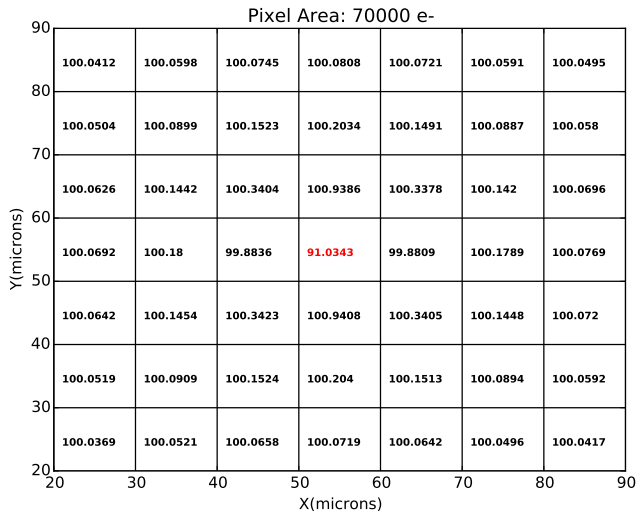


# Pixel Areas and Correlations

Craig Lage

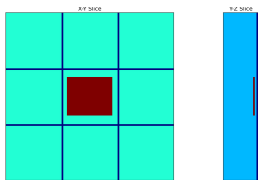
December 1, 2015

# Initial Simulation

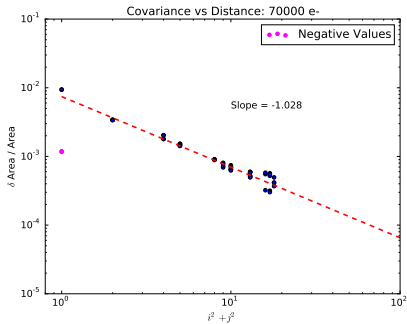
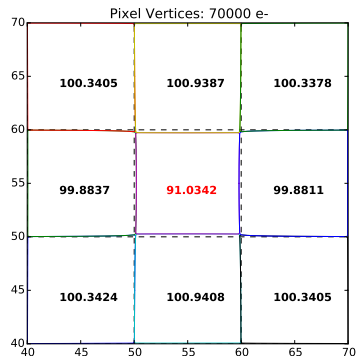


Channel Stop  $-2.0E12 \text{ cm}^{-2}$ ;  $2.0 \mu$ ; Uniform charge.

# Pixel Areas and Correlations - 70,000 e<sup>-</sup> in Central Pixel

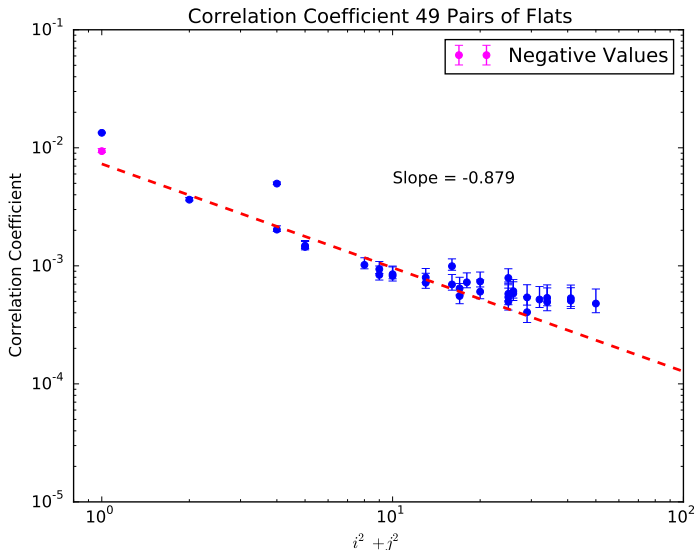


## Charge Distribution (Assumed)



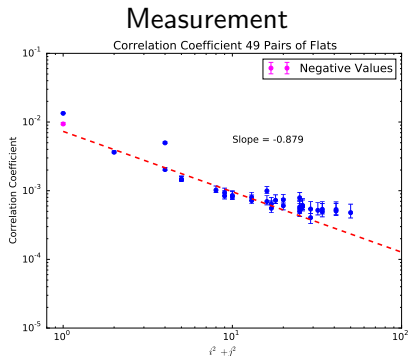
- Assumed Charge Distribution
- Channel Stop  $-2.0\text{E}12 \text{ cm}^{-2}$
- Channel Stop Depth  $2.0 \mu$
- $C_{10}$  correlations are negative

# Correlation Data - 49 pairs of flats

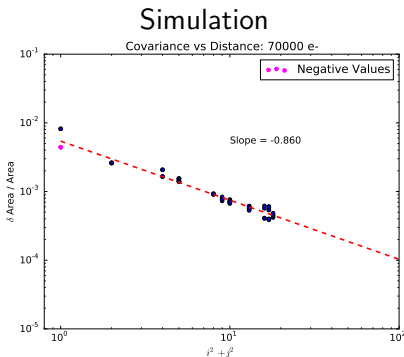


Average signal  $\approx 13,000$  ADU with gain of  $\approx 5.6$  e-/ADU

# Best Fit Pixel Areas and Correlations



- 49 Pairs of flats
- Average signal  $\approx 13,000$  ADU with gain of  $\approx 5.6$  e-/ADU

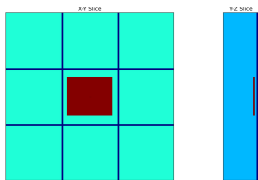


- Assumed Charge Distribution
- Channel Stop  $-4.0E12$  cm $^{-2}$
- Channel Stop Depth  $2.0$   $\mu$

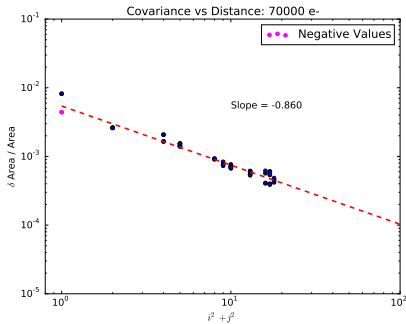
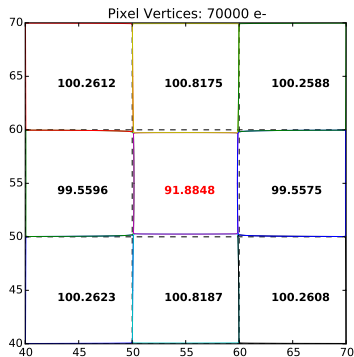
# Summary

- Simulations:
  - Results of several runs calculating pixel areas.
  - Placed 70,000 e<sup>-</sup> in central pixel.
  - Pixels are polygons with 256 vertices.
  - Areas calculated using shoelace algorithm.
  - Both assumed and self-consistent charge distributions run.
  - Three different channel stop implants and two different depths.
- Data:
  - Results on 50 pairs of flats.
  - $C_{10}$  correlation is negative. Not the case with e2V.
  - $C_{20}$  correlation is enhanced.
  - Analysis with 1000 flats in progress.
- Conclusions:
  - Best fit has strong channel stops ( $-4E12 \text{ cm}^{-2}$ ).
  - Successfully simulating negative  $C_{10}$  and enhanced  $C_{20}$ , but both of these effects too small.
  - Weaker channel stop increases  $C_{10}$  correlations and slope.
  - Self-consistent charge increases  $C_{10}$  correlations.

# Pixel Areas and Correlations - 70,000 e<sup>-</sup> in Central Pixel

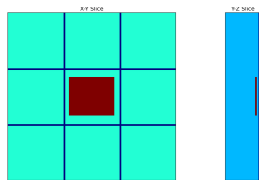


Charge Distribution (Assumed)

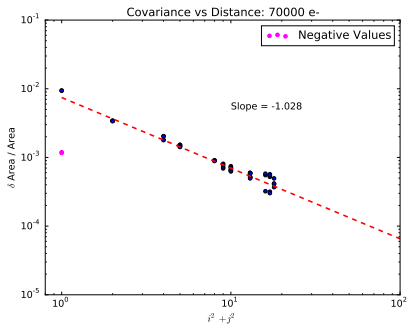
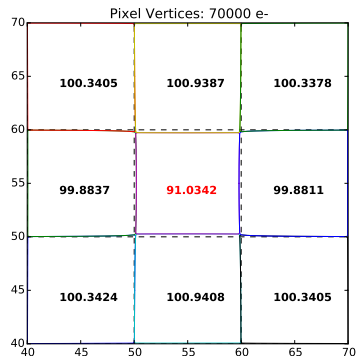


- Assumed Charge Distribution
- Channel Stop  $-4.0\text{E}12 \text{ cm}^{-2}$
- Channel Stop Depth  $2.0 \mu$
- $C_{10}$  correlations are negative

# Pixel Areas and Correlations - 70,000 e<sup>-</sup> in Central Pixel



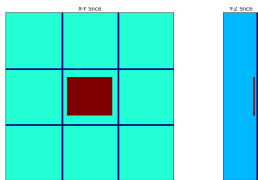
## Charge Distribution (Assumed)



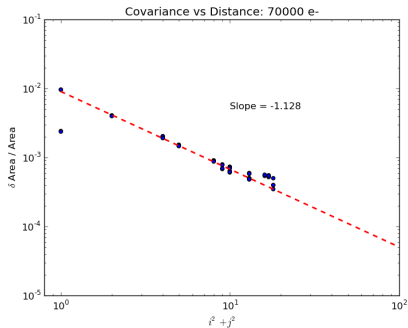
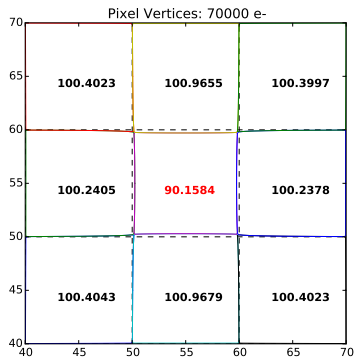
- Assumed Charge Distribution
- Channel Stop  $-2.0\text{E}12 \text{ cm}^{-2}$
- Channel Stop Depth  $2.0 \mu$
- $C_{10}$  correlations are negative



# Pixel Areas and Correlations - 70,000 e<sup>-</sup> in Central Pixel

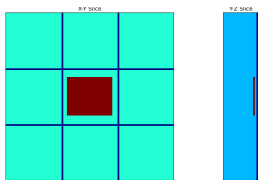


Charge Distribution (Assumed)

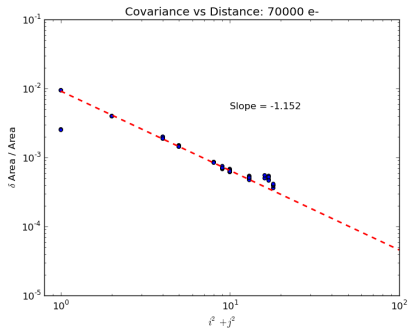
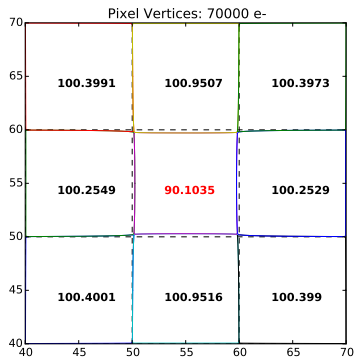


- Assumed Charge Distribution
- Channel Stop  $-1.0\text{E}12 \text{ cm}^{-2}$
- Channel Stop Depth  $2.0 \mu$

# Pixel Areas and Correlations - 70,000 e<sup>-</sup> in Central Pixel

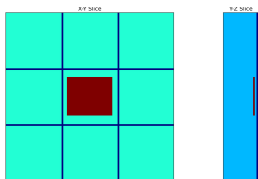


Charge Distribution (Assumed)

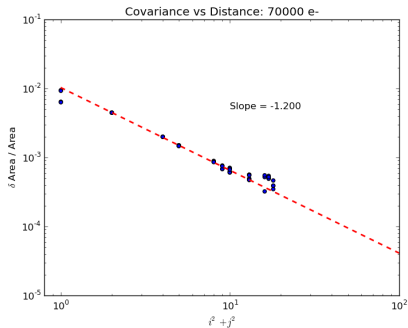
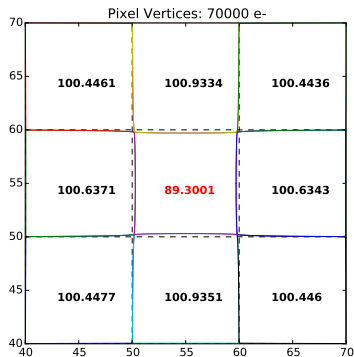


- Assumed Charge Distribution
- Channel Stop  $-2.0E12 \text{ cm}^{-2}$
- Channel Stop Depth  $1.0 \mu$

# Pixel Areas and Correlations - 70,000 e<sup>-</sup> in Central Pixel

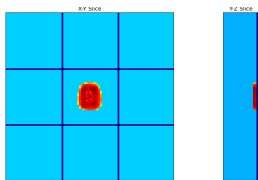


## Charge Distribution (Assumed)

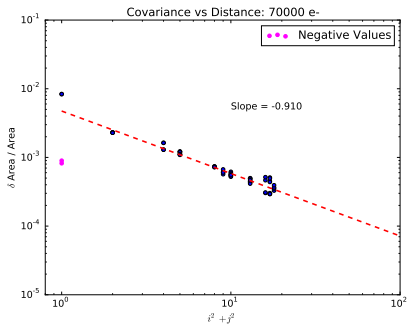
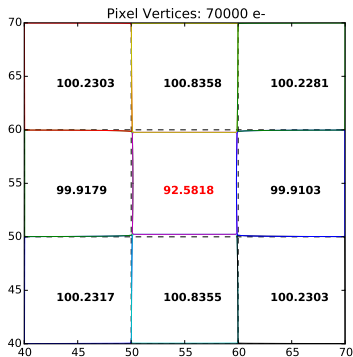


- Assumed Charge Distribution
- Channel Stop  $-1.0\text{E}12 \text{ cm}^{-2}$
- Channel Stop Depth  $1.0 \mu$

# Pixel Areas and Correlations - 70,000 e<sup>-</sup> in Central Pixel

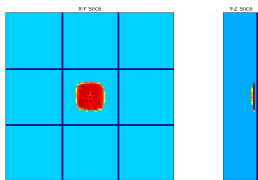


## Charge Distribution (Self-Consistent)

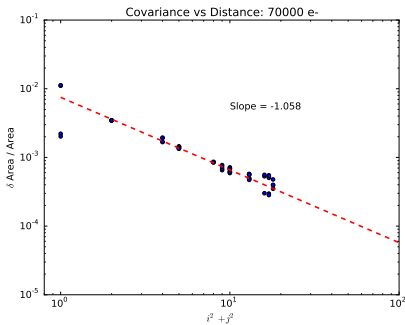
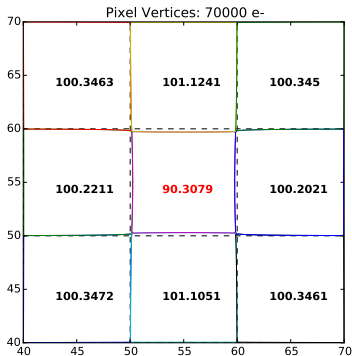


- Self-Consistent Charge Distribution
- Channel Stop  $-4.0E12 \text{ cm}^{-2}$
- Channel Stop Depth  $2.0 \mu$

# Pixel Areas and Correlations - 70,000 e<sup>-</sup> in Central Pixel

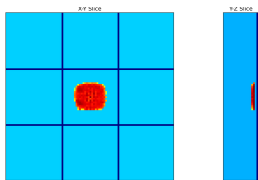


## Charge Distribution (Self-Consistent)

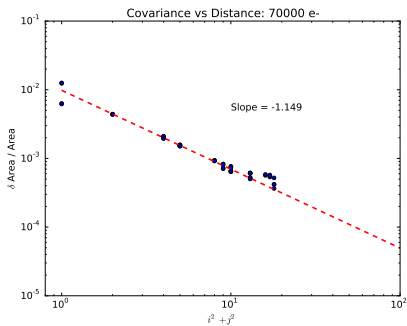
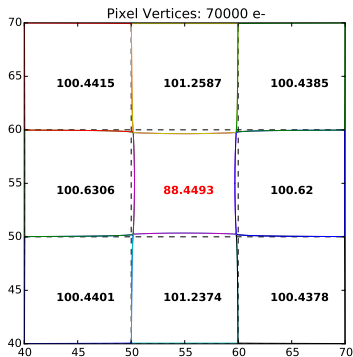


- Self-Consistent Charge Distribution
- Channel Stop  $-2.0E12 \text{ cm}^{-2}$
- Channel Stop Depth  $2.0 \mu$

# Pixel Areas and Correlations - 70,000 e<sup>-</sup> in Central Pixel

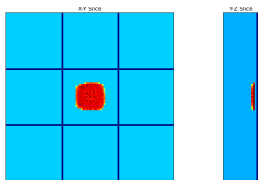


## Charge Distribution (Self-Consistent)

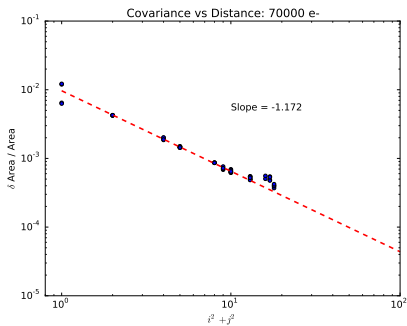
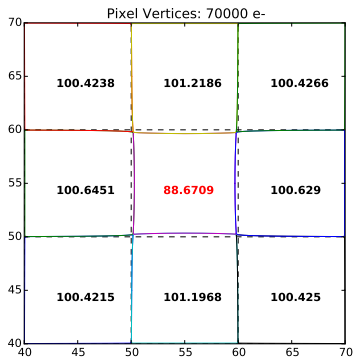


- Self-Consistent Charge Distribution
- Channel Stop  $-1.0\text{E}12 \text{ cm}^{-2}$
- Channel Stop Depth  $2.0 \mu$

# Pixel Areas and Correlations - 70,000 e<sup>-</sup> in Central Pixel

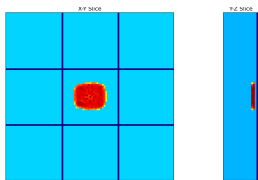


## Charge Distribution (Self-Consistent)

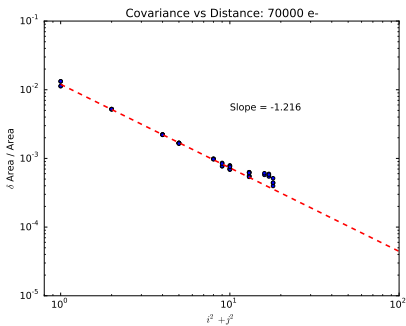
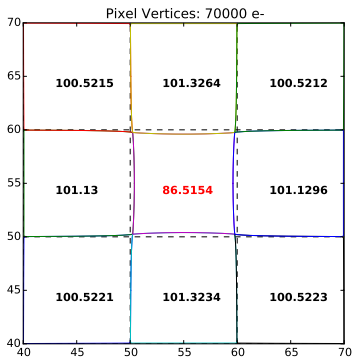


- Self-Consistent Charge Distribution
- Channel Stop  $-2.0E12 \text{ cm}^{-2}$
- Channel Stop Depth  $1.0 \mu$

# Pixel Areas and Correlations - 70,000 e<sup>-</sup> in Central Pixel



## Charge Distribution (Self-Consistent)



- Self-Consistent Charge Distribution
- Channel Stop  $-1.0\text{E}12 \text{ cm}^{-2}$
- Channel Stop Depth  $1.0 \mu$