

## Goal:

Estimate FOM impact from reduced septum acceptance  
(based on HAPLOG 3445)

Pinch points:

- Near septum entrance ( $z \approx 21.3$  cm)
- Near septum exit ( $z \approx 109.5$  cm)

Clearance requirements:

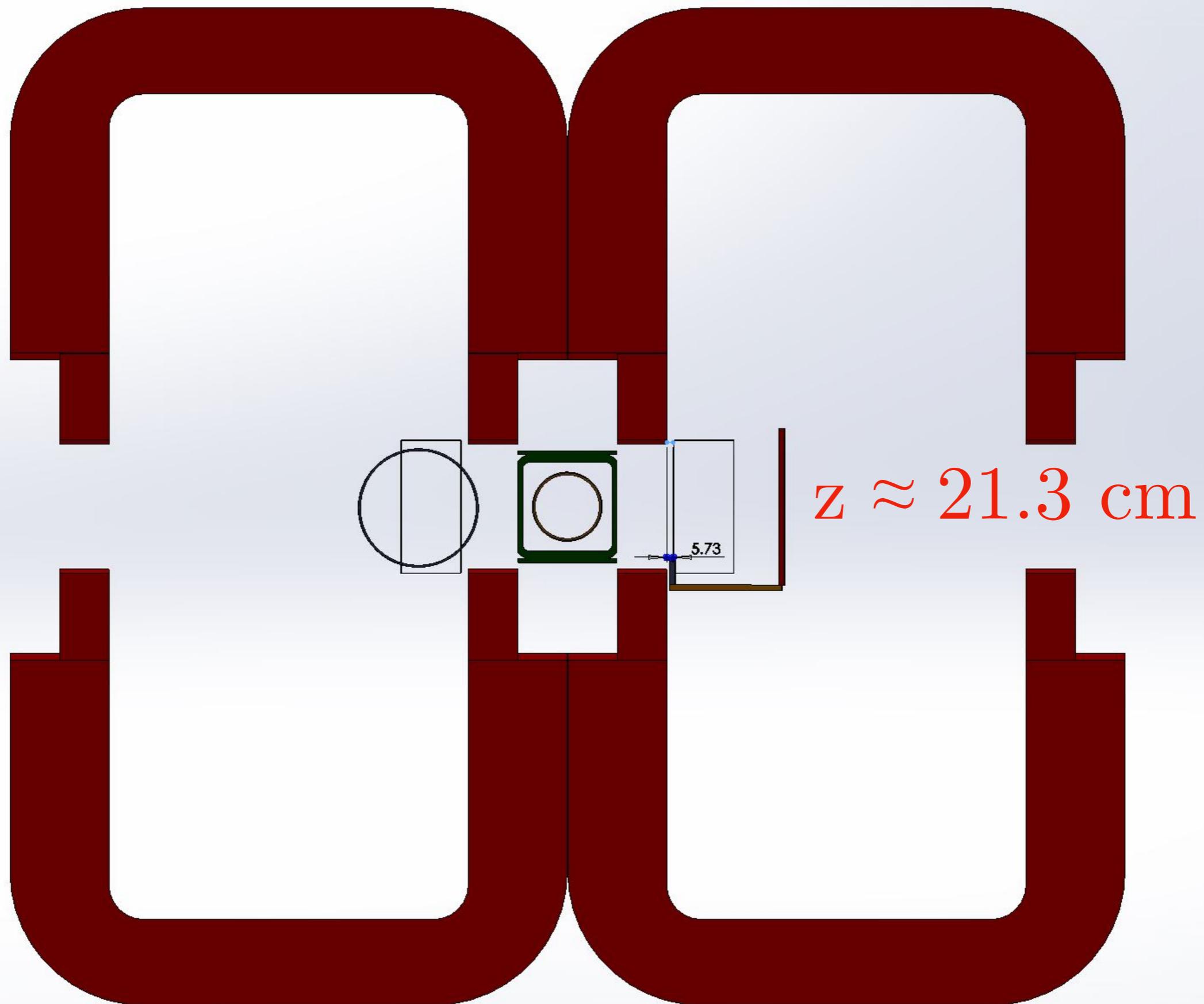
- 6 mm (vacuum wall)
- 3 mm (alignment)
- 3 mm (acceptance buffer)

= 12 mm = 1.2 cm total

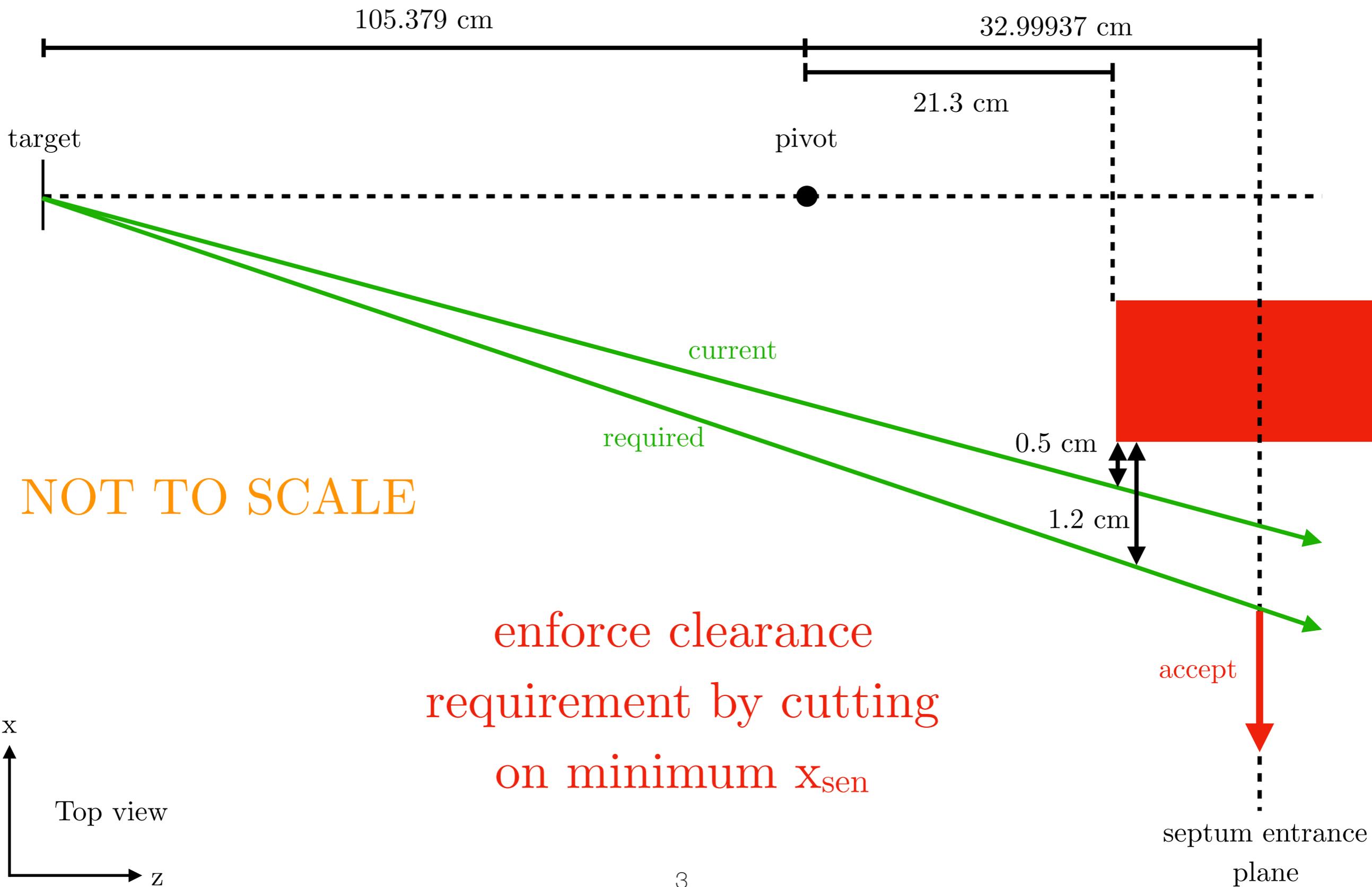
ROOT file doesn't have x-y distributions at arbitrary z position, so cuts cannot be made directly at pinch points. However, pinch points occur close to septum entrance/exit planes, where ROOT *does* have x-y distributions.

Approach: project “pinched” edge to septum plane and make cut there.

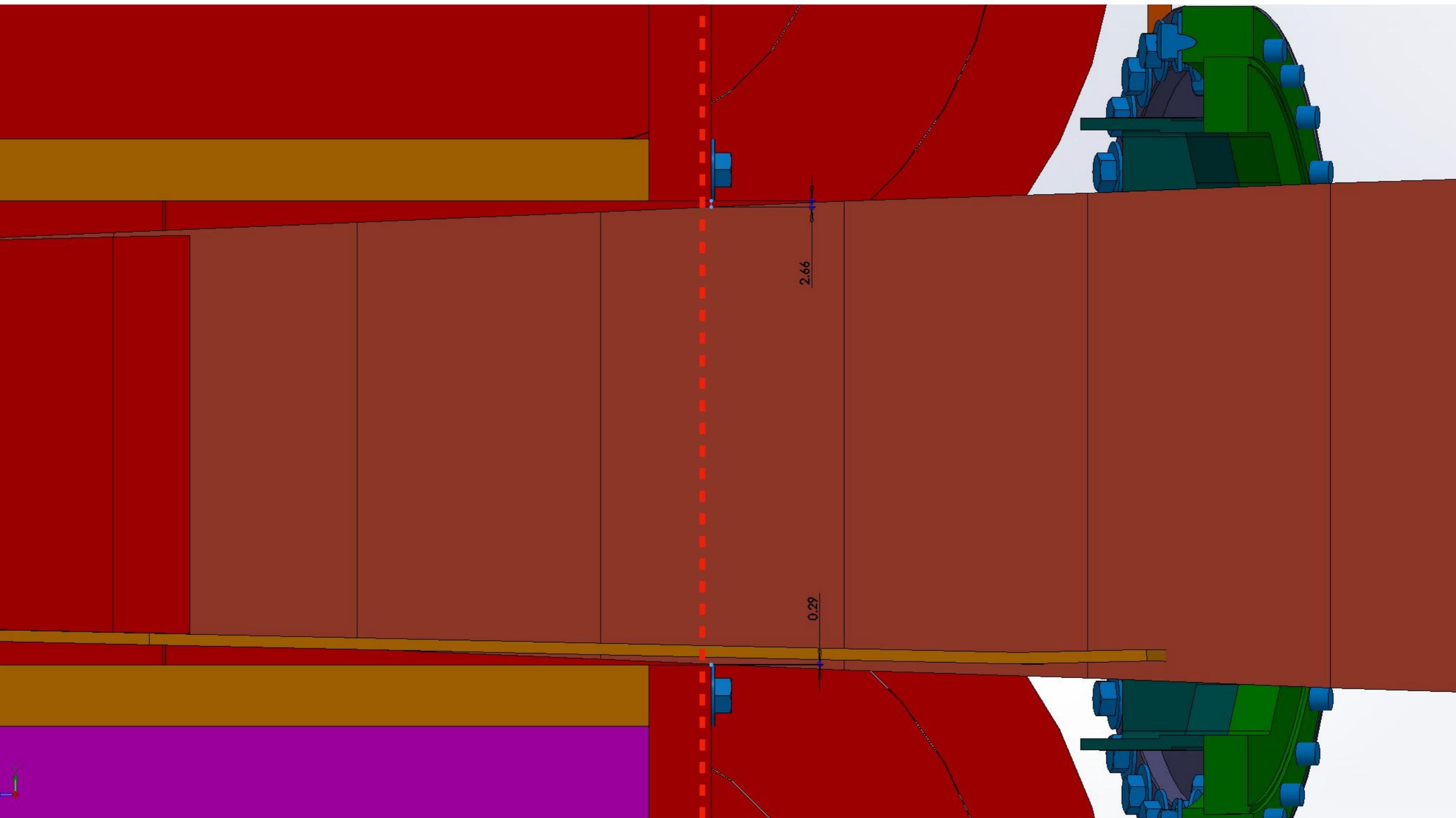
# Upstream constraint (near septum entrance)



# Upstream constraint (near septum entrance)



# Downstream constraint (at septum exit)

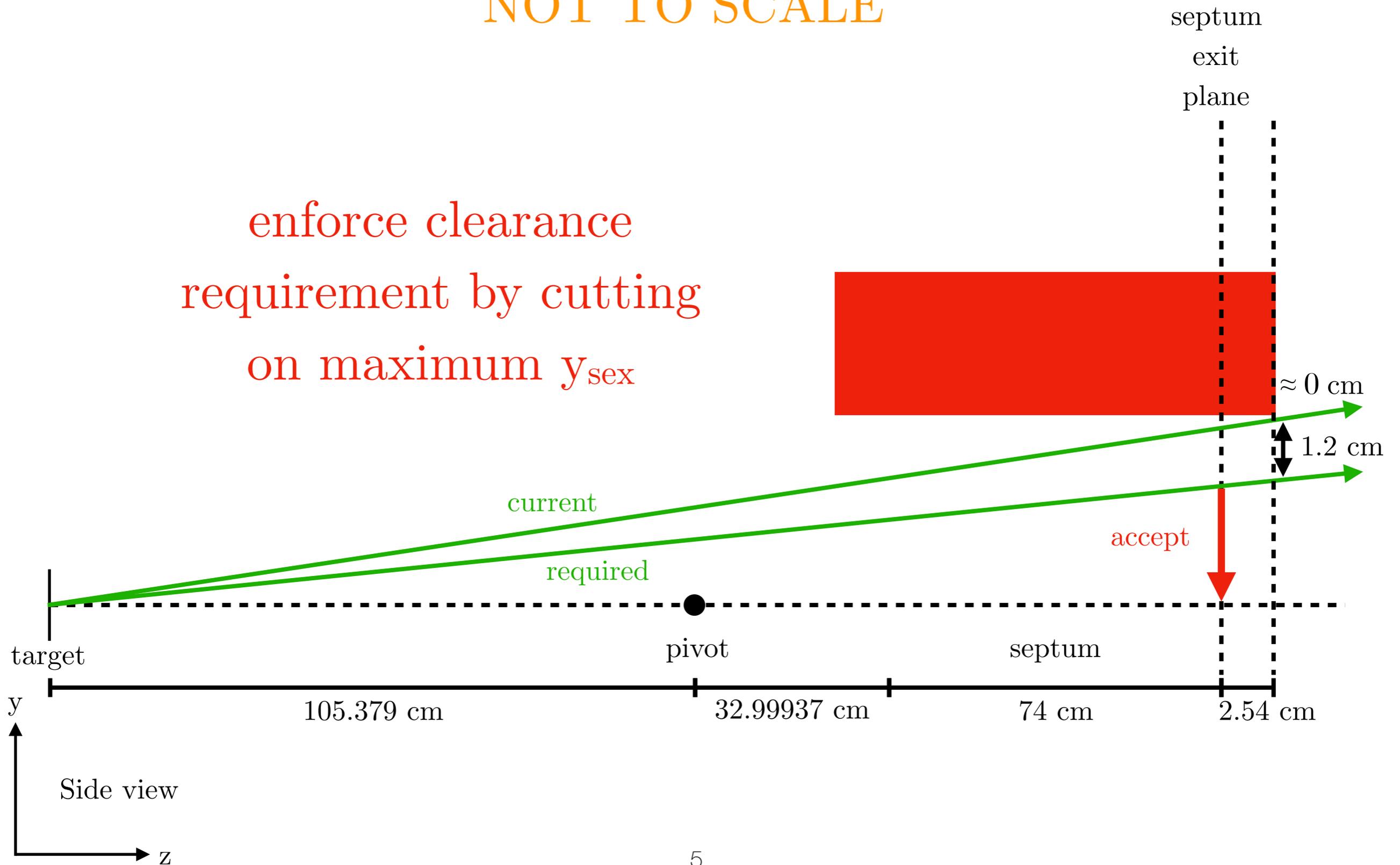


$z \approx 109.5 \text{ cm}$

# Downstream constraint (at septum exit)

NOT TO SCALE

enforce clearance  
requirement by cutting  
on maximum  $y_{sex}$



Resulting septum cuts:

$$|x_{\text{sen}}| > 10.66 \text{ cm}$$

$$|y_{\text{sex}}| < 8.14 \text{ cm}$$

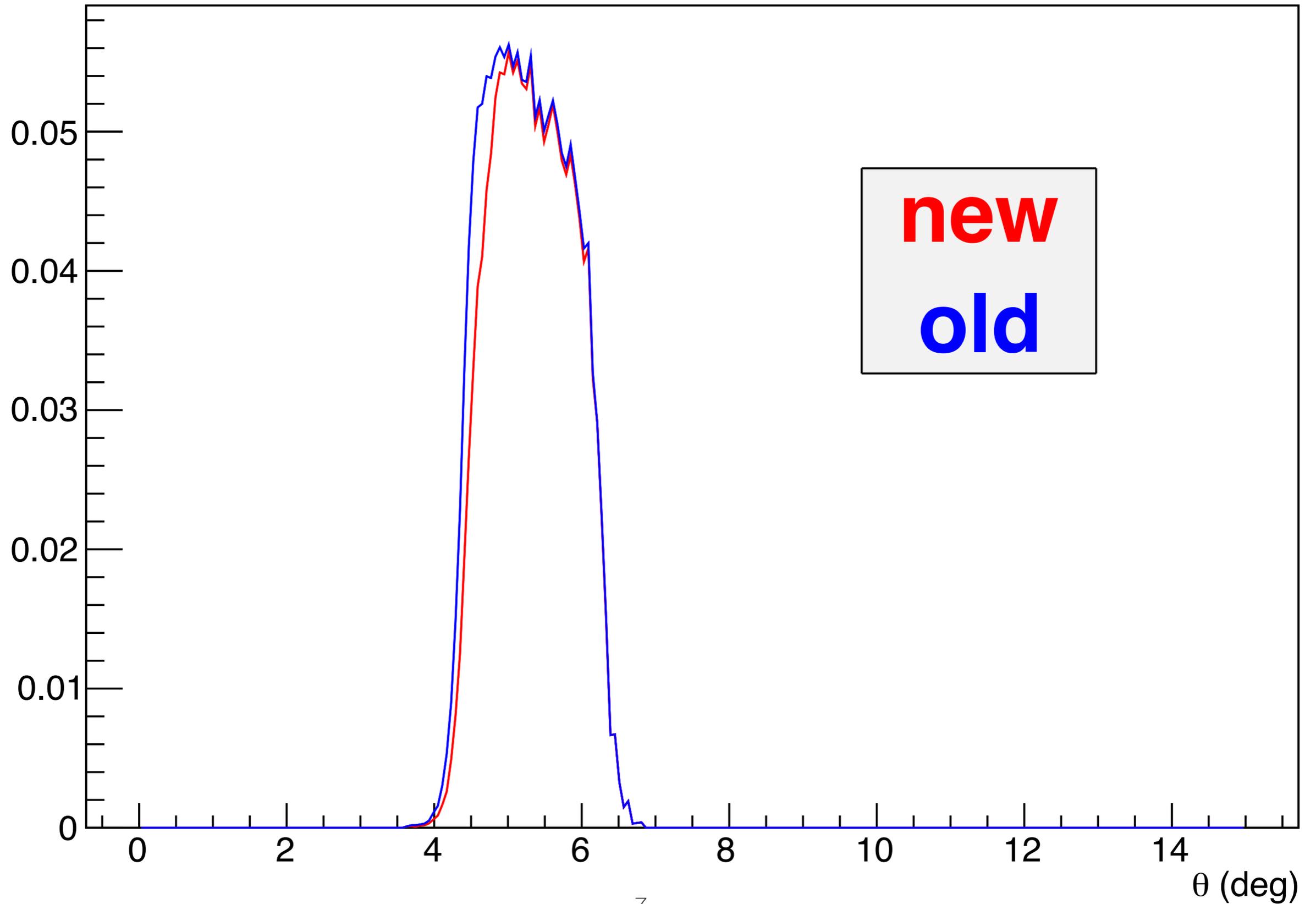
For all comparisons (plots, tables, etc.),

red is *with* these septum cuts,

blue is *without* these septum cuts.

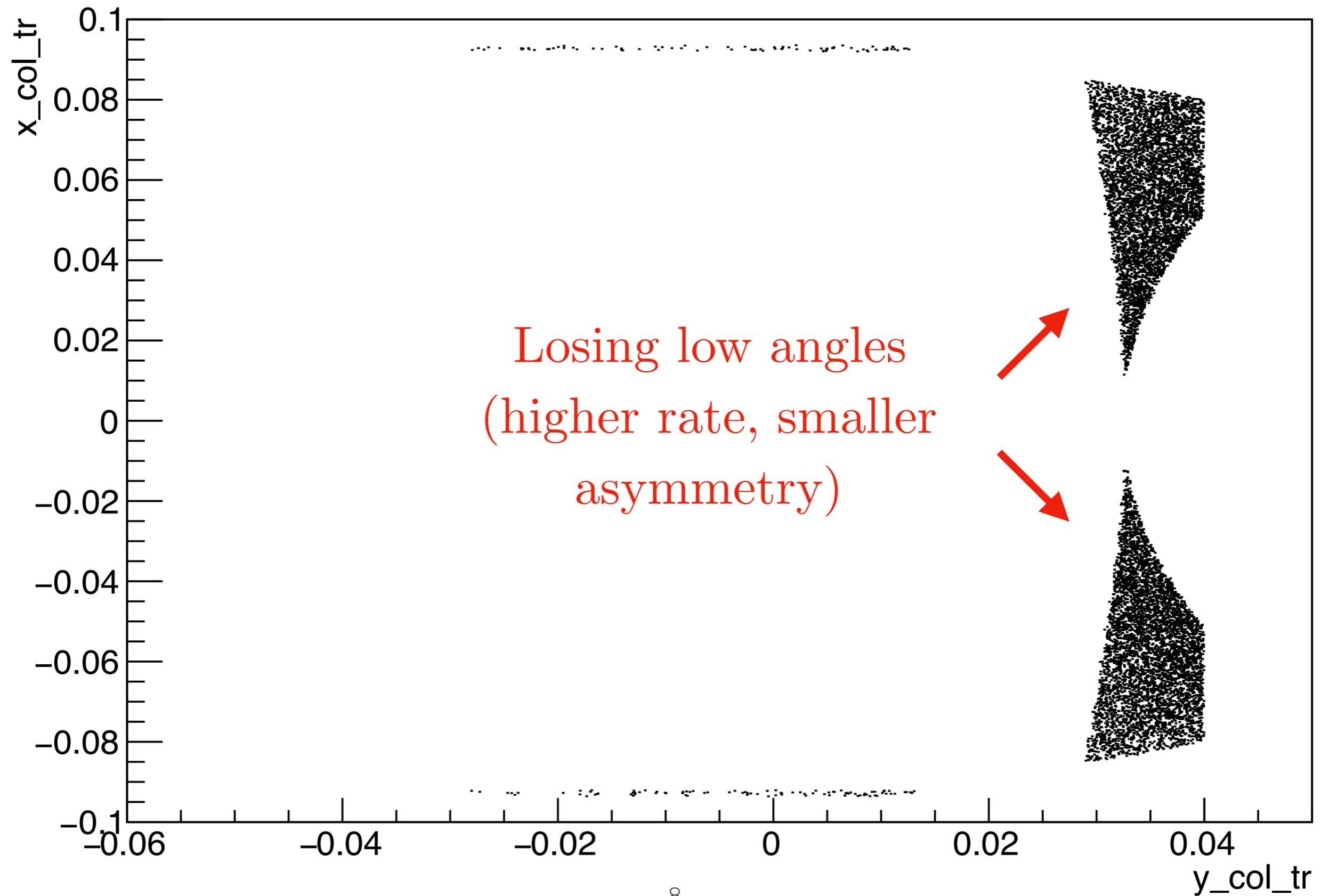
# Impact on acceptance function

## Acceptance



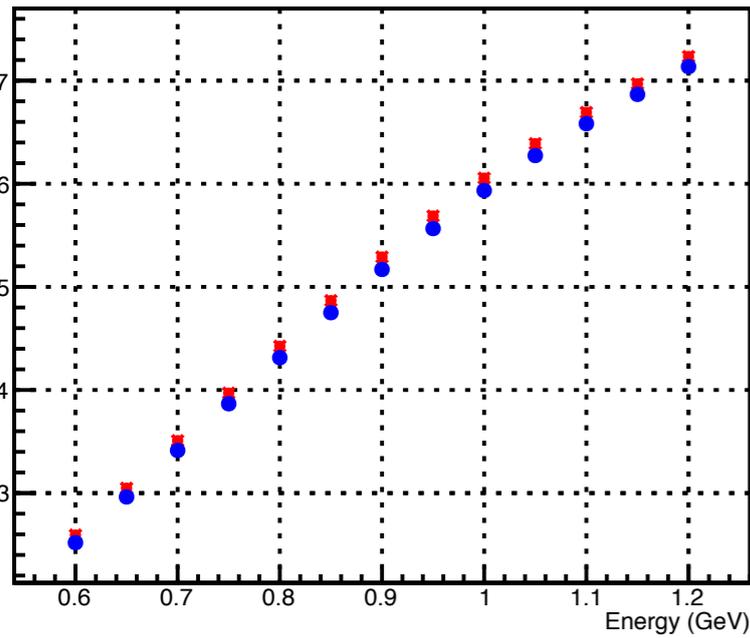
# Impact on collimator profile

## Lost events (at collimator)

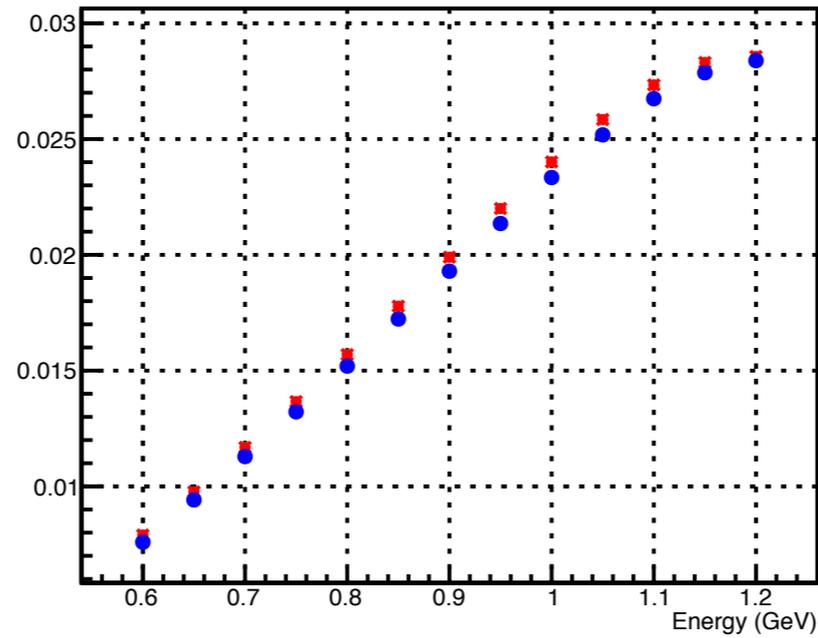


# Impact on FOM

Asymmetry (ppm)



Sensitivity to neutron radius



Rate (Hz)

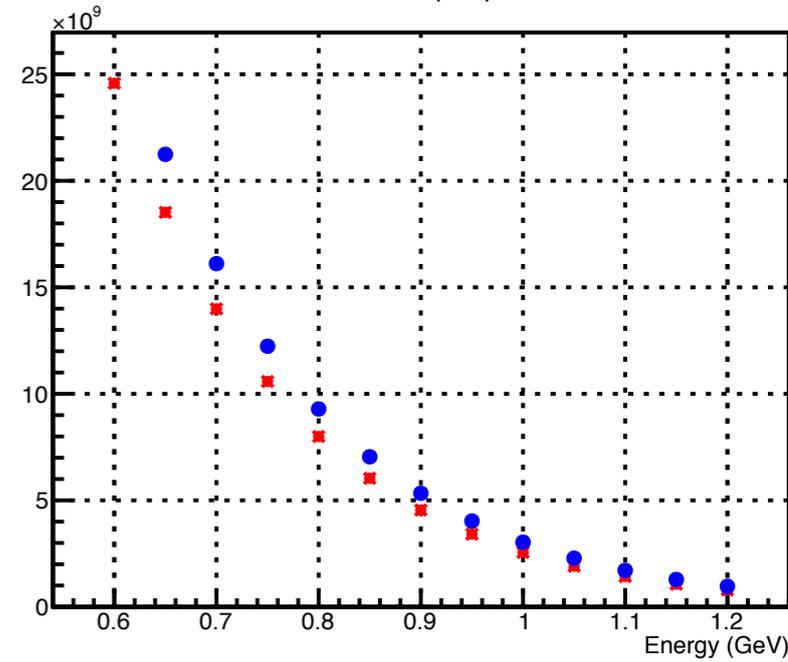
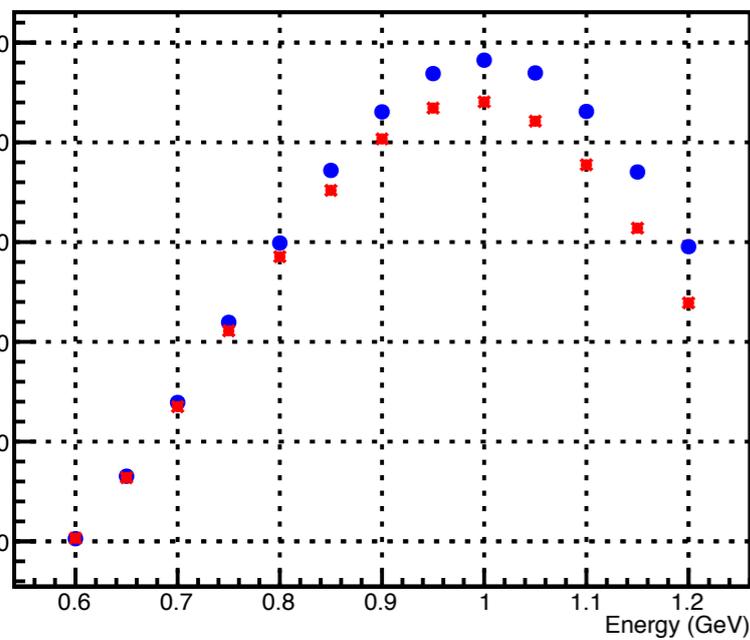
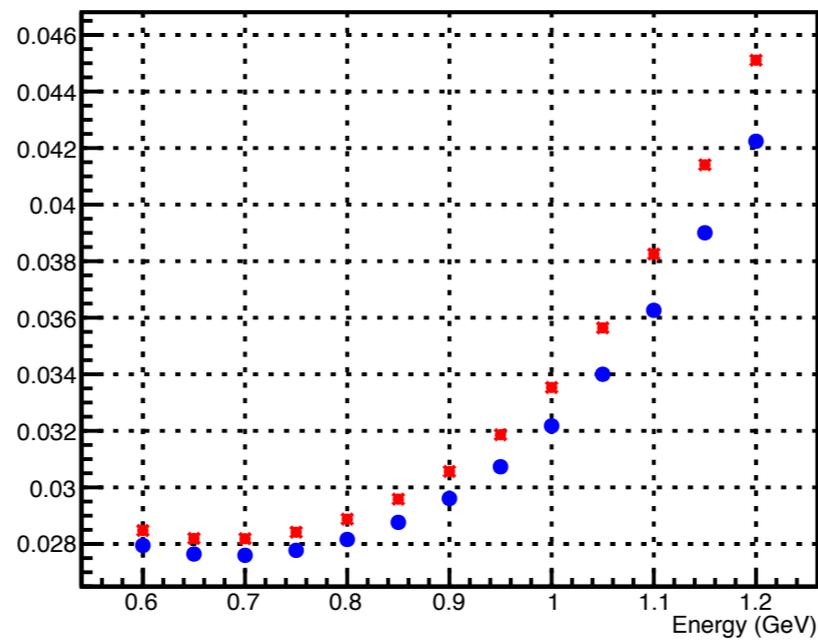


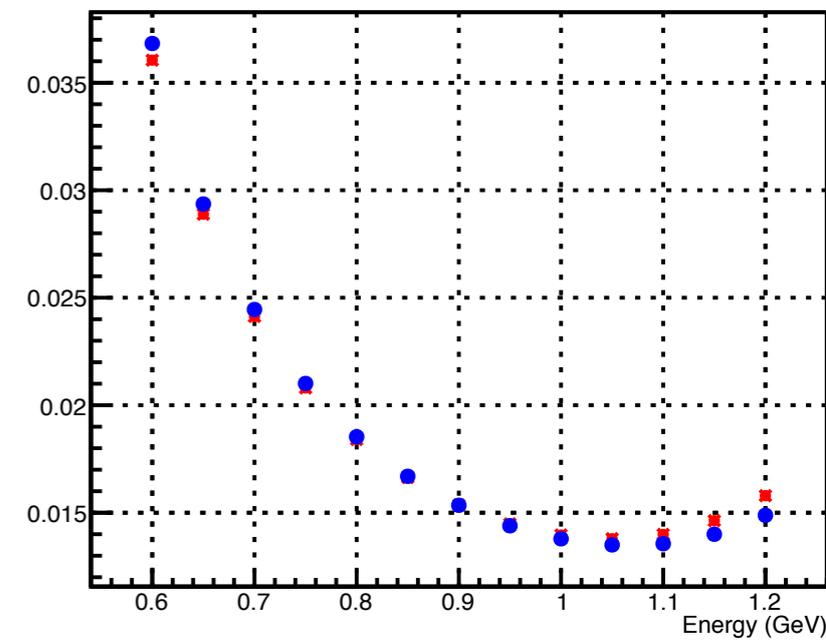
Figure of merit



newdaa



Error in neutron radius



$$\text{Recall FOM} = 10^9 \times R \times A^2 \times S^2$$

# Impact on FOM

Energy	Asymmetry	Rate	Sensitivity	FOM	dA/A	dR <sub>n</sub>
0.95	0.56871	3.41328E+09	0.0220009	534.361	0.0318632	0.0144827
1	0.605448	2.5573E+09	0.0240127	540.53	0.0335345	0.0139653
1.05	0.638917	1.91156E+09	0.025844	521.191	0.0356432	0.0137917
1.1	0.669201	1.42642E+09	0.0273401	477.488	0.038253	0.0139915
1.15	0.696925	1.06371E+09	0.0283063	413.963	0.0414086	0.0146288

Energy	Asymmetry	Rate	Sensitivity	FOM	dA/A	dR <sub>n</sub>
0.95	0.556558	4.02853E+09	0.021352	568.909	0.0307296	0.0143919
1	0.593467	3.03568E+09	0.0233383	582.357	0.0321758	0.0137867
1.05	0.627378	2.28246E+09	0.0251794	569.578	0.0340008	0.0135034
1.1	0.658301	1.71311E+09	0.0267435	530.973	0.0362617	0.0135591
1.15	0.686687	1.28462E+09	0.0278625	470.254	0.0390039	0.0139987