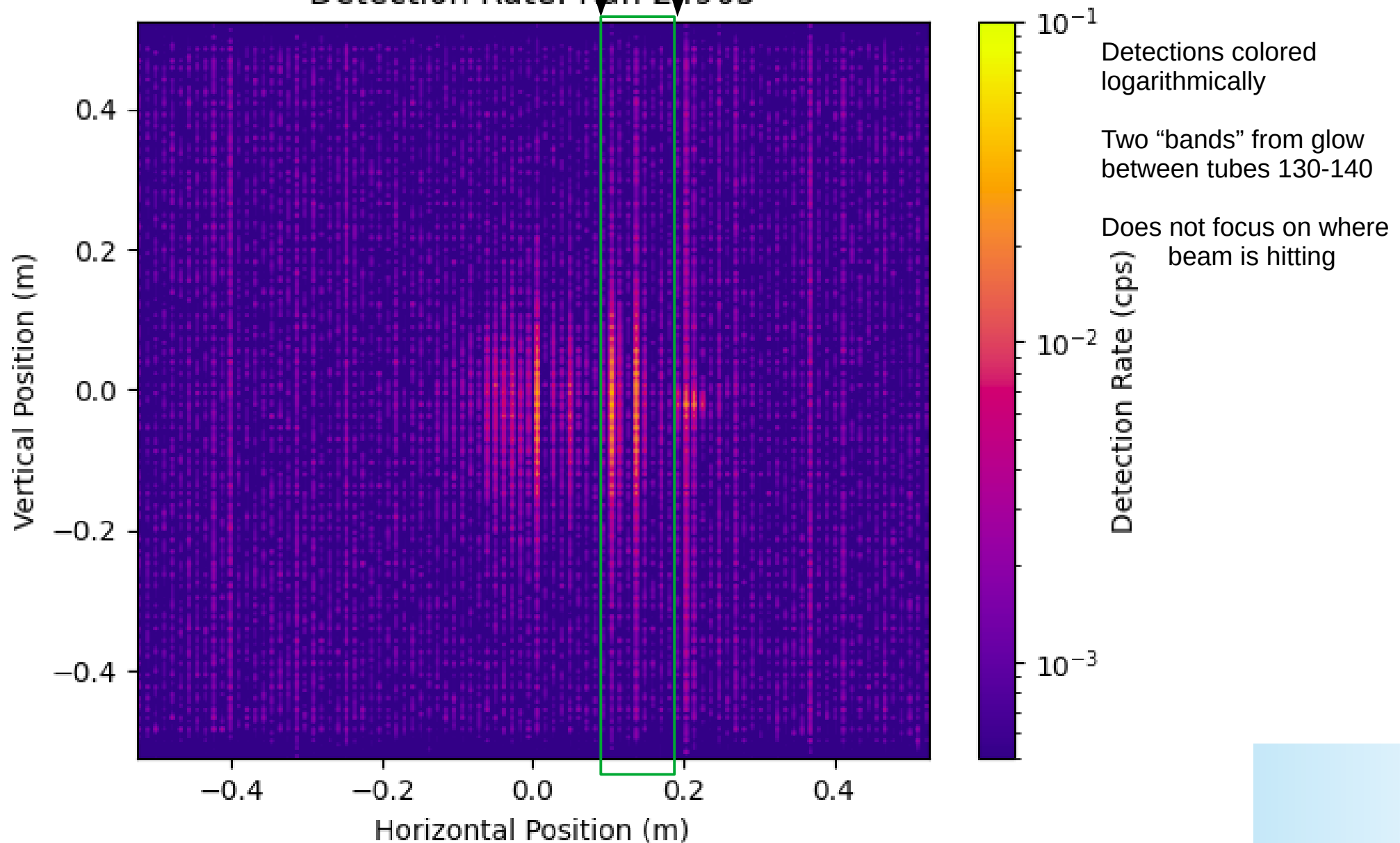
Tubes 140-130

Tube 140: $x=0.08$

Tube 130: $x=0.19$

Run 24905, +z (back) array

Detection Rate: Run 24905



-plots show run#, ypos
for tubes 130-140

Tube histograms: [Run#, Y pos]

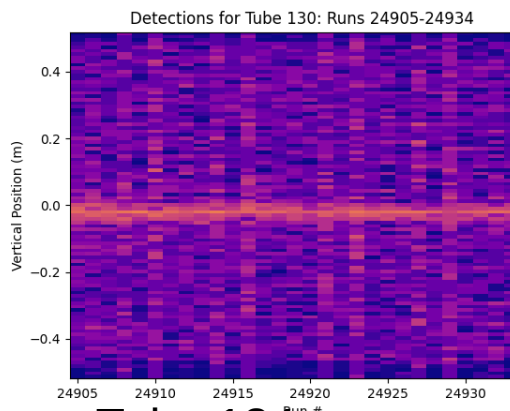
-135, 138 show decay
of bands from glow

-130 shows Roi, beam
hitting in center

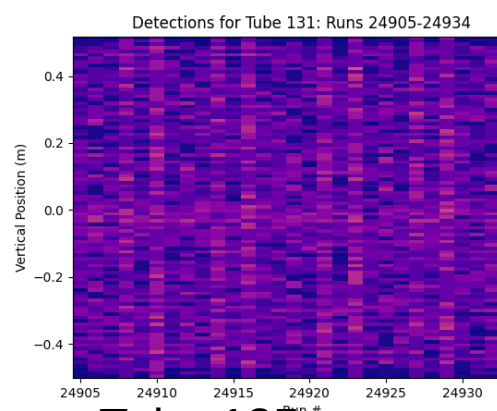
-x(140)=0.08m

-x(130)=0.19m

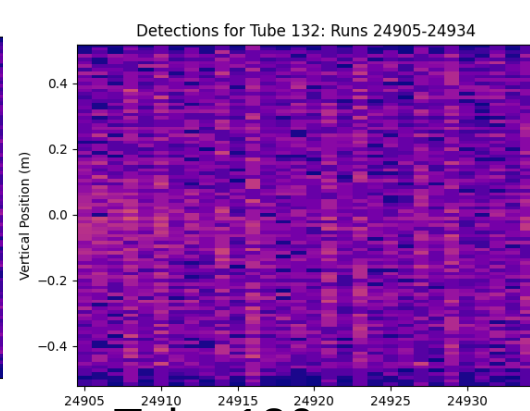
Tube 130



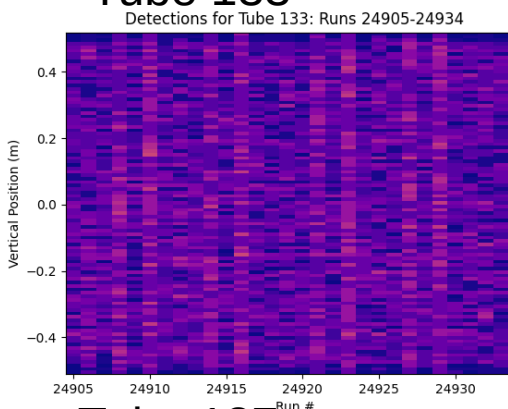
Tube 131



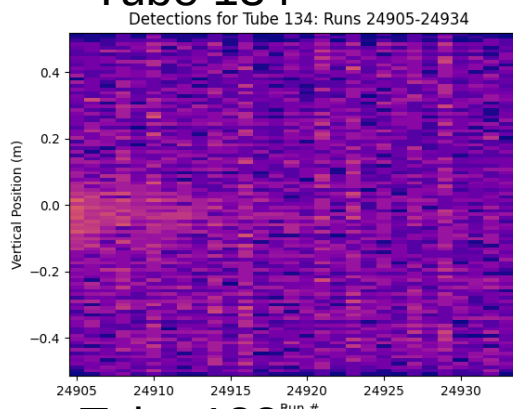
Tube 132



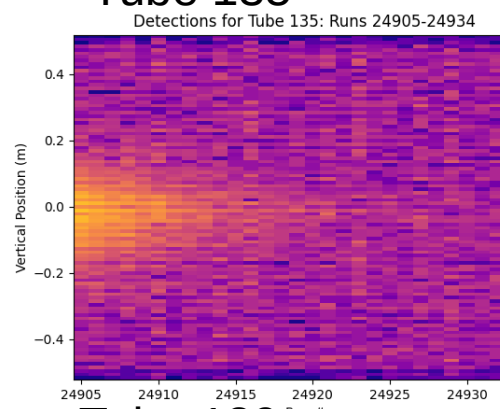
Tube 133



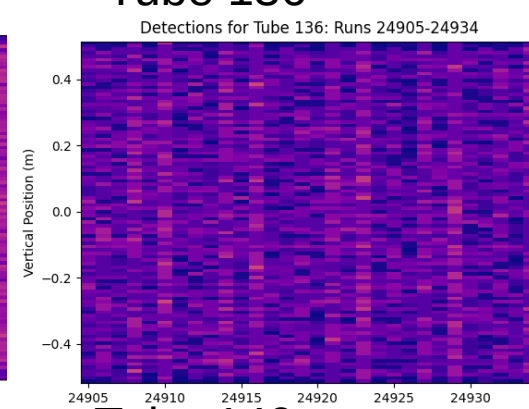
Tube 134



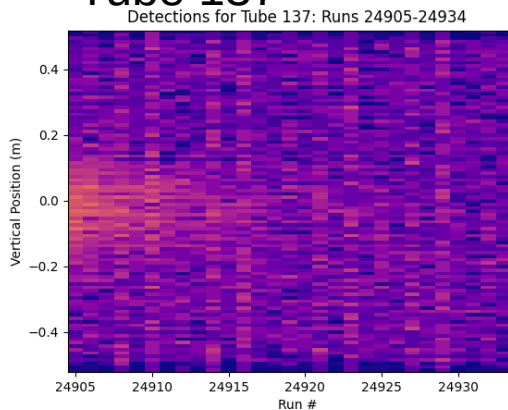
Tube 135



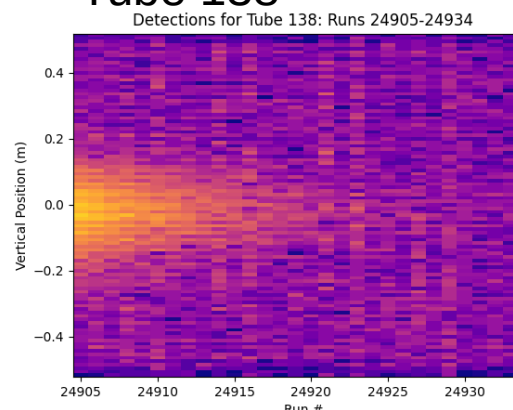
Tube 136



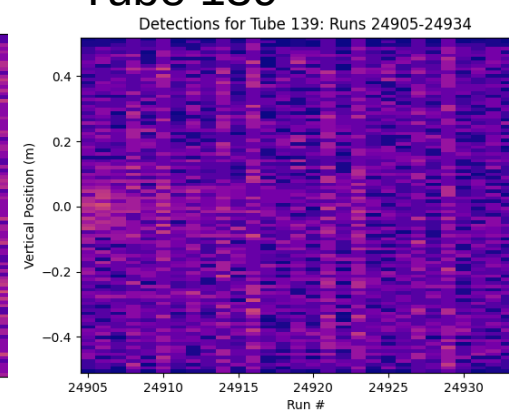
Tube 137



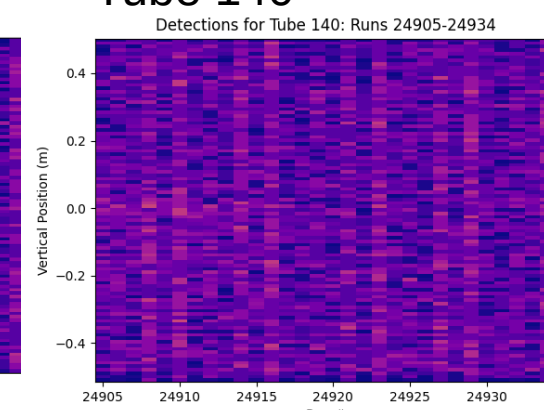
Tube 138



Tube 139



Tube 140



Detection Rate/ Unit area video

- **Video shows logarithmically colored histograms for all runs in second experimental sequence (24905-24937)**
- Includes runs (24903-24904 to show calibration irradiation (24899-24903) and detector movement (24904))
- includes runs (24936-24937) to show background when HFIR on (higher than background when HFIR has been off for a long time (runs 24976-24986 are ~36hrs after 24937))
- constant coloring scale for all runs
- shows **counts/ unit area/ time**
(histogram for each run is scaled by length of run to find detections/second)
- trials with higher average counts/ unit area/ time (more purple than blue) correspond to “ramping down” trials where $|B|$ decreasing
- “glowing” region decays with time

Conclusions

- 'Glowing' on detector and tube interference add background that affects data analysis
- Can correct for interference by analyzing only Roi, subtracting predicted interference counts within Roi

Questions

- What is causing tube interference?
 - Is beam “scattering” in y direction just from beam profile? (actual data)
 - Tubes are dirty? (if gas mixture within tube contains methane, radiation may cause radicals to form and oil tubes, causing interference lengthwise)
 - Gas escaping? (small helium particles escaping thin steel tubes, pressure decreases, constant threshold means it detects protons too)