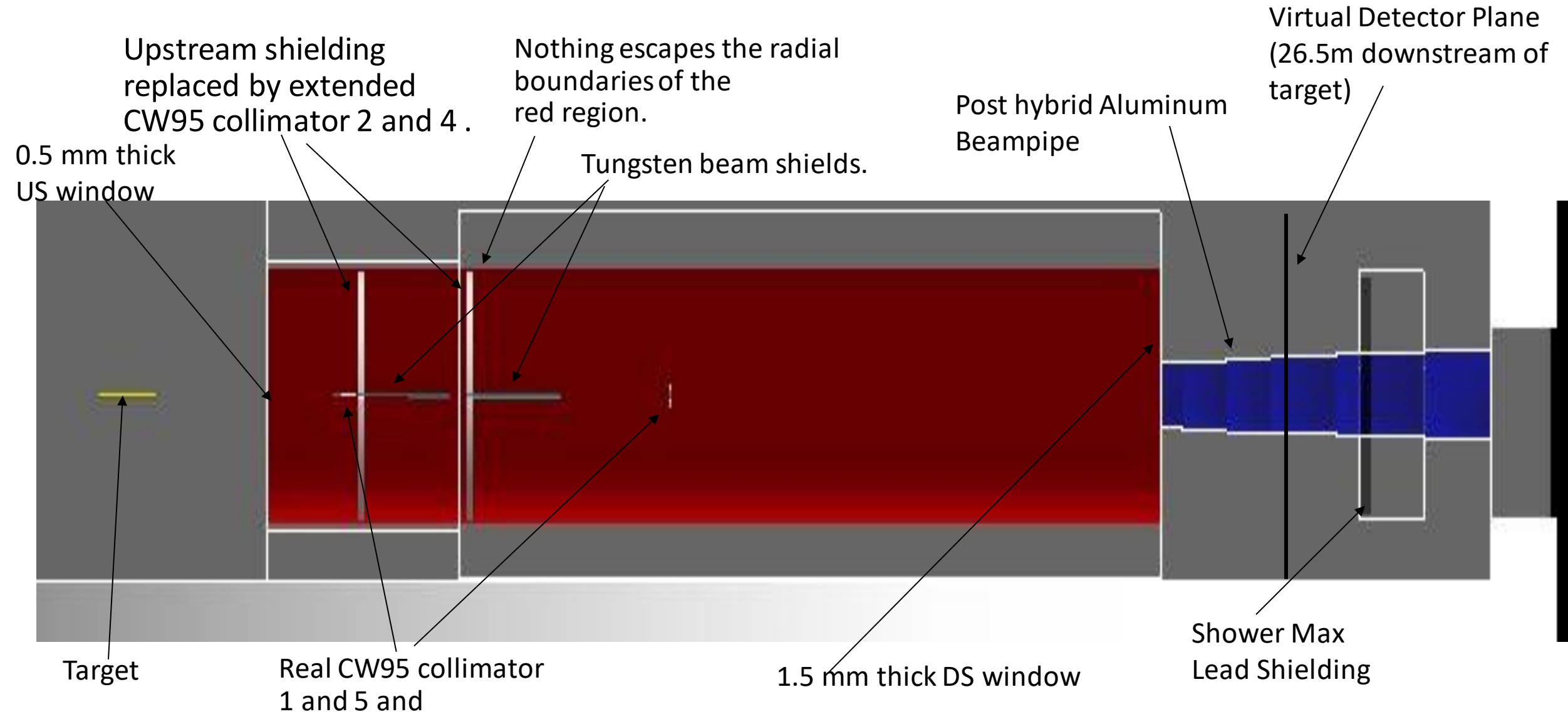




Sensitivity to Beam Direction

Sakib Rahman

Geometry Used

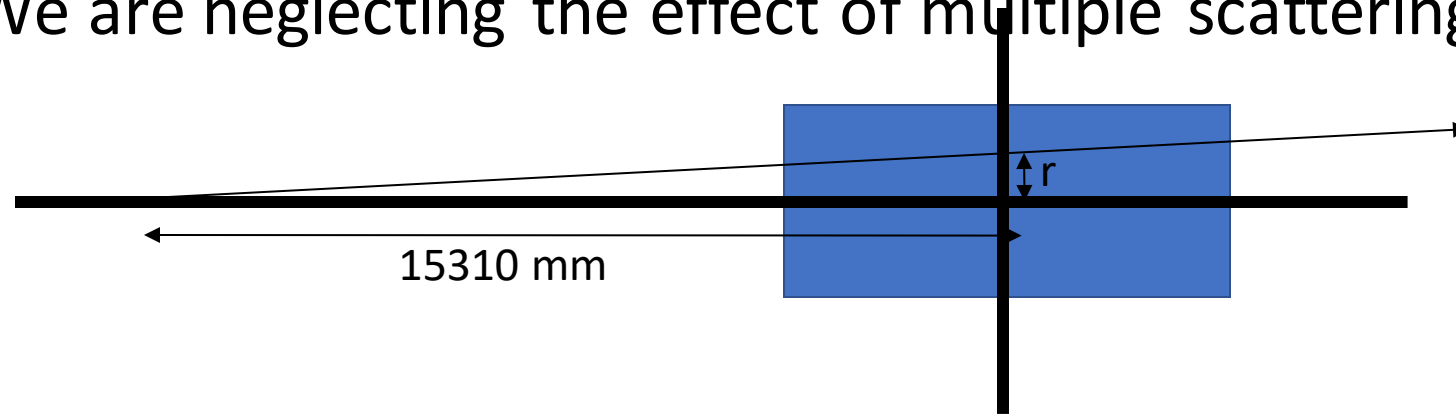


Simulation Settings

- Raster: 5x5 mm
- Raster Correlation Slope Used in Sim: slope $\sim \text{atan}(1/15300) = 65 \text{ urad/mm}$
- Statistics: 50 million mollers, 100 million elastics
- Current: 65 μA

Analysis Cut

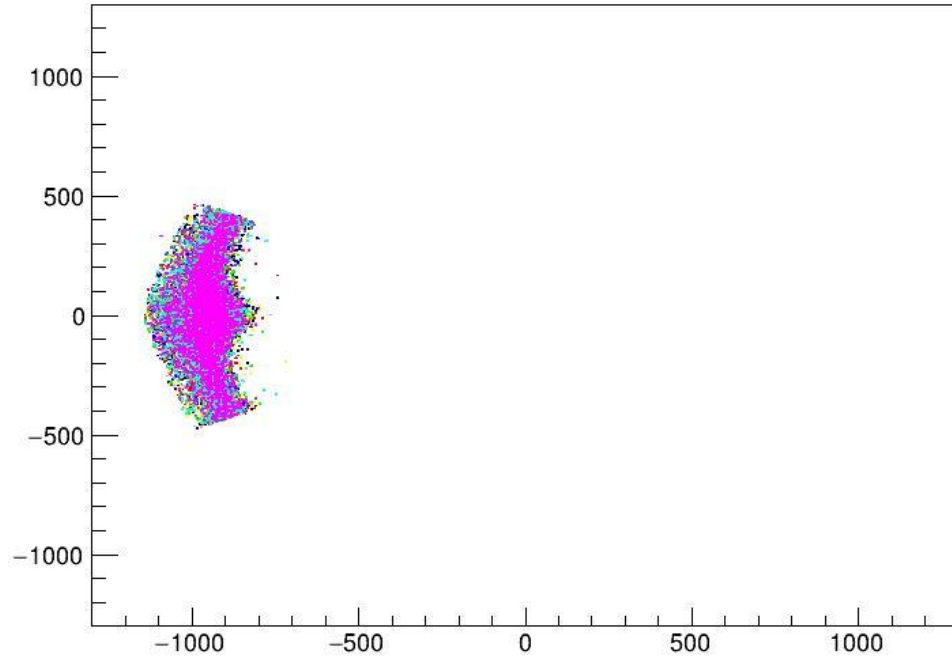
- 1mm radial offset of beam spot at target center =65 urad angle between beam direction and central axis.
- We are neglecting the effect of multiple scattering in our analysis.



- Move in steps of $\Delta x=0.5$ mm and calculate rates going through 0.5mm^2 pixels at target center plane.

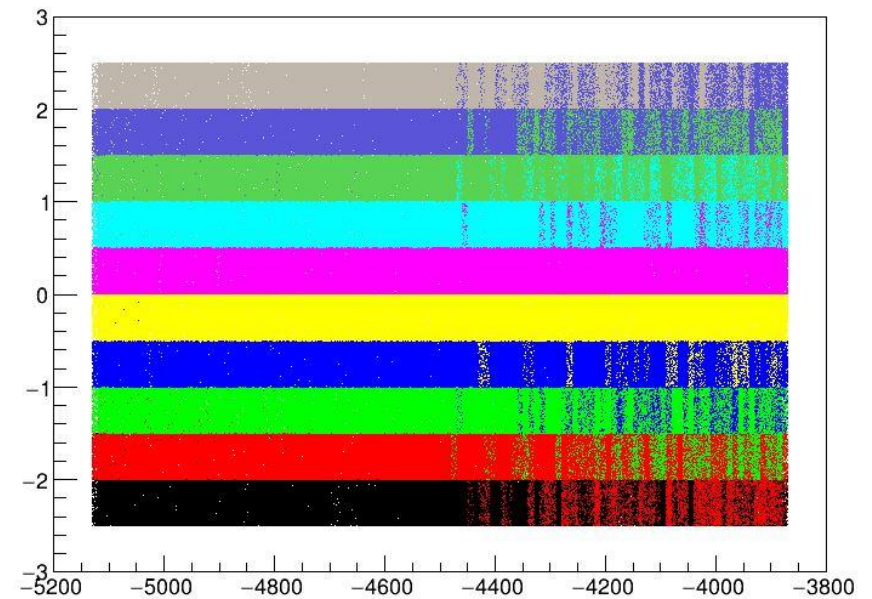
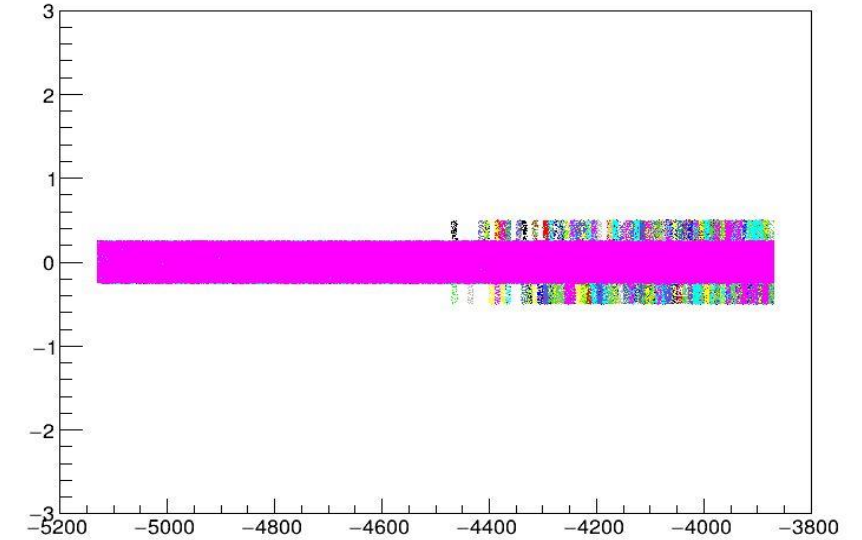
Analysis Cut

Only particles passing through beam right septant



Vertex-x vs vertex-z: 0.5 mm bins from -2.5 to 2.5 mm at target center.

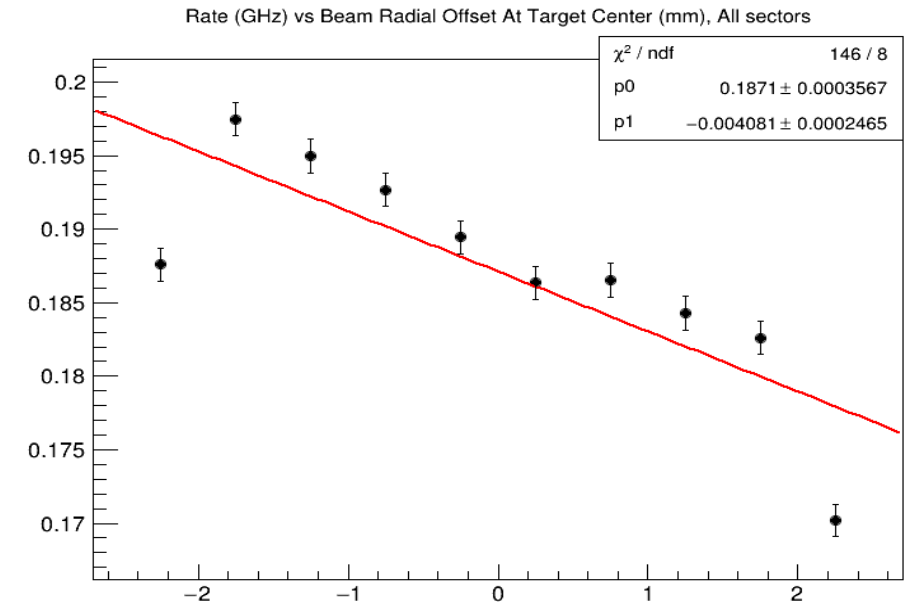
vertex-y vs vertex-z:
Incident beam if extrapolated hits between -0.25 to 0.25 mm along the vertex y-axis at target center.



Result (Moller)

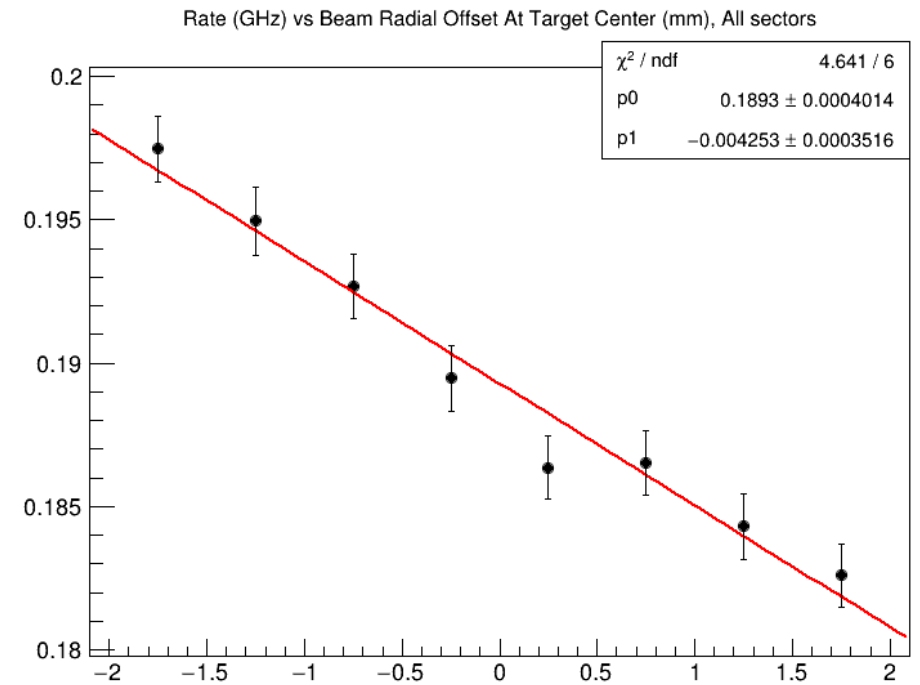
Including end bins, change from center to beam right septant maximum

$$0.004081 * 2.25 / 0.1871 \sim 4.9\%$$



Excluding end bins, change $0.004253 * 1.75 / 0.1893 \sim 3.9\%$

$$\text{Sensitivity} = 3.9\% / (65 \text{ urad/mm} * 1.75 \text{ mm}) \sim 342.86 \text{ ppm/urad}$$



Result (Elastic)

Change is $0.002794 * 2.25 / 0.0366 \sim 17.2\%$

