

Acceptance Study Status

Chao Gu

Acceptance Study

- Check the acceptance with elastic cross-section
- Since we have pretty enough data, we could only use the central region of the acceptance to calculate the cross-section
- Elastic cross-section is well-known so we should be able to compare the calculated cross-section with different cut of the acceptance to give a check

$$\sigma_0 = \frac{P_S N}{\frac{Q}{e} (\rho \Delta Z) T_L \epsilon_{\text{det}}} \frac{1}{\Delta \Omega \Delta E' A}$$

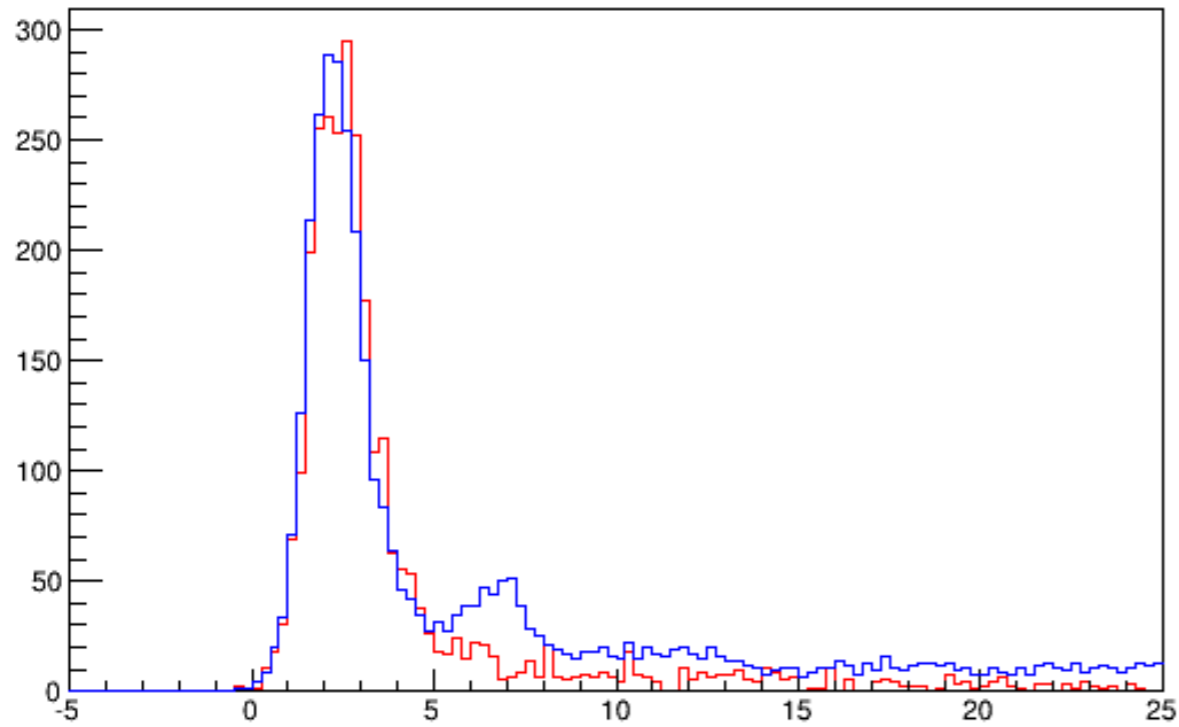
initial angle and
momentum coverage
in simulation

ratio of accepted
events and total
events

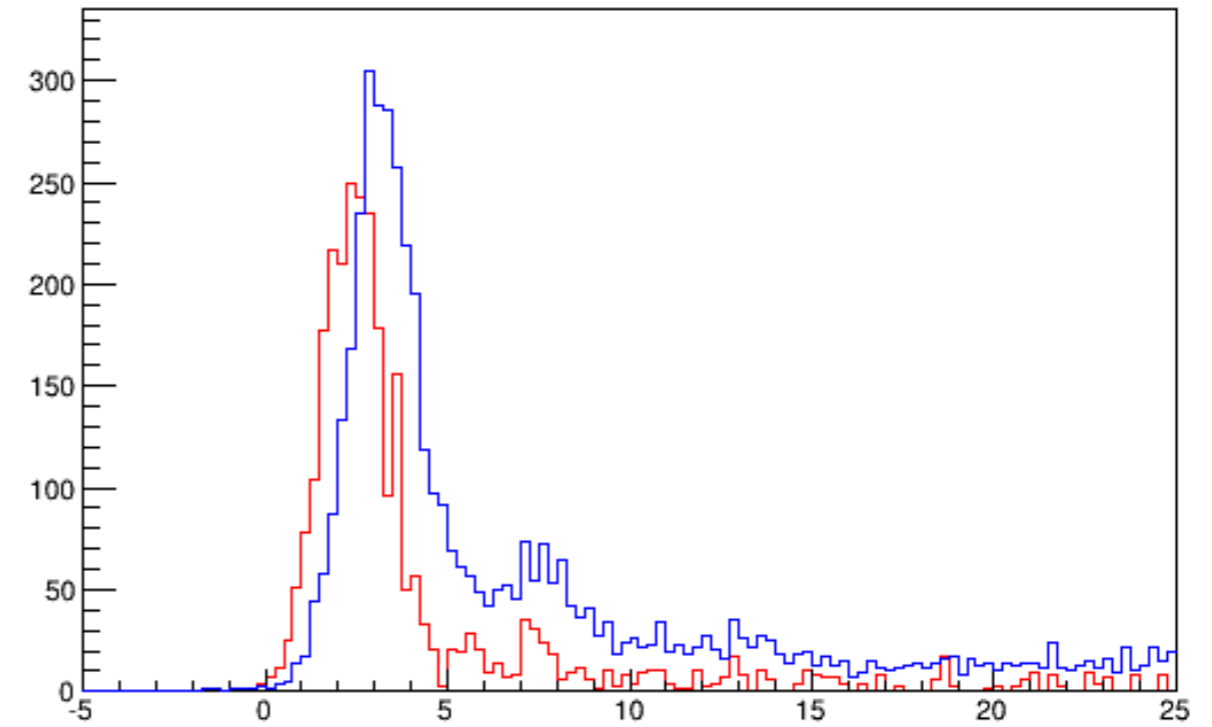
Acceptance Study

Sim
Data

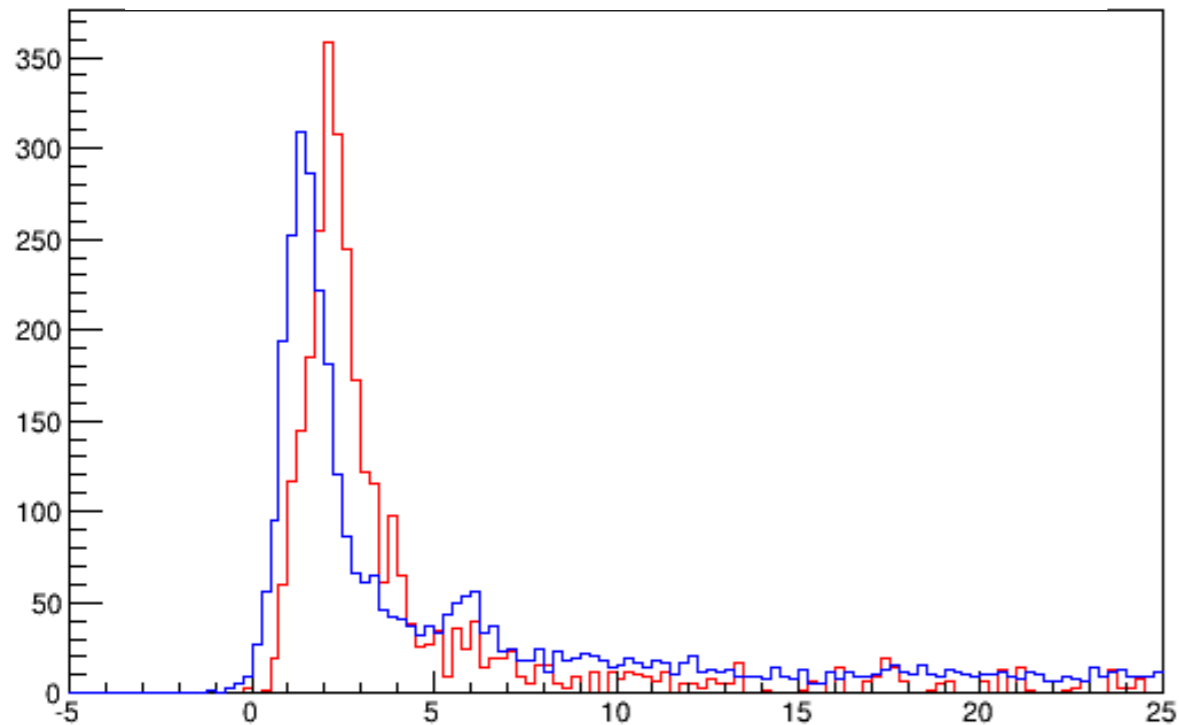
raster radius < 5 mm, (0, 0)



raster radius < 5 mm, (-10 mm, 0)



raster radius < 5 mm, (10 mm, 0)

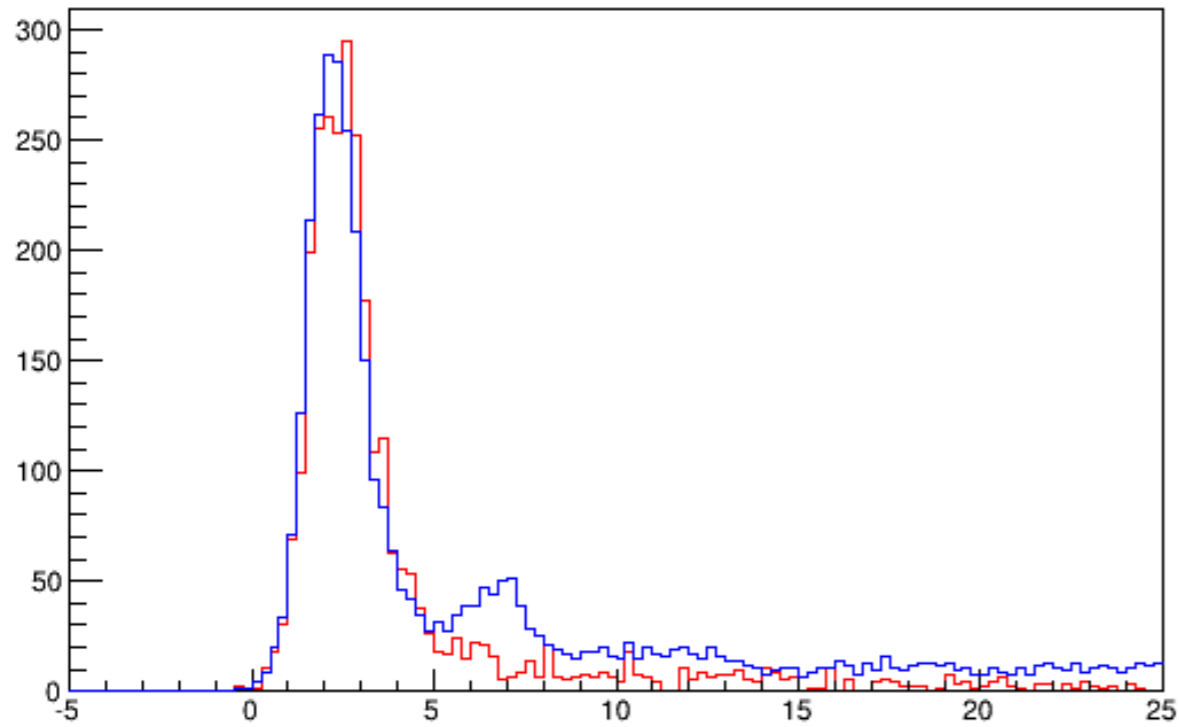


- $-0.015 < \text{phi} < -0.005$
- $-0.01 < \text{theta} < 0.03$
- no subtraction

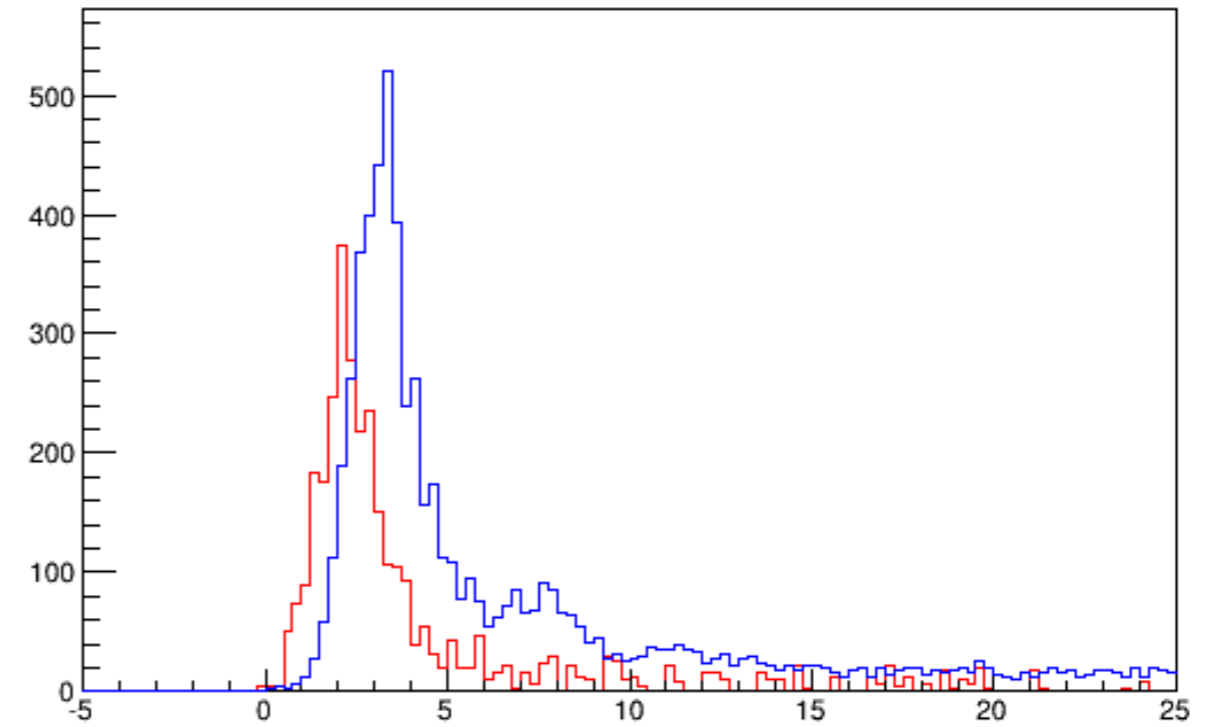
Acceptance Study

Sim
Data

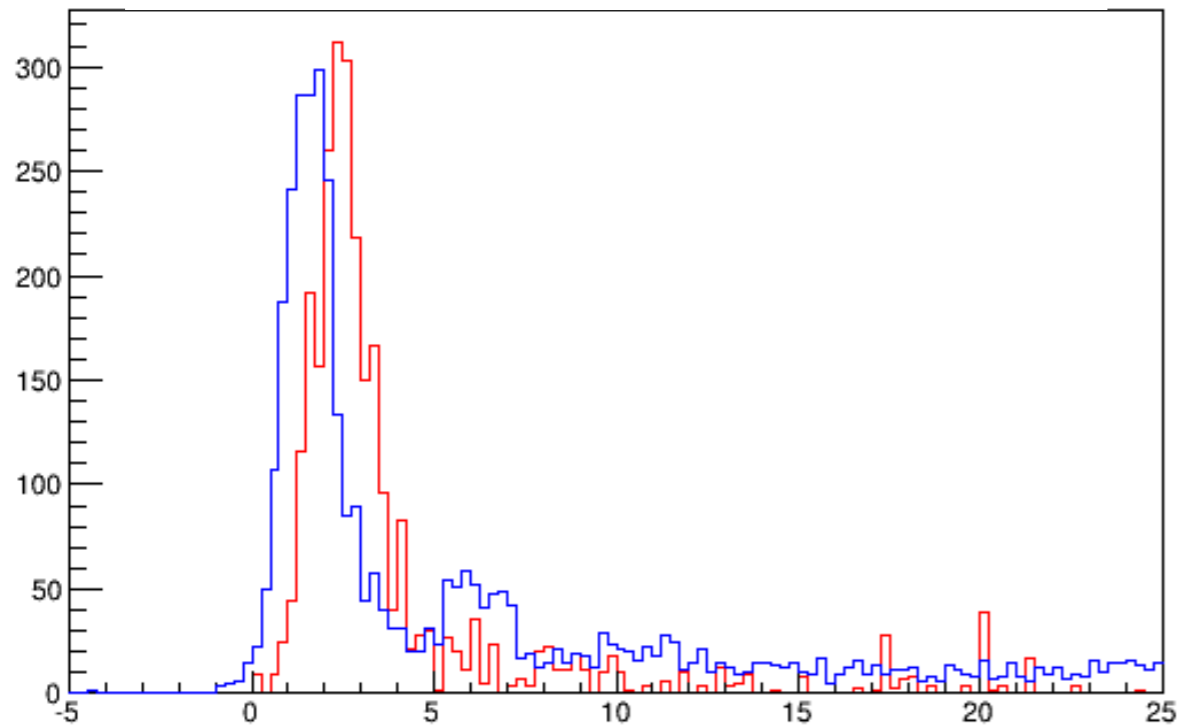
raster radius < 5 mm, (0, 0)



raster radius < 5 mm, (0, -10 mm)



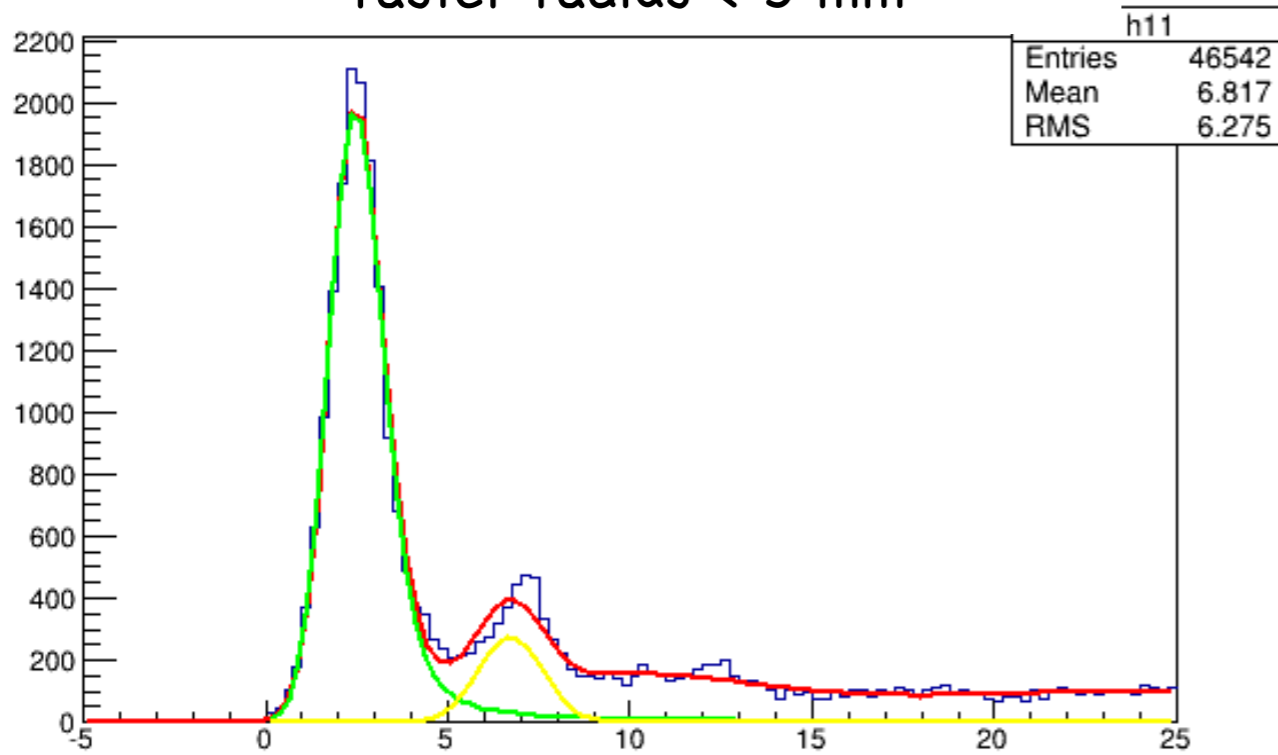
raster radius < 5 mm, (0, 10 mm)



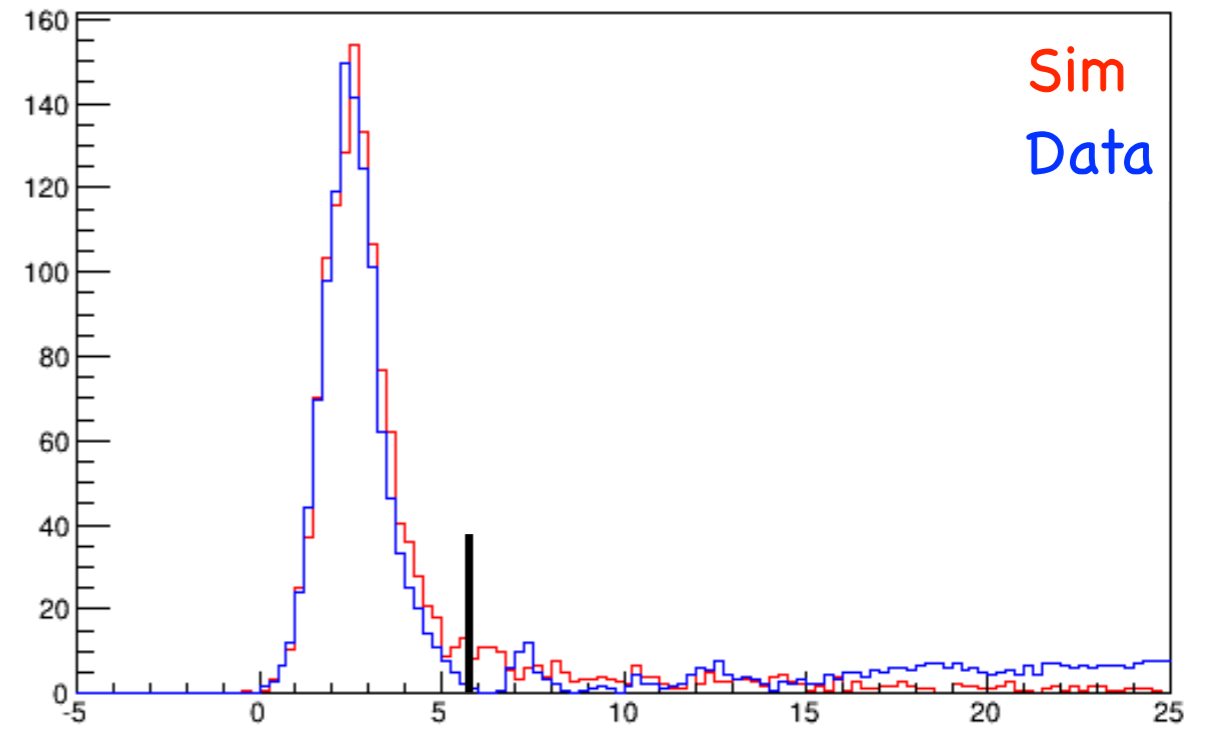
- $-0.015 < \text{phi} < -0.005$
- $-0.01 < \text{theta} < 0.03$
- no subtraction

Acceptance Study

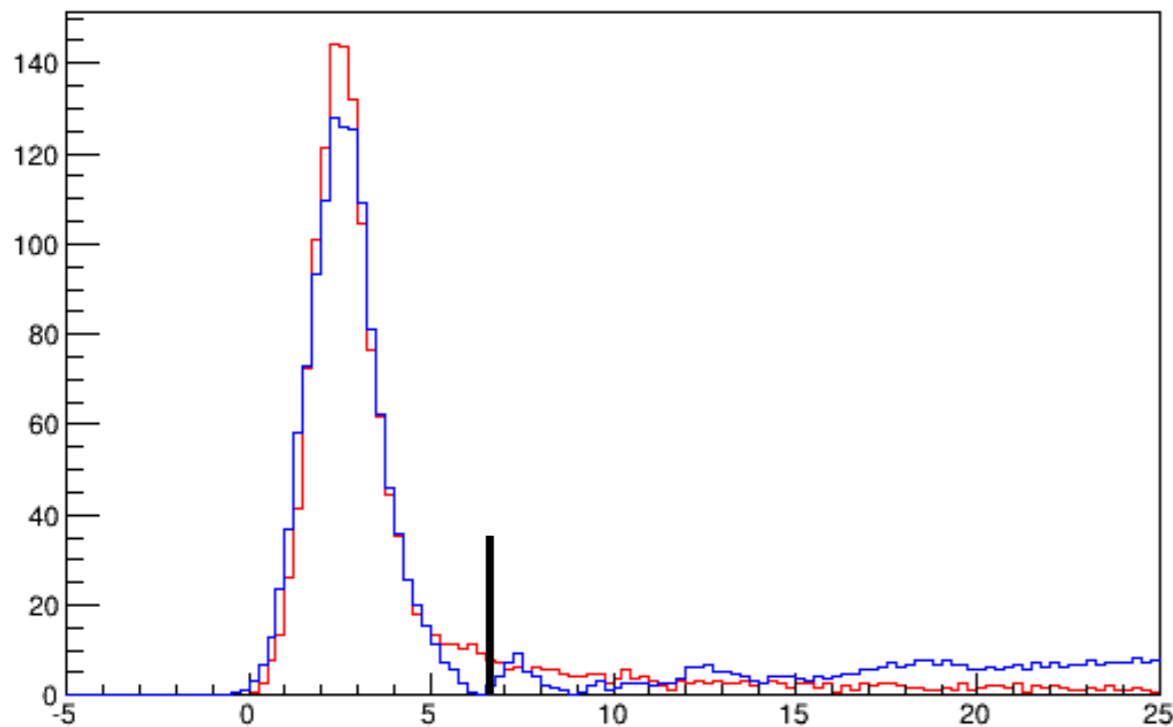
raster radius < 5 mm



raster radius < 5 mm



raster radius < 8 mm

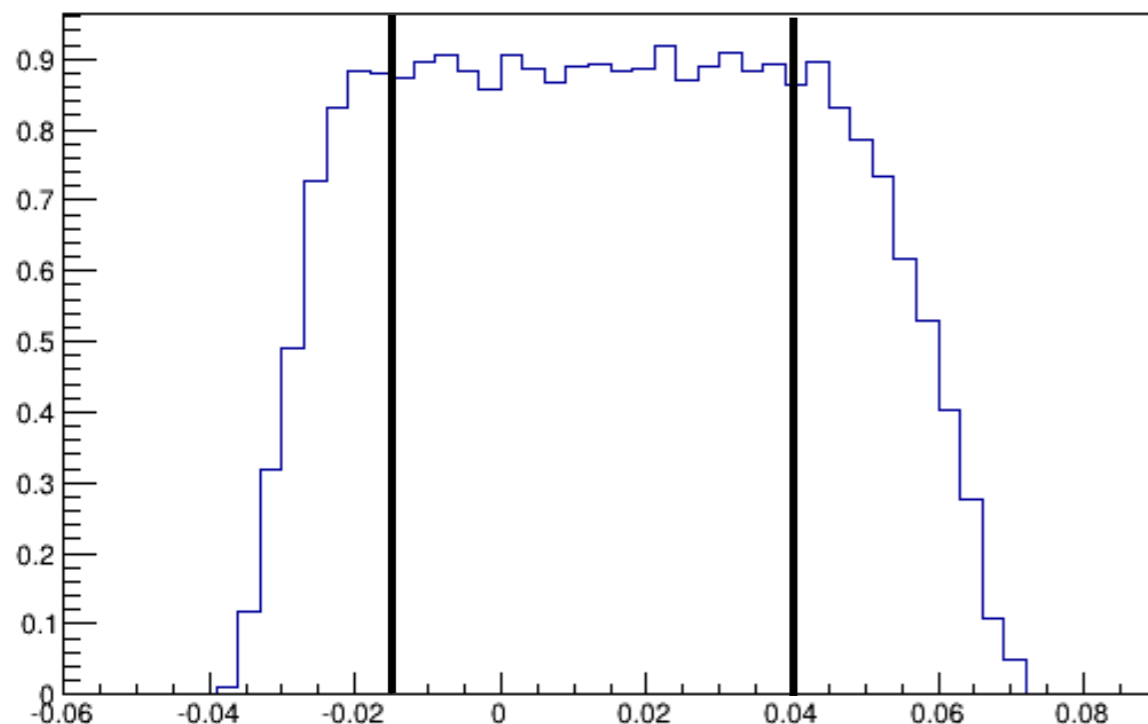


- $-0.015 < \phi < 0.015$ rad
- $-0.01 < \theta < 0.03$ rad
- 1st/2nd excited states subtracted
- Integral of elastic peak (5 sigma)
- 5mm: 1123, 1210
- 8mm: 1222, 1263

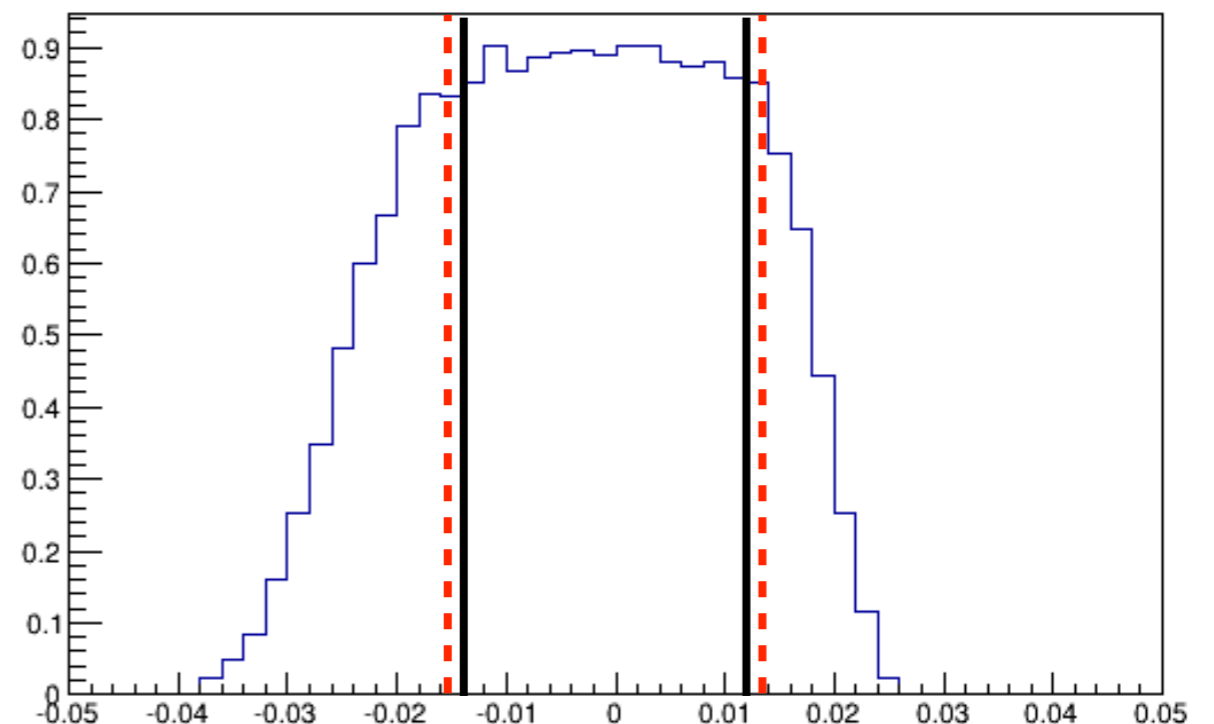
Acceptance Study

- Uncertainty:
 - Cut in center, so the absolute value has little effect to the acceptance
 - The difference between the higher cut and the lower cut dominates the uncertainty
 - $-0.020 < \theta < 0.040$, $-0.015 < \phi < 0.015$ could be used as acceptance cut with an contribution of 4% to acceptance uncertainty (longitudinal, $P_0 = 2.228$ GeV)
 - Still running simulation to study the acceptance uncertainty contributed by beam position

Theta (rad)



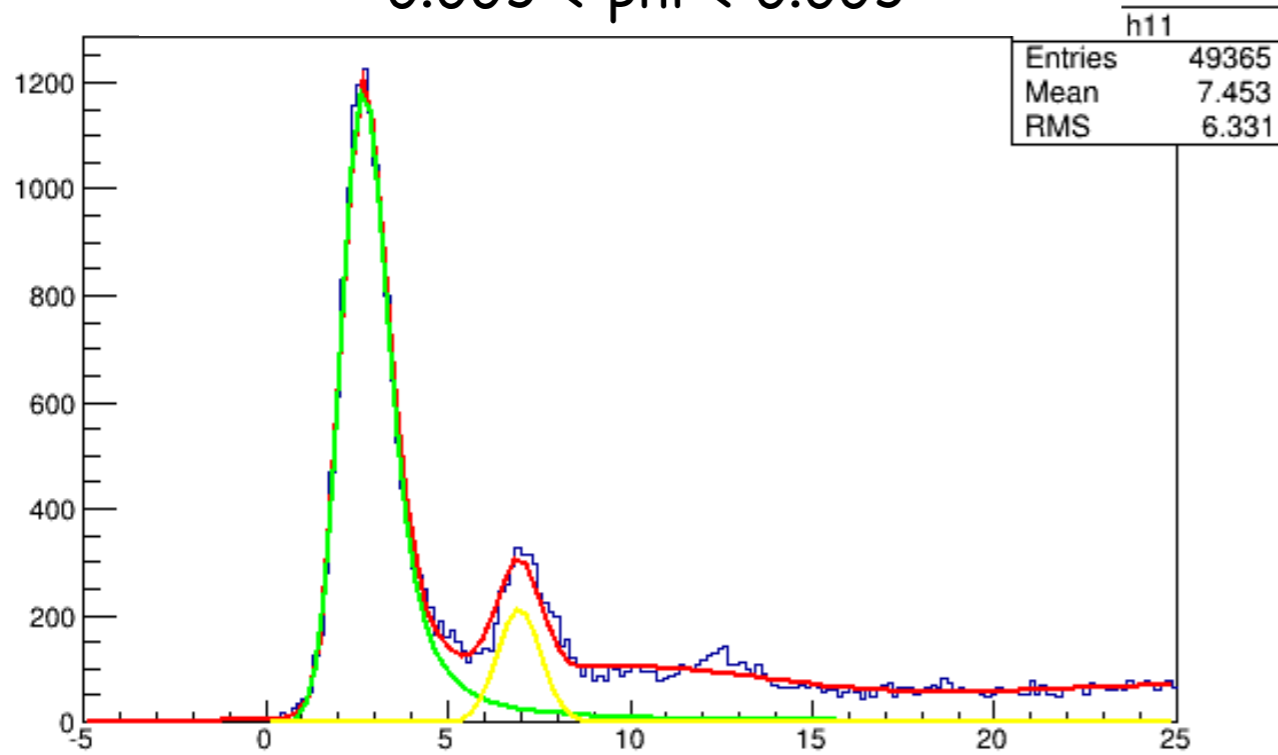
Phi (rad)



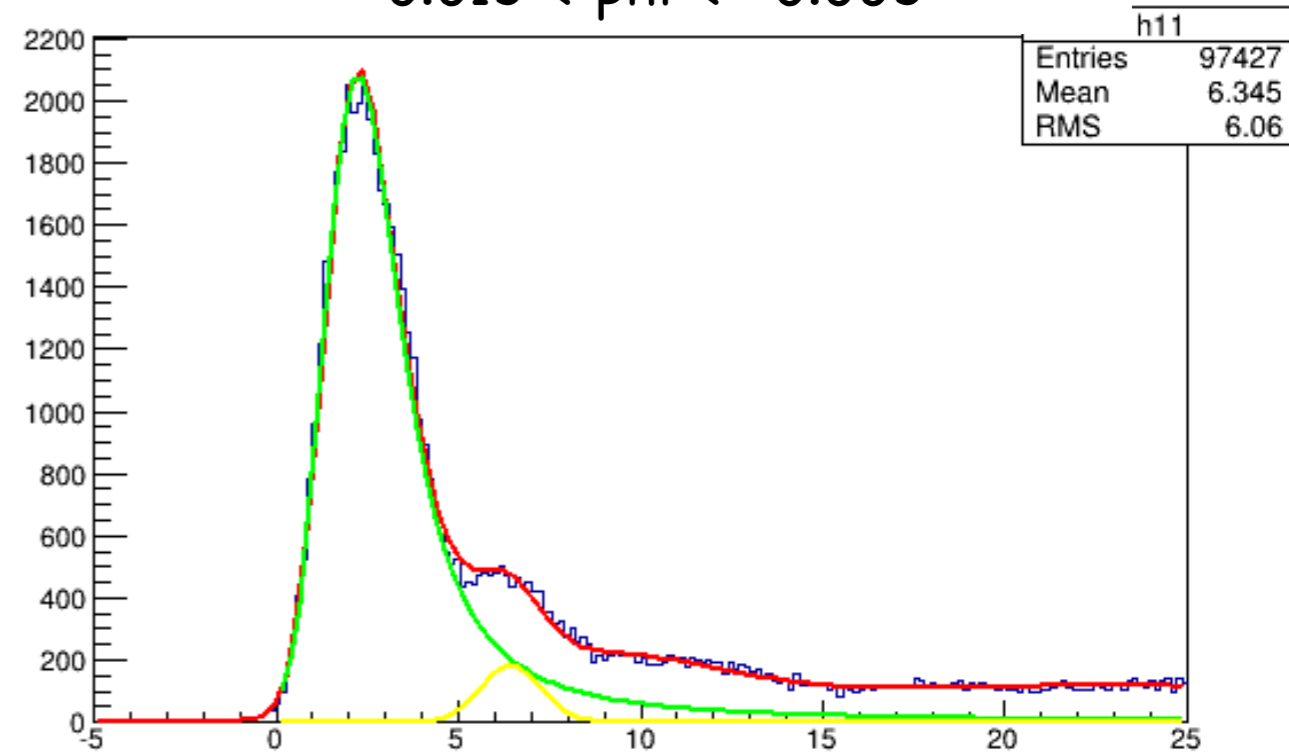
Backups

Acceptance Study

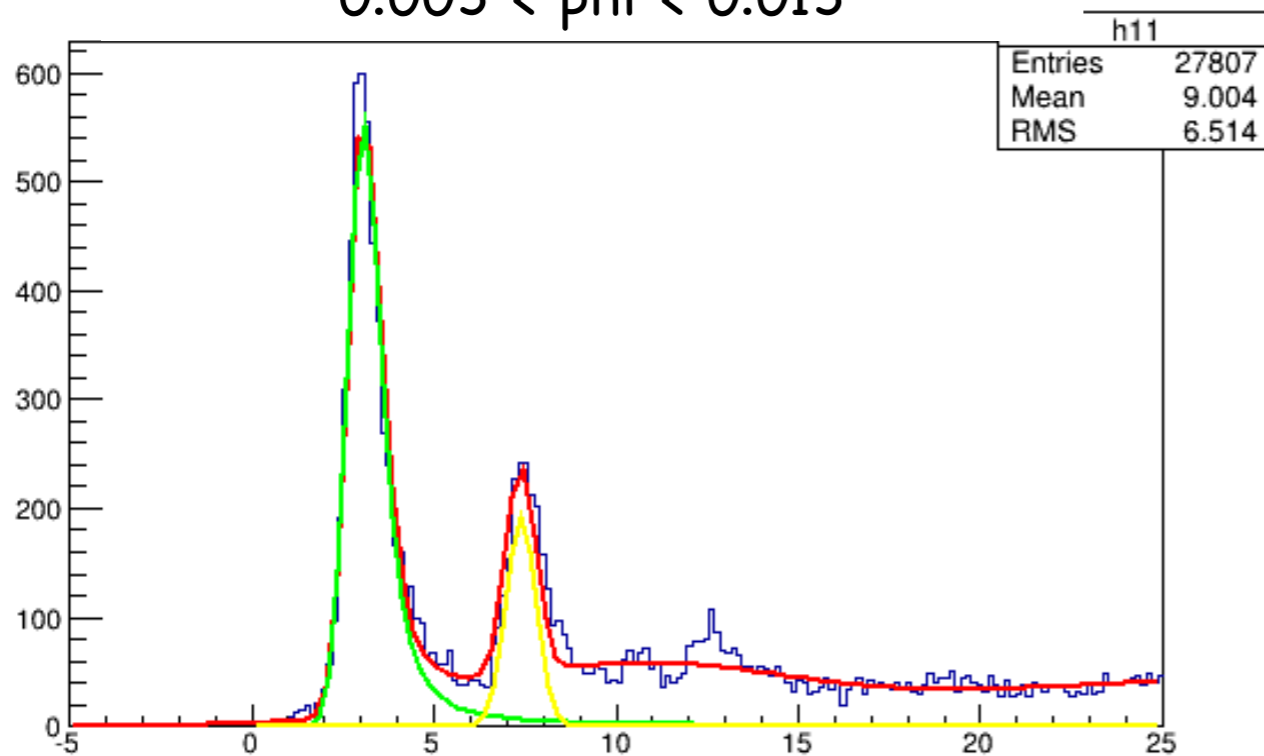
$-0.005 < \phi < 0.005$



$-0.015 < \phi < -0.005$



$0.005 < \phi < 0.015$

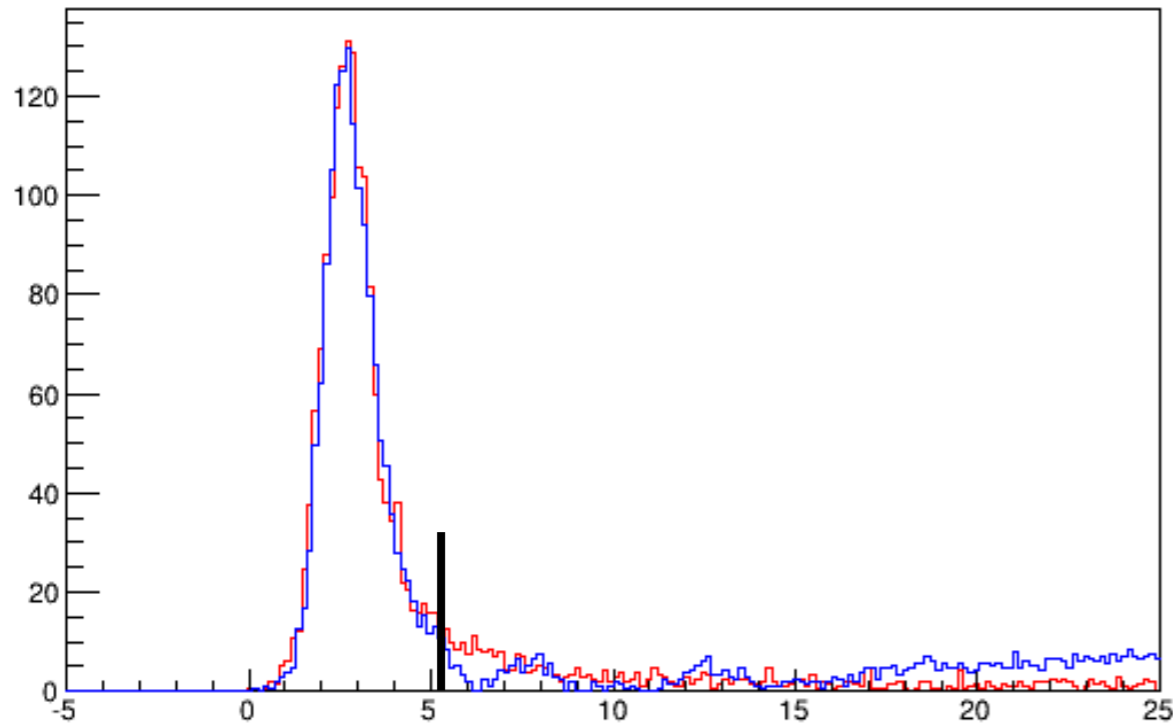


- Fit the elastic spectrum:
 - Elastic peak: Landau-Gaussian function
 - 1st and 2nd excited peak: Gaussian function
 - Background

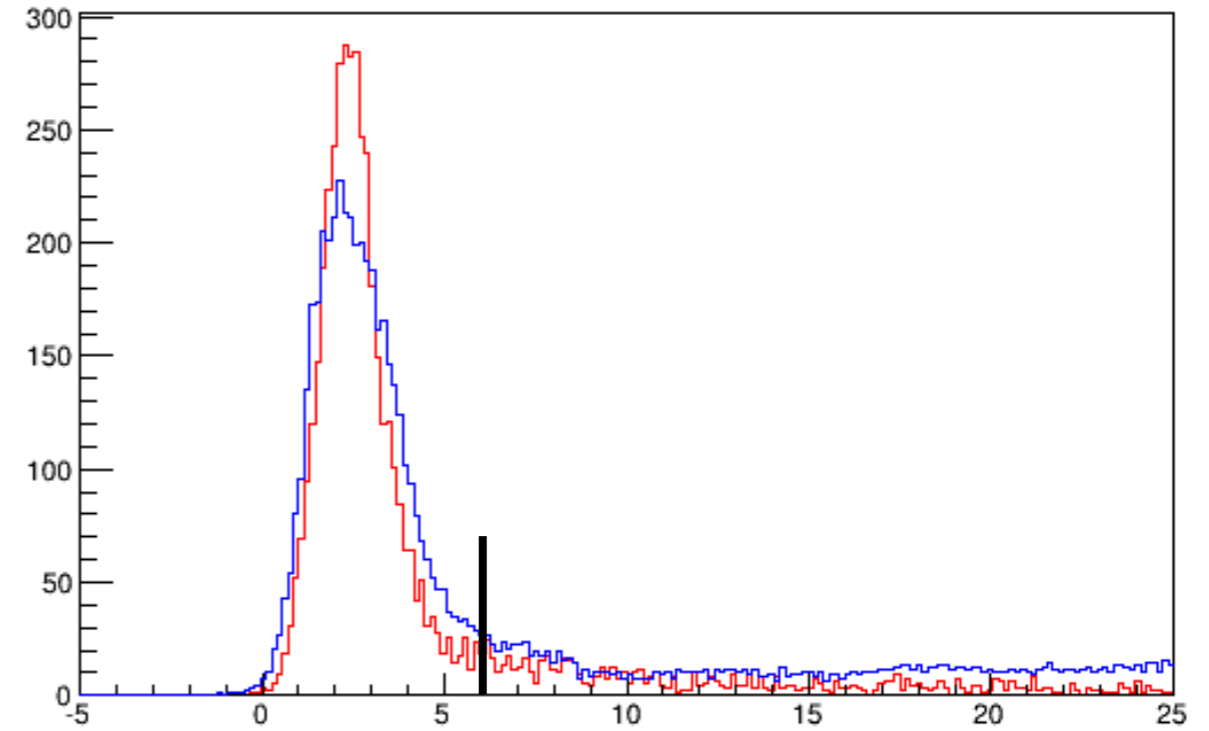
Acceptance Study

Sim
Data

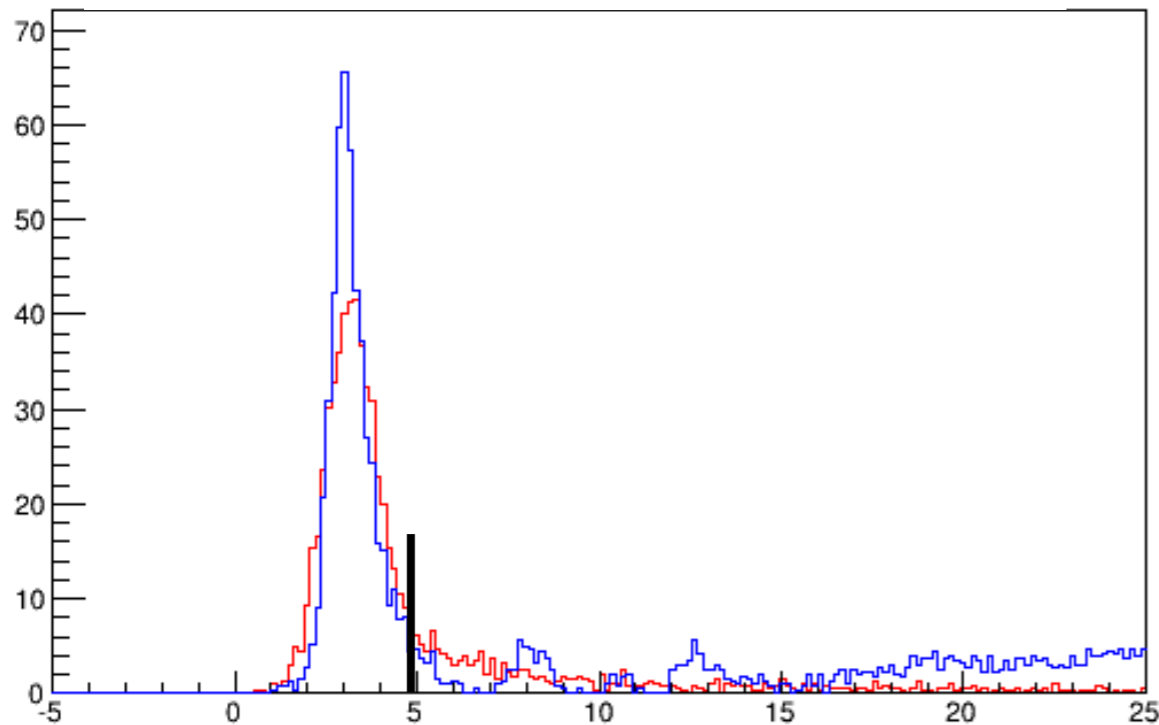
$-0.005 < \phi < 0.005$



$-0.015 < \phi < -0.005$



$0.005 < \phi < 0.015$



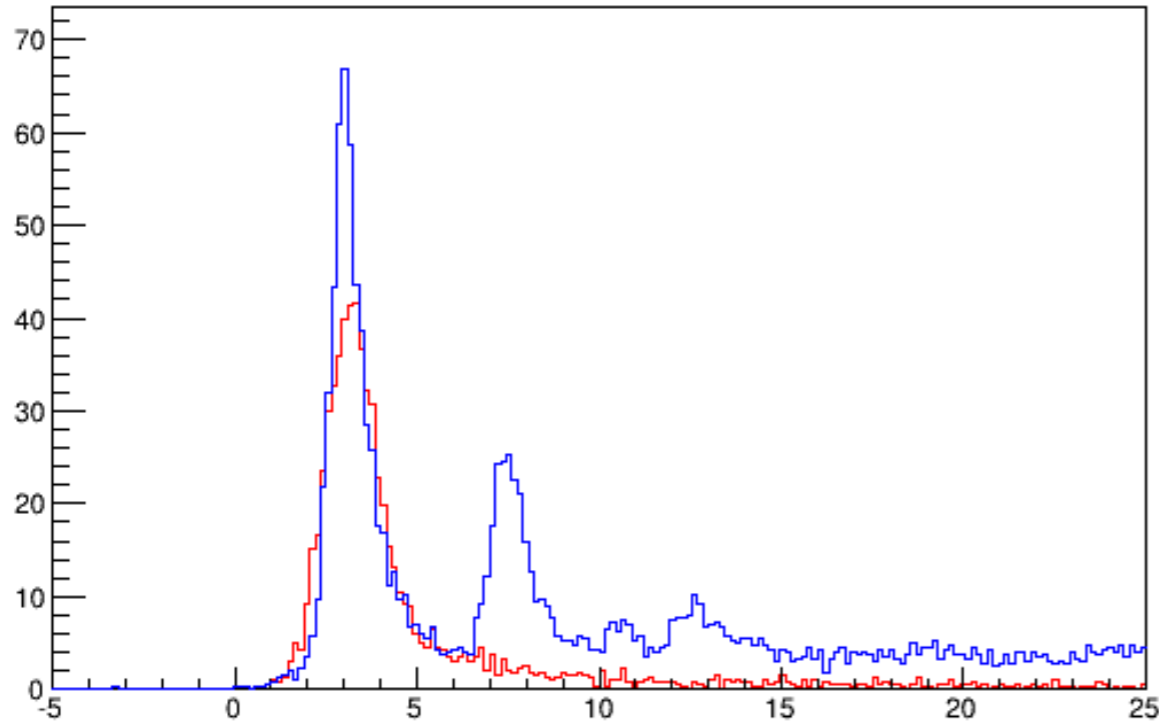
- $-0.01 < \theta < 0.03$
- Subtract 1st and 2nd excited peak
- Integral of elastic peak (5 sigma)
 - $-0.015 < \phi < -0.005$: 4353, 4036
 - $-0.005 < \phi < 0.005$: 1486, 1546
 - $0.005 < \phi < 0.015$: 500, 502

-0.015 < phi < -0.005, no subtraction

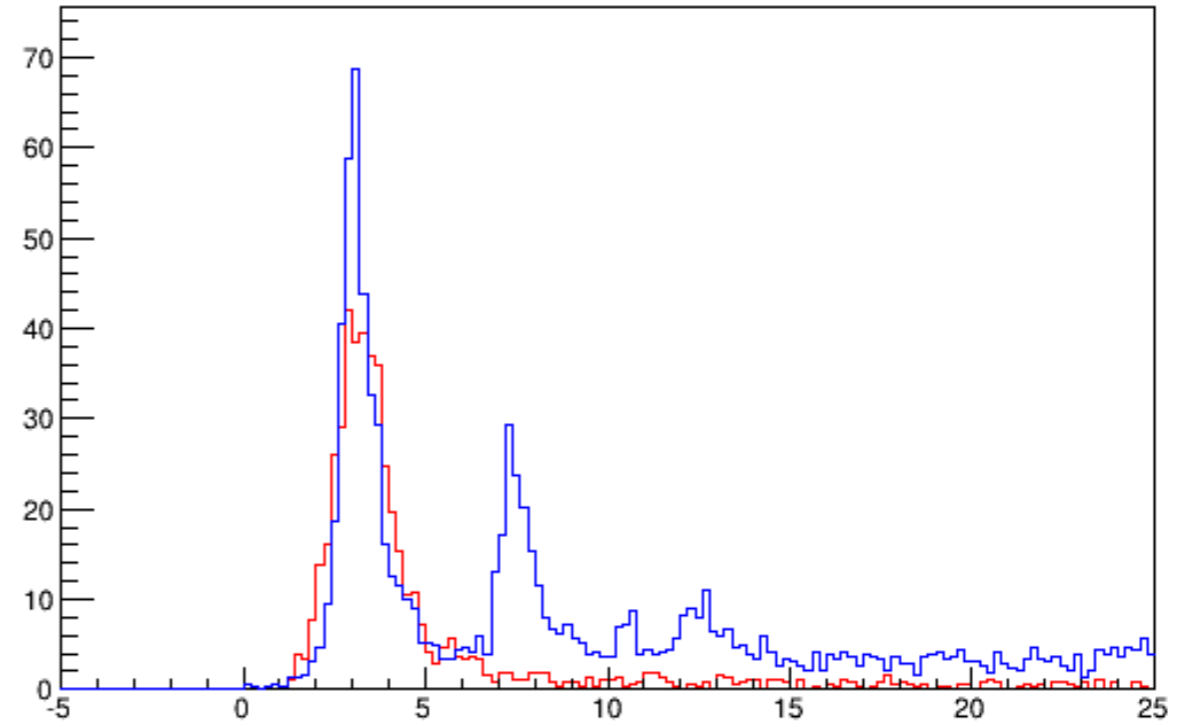
Acceptance Study

Sim
Data

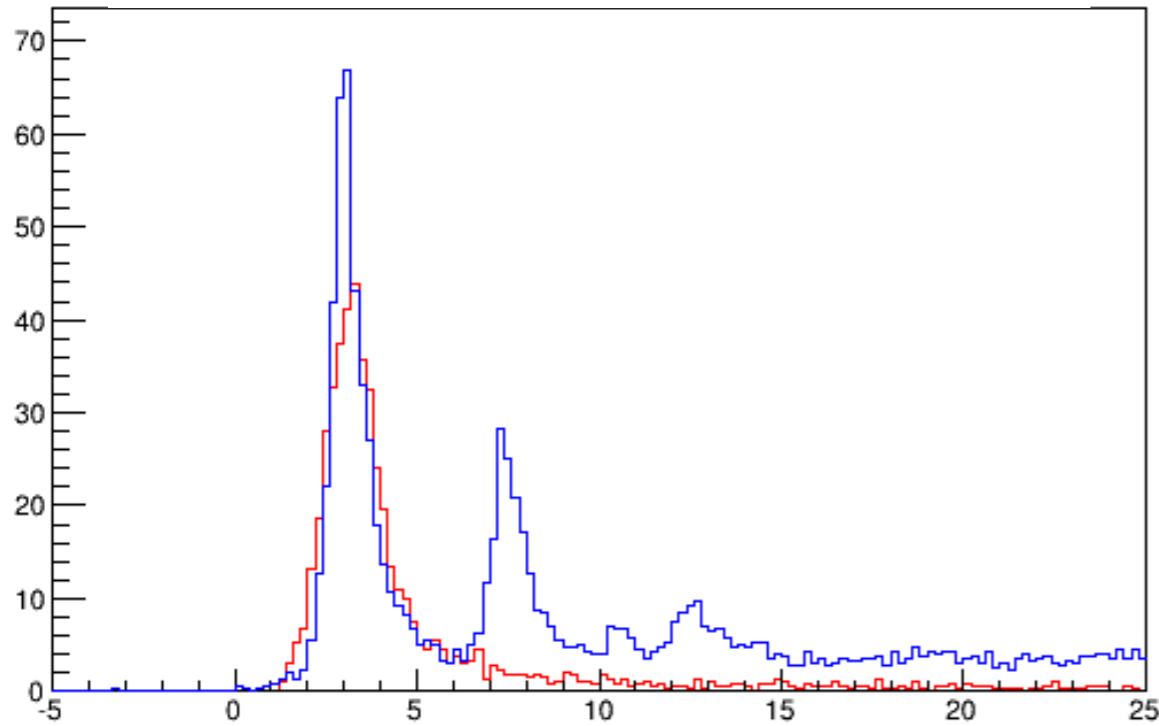
No raster cut



raster radius < 5 mm



raster radius < 8 mm



- -0.01 < theta < 0.03