OSU Light Collection 3/31/25

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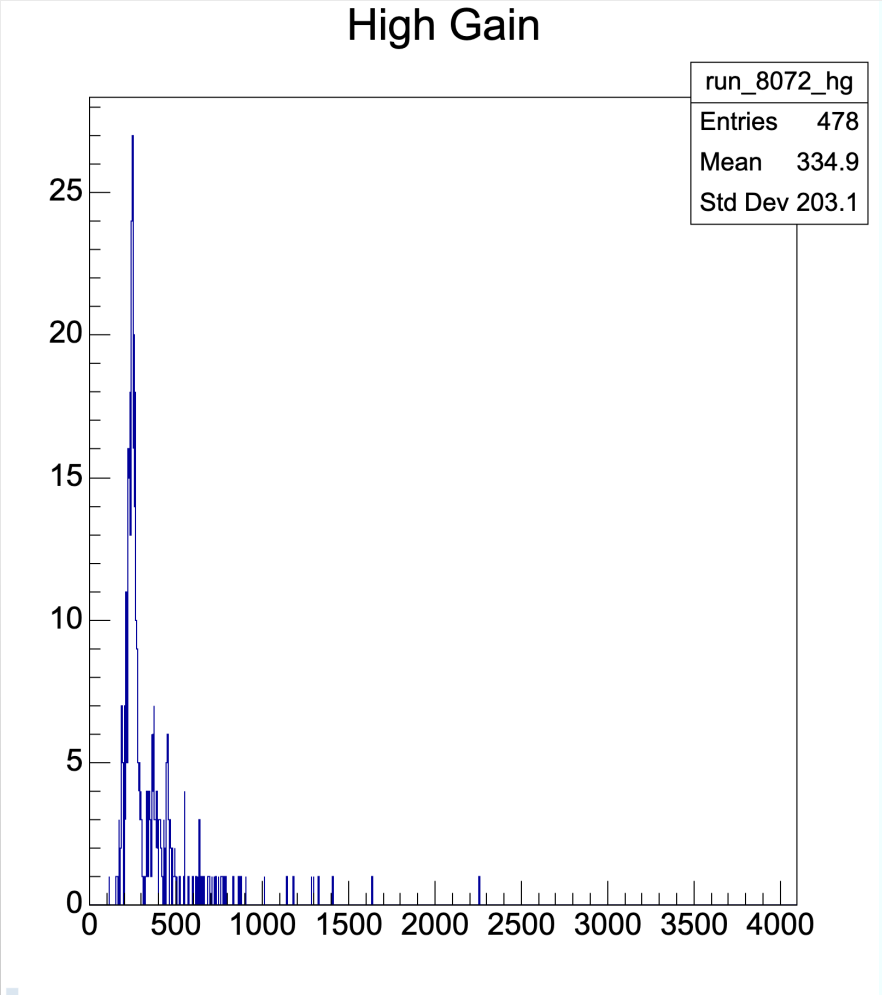
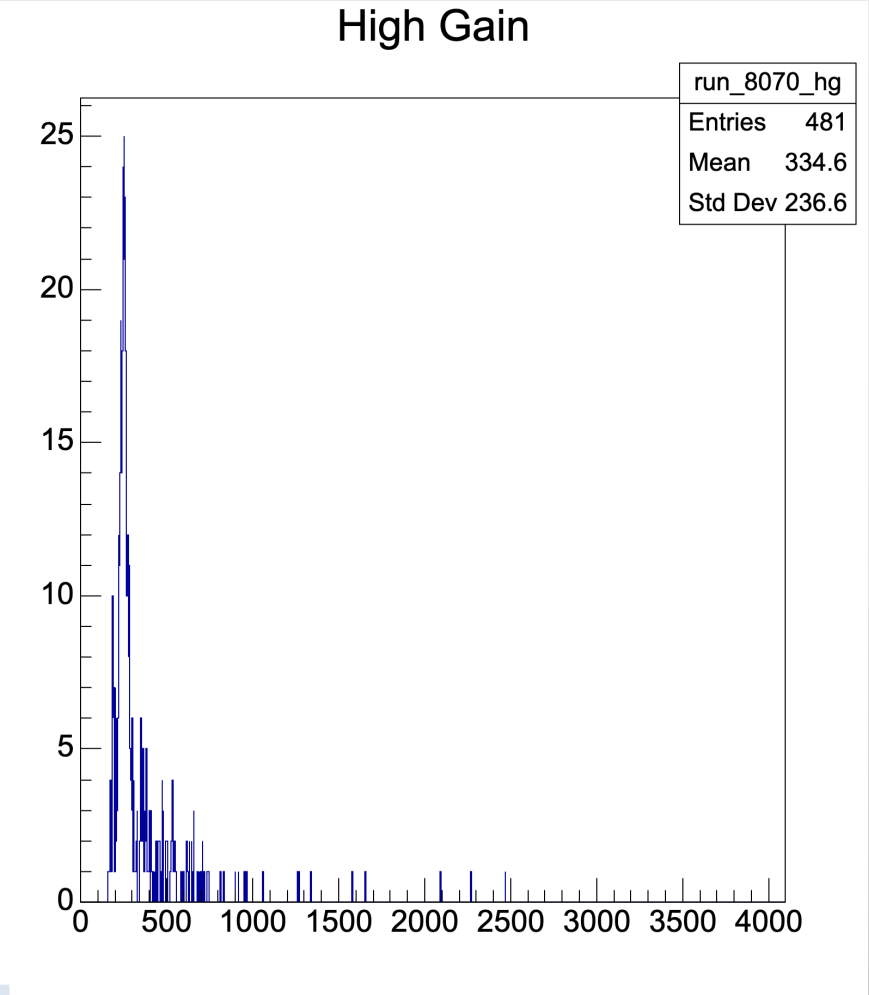
Noise measurements

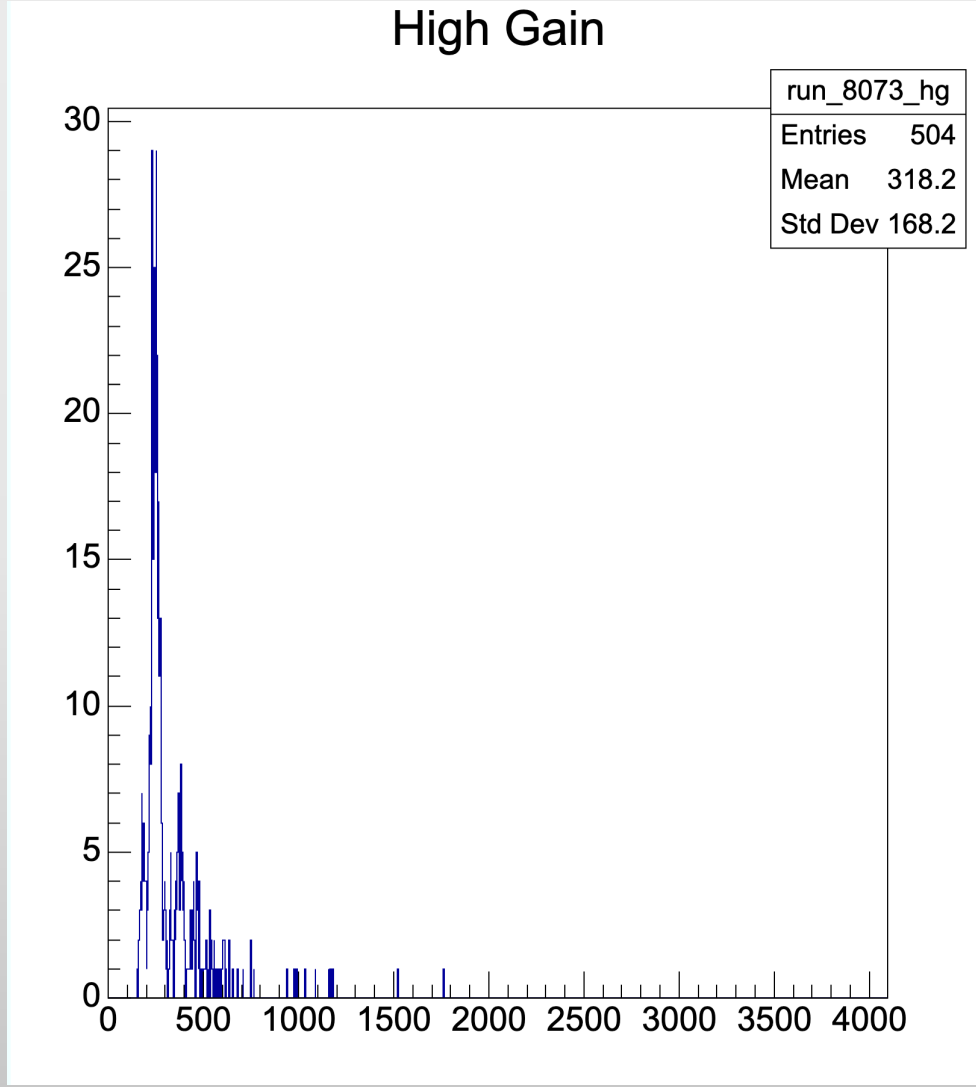
- 2 noise measurements, 5min exposure.
- Repeat with different sources of extra light leaking in to see size of effect

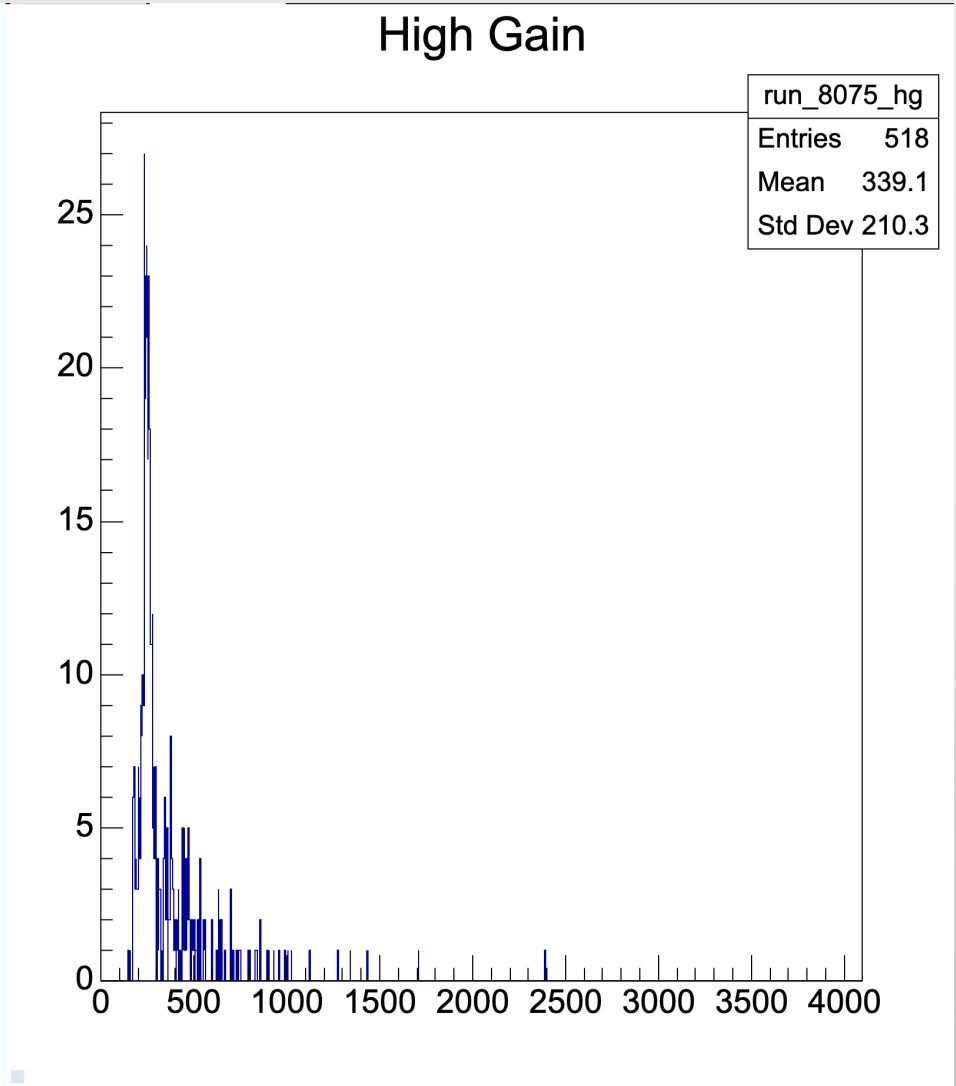




This run: as little light as we can with current setup

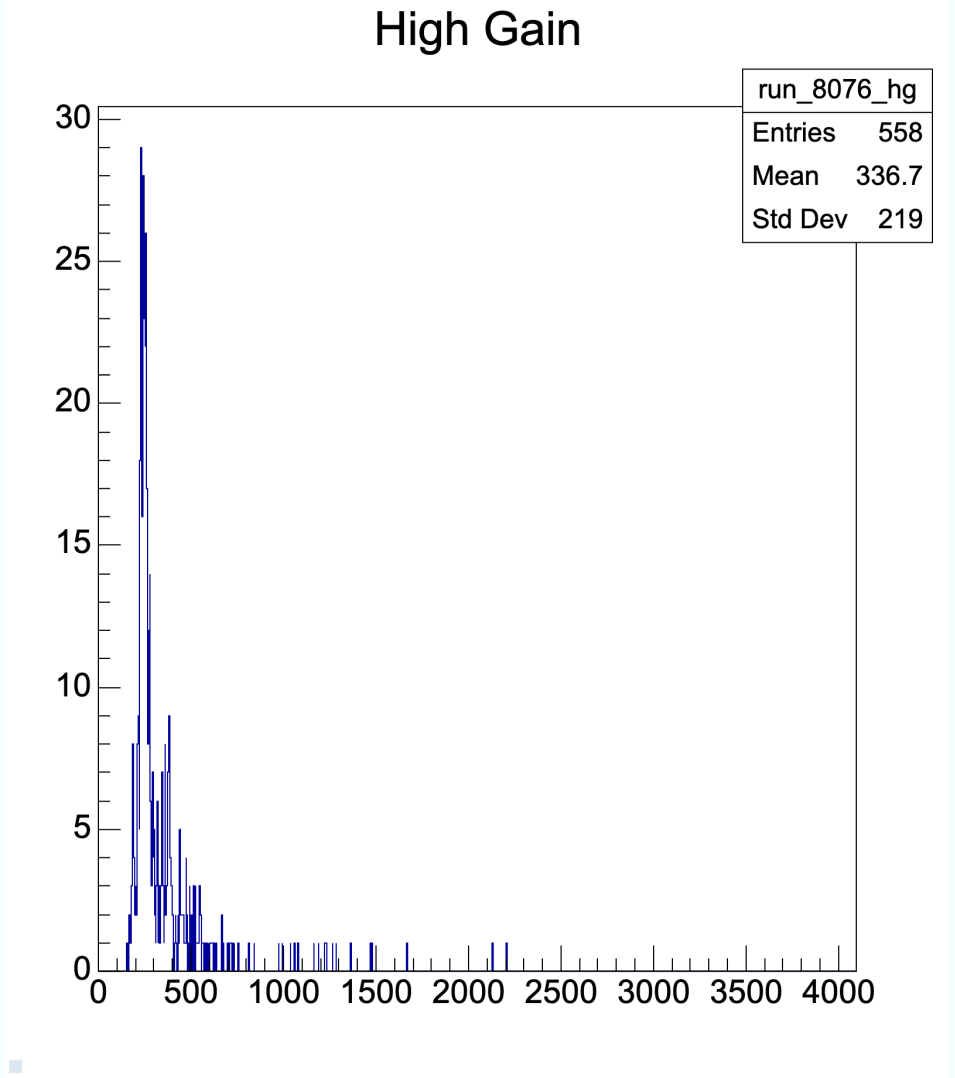
Noise Measurements

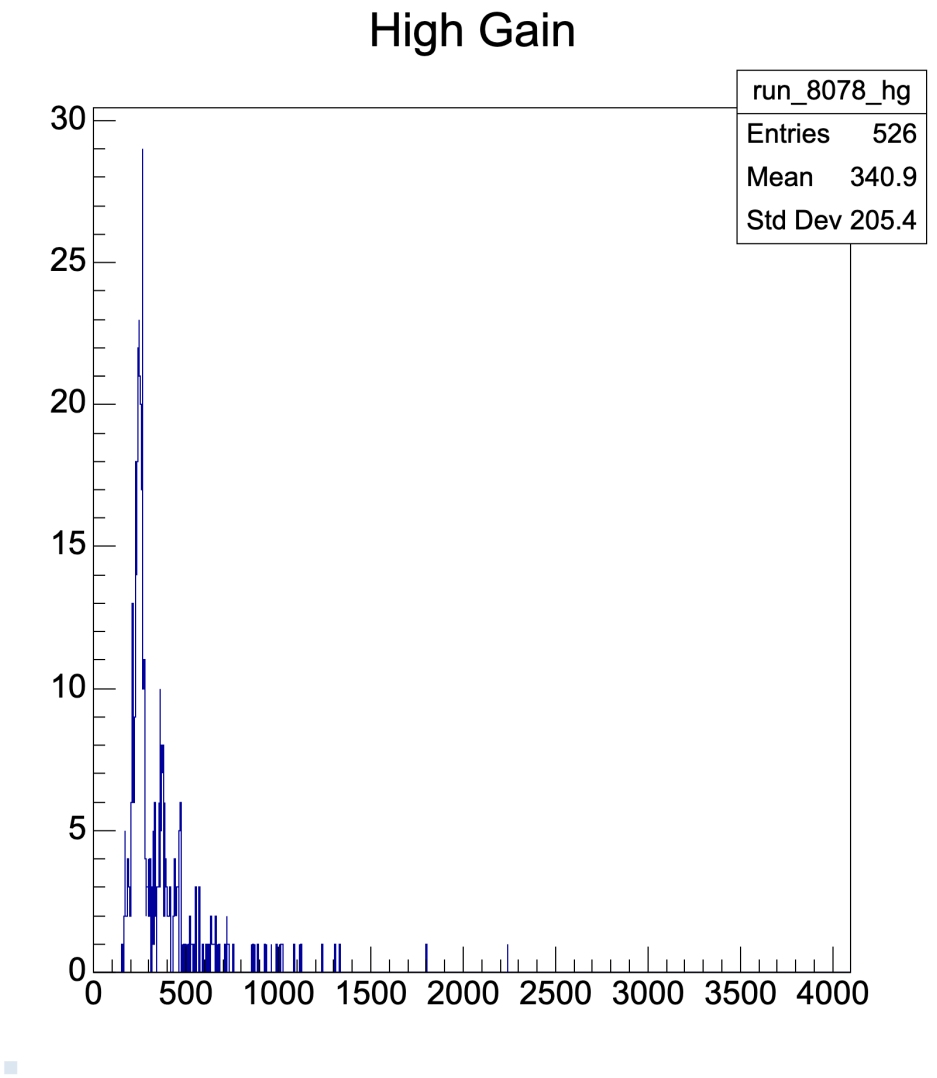




Nearby computer monitor left on

Noise Measurements

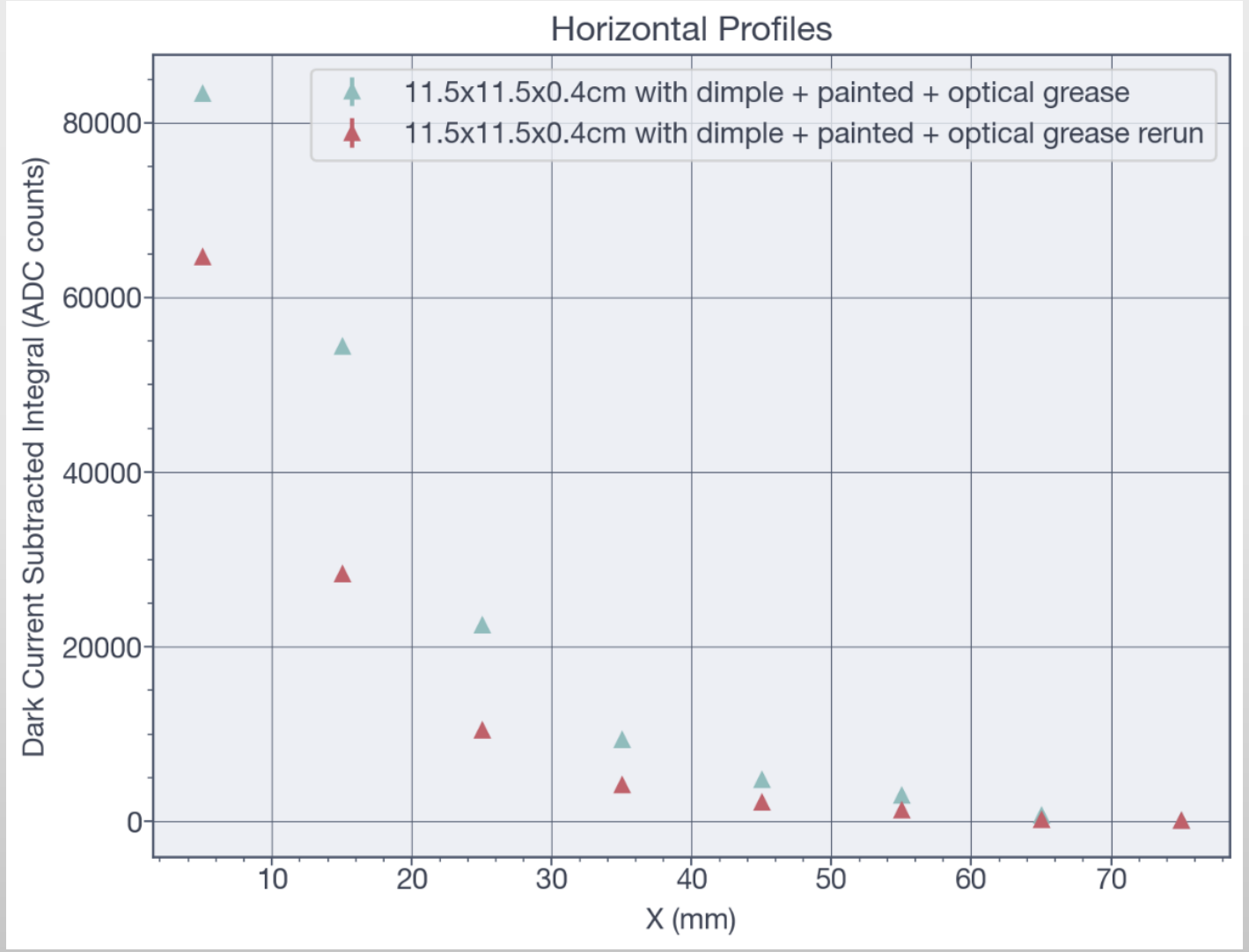




Flashlight left on ~20 ft from test setup

Reproducability

- We have some inconsistency occurring when we retake data.
- Currently investigating. Here are my examples.



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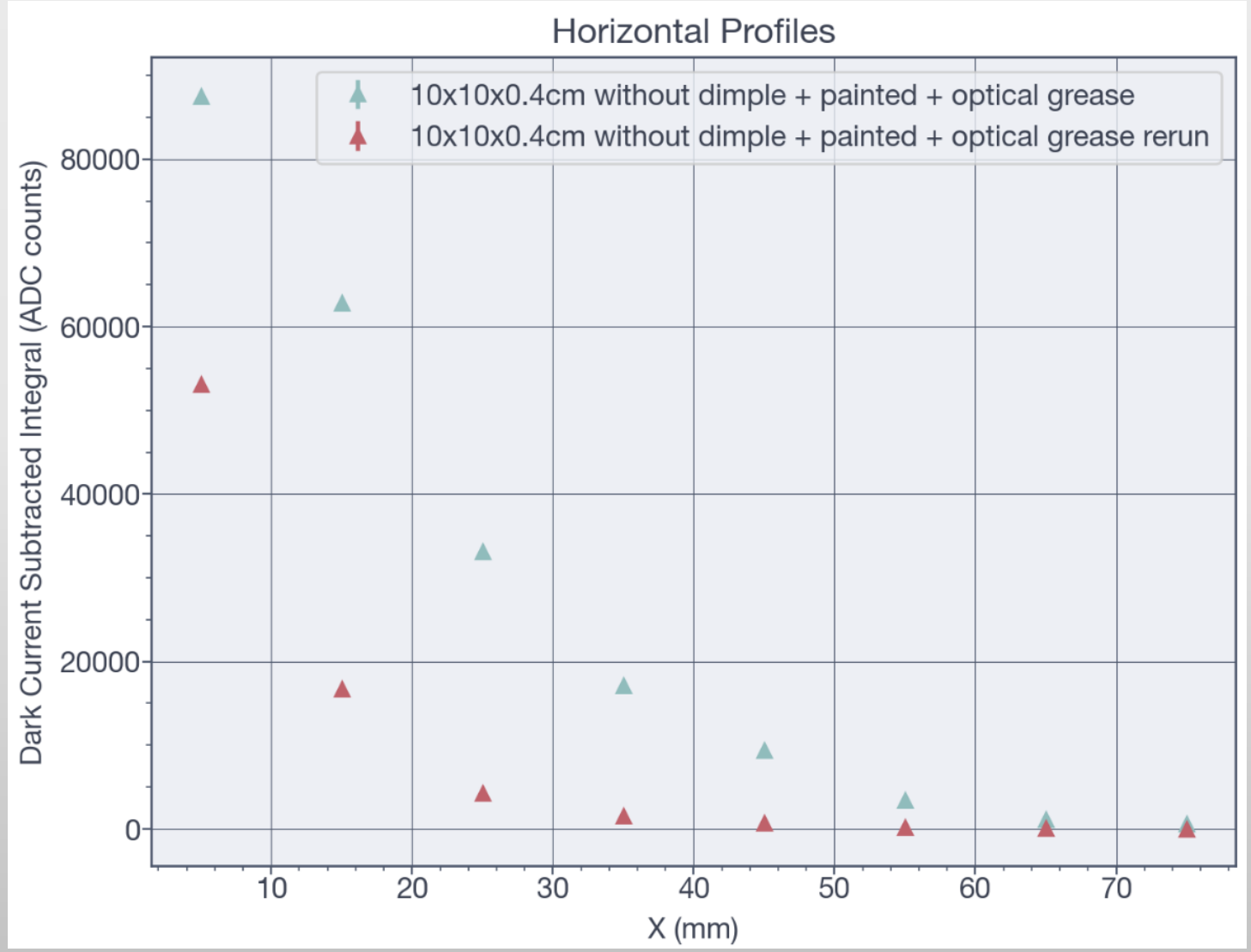


Backup

List of available sample tiles

Polished+milled to correct size

- ~20 2.4x2.4x0.4 with dimple
- 1 2.4x2.4x0.4 painted with dimple
- 3 4.7x4.7x0.4 with dimple
- 1 4.7x4.7x0.4 painted with dimple
- 1 4.7x4.7x0.4 wrapped with dimple
- 2 5x5x0.4
- 1 5x5x1.6
- 1 10x10x1.6

Unpolished+not milled to stated size.

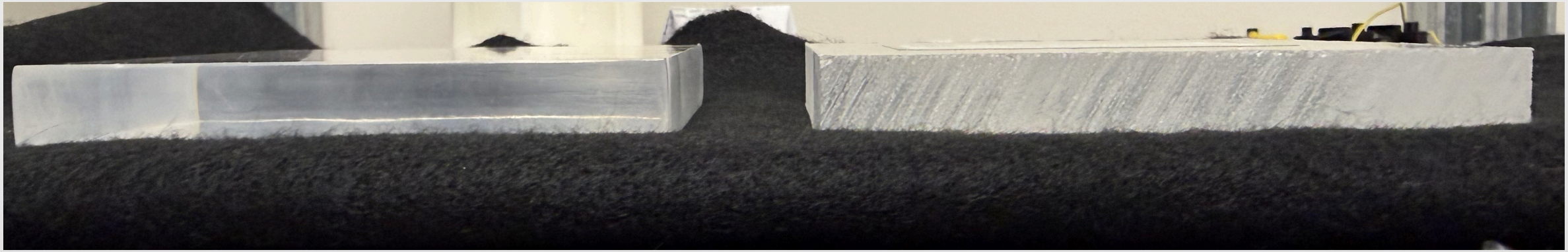
- 3 5x5x0.4
- 2 5x5x0.8
- 1 5x5x0.8 with dimple
- 3 5x5x1.6
- 1 10x10x0.4
- 1 10x10x0.4 with dimple
- 3 10x10x0.8
- 3 10x10x1.6

About ~2cm extra material in x,y

Will show results from this one today

Polishing the unpolished tiles

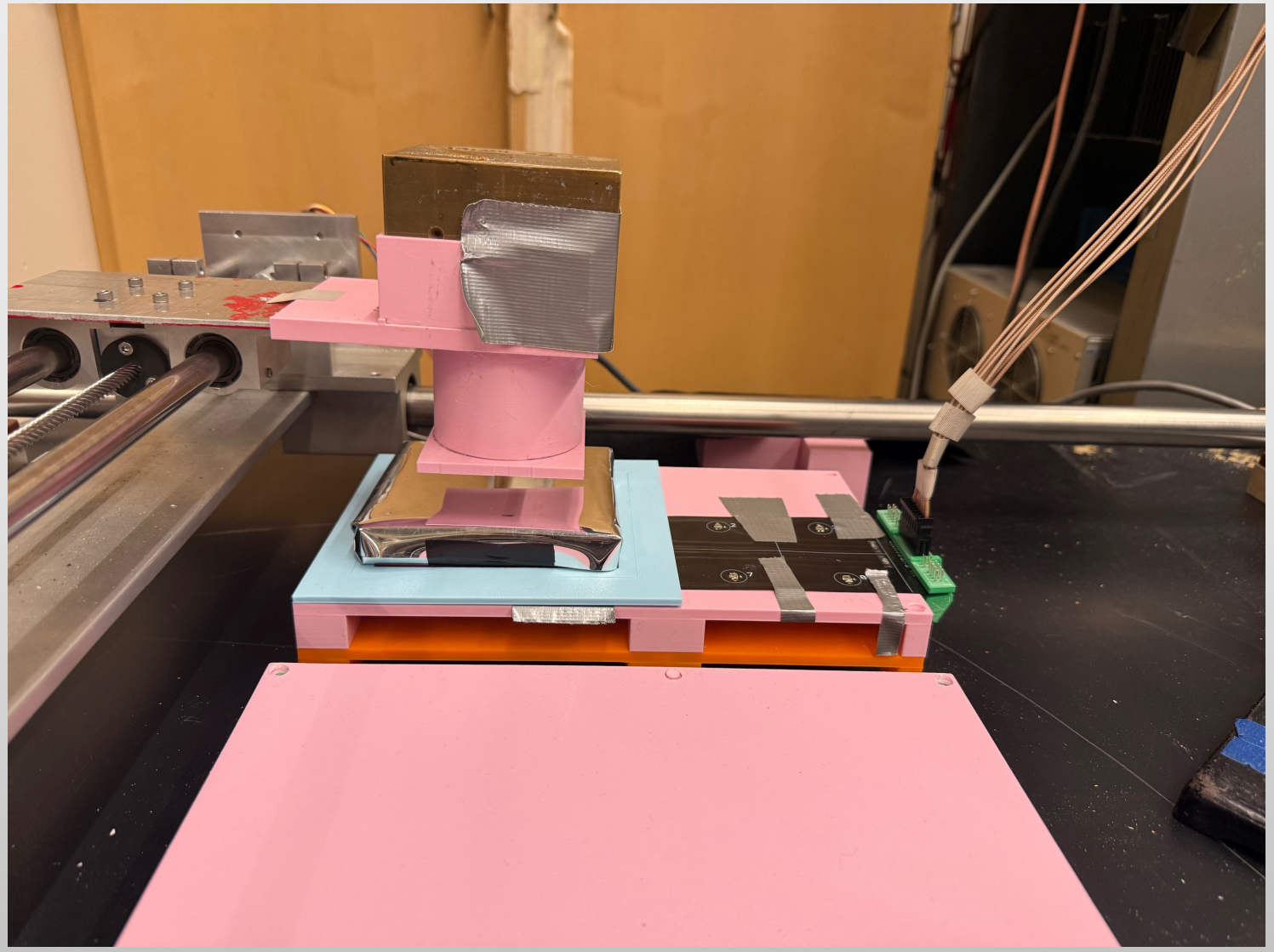
- Recently started polishing some of the un-milled tiles by hand.
- Here's an example



Polished

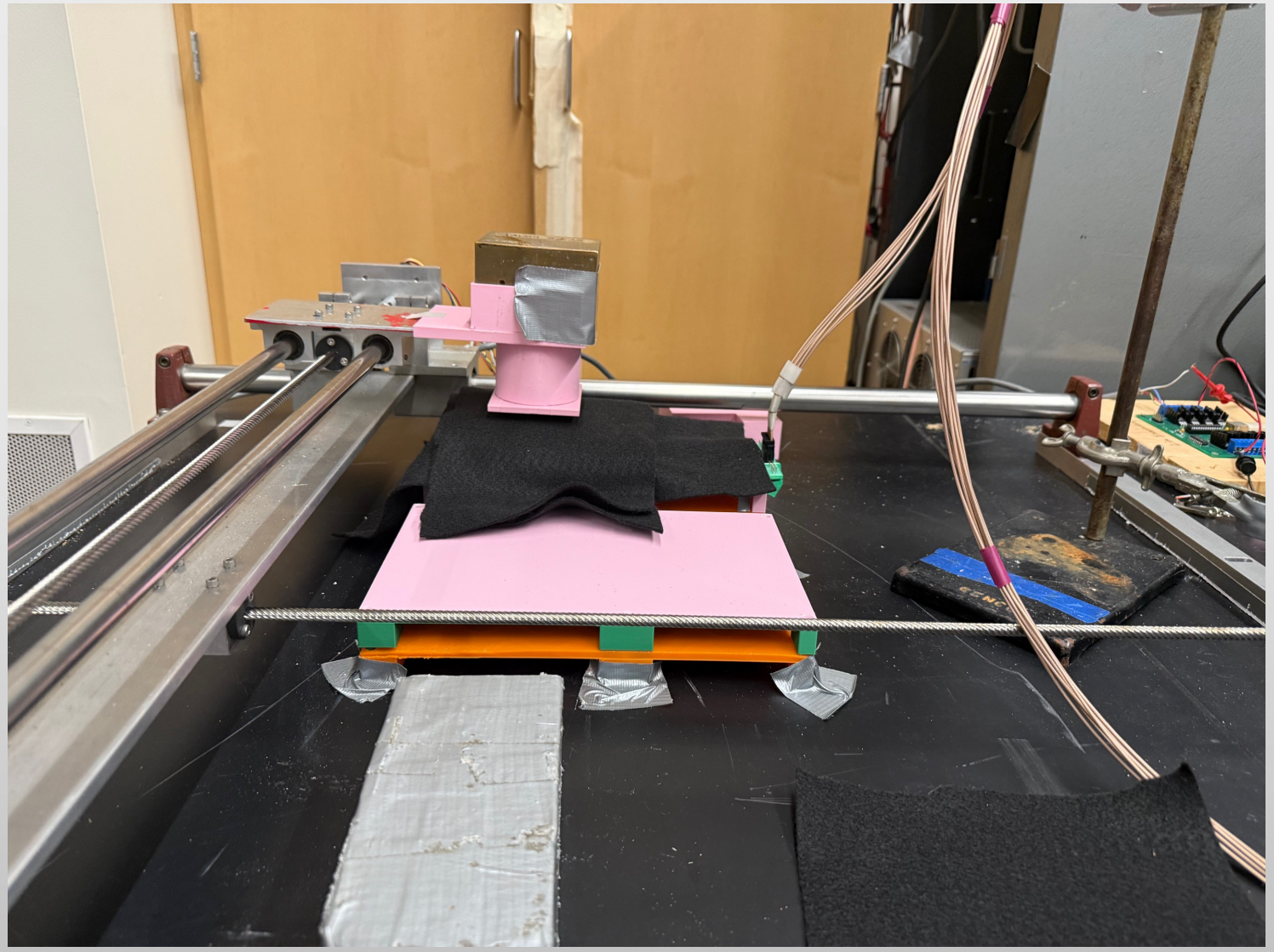
Original

Lab setup



- Sr90 beta source
- Source oved through a list of positions via x-y table
- Tile centered over SiPM
- Readout through CAEN module

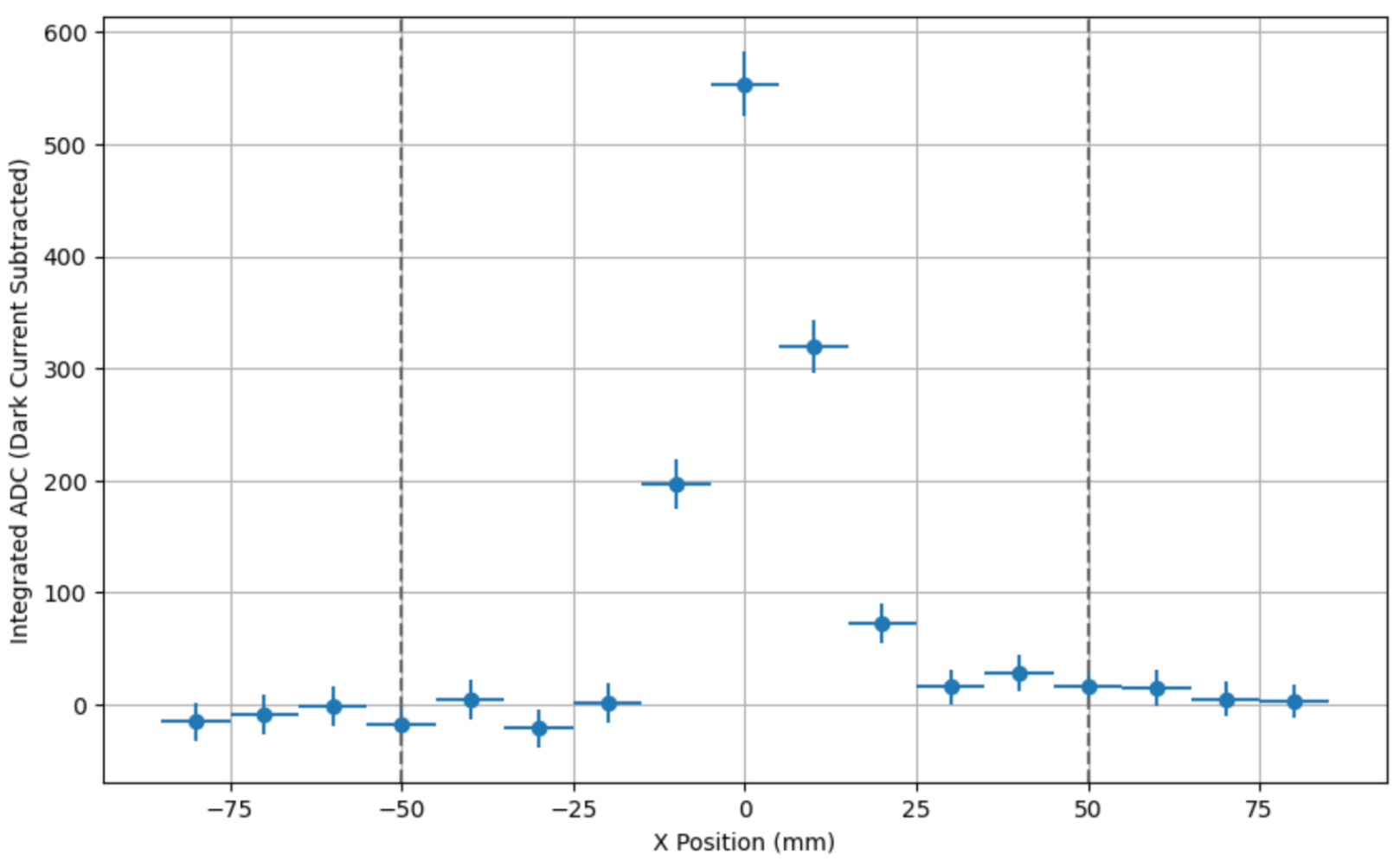
Lab setup (pt 2)



- For data taking, cover tile with felt and turn off the lights

Results from unwrapped, polished 10x10 tile

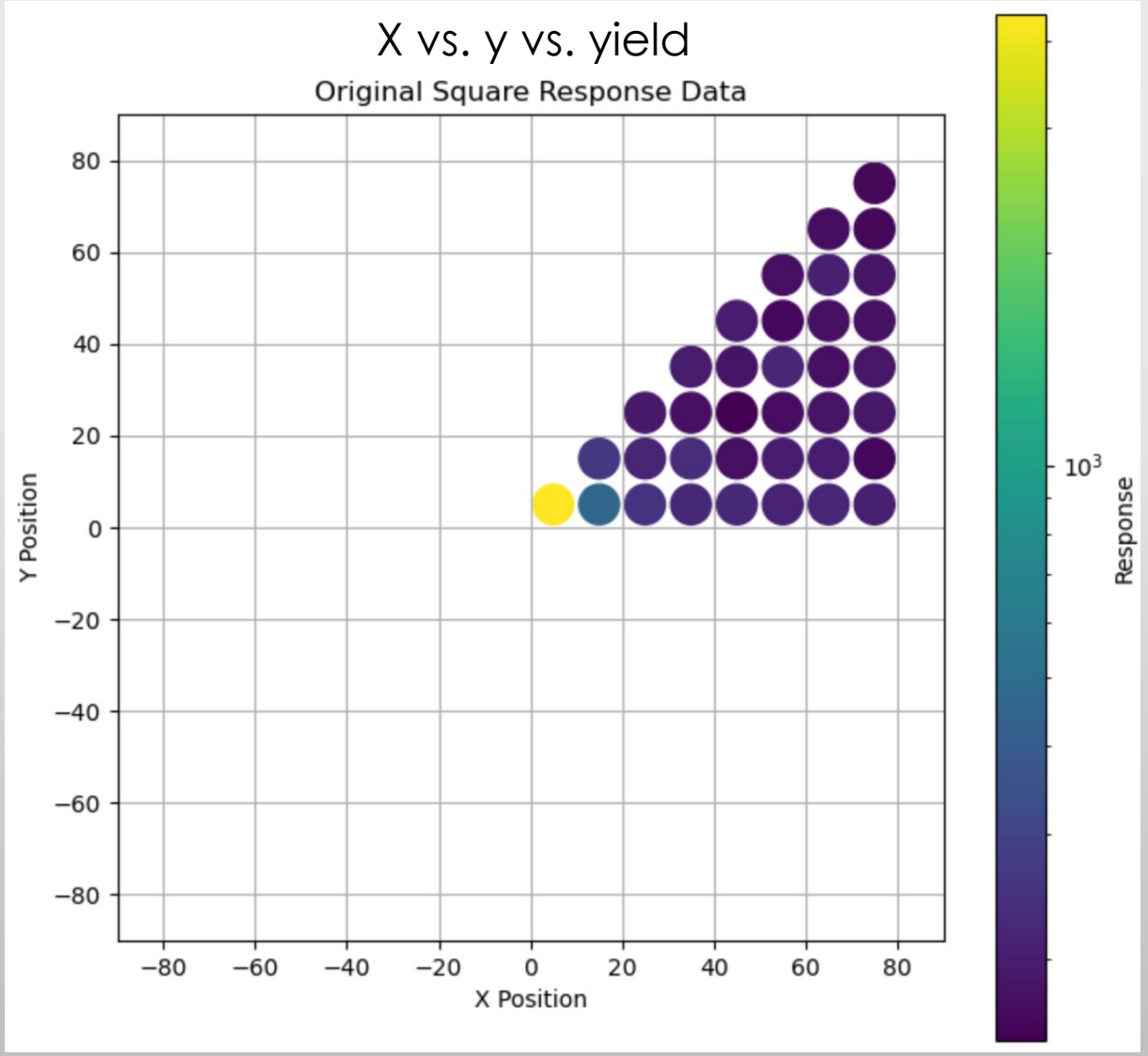
- Horizontal scan across the center of the tile:



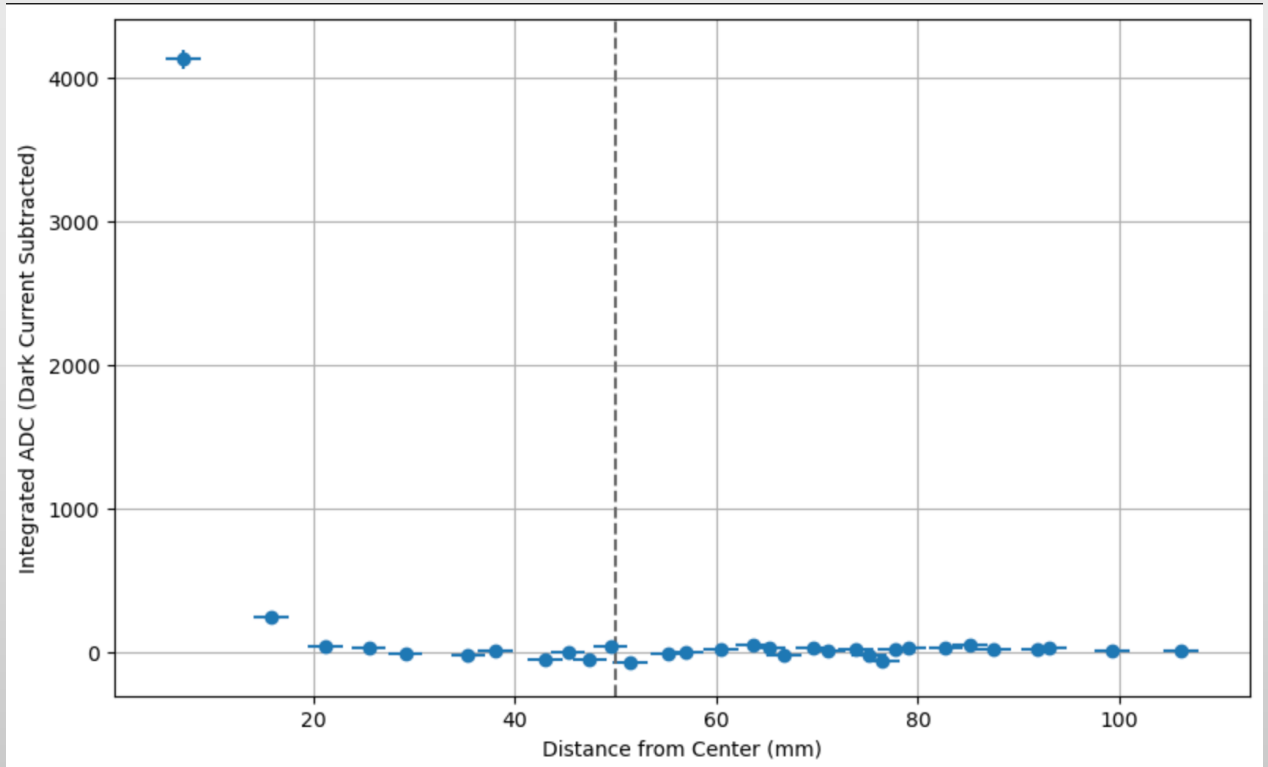
Vertical lines=edge of the tile

Results from unwrapped, polished 10x10 tile

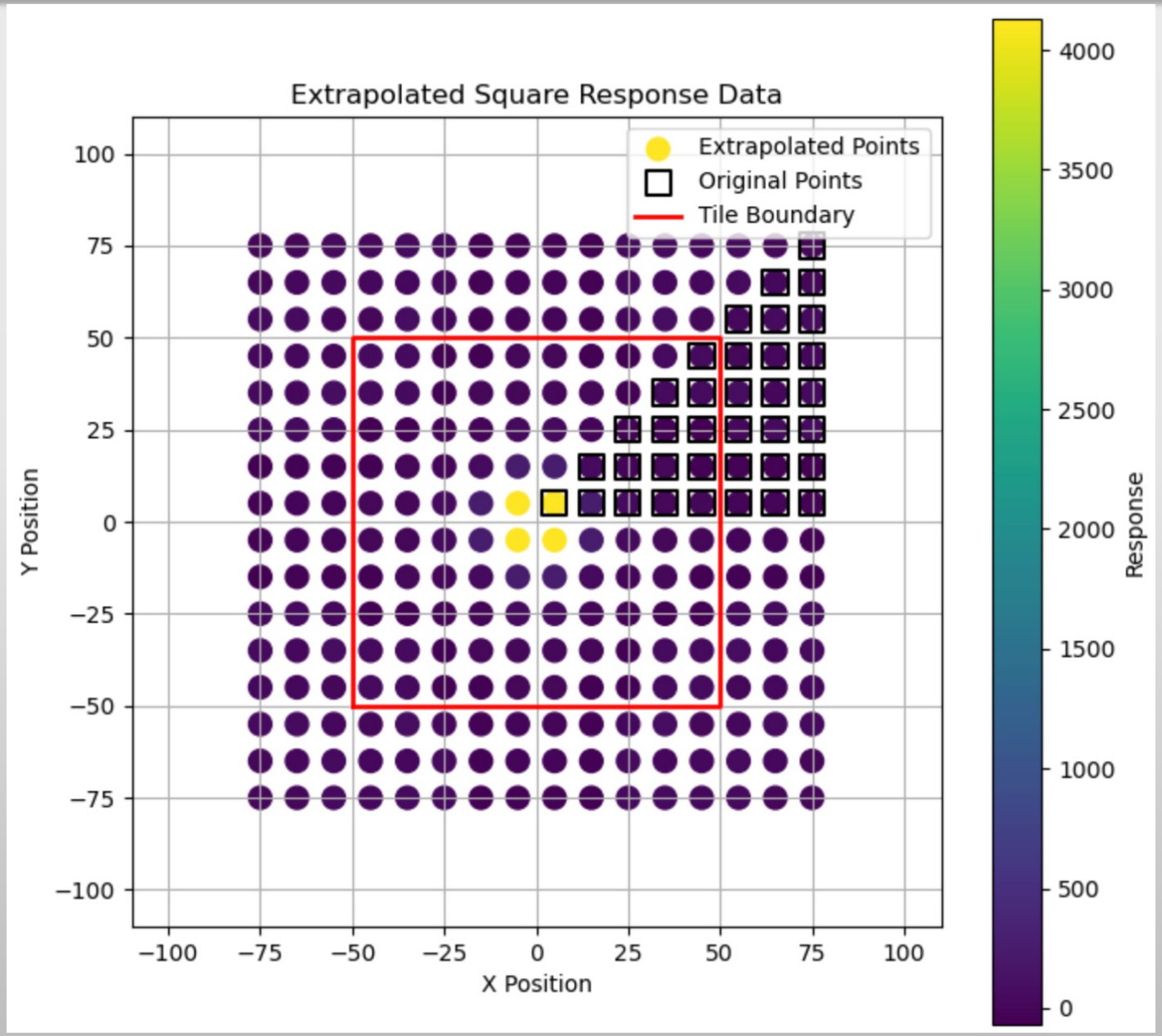
- 1/8th grid scan



$\sqrt{x^2 + y^2}$ vs yield

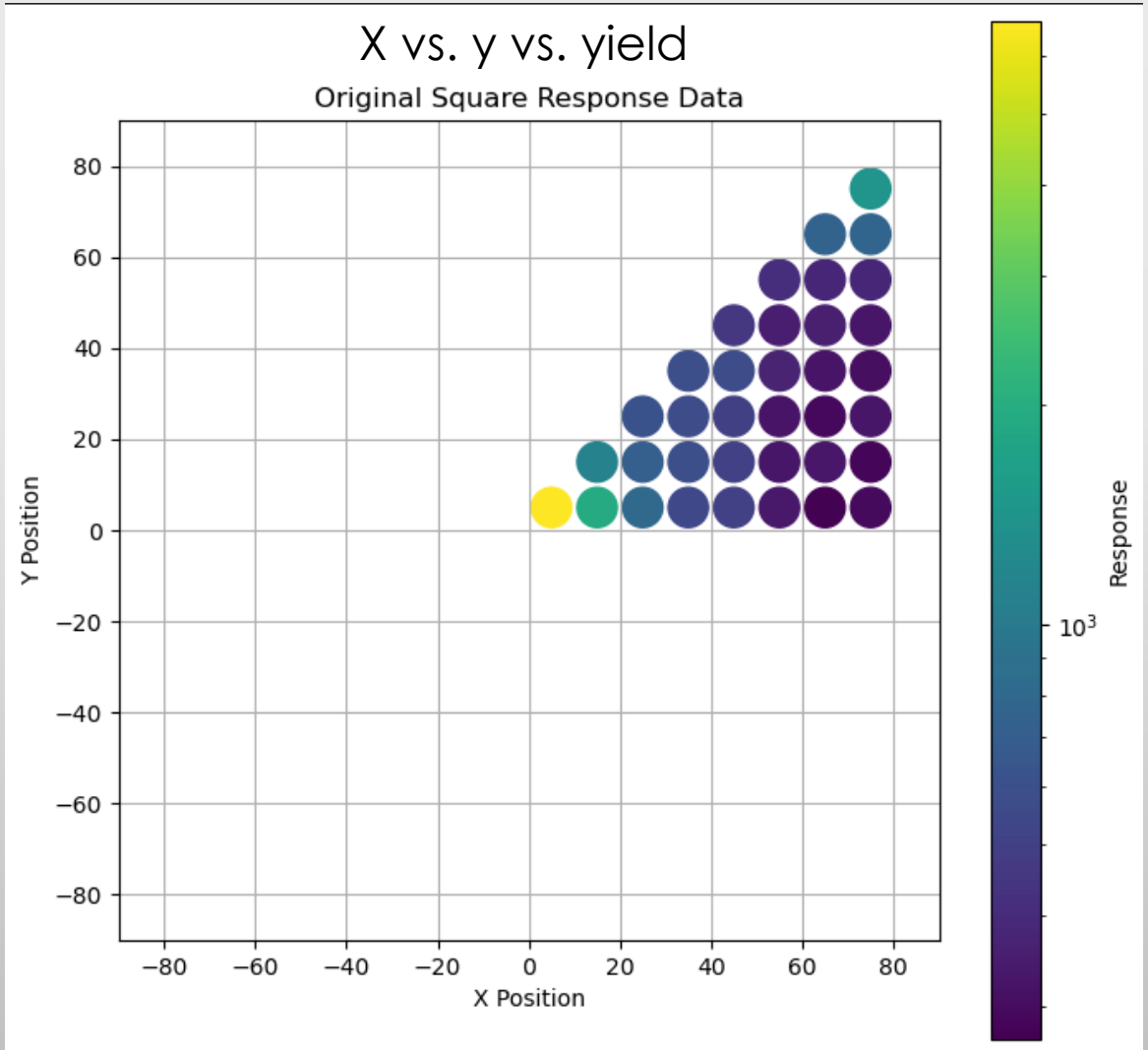


Heatmap from exploiting square symmetry

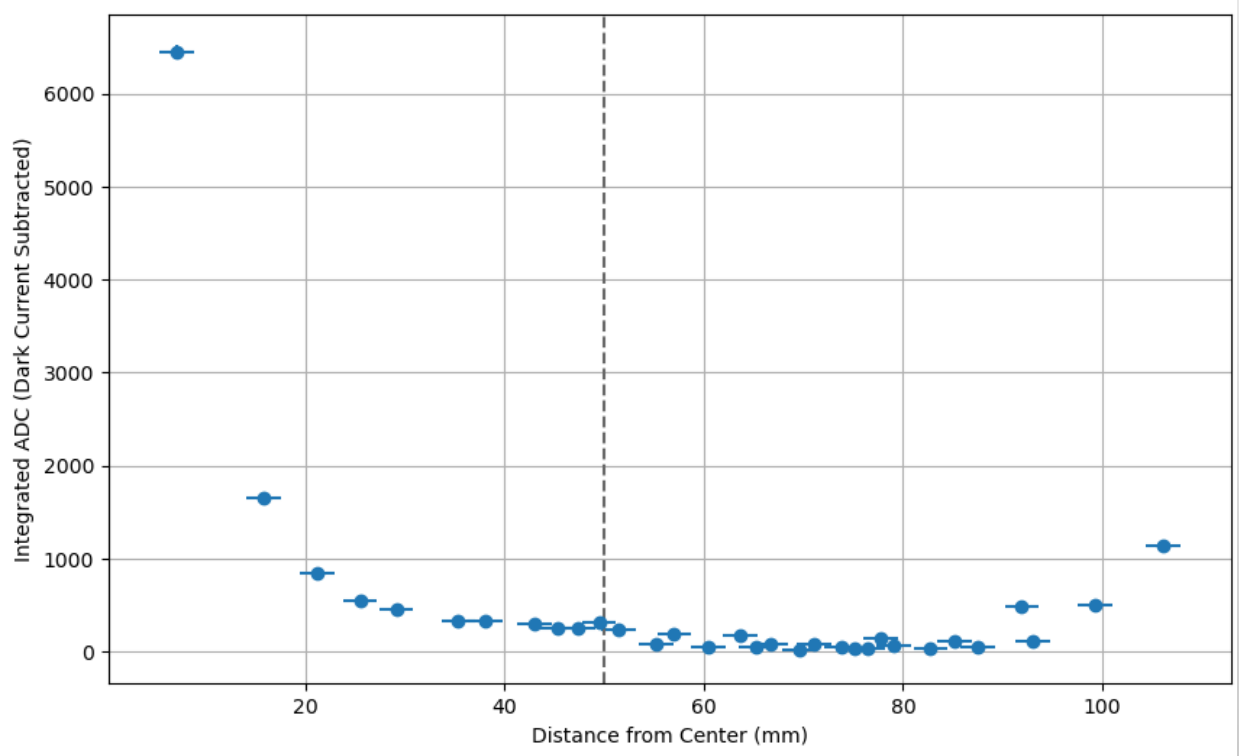


Results from **wrapped**, polished 10x10 tile

- 1/8th grid scan

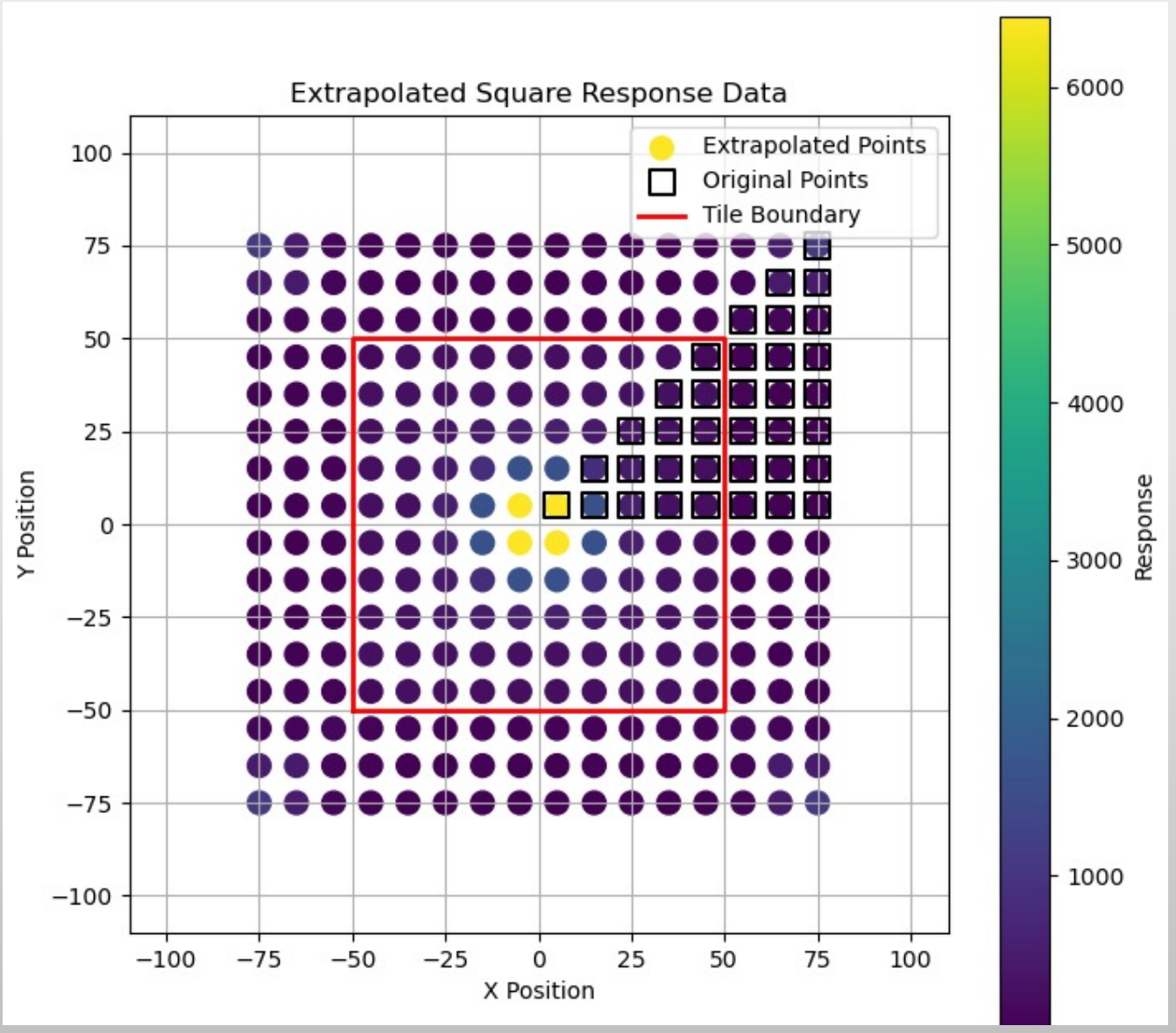


$\sqrt{x^2 + y^2}$ vs yield



Note: ignore these high yield points at 75, 75
I suspect due to my phone flashlight checking if it was done

Heatmap from exploiting square symmetry

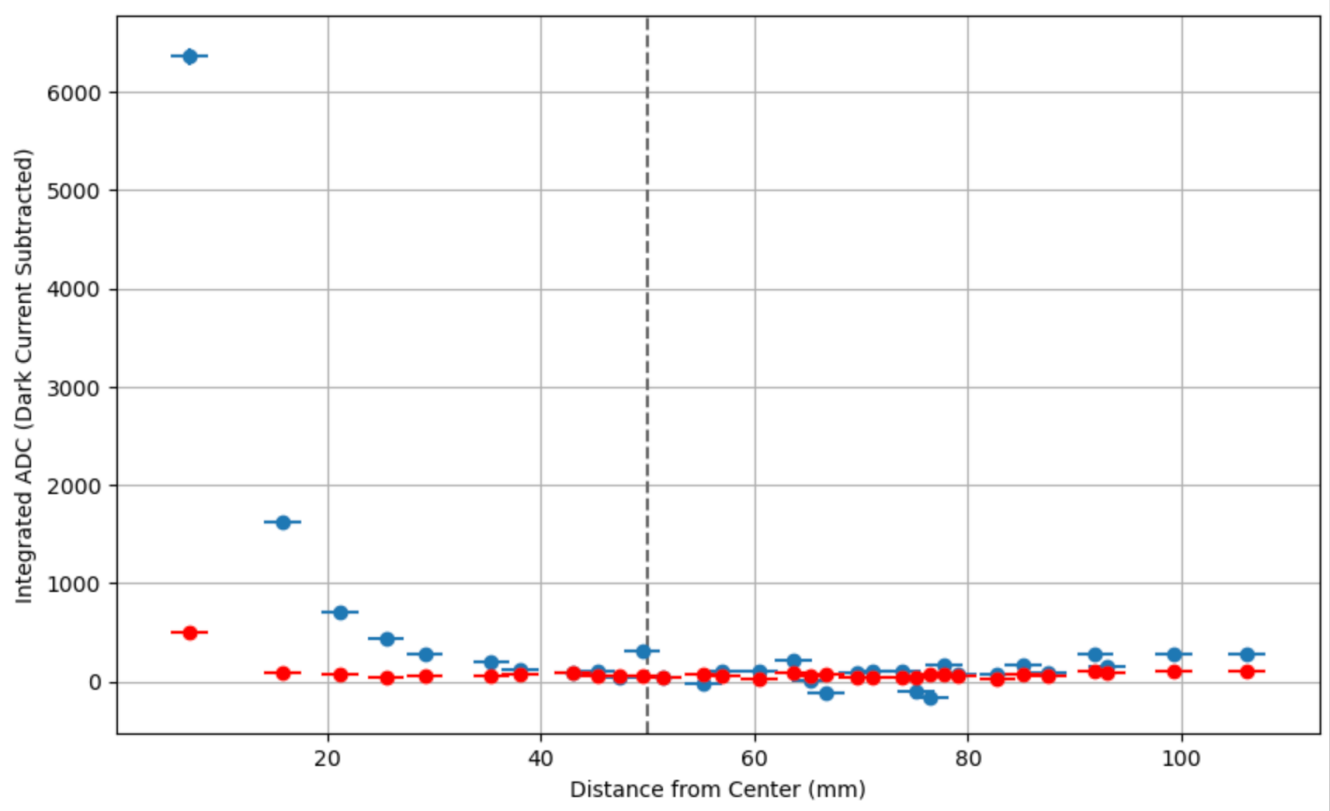


Clear improvement from unwrapped case, but very far from ideal.

Maybe wrapping can be improved (better technique/methodology)

Possible improvement by adding layer of reflective material over the PCB with only a very small hole for the SiPM. Could be that the whole cut into the tile's wrapping is too large.

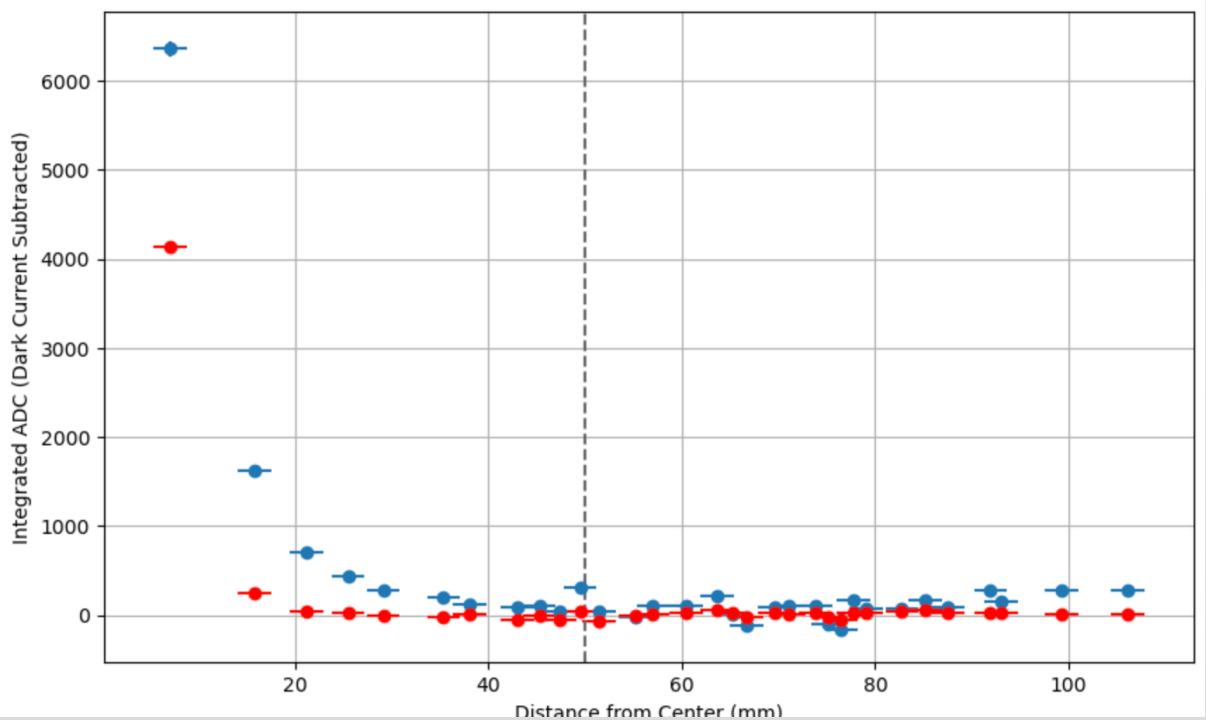
Scan with no tile

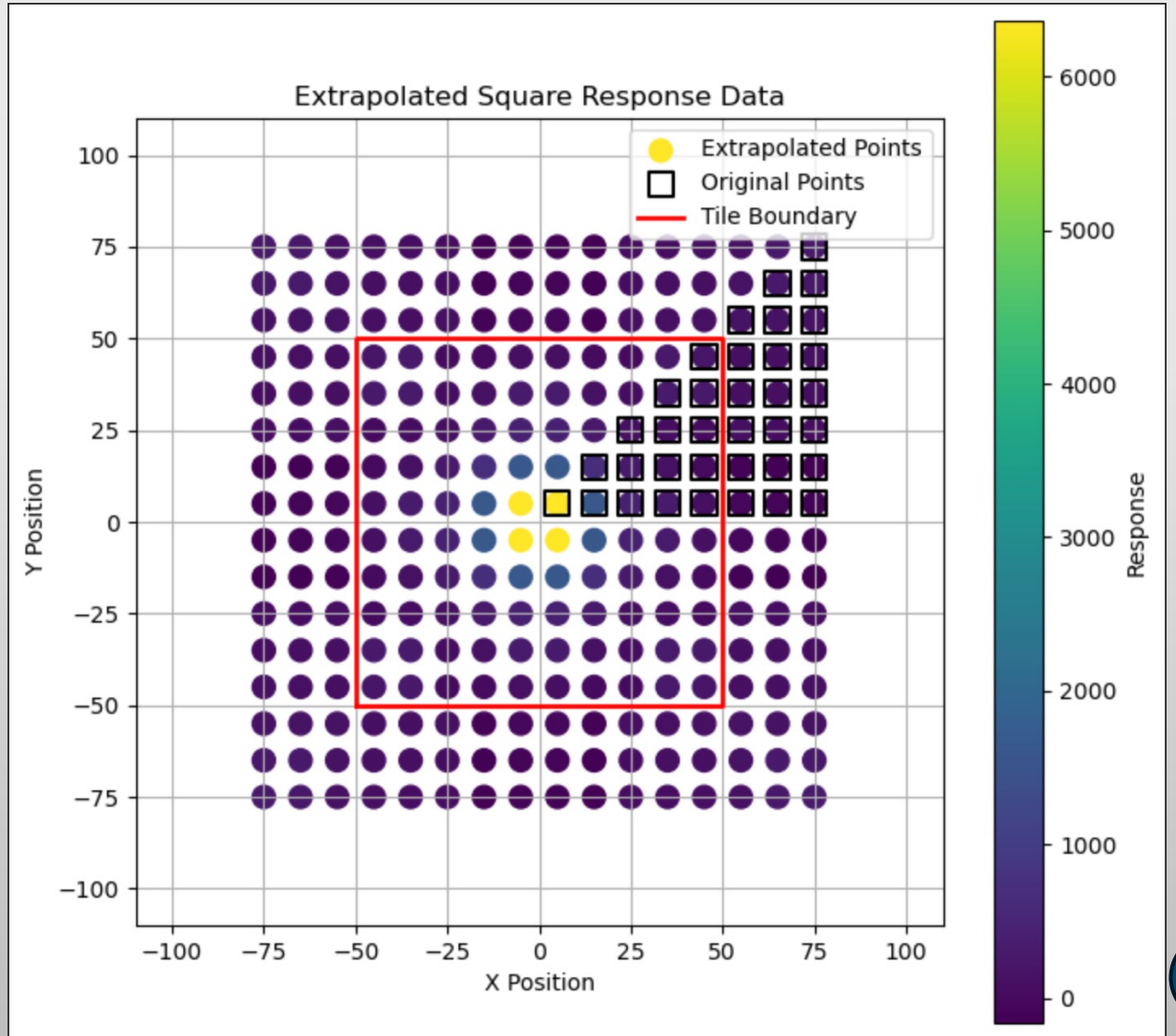


- Repeat the same scan as before but with no tile at all
- This contributes some to the non-uniformity. ~7.5% overestimating most central region of tile.
- Great to know, but doesn't solve issues.

On the list: painted 10x10 tile, extra mechanical pressure, optical grease
Also, will try move SiPM to edge of tile, but this will take longer to set up.

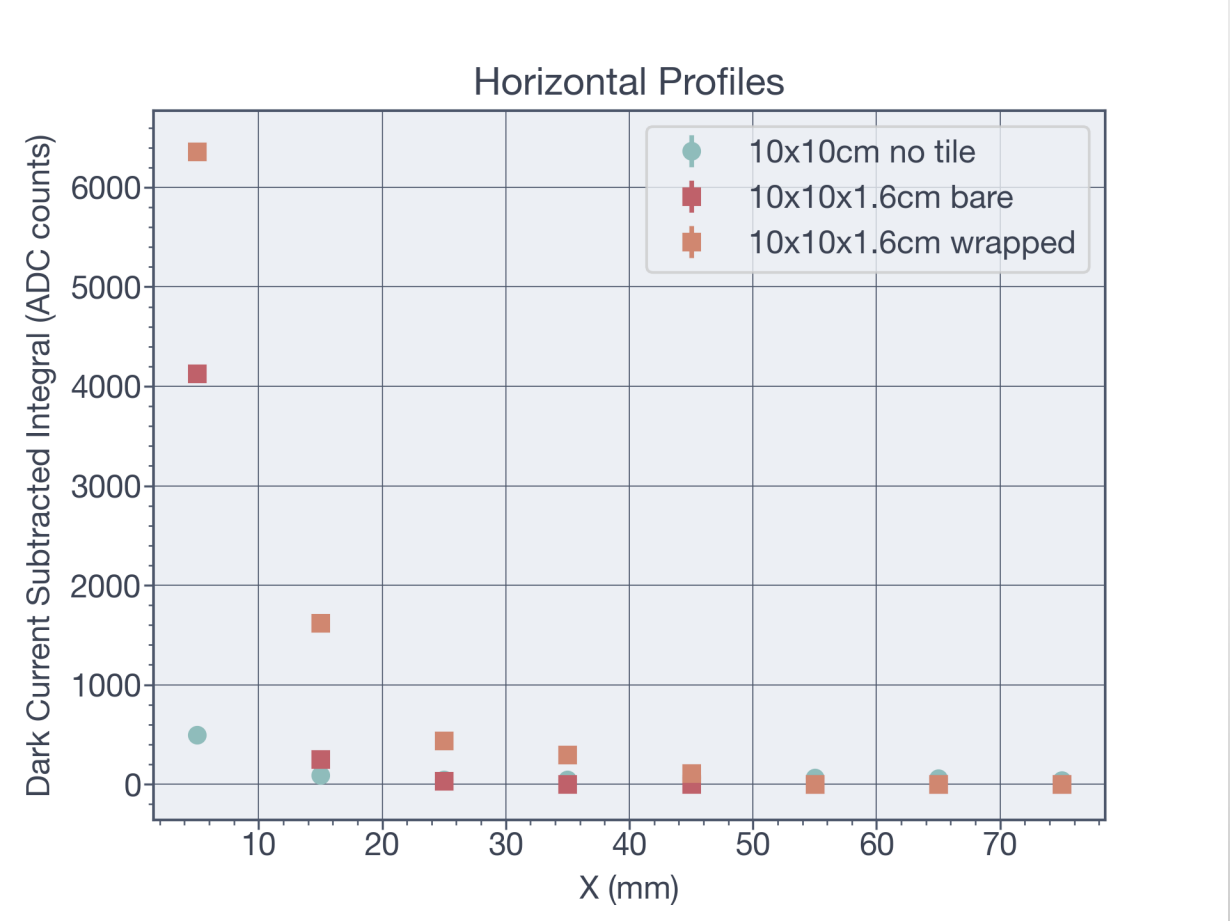
“Improved” wrapping results

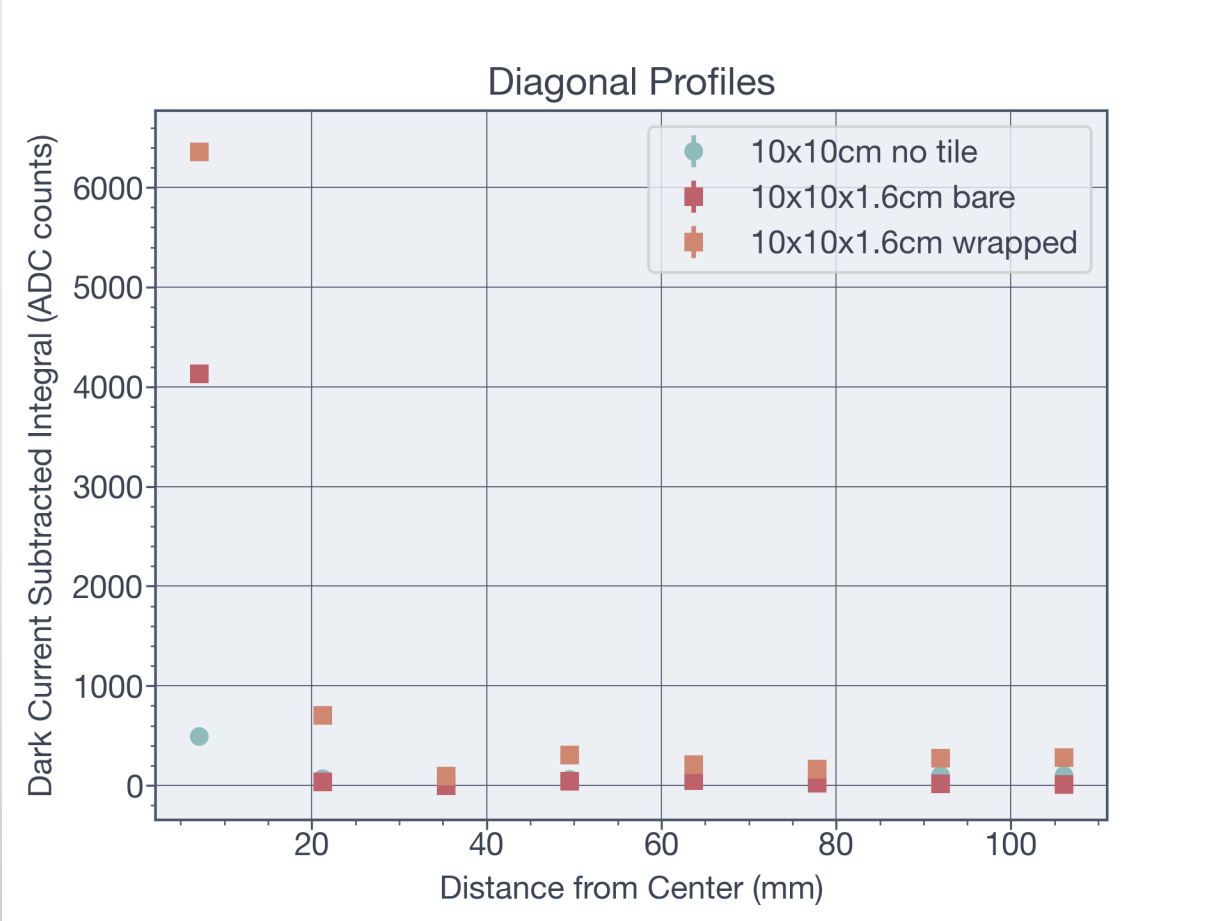




One (of many) questions: is it possible that we are uniform above ~25 cm and we’re seeing our source directly at the 0cm peak?

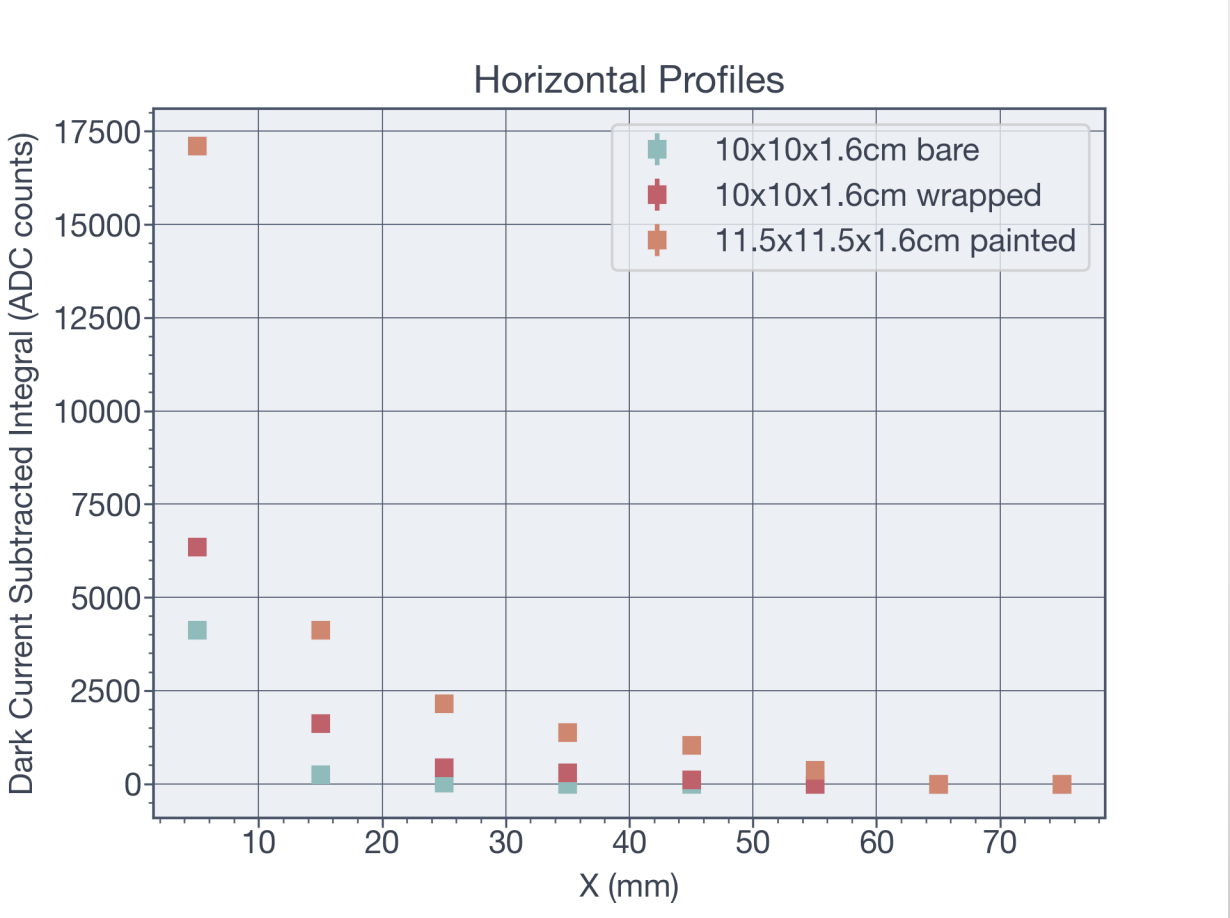
So far: 10x10x1.6 with and without wrapping

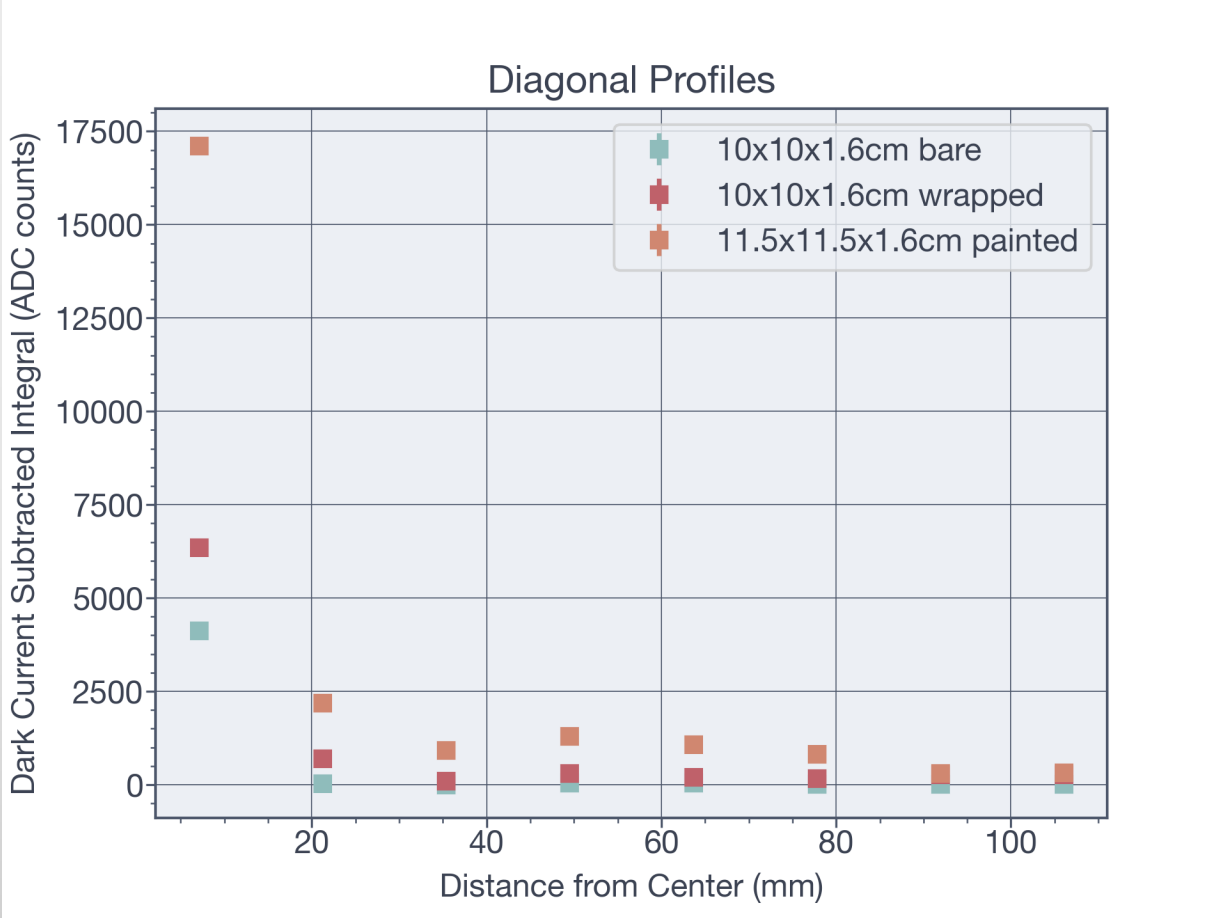




- As of last week, we have scans of this tile with no dimple or optical grease
- Tried wrapped vs. unwrapped. Also checked response of bare SiPM

Swap to another tile: 11.5x11.5 painted

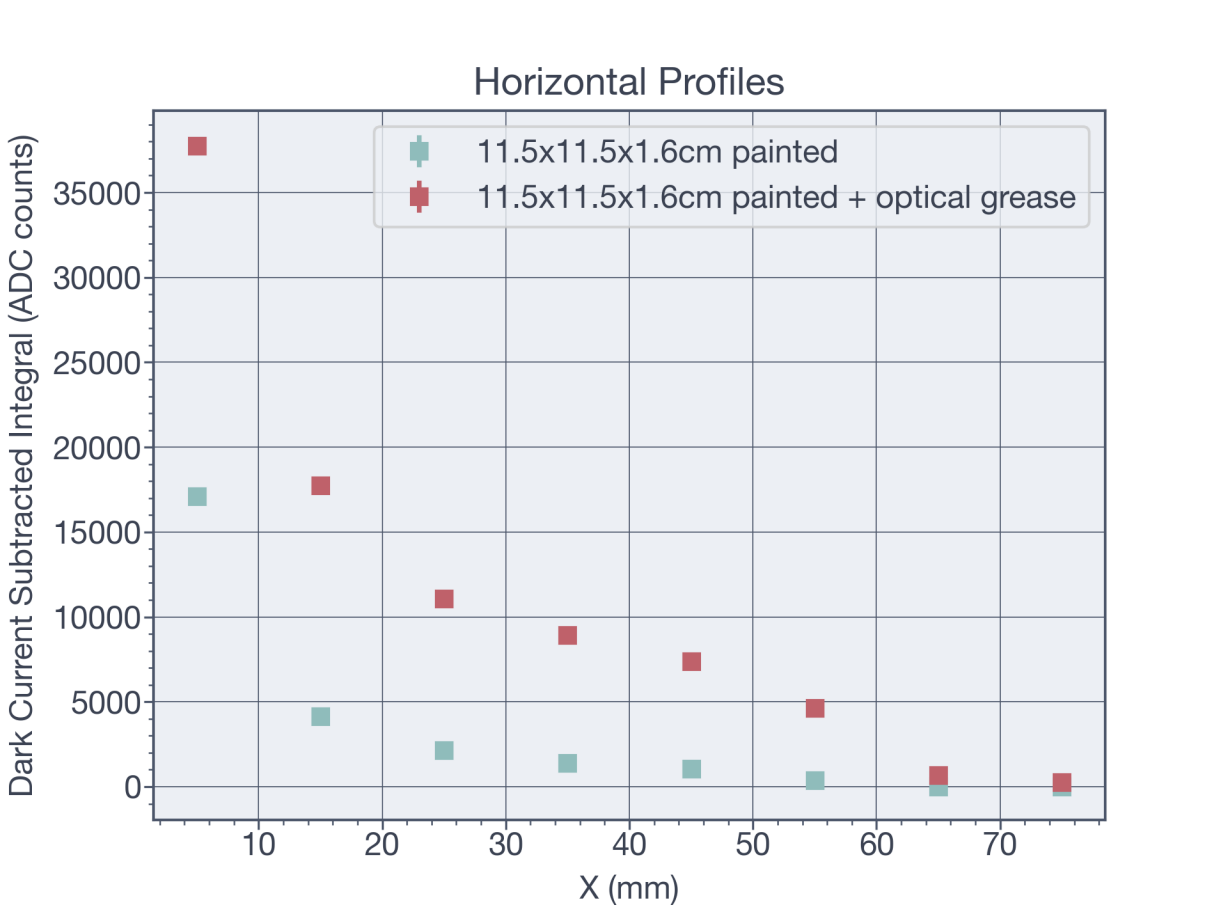


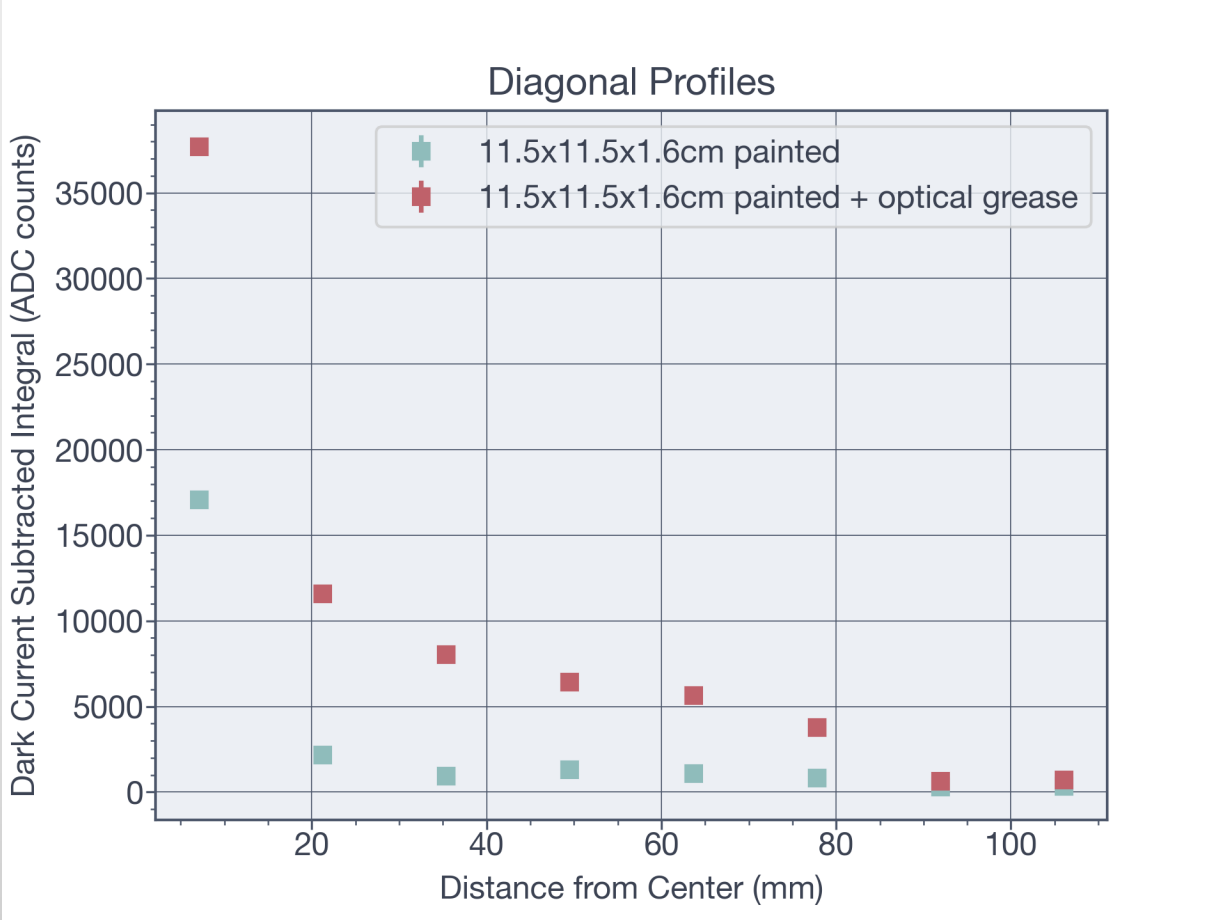


- ~3x higher yield than wrapped at center of the tile
- ~10x higher yield at the edge

Now add optical grease

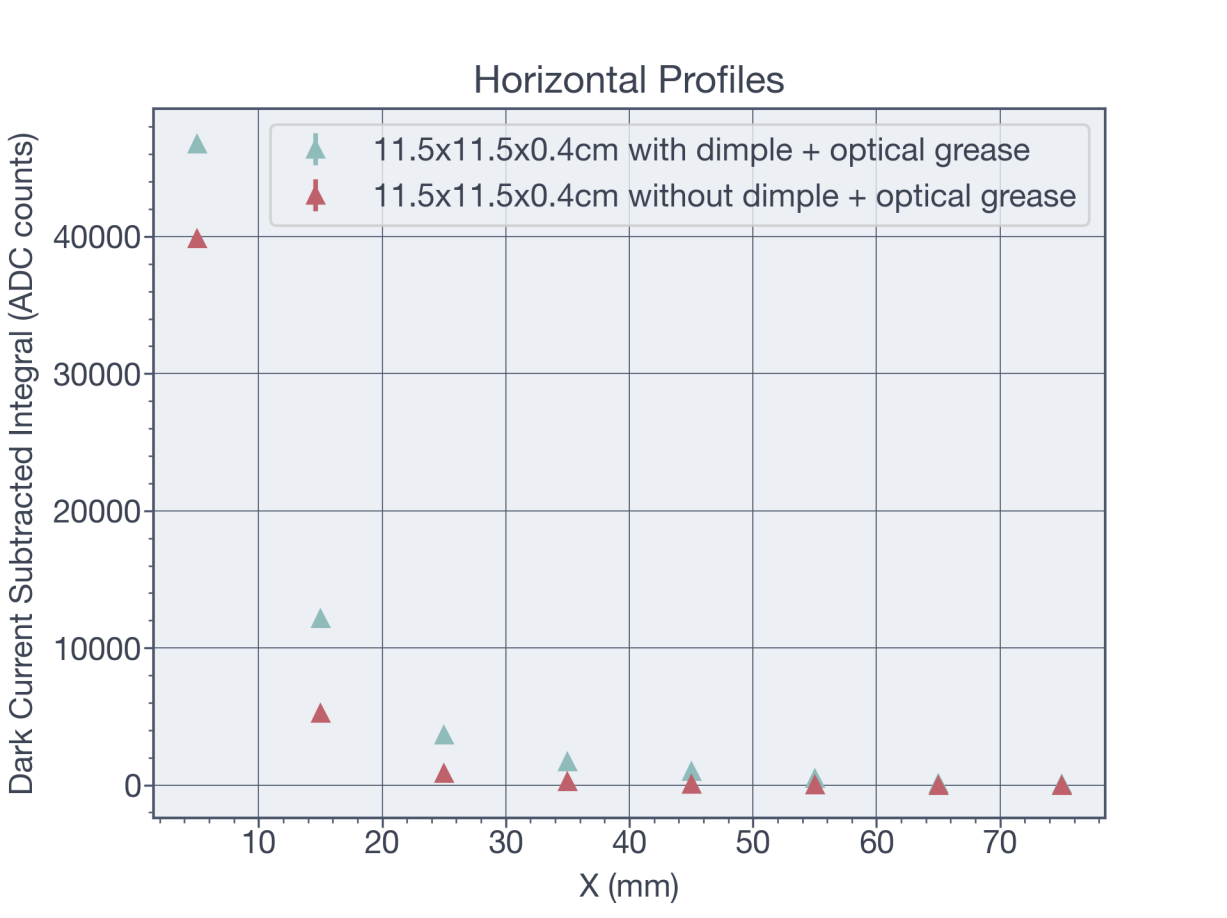
11.5x11.5 painted w/ optical grease

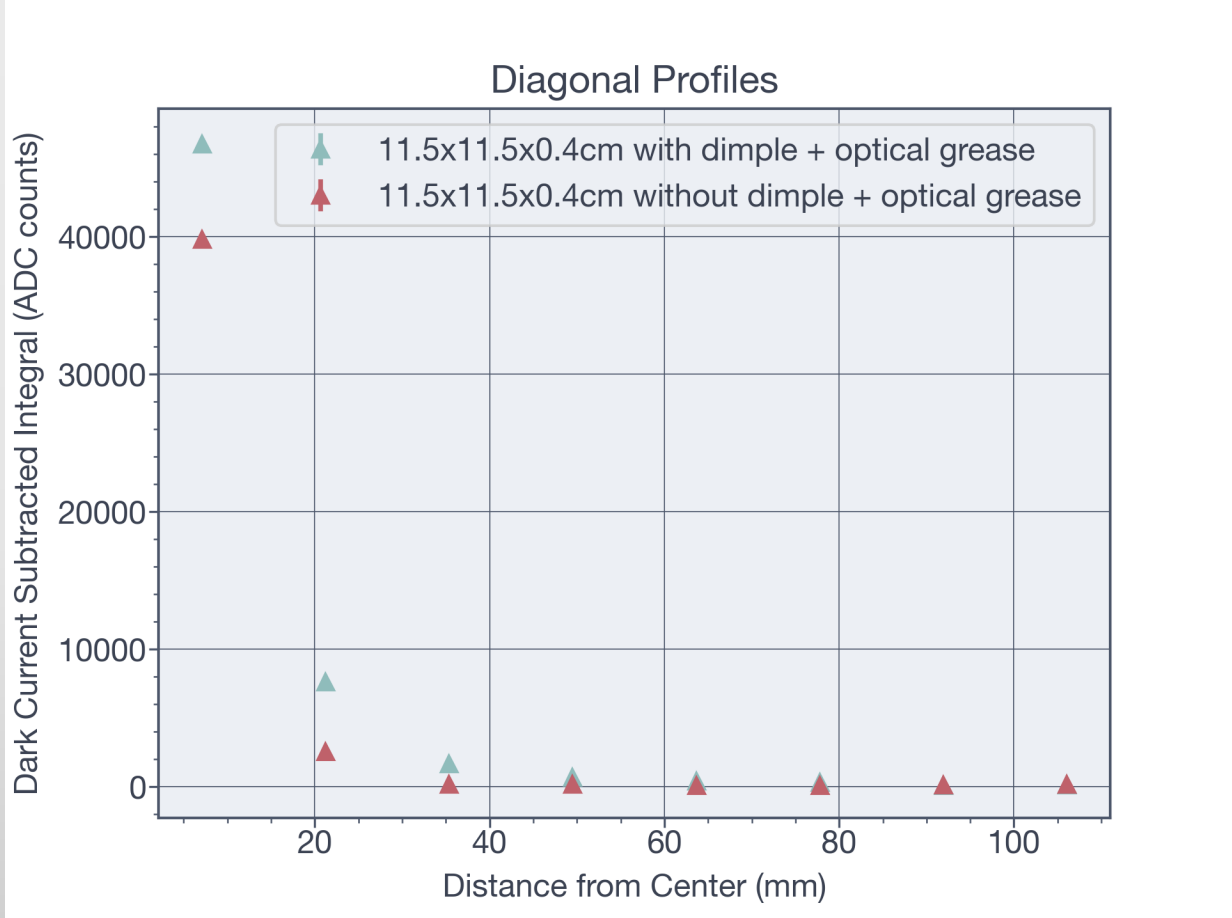




- Another >3x improvement!
- Painted tiles+optical grease seems very good!
- But still not very uniform->check out tiles with a dimple.

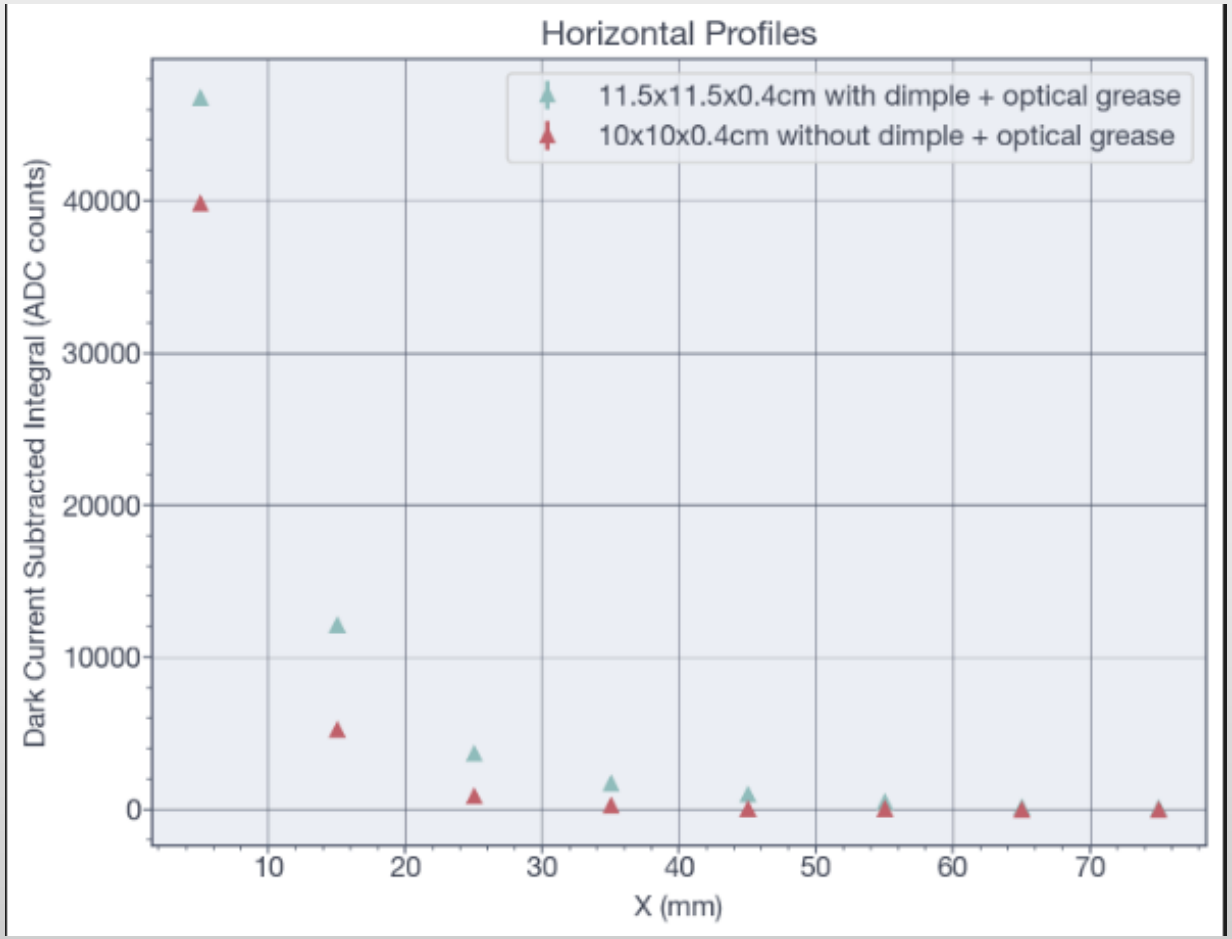
11.5x11.5x0.4 bare tile w/ optical grease



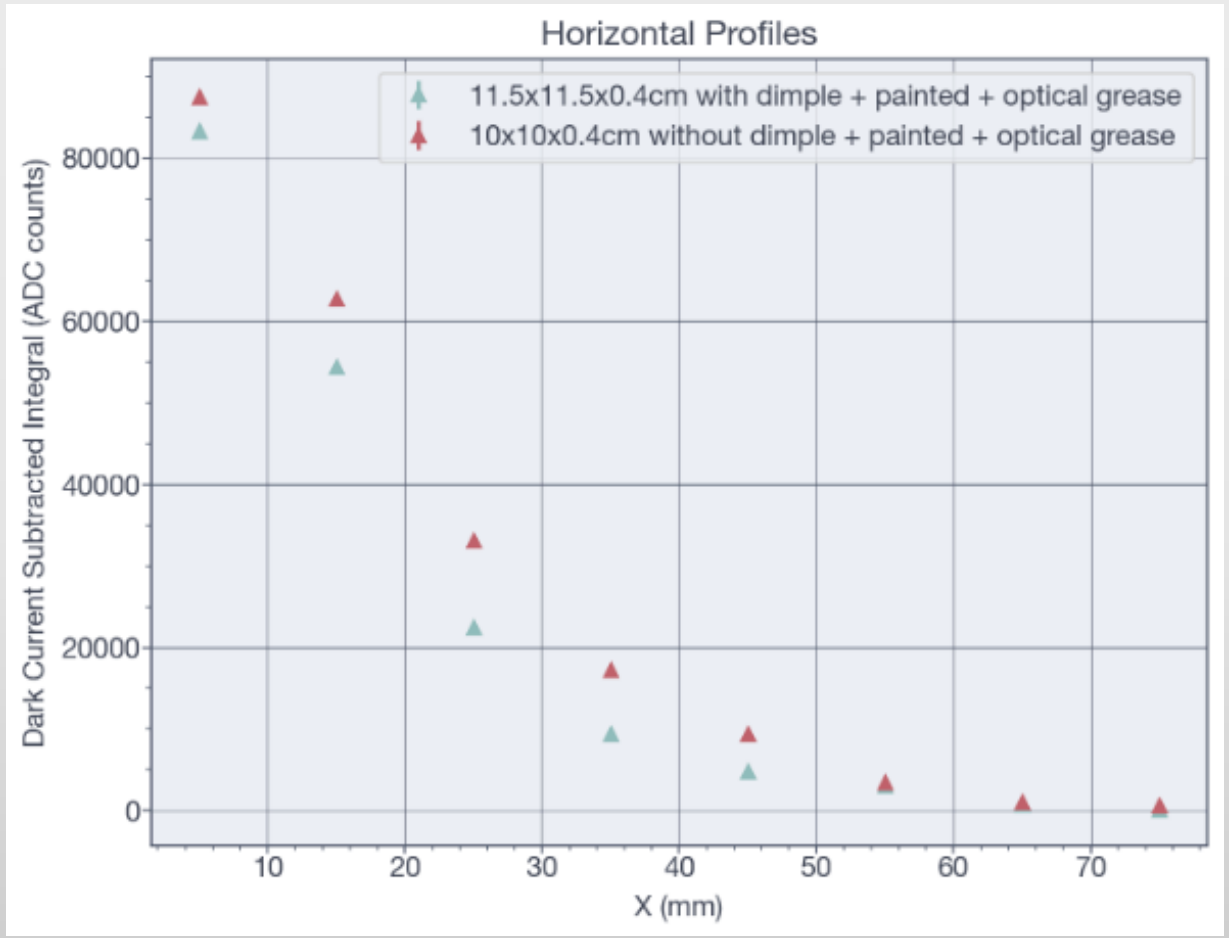


- Forthcoming: Wrap these, test again, then paint them. Also, various 5x5 tiles.

Thin tiles with/without dimple

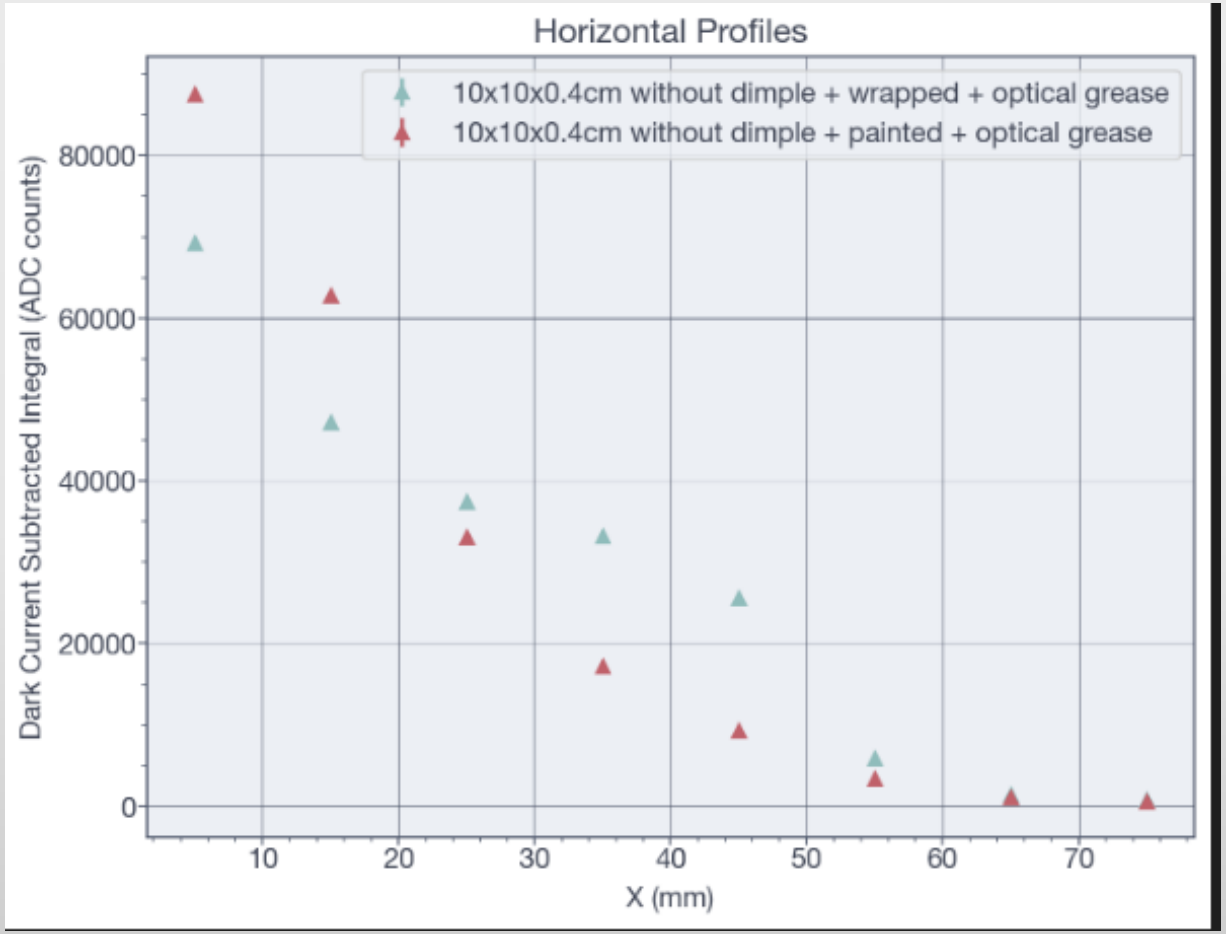


Bare tiles

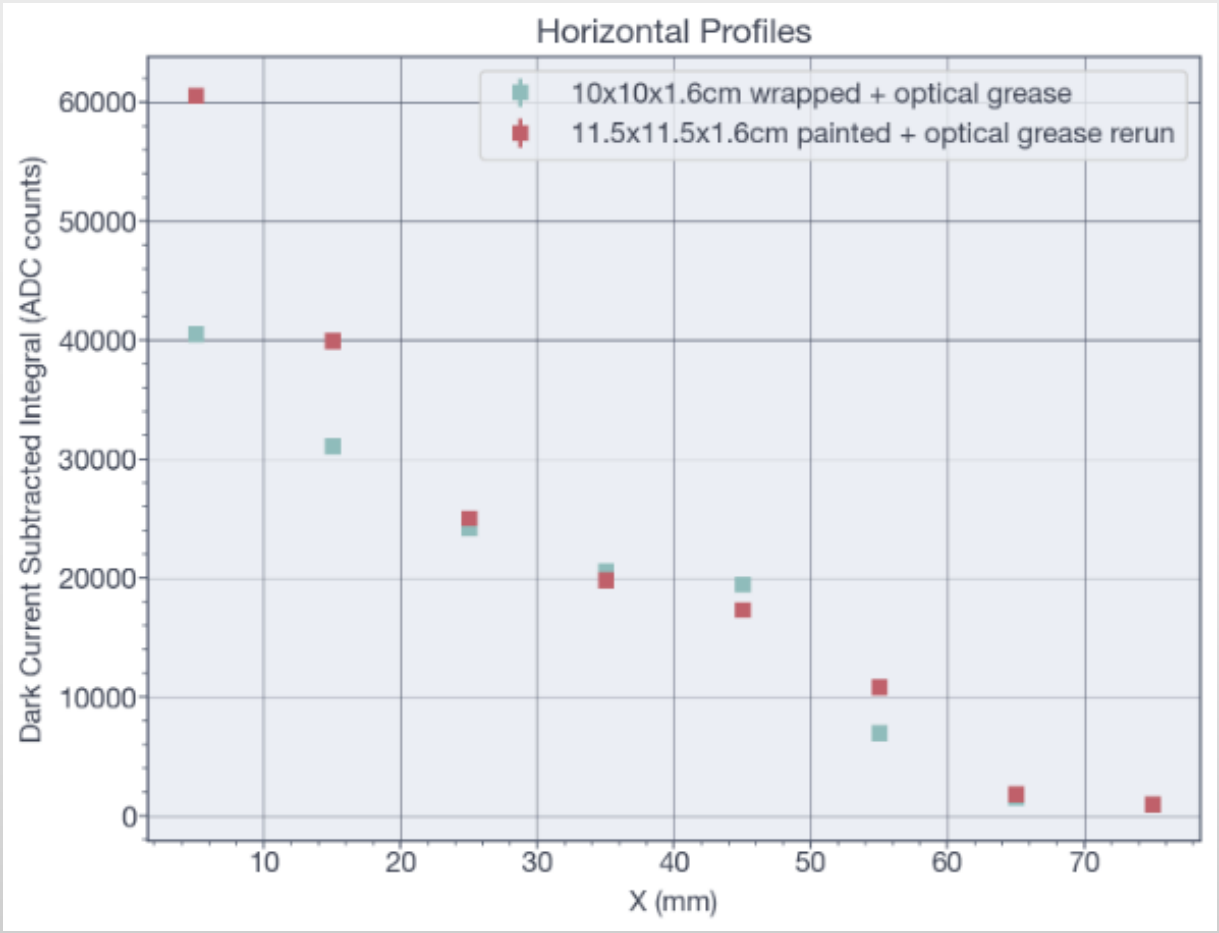


Painted tiles

wrapped vs. painted w/ optical grease

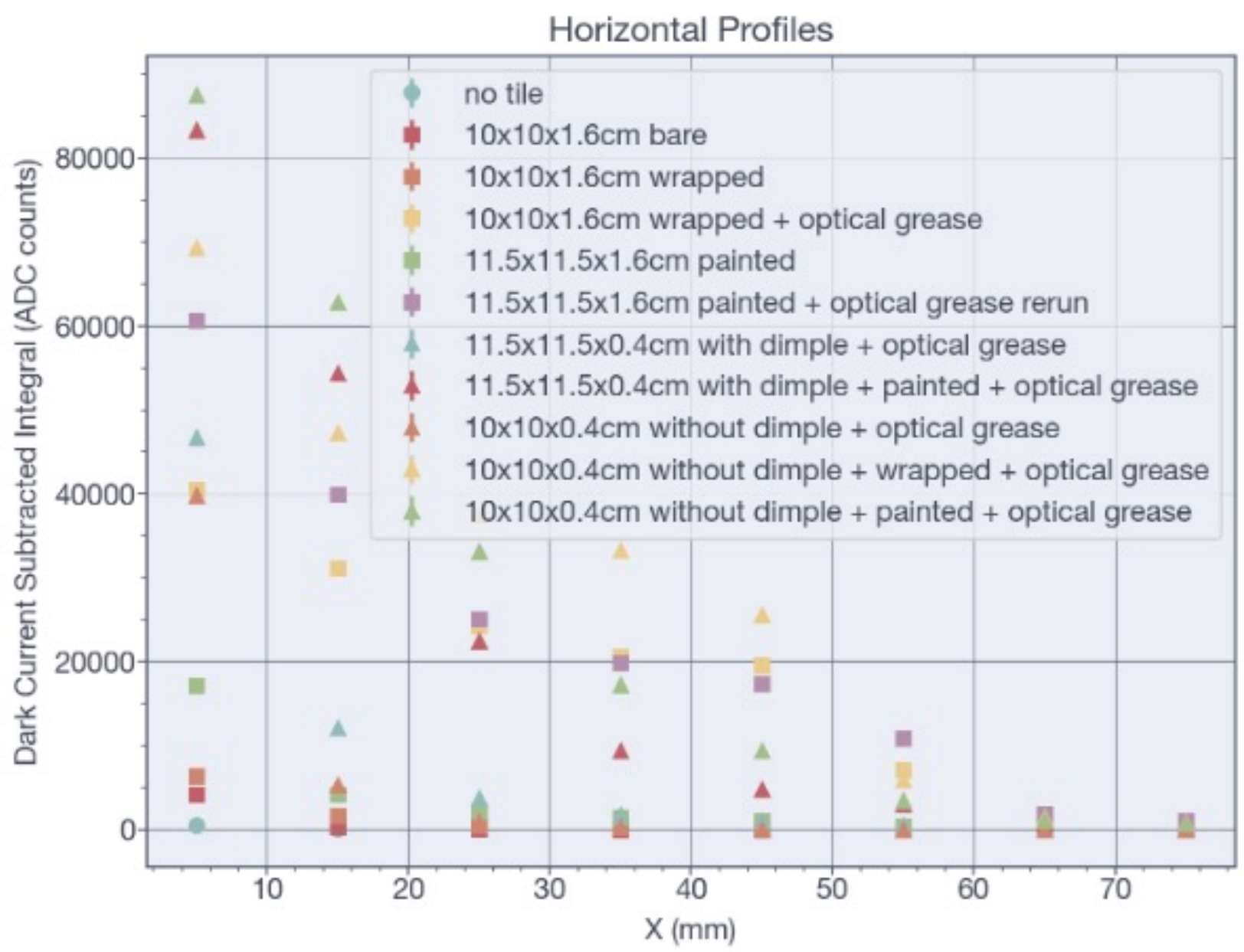


4mm tiles



16mm tiles

Everything so far



Obviously hard to read like this; please request whatever subset you'd like to see, and I will pull up my plotting notebook