

Optics Status Update

Chao Gu

Optics Status Update

- Single foil target could not provide enough constrain
- One way is to add a linear correction to the reconstructed kinematics based on the relation between the kinematics and the beam position from the beam position scan runs
 - Could correct all optics run
- The other way is to include the Aluminum window into the fitting to directly correct the reconstruction matrix
 - Test this method this time

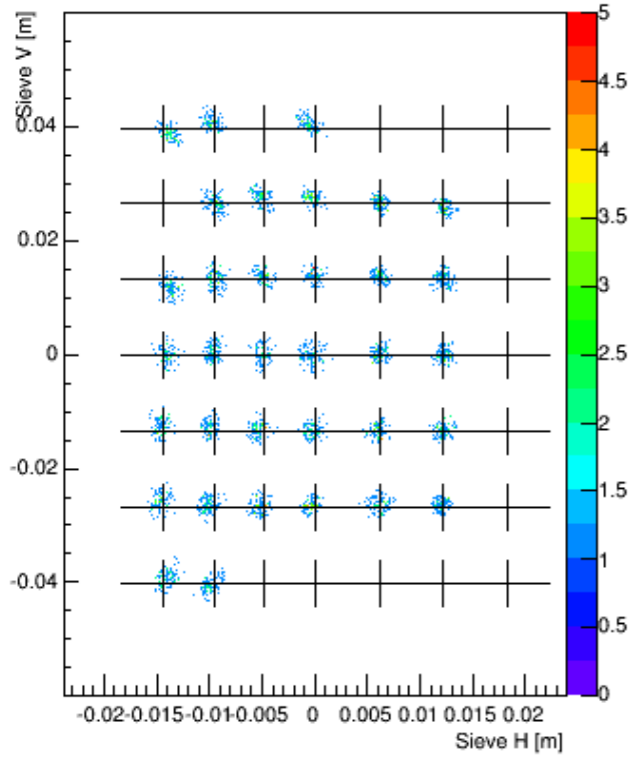
Optics Status Update

$$\phi_{\text{tg}} = \sum_{i,j,k,l} P_{ijkl} x^i \theta^j y^k \phi^l \quad \theta_{\text{tg}} = \sum_{i,j,k,l} T_{ijkl} x^i \theta^j y^k \phi^l$$

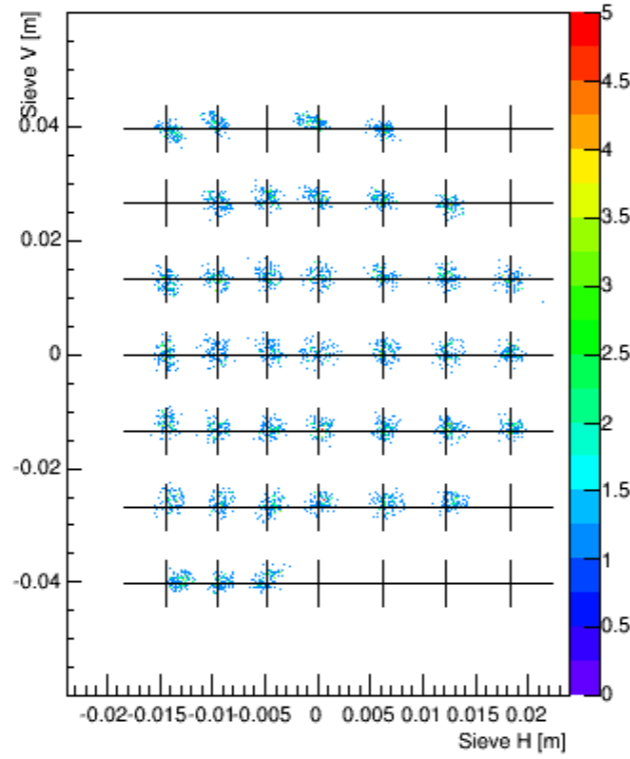
- Polynomial order up to 3 ($i+j+k+l \leq 3$)
- The target only has one foil so keep the order of y less than 2 ($k \leq 1$)
- First fit the $k=0$ matrix elements without the Aluminum window data
- Then fix all the other matrix elements, add the Aluminum window data and fit $k=1$ matrix elements

Optics Status Update

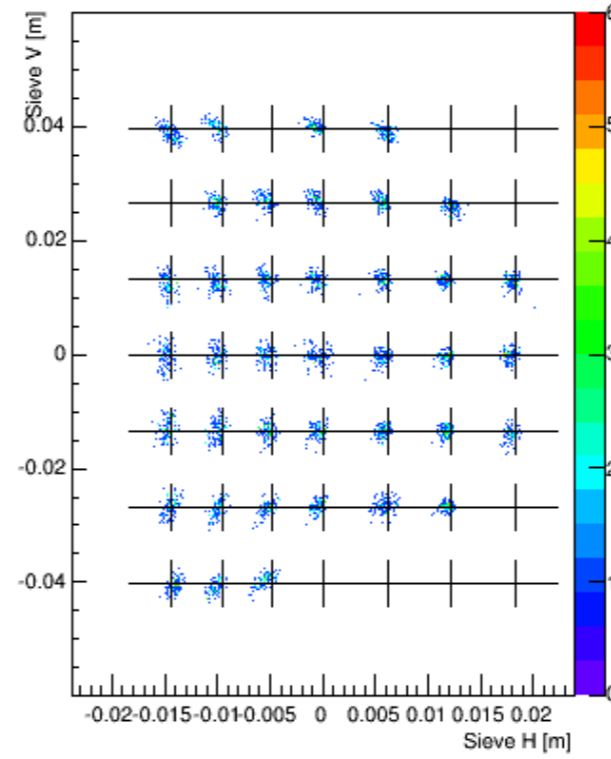
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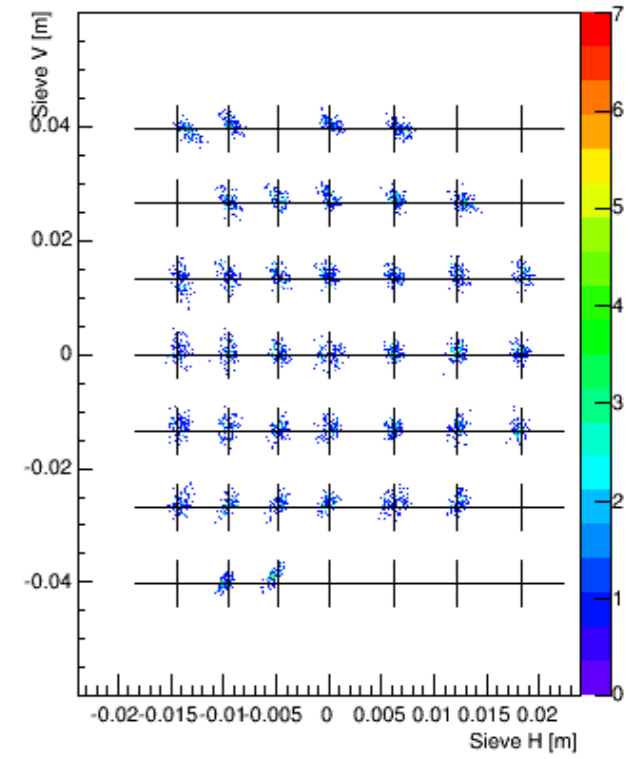
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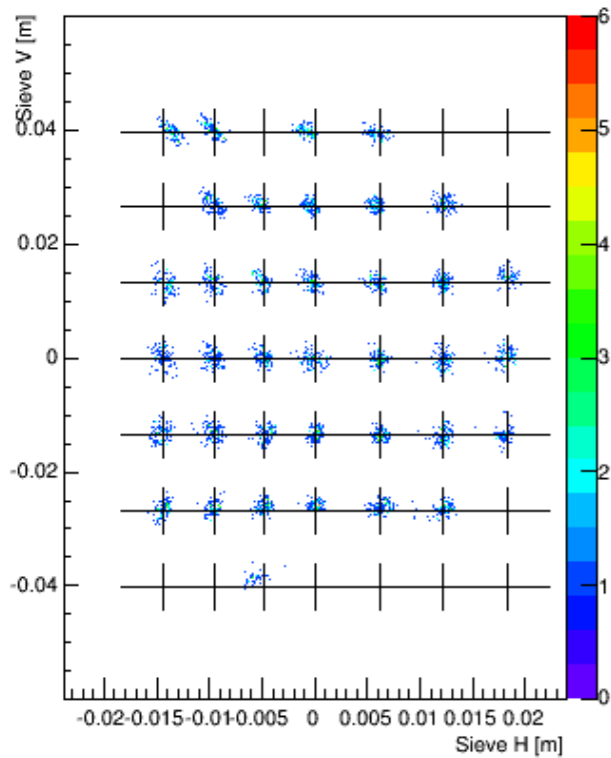
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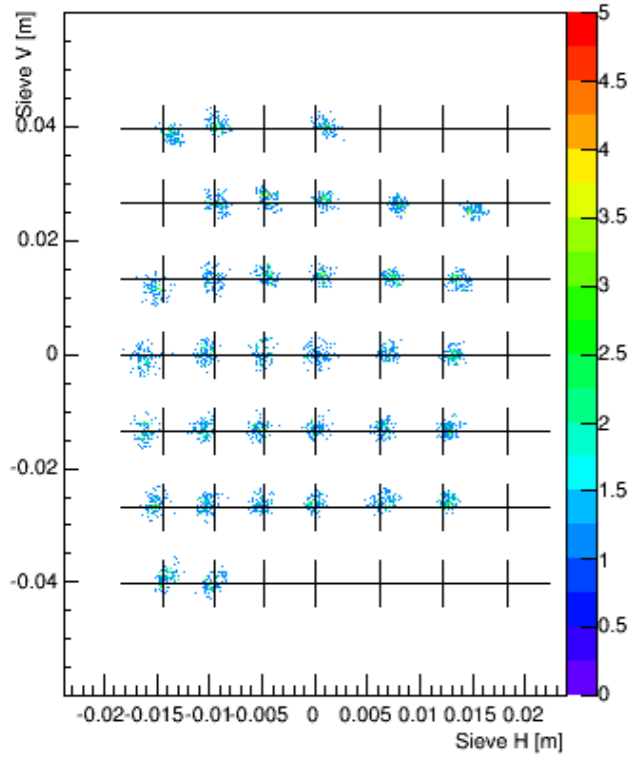
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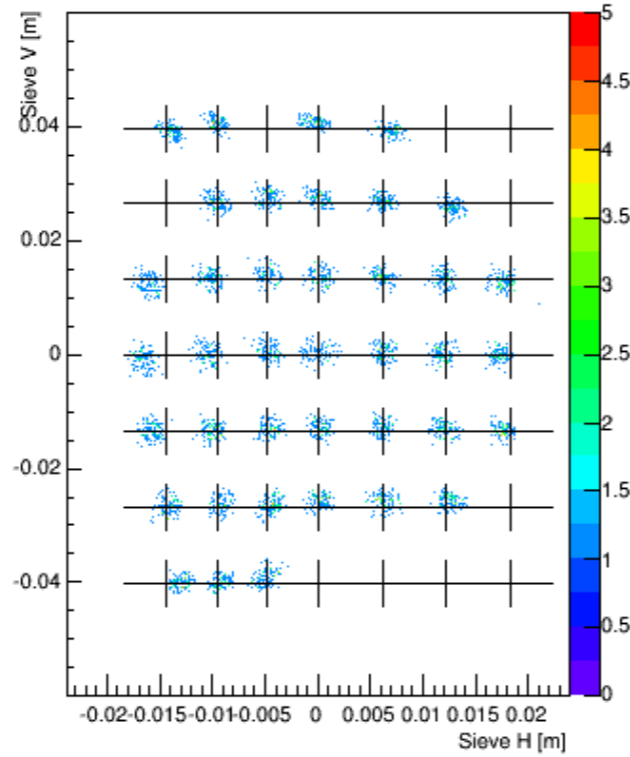
After First Fit

Optics Status Update

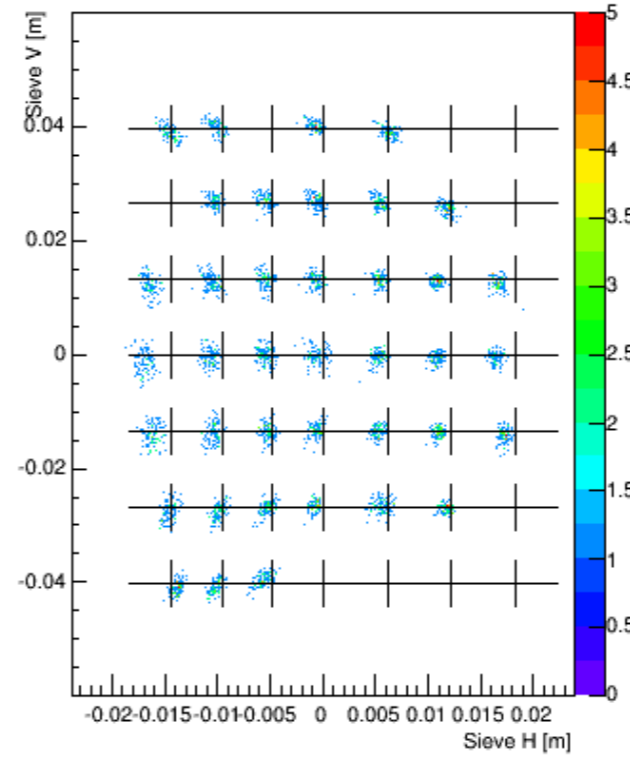
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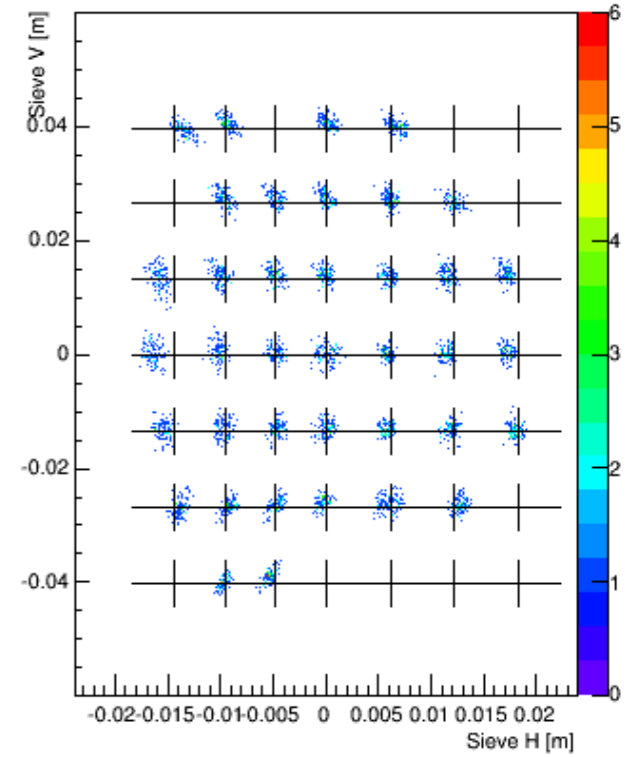
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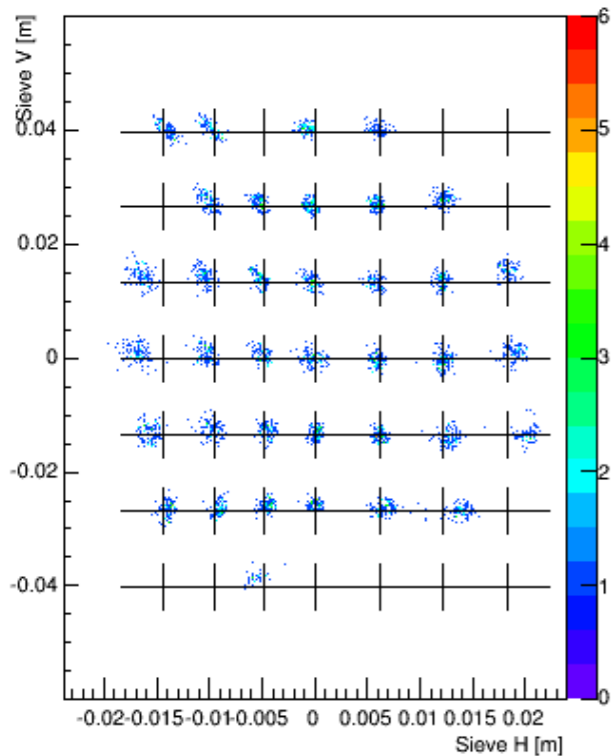
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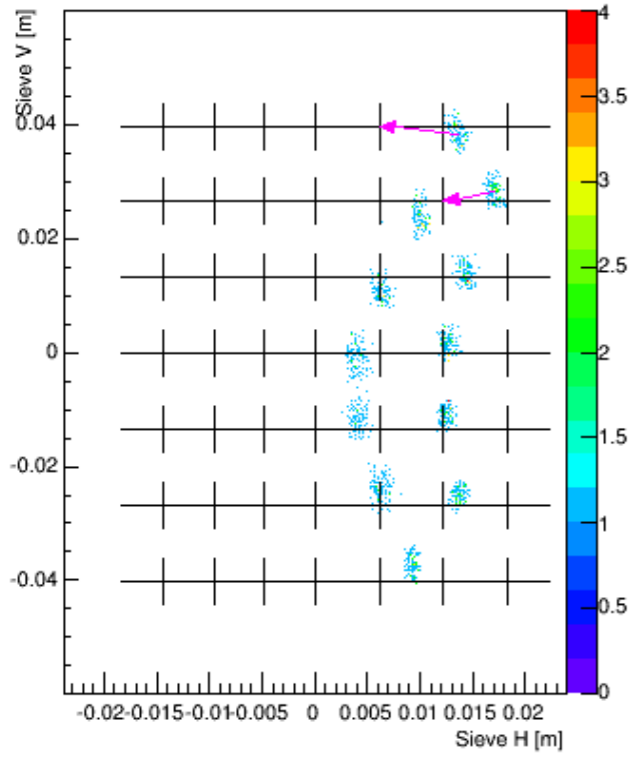
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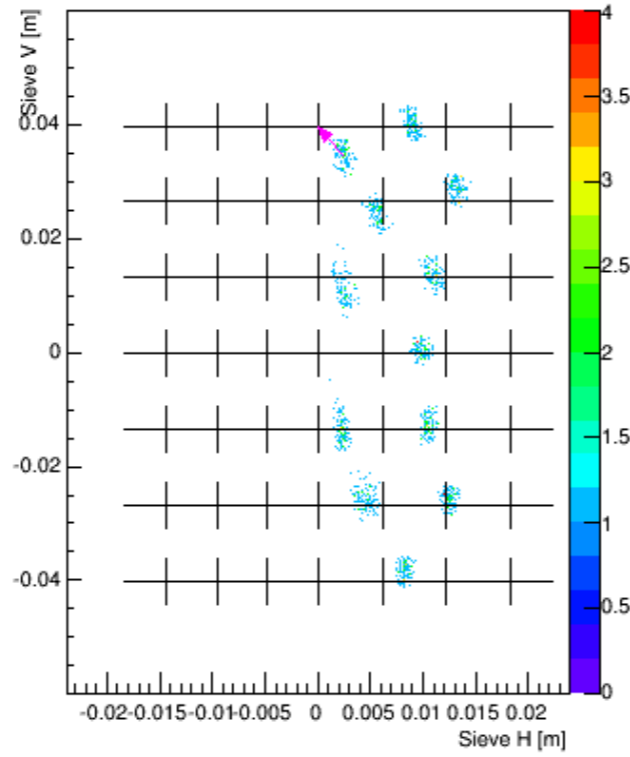
After Second Fit
Event from Carbon foil

Optics Status Update

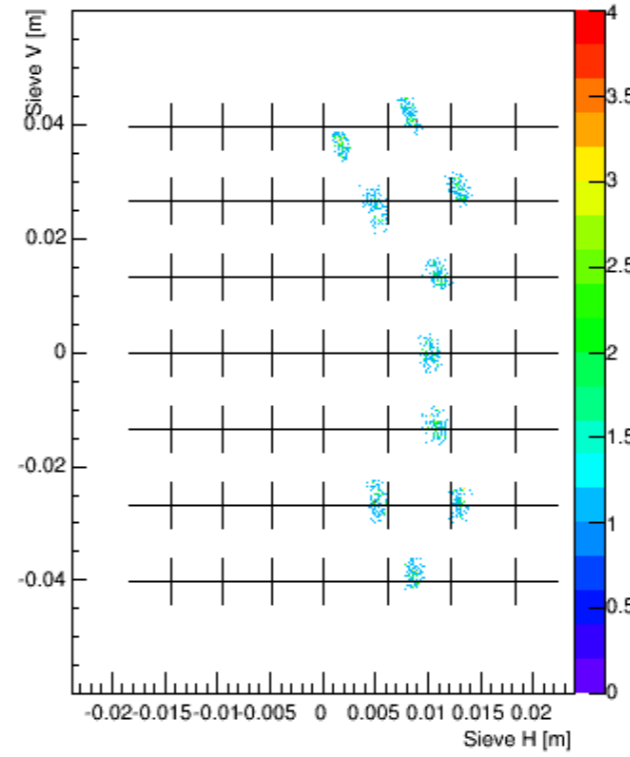
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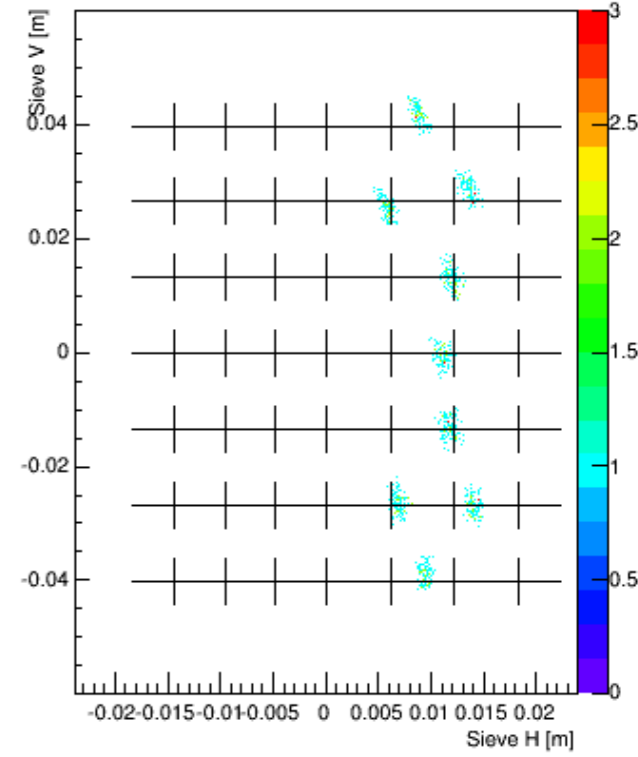
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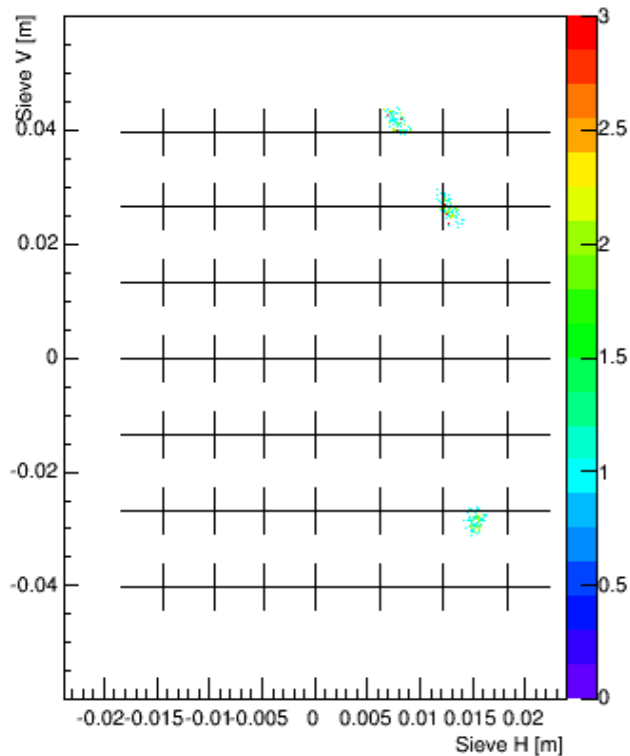
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After Second Fit
Event from Aluminum window

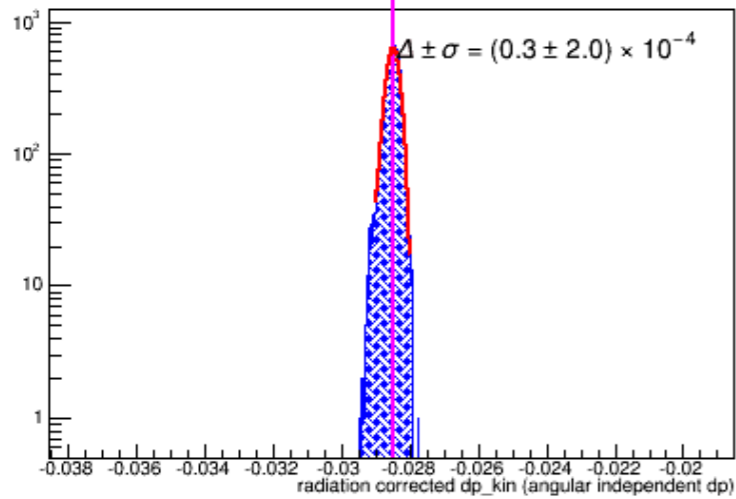
Optics Status Update

- No good fit with aluminum window even we only allow y_{fp} related matrix elements to move
- Possible reason?
 - Up to 3rd order is not enough?

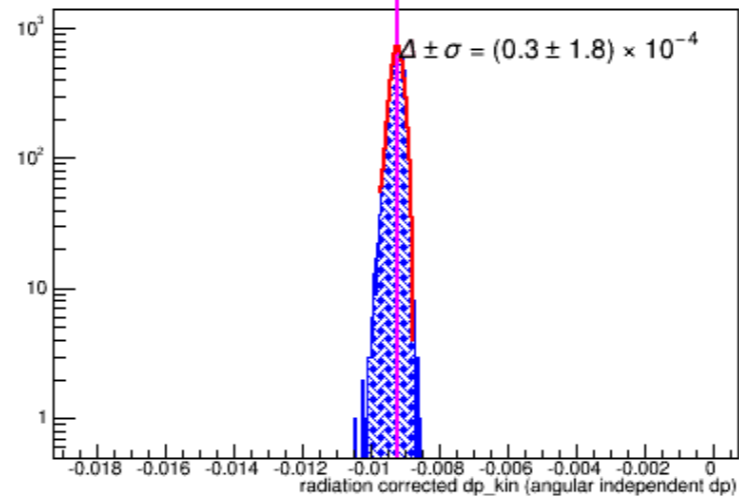
Backups

Optics Status Update

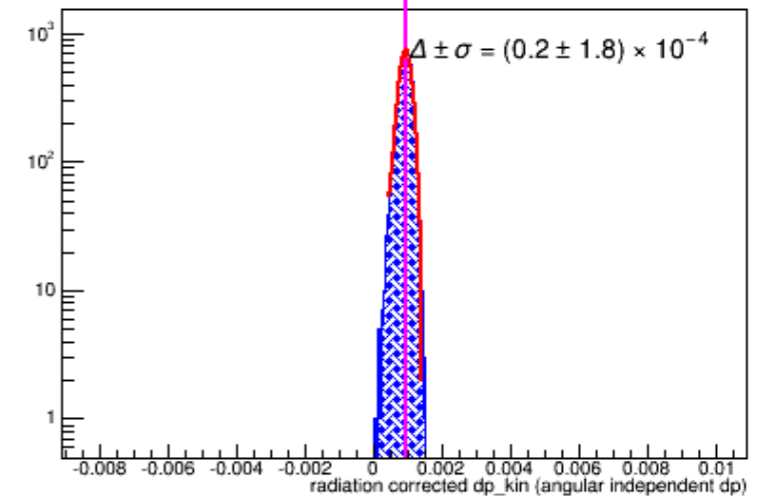
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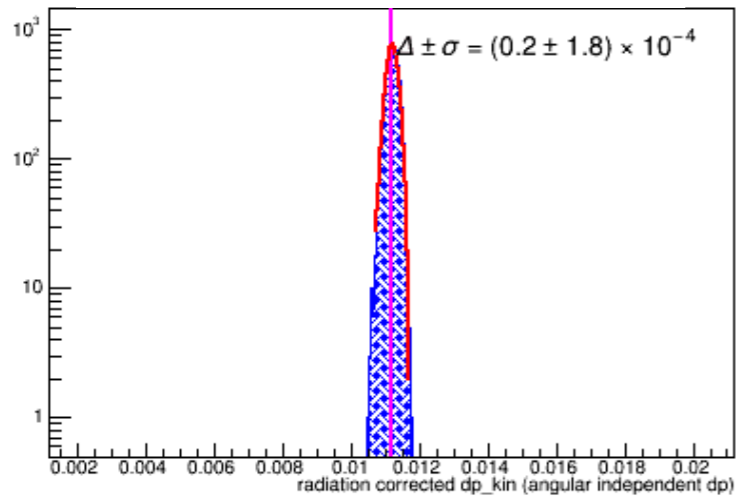
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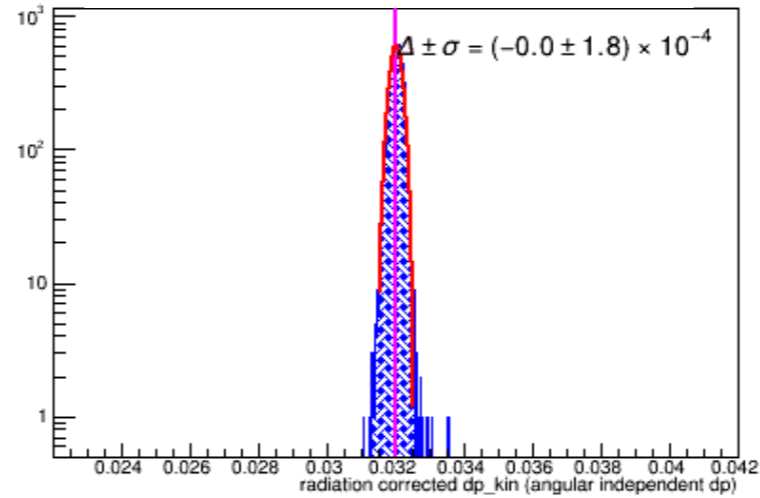
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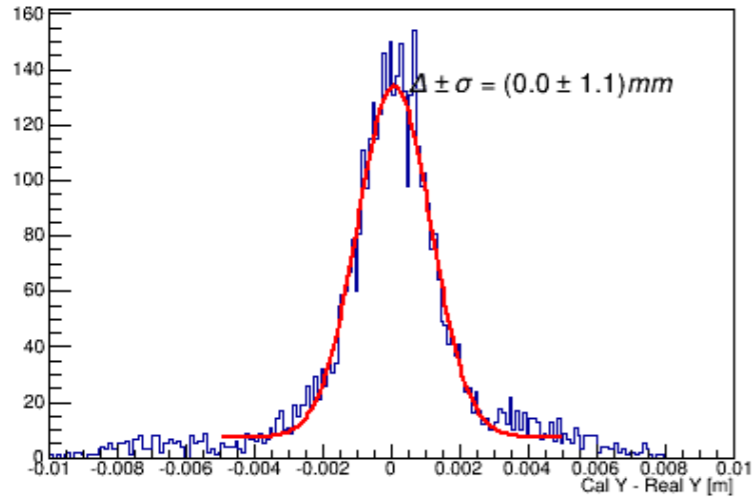


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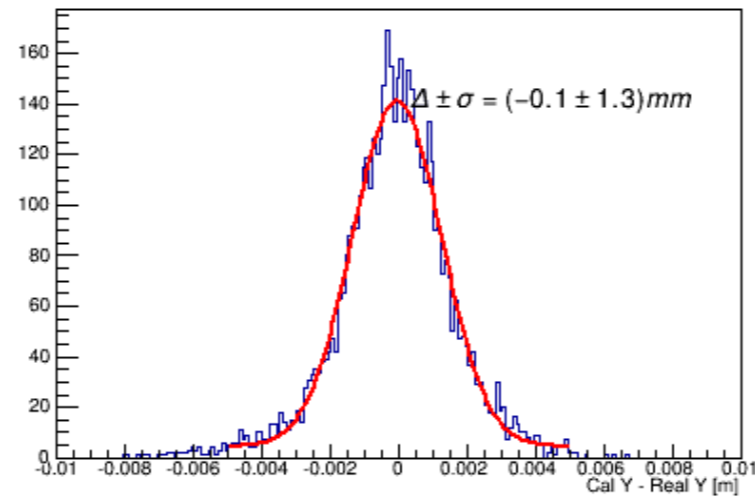


Optics Status Update

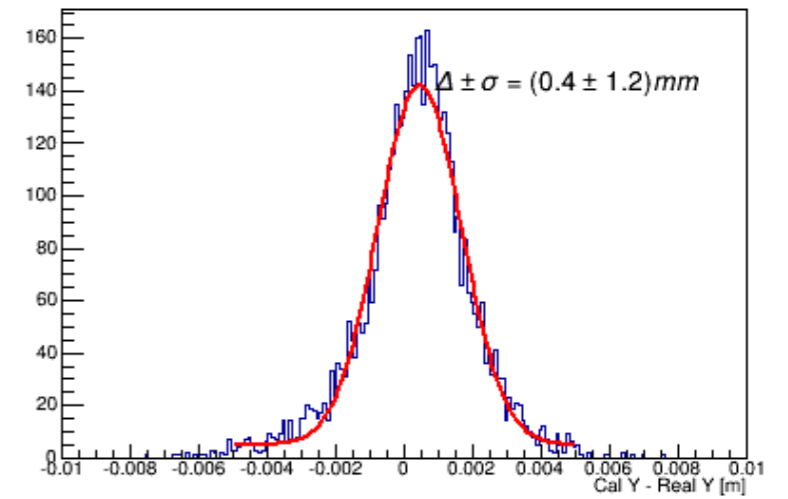
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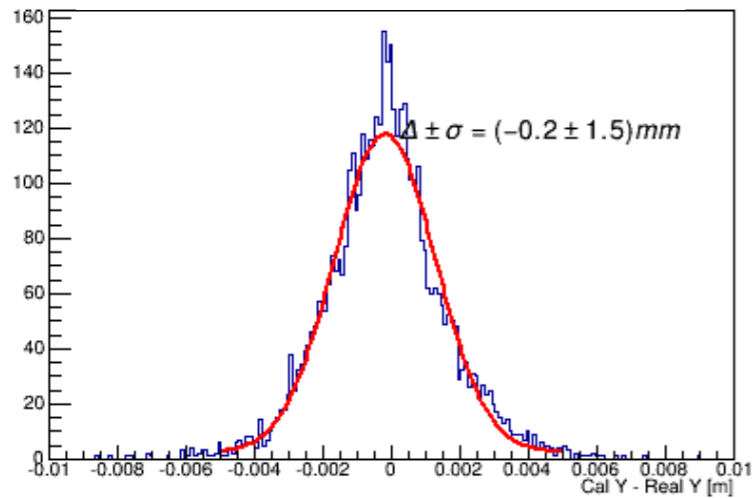
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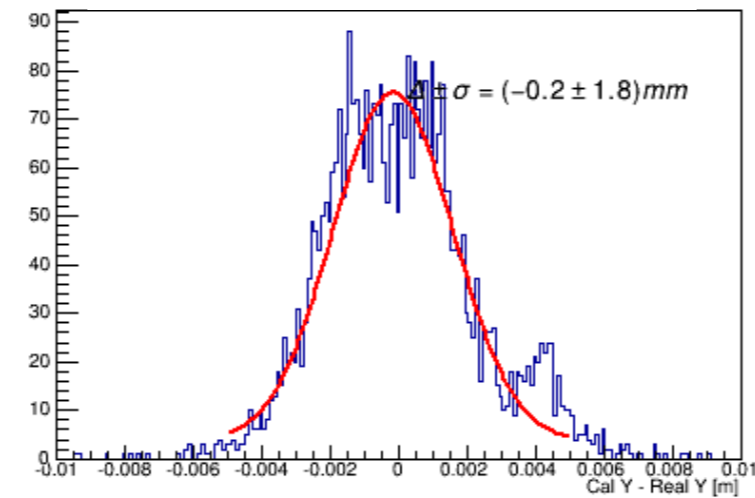
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Optics Status Update

- Fit result:
 - $\theta = \theta_{\text{matrix}} + 0.313 \times X_{\text{tg}}$
 - $\varphi = \varphi_{\text{matrix}} - 0.377 \times Y_{\text{tg}}$
 - $dp = dp_{\text{matrix}} + 0.140 \times X_{\text{tg}} - 0.090 \times Y_{\text{tg}}$
- These results already contains extended target correction
- X_{tg} and Y_{tg} are effective beam position calculated from the beam position from beam package (BPM+raster)

- Test with run 5650 (production run)

X vs Y

