Update of ARCADIA Readout Measurement

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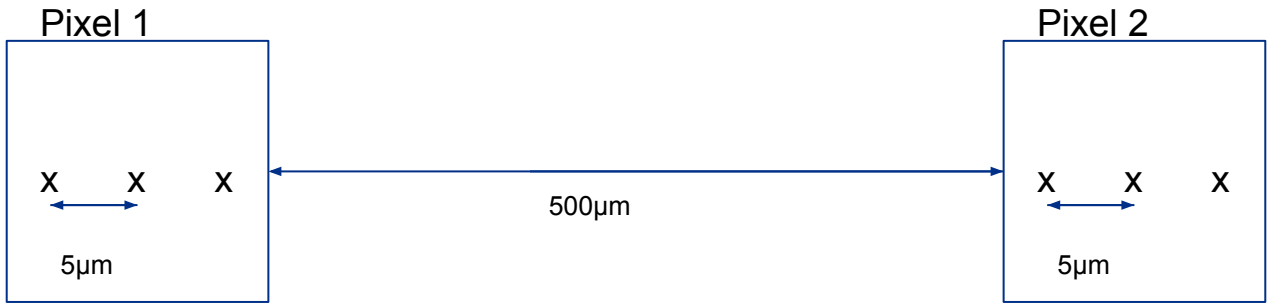
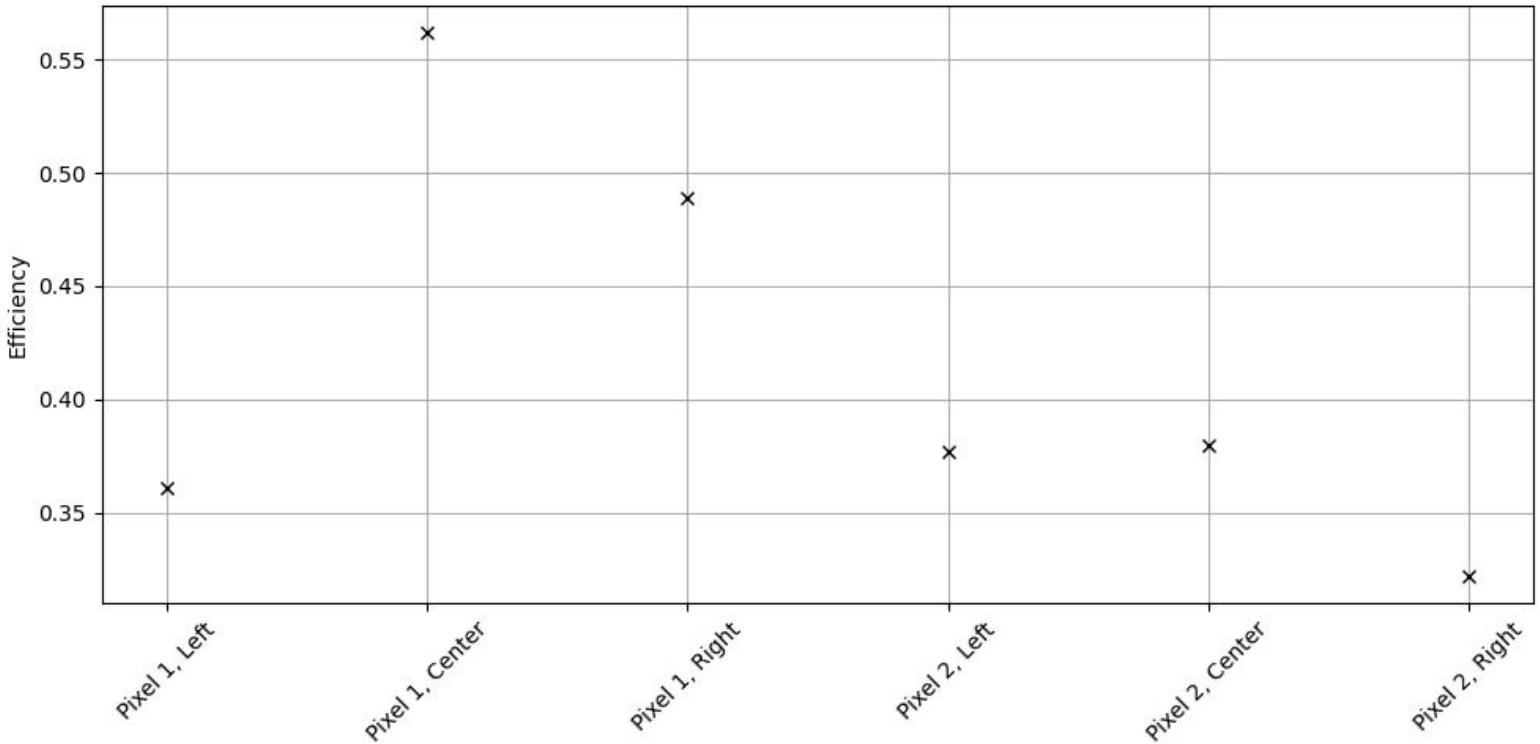
Introduction

- Last time from Nelson:
  - ARCADIA measurements
  - Laser spot measurements
- This time:
  - Measure efficiency of ARCADIA pixels with new laser configuration
    - Set power of IR laser approximately to MIP from LGAD measurements
  - Characterize pixel readout efficiency following a 1D line
    - Measure three 1D points with 5μm spacing for two pixels
  - Implement custom python script for platform movement



1D Scans Efficiency at VCASN=31



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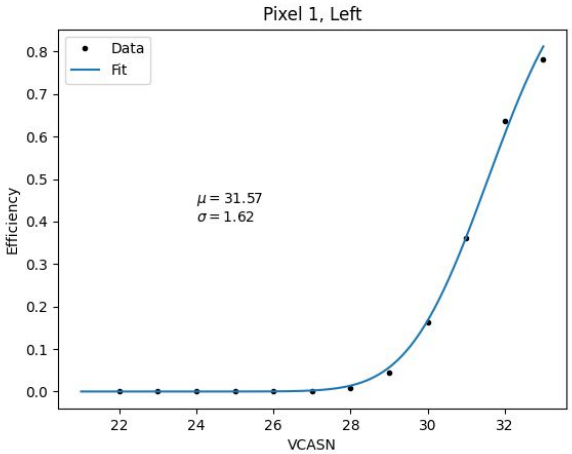
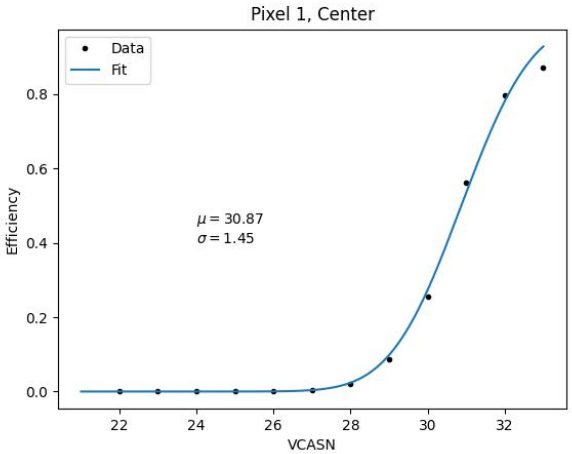
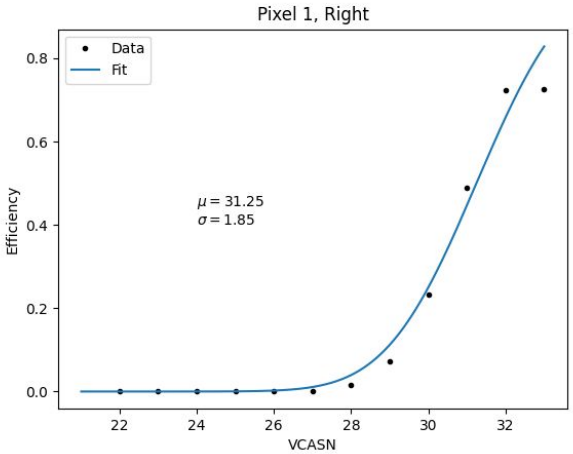
Efficiency S-Curve of Pixel 1

5μm

5μm







See backup of S-Curve for Pixel 2

$$\frac{1}{2}\left[1 + \mathrm{erf}\left(\frac{x-\mu}{\sigma\sqrt{2}}\right)\right]$$

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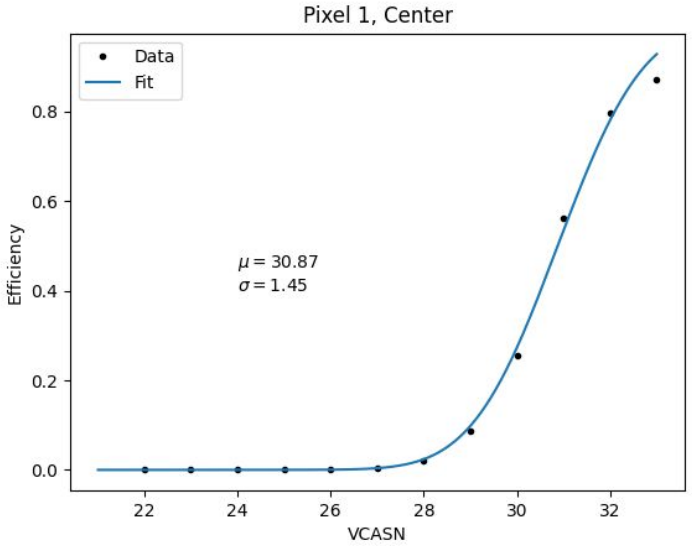
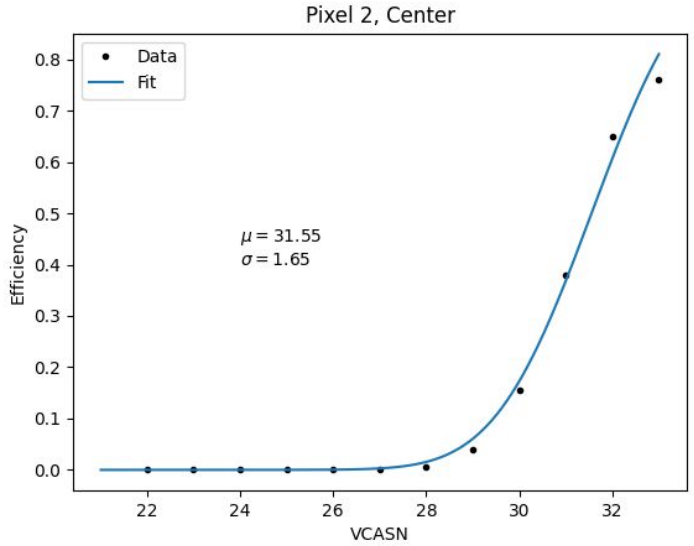
Comparison Pixel 1 and Pixel 2 Centers





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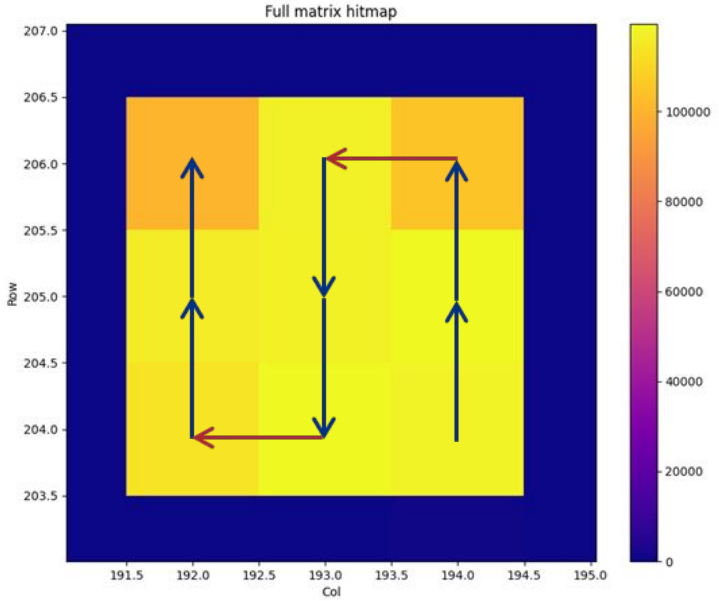
Update in the Automation of Testing

- Instead of using the Particulars website software (PSTCT) to control the platform, we developed a Python code. With this, we are no longer limited in how we can program the laser path.

- In addition, with this improvement, we aim to enable communication between data collection from Arcadia readout and platform movement, allowing both to synchronize and thereby simplify data collection and post-processing.



New Possibilities for Programming a Laser Path

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Conclusions

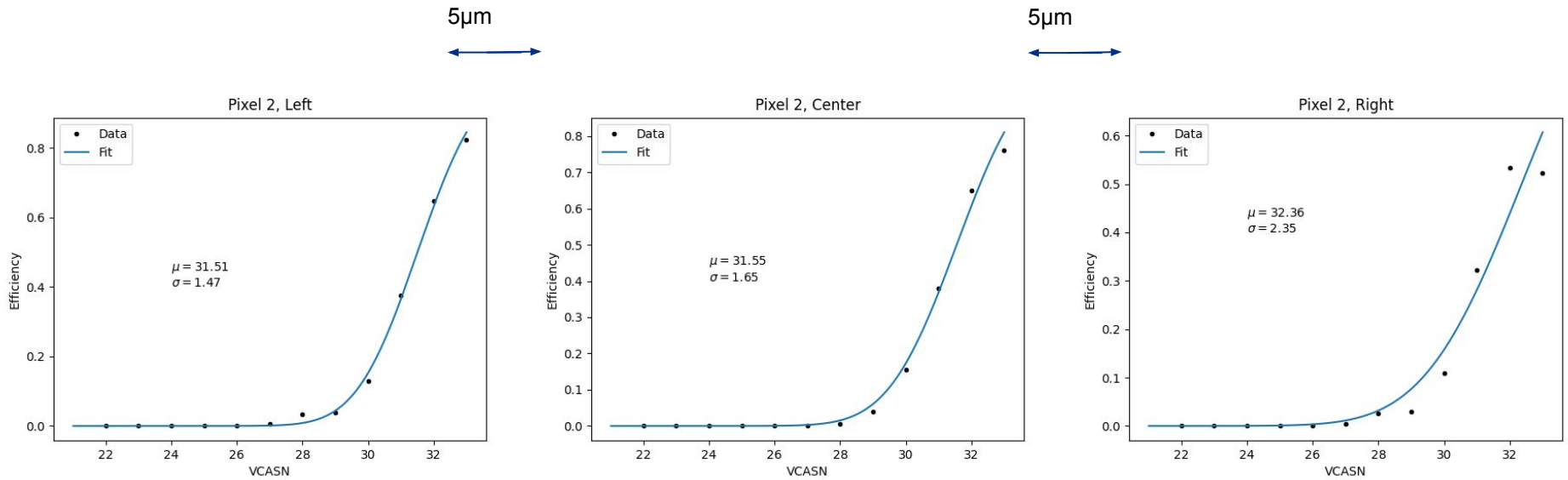
- In our initial measurements, we have observed that the pixels don't provide a uniform reading across the entire surface, with lower efficiency at the edges. However, the configuration of the laser and the programmed movement through one or more pixels are still being debugging.

- Environmental factors affects measurements especially near pixel edges
  - Temperature of sensor
  - Vibrations of table

Next steps

- Upgrade the test box
  - Install water cooler to study temperature dependence of efficiency
  - Install tilt controls for beam expander
- Update software to unify stage control and ARCADIA readout software
  - Currently separate in two computer systems
- Increase domain of scans
  - Include 2D measurements within a pixel (9 total per pixel)
  - Increase number of total pixels

Efficiency S-Curve of Pixel 2



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