Data Reconstruction Strategies for CCDs

Asher Kaboth

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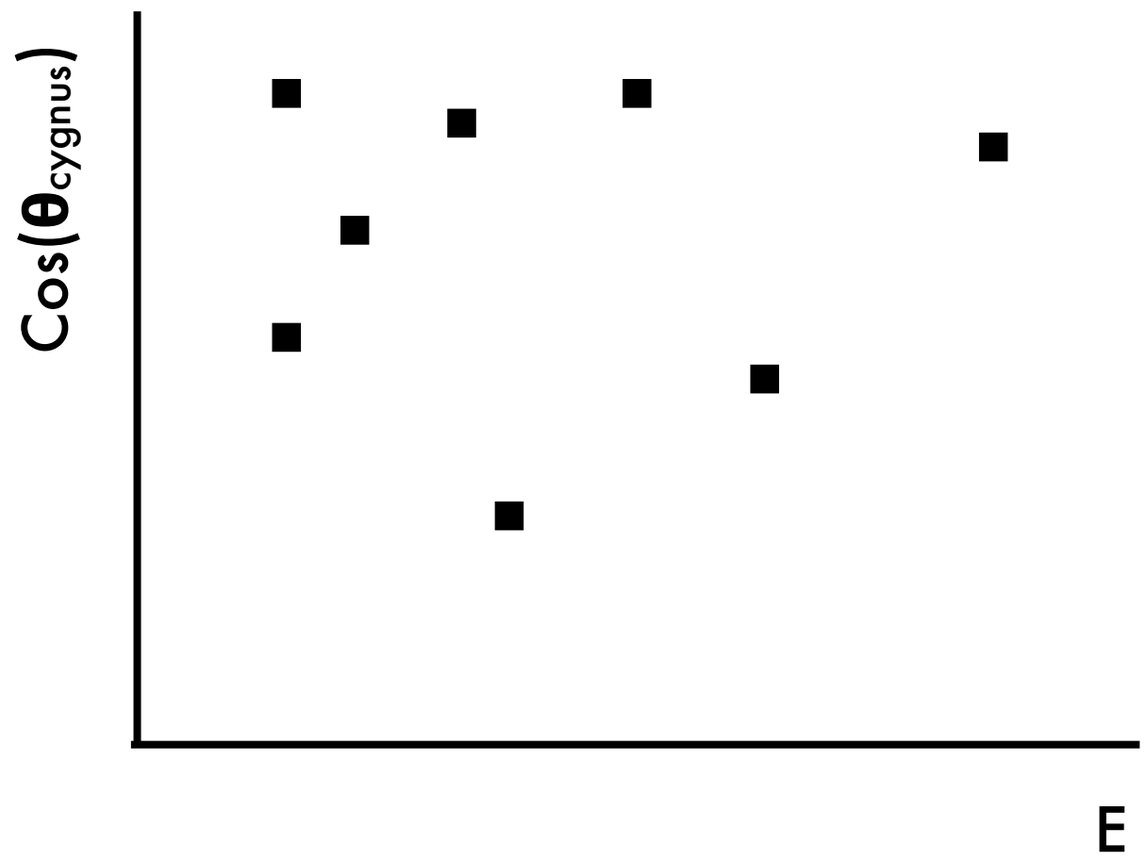
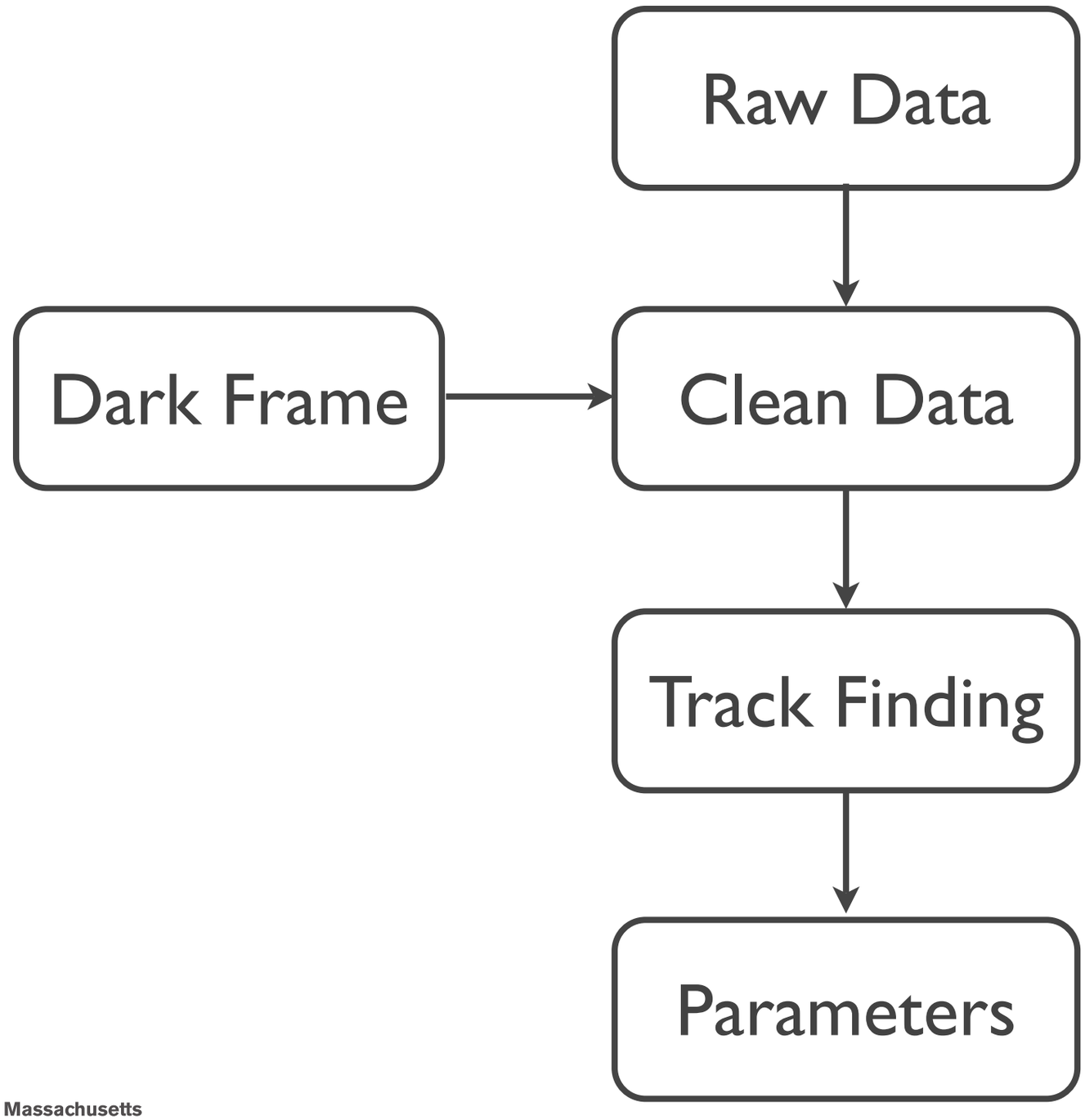
From Camera to Plot

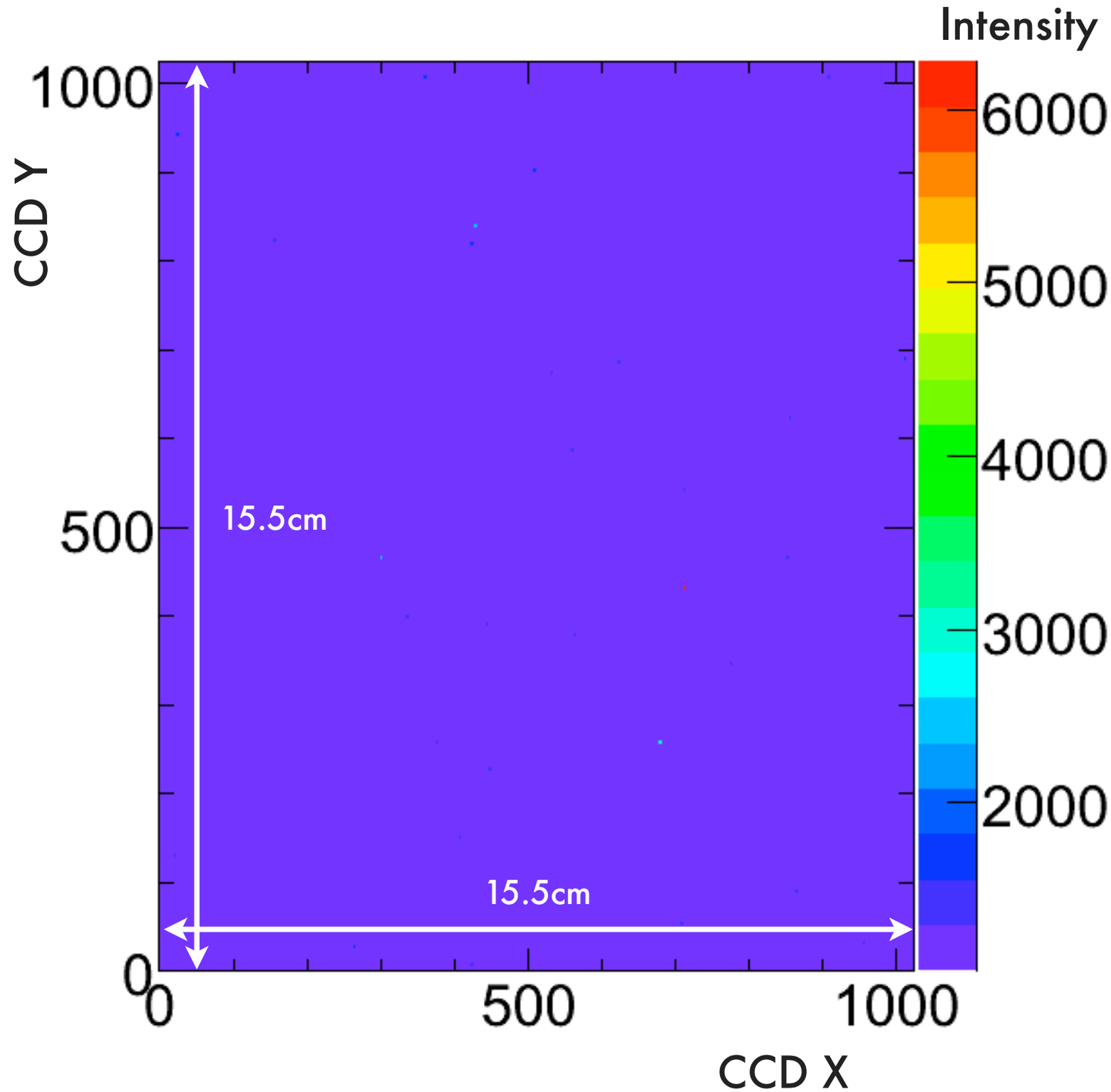


Analysis Chain

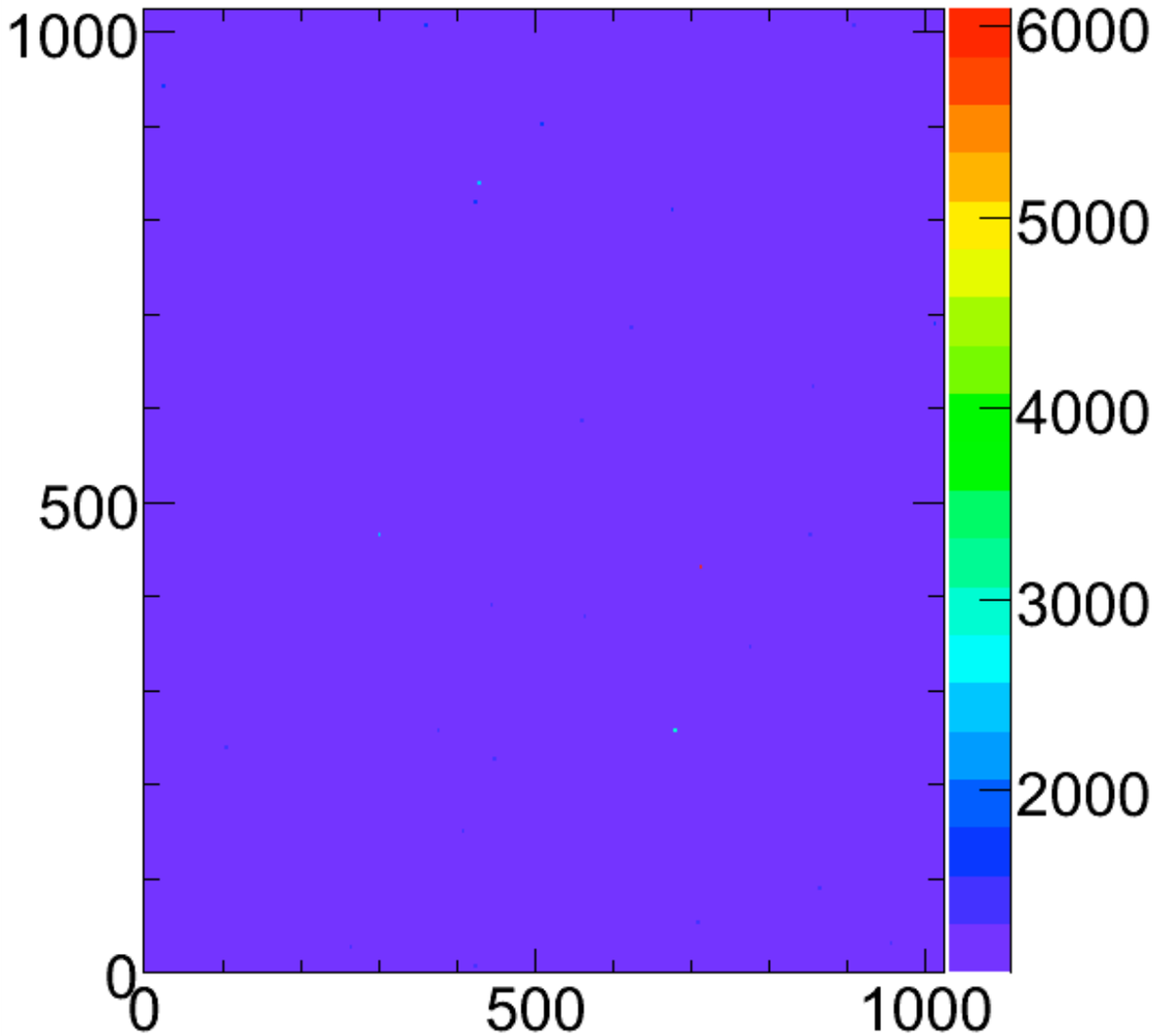


Raw Data

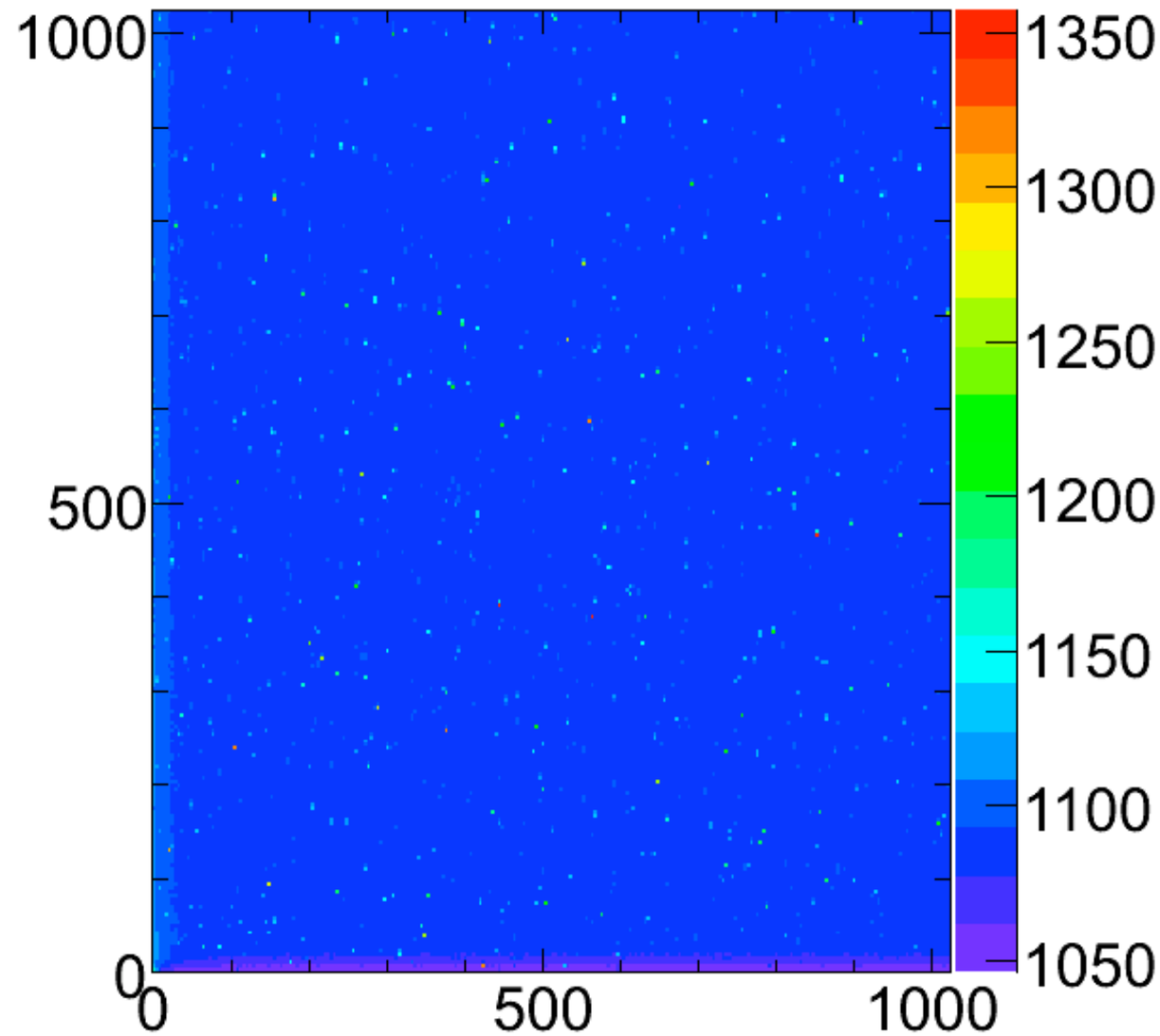
- Cf-252 run
- 1s exposure



Background Subtraction

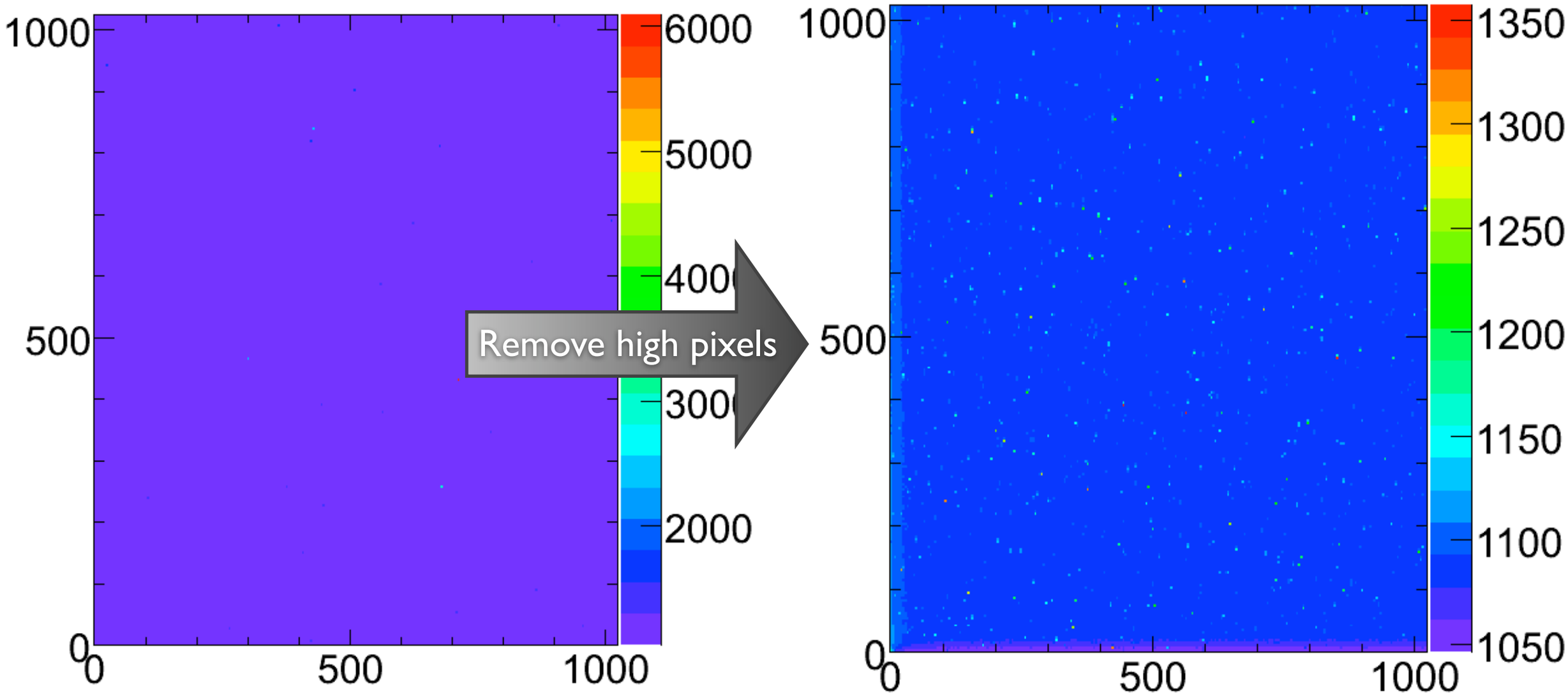


Raw Dark Frame



Cleaned Dark Frame

Background Subtraction

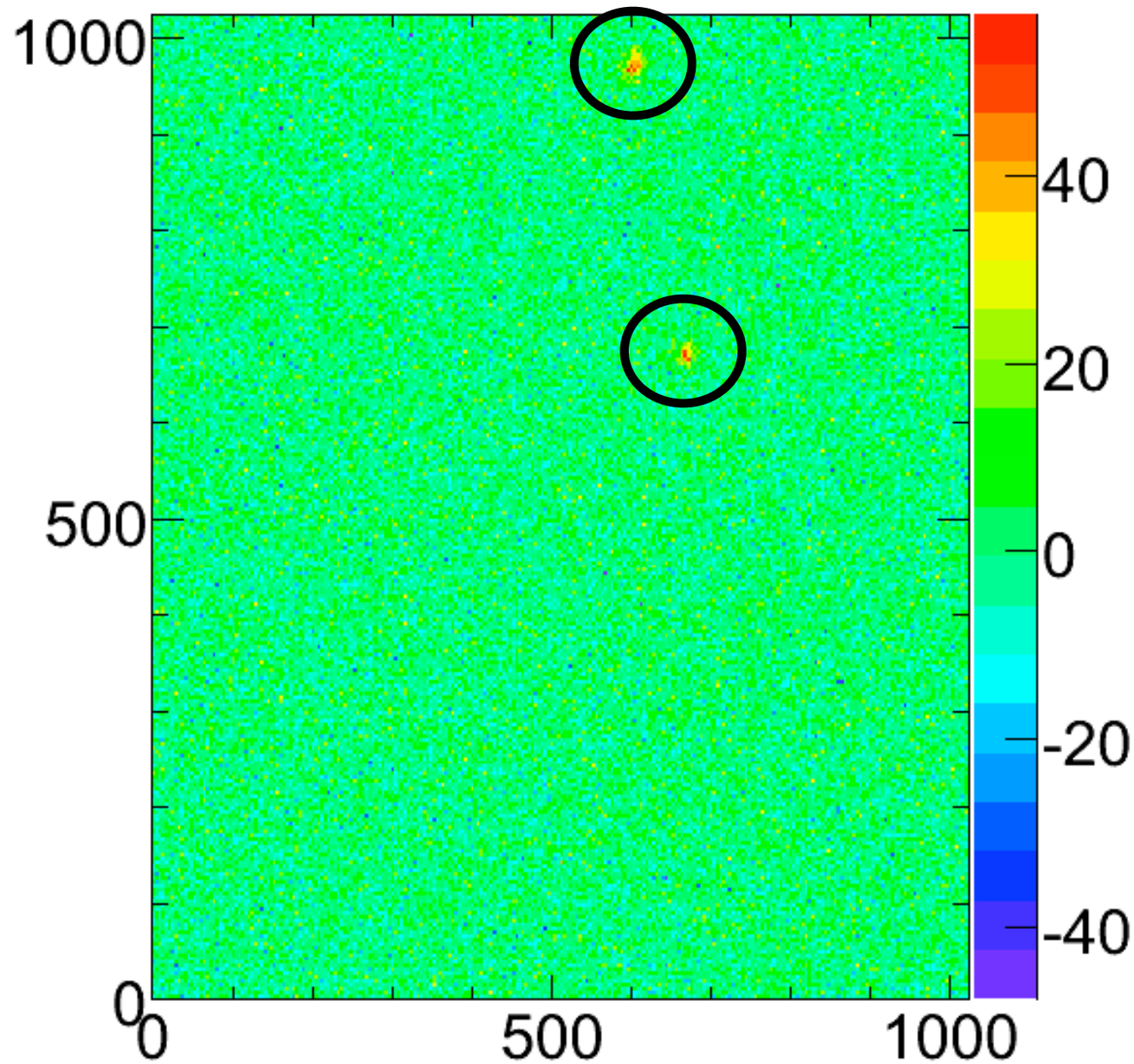


Raw Dark Frame

Cleaned Dark Frame

Cleaned Data

- Subtracted dark frame
- Removed high pixels



Track Finding

- Rebin image in 2x2 superbins
- Blur image

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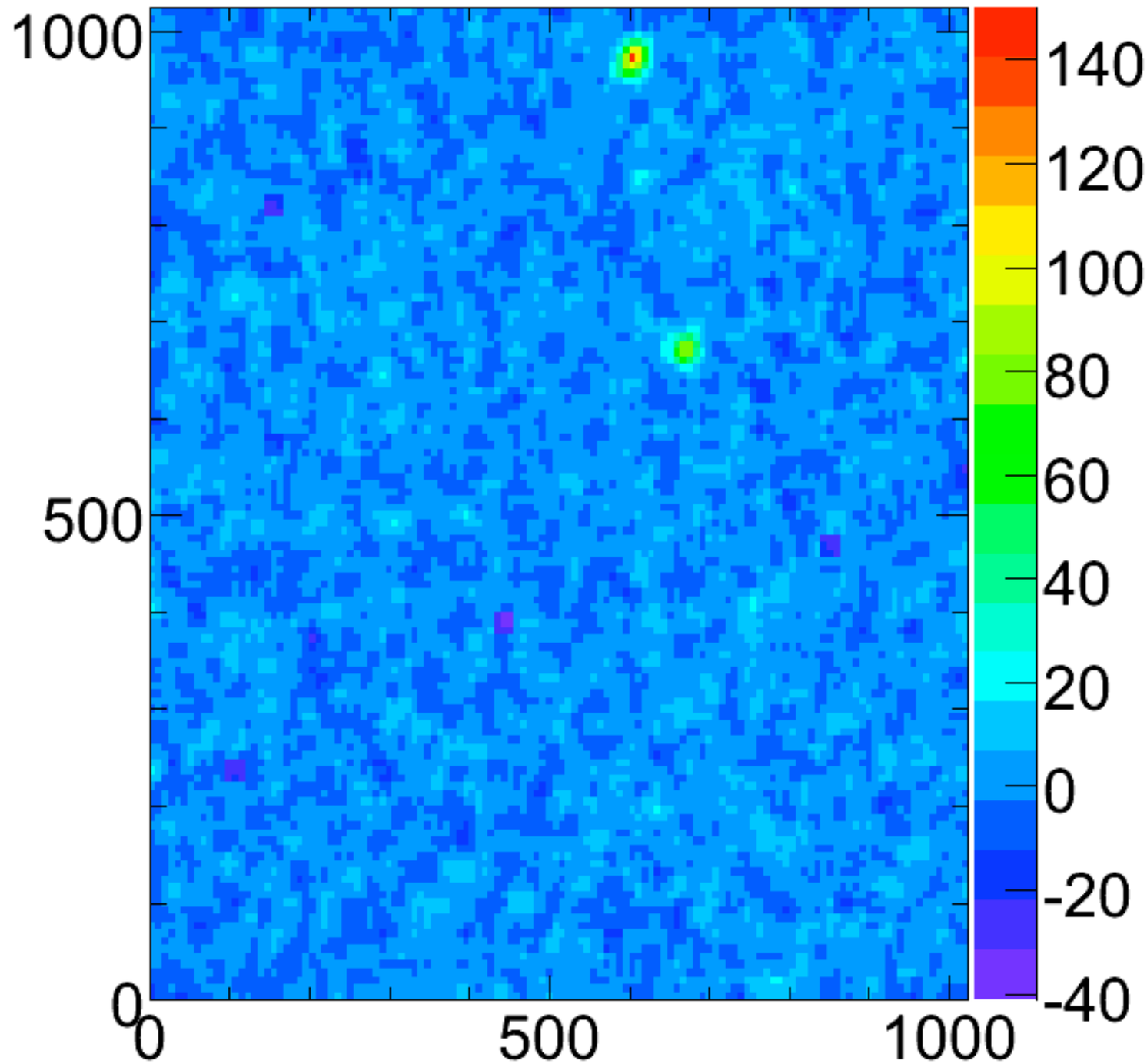
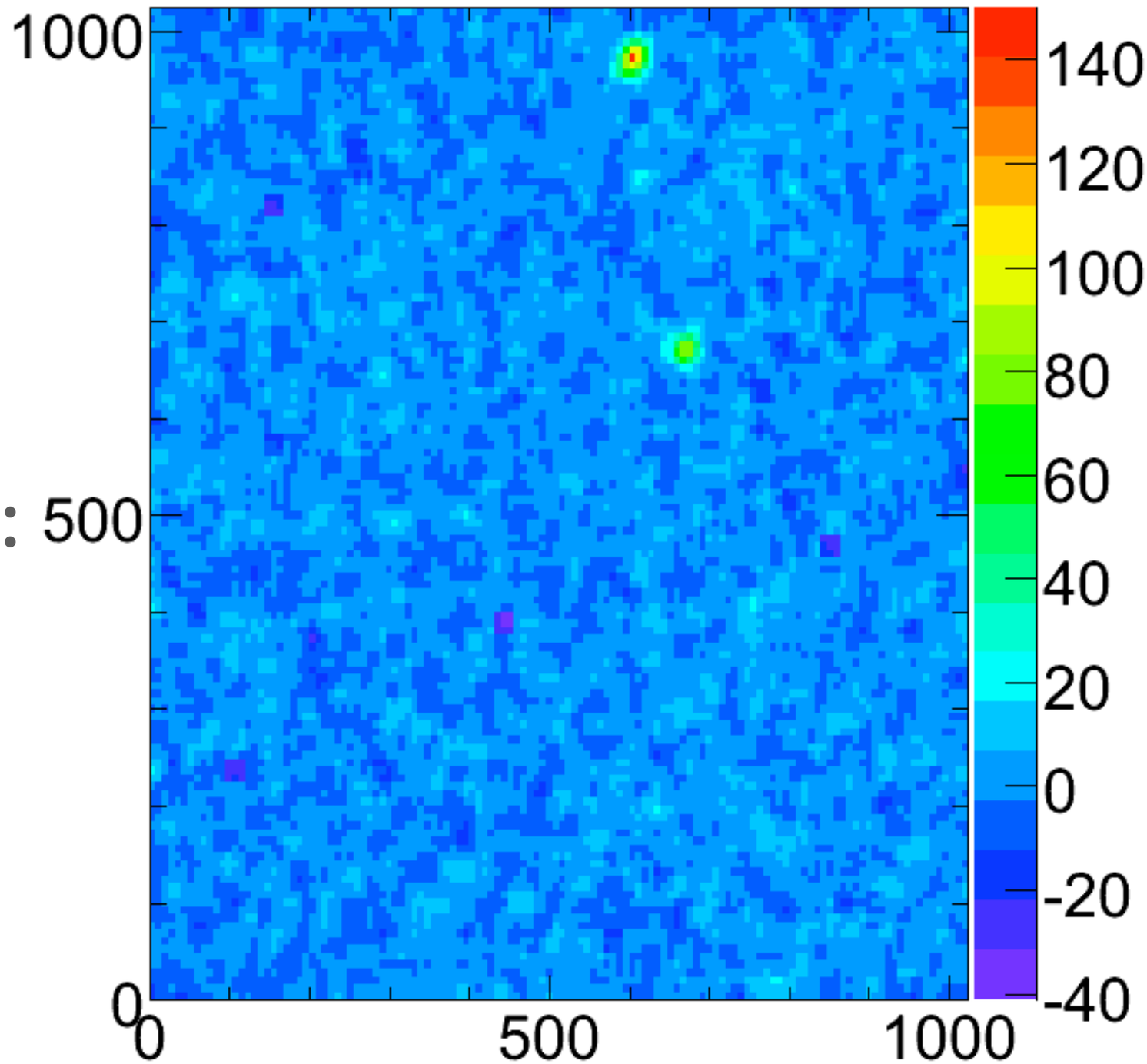


Track Finding

- Rebin image in 2x2 superbins
- Blur image

Cluster parameters:

- 5 pixels
- 3.7σ threshold
- 60 pixel units minimum distance



Types of Tracks

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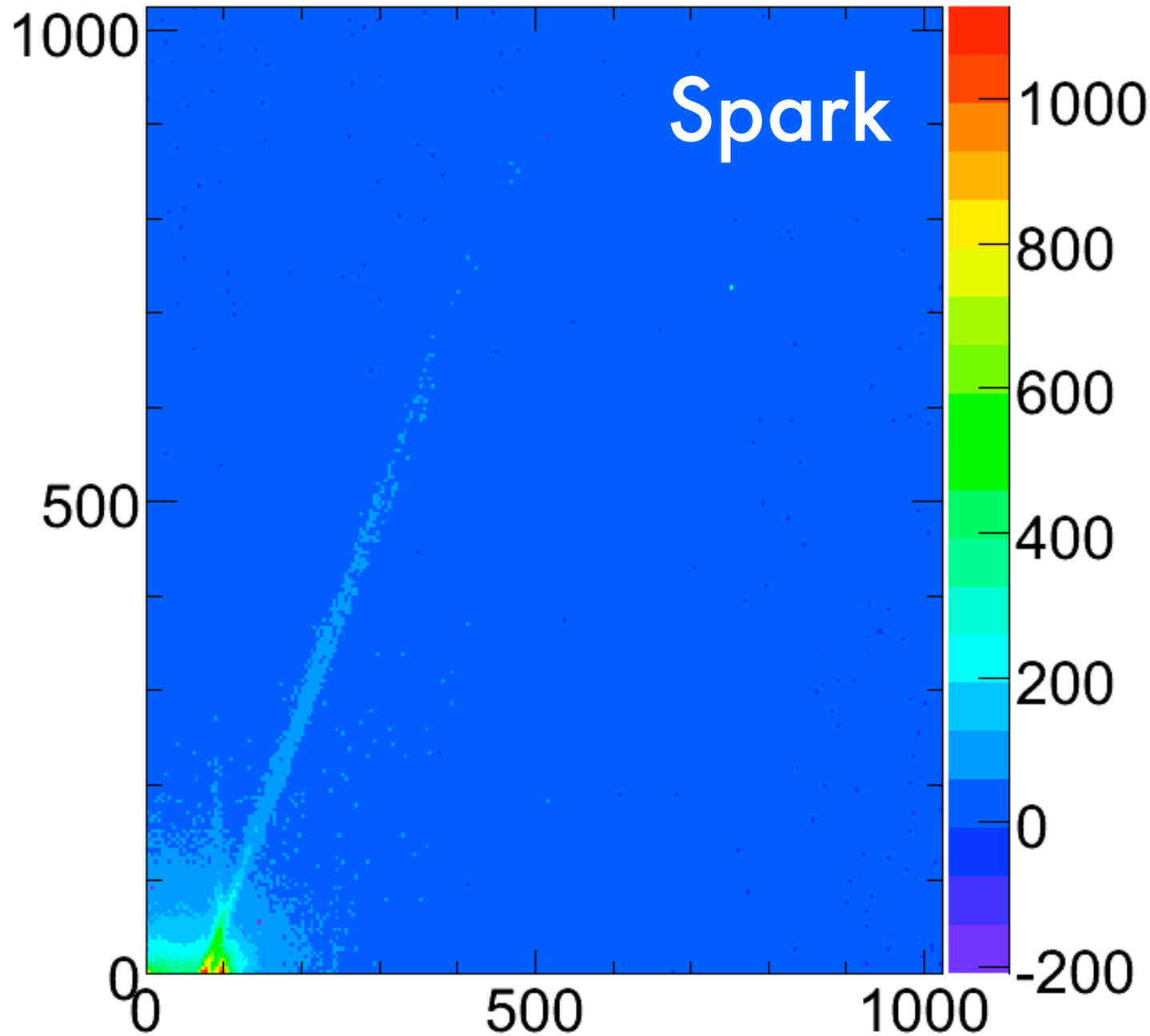

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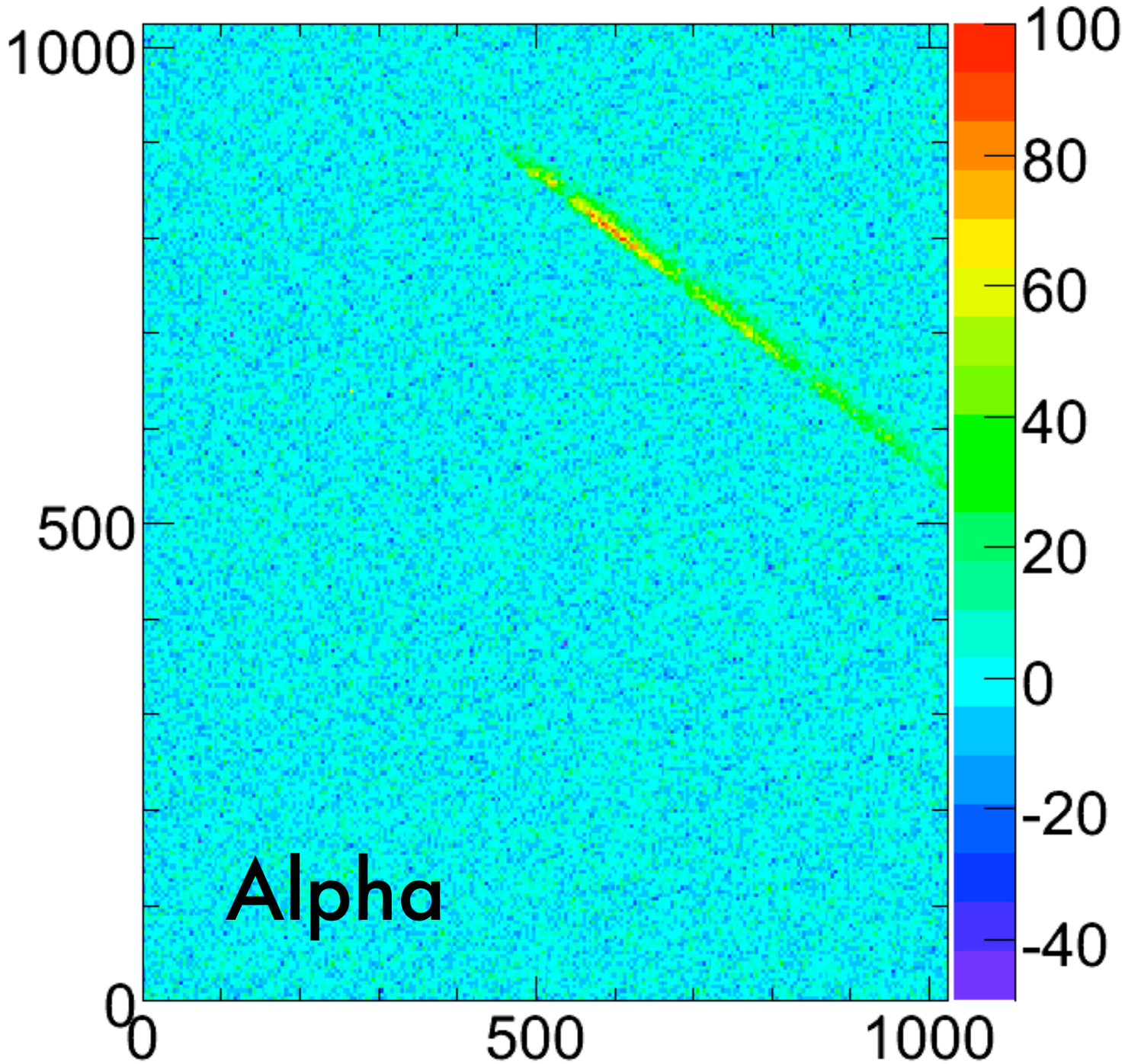

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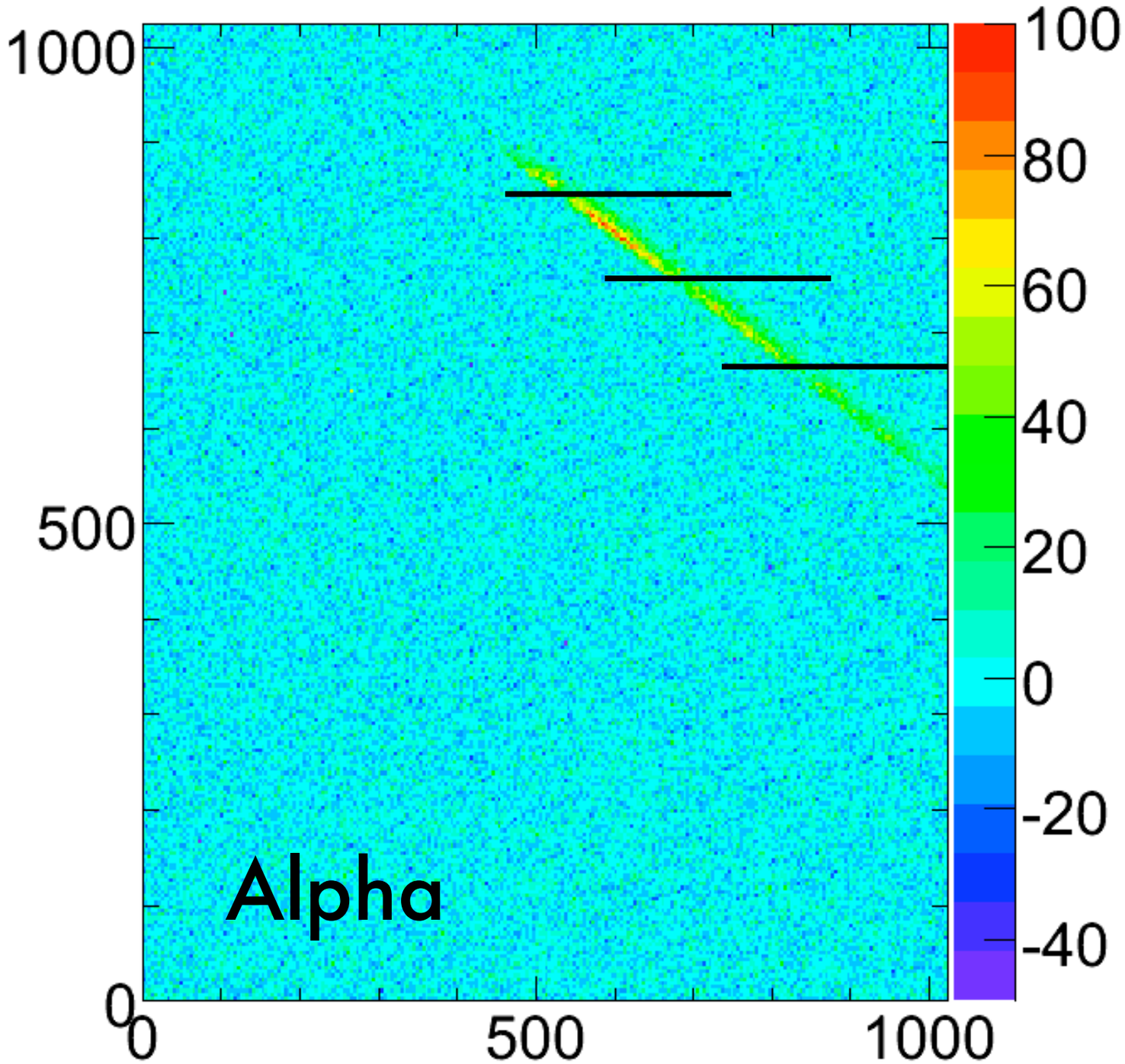

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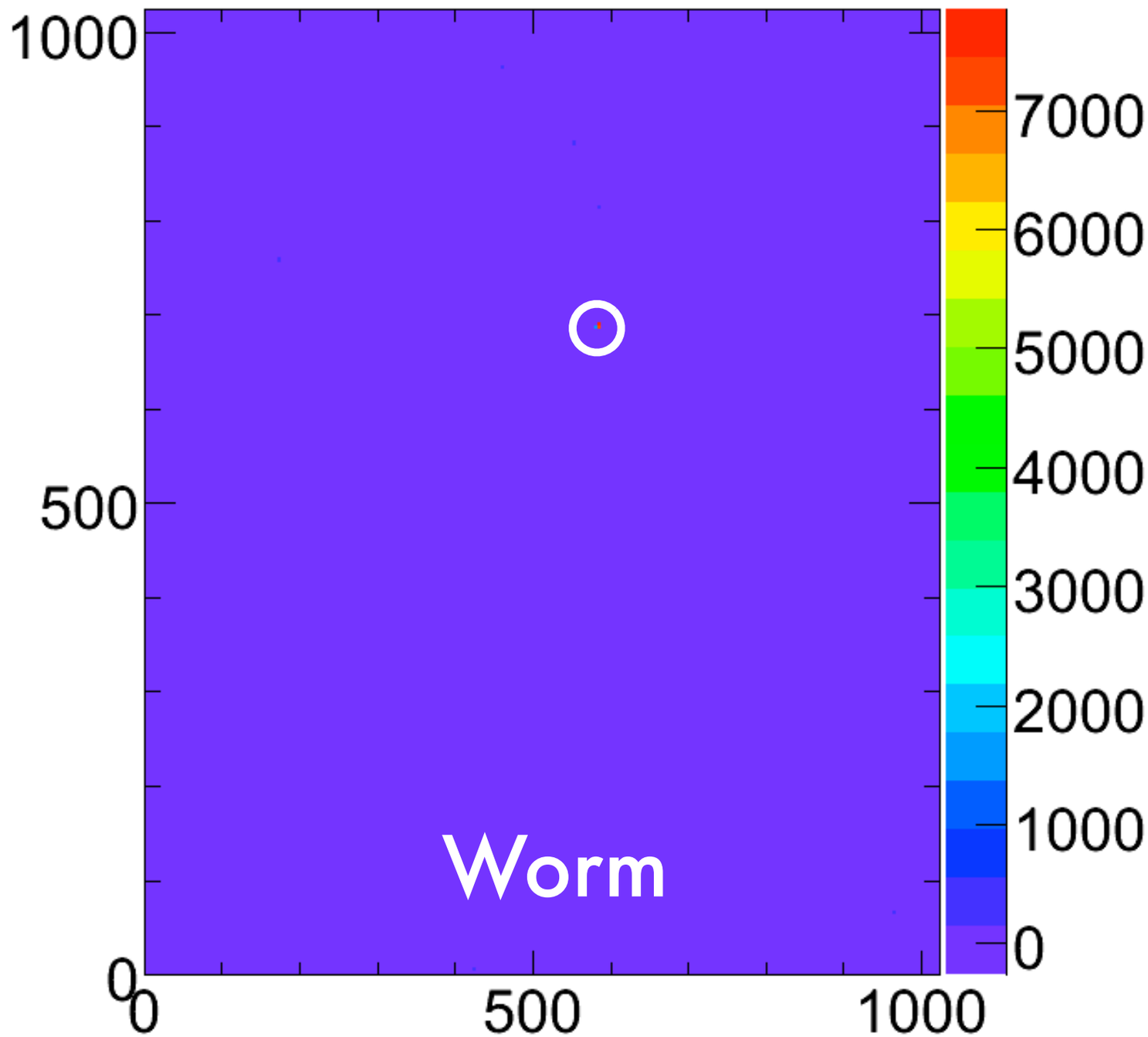
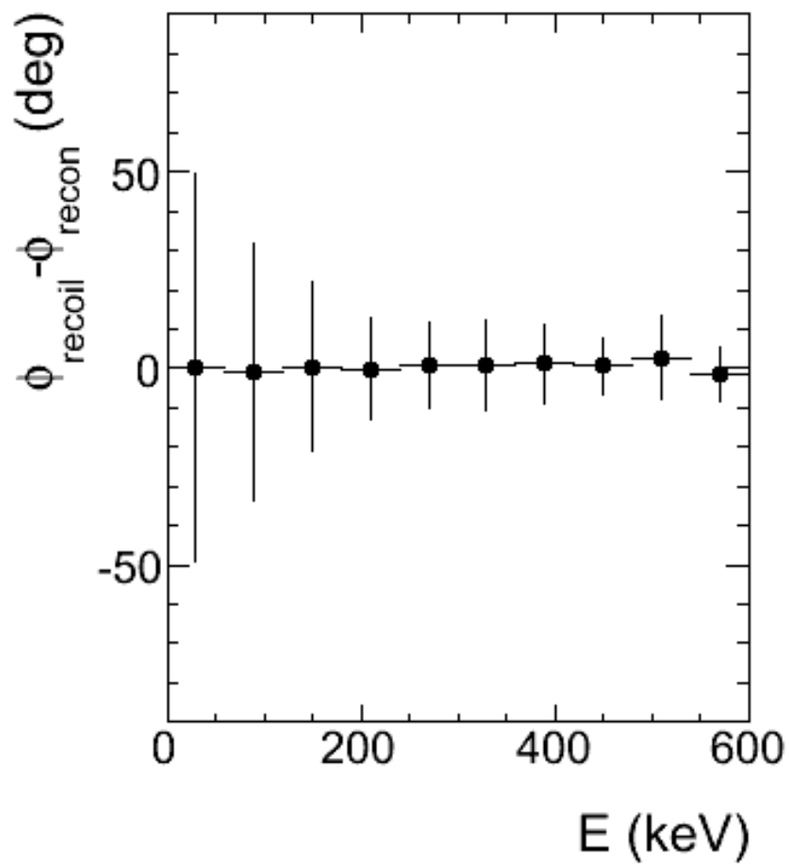


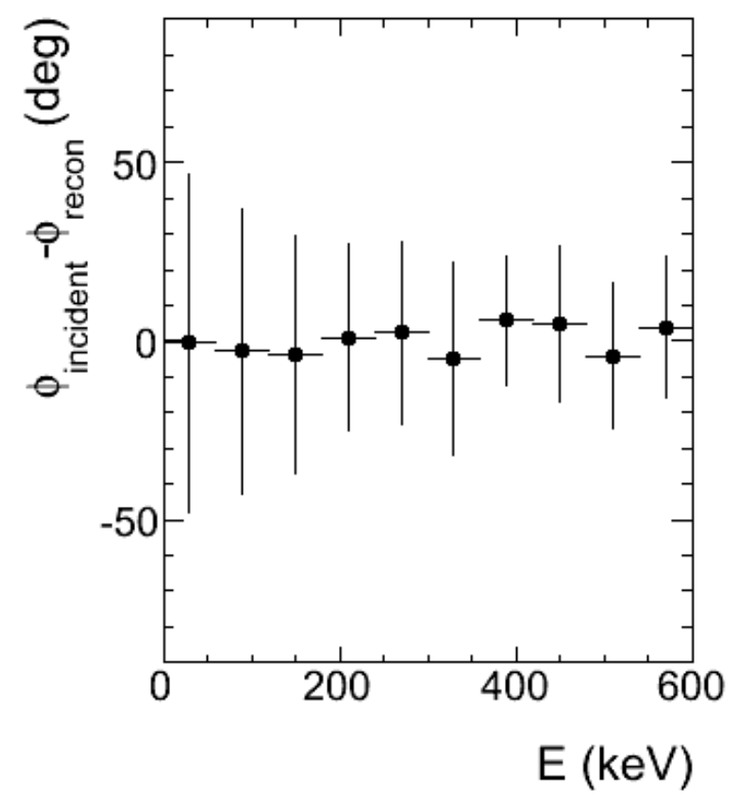
Parameter Reconstruction

- Energy
- Angle
- Range
- Position

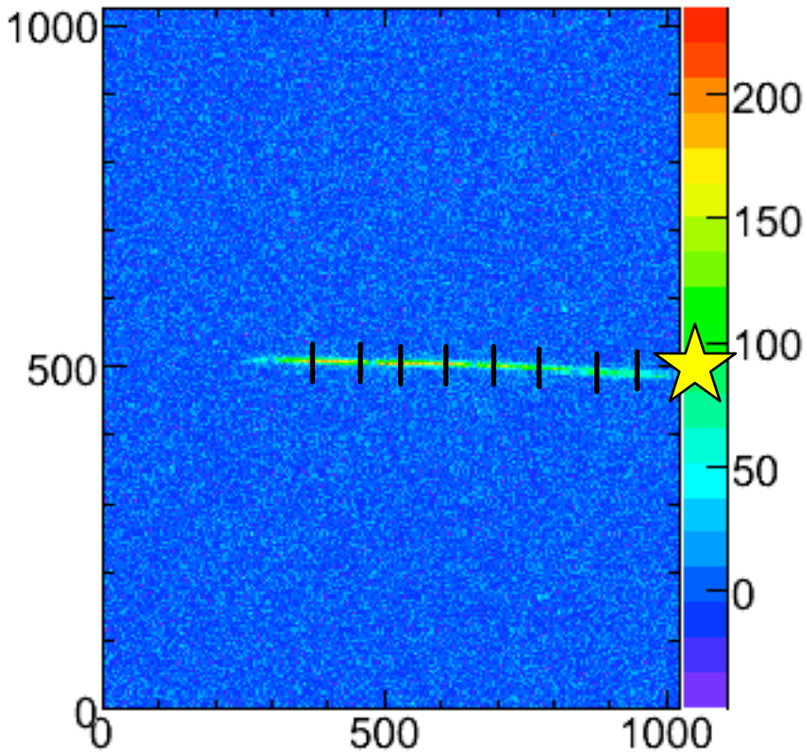


Recoil Direction

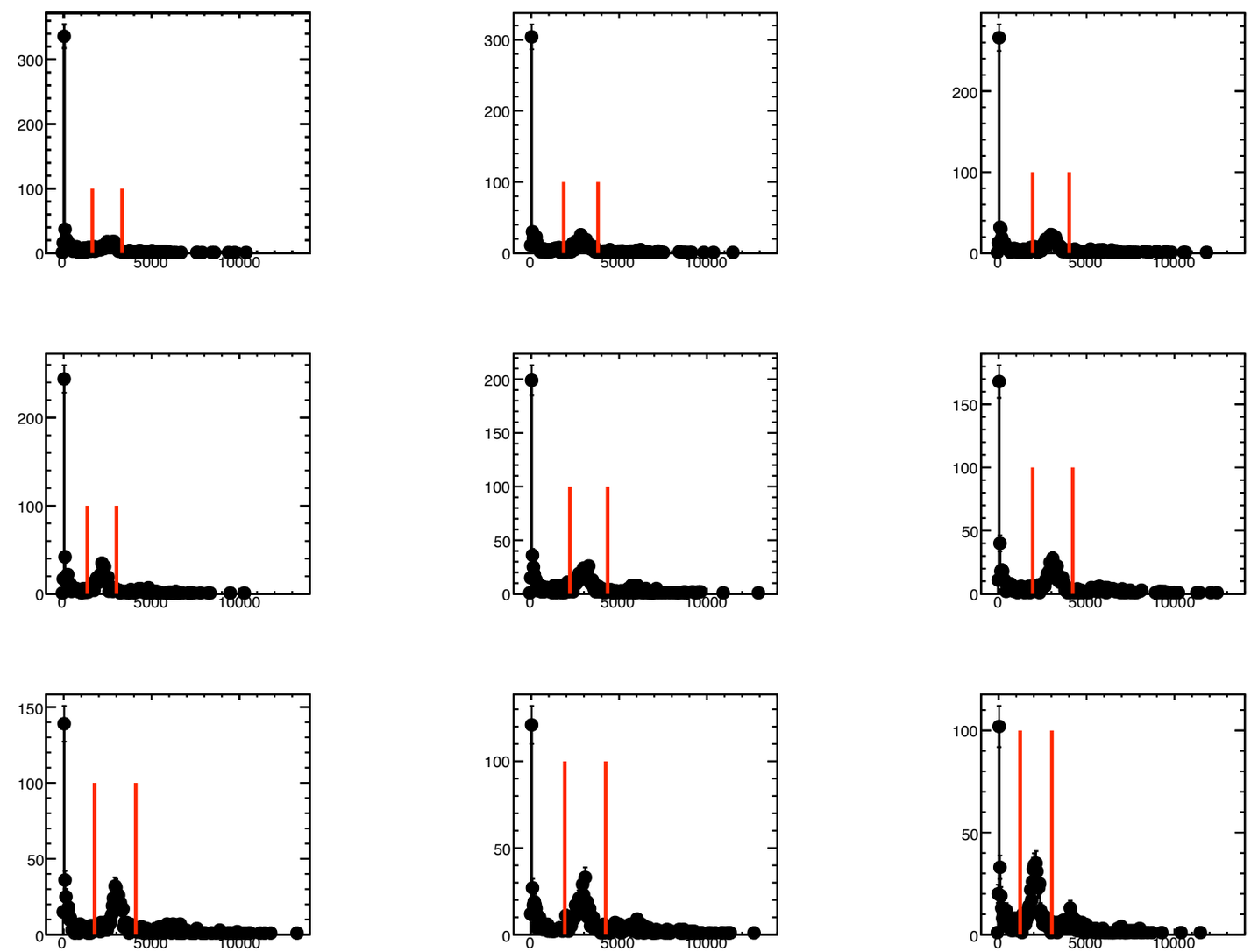
Projectile Direction



Energy Calibration



Use predicted dE/dx from alphas



System Gain

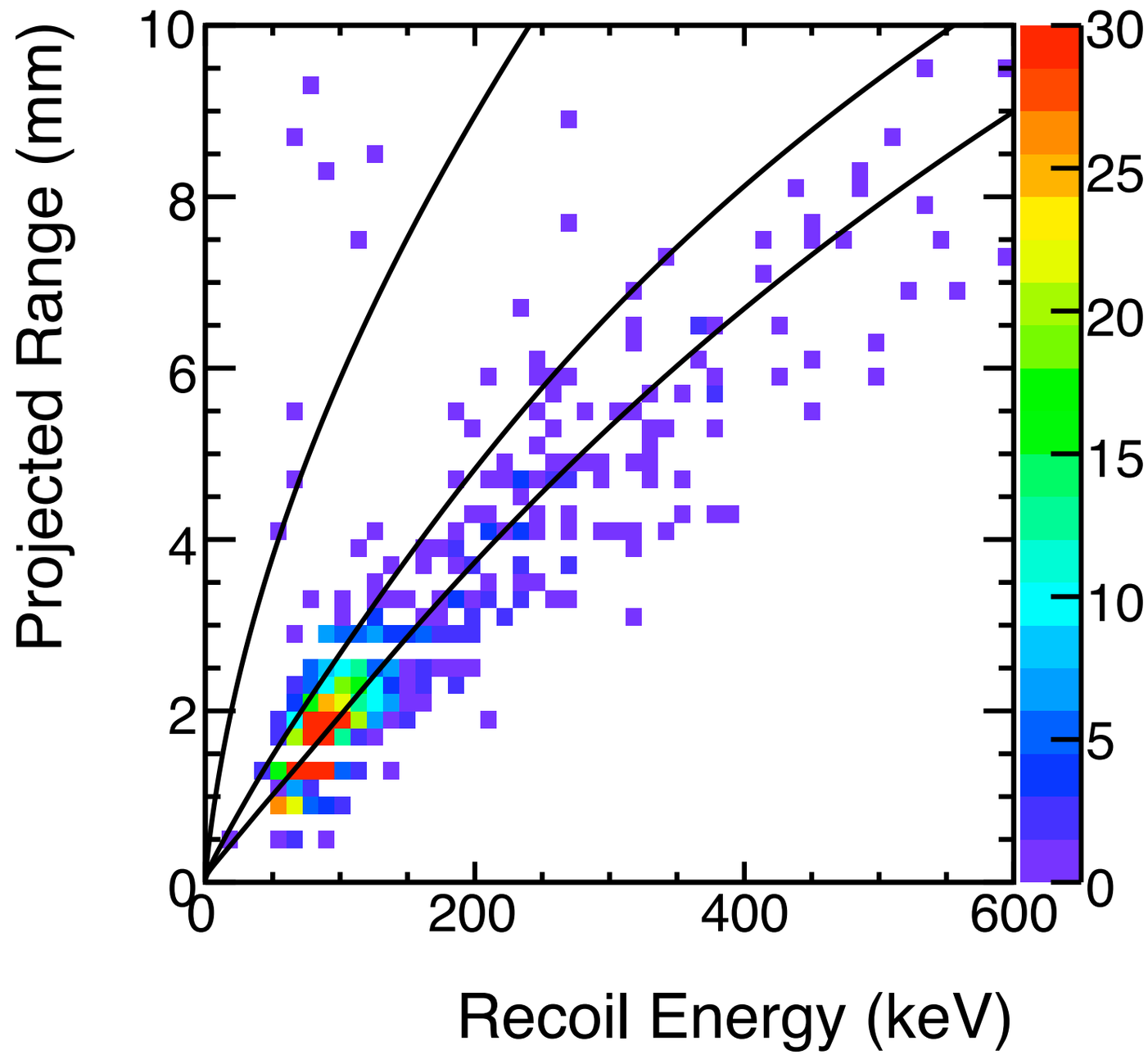
Camera 0: 9 adu/keV

Camera 1: 12 adu/keV

Massachusetts Institute of Technology

How low can we go?

Significant number of nuclear recoils down to 50 keV



Future Work

- Position-dependent effects
- Lower thresholds
- Zenith angle reconstruction
- Z postion
- Track categorization
- Multicamera reconstruction
- Integrate PMT, charge readout