Binning research of Hough map in 3D reconstruction and tracking eficiency

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Outline

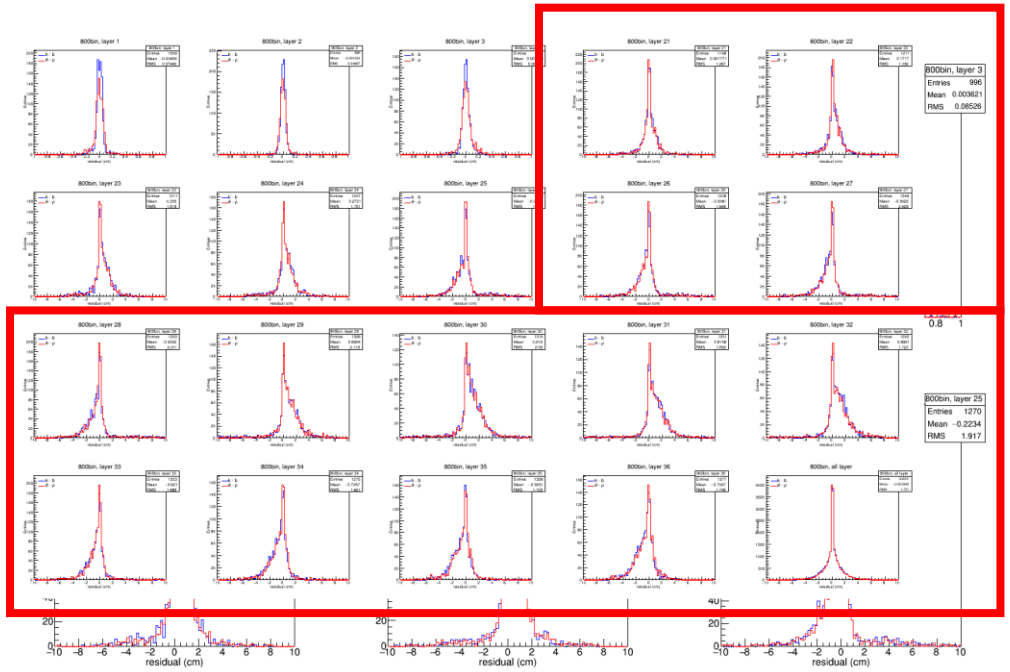
1. Binning research of Hough map in 3D reconstruction
2. Efficiency

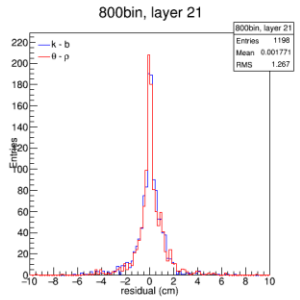
Binning research of Hough map in 3D reconstruction (Pt=150MeV)

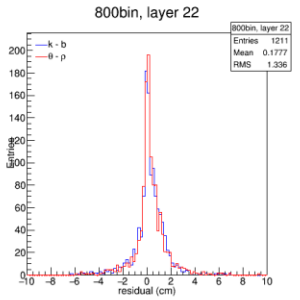
- In 3D reconstruction, we can calculate helix parameters $tan\lambda$ and dz from the peak of the Hough map.
- Then we collect stereo wire hits whose residual is smaller than the given cuts.
- These given cuts should come from the residual distribution which is affected by the binning of Hough map.
- So, we need to research the binning of the Hough map first.

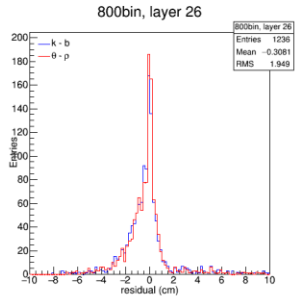
Residual of Z

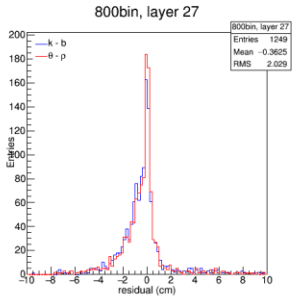
- Residual of Cgem is symmetry
- Residual of Mdc is asymmetry
- So we put the residual of Cgem together to fit. Same as residual of Mdc.

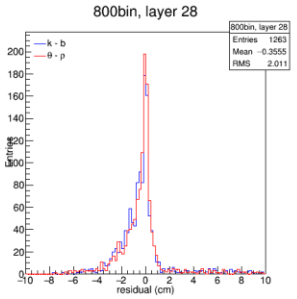


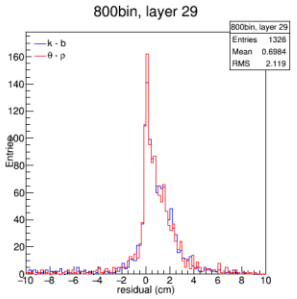


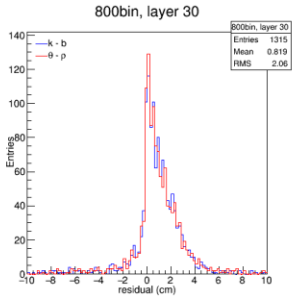


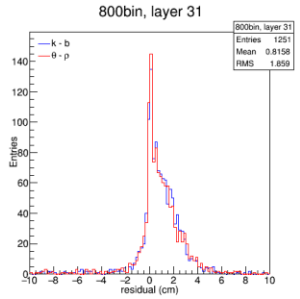


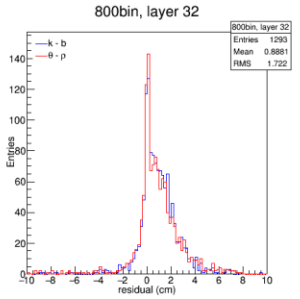


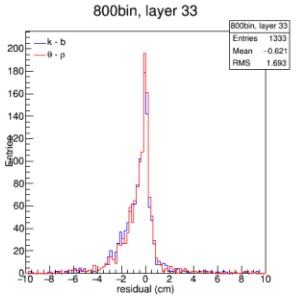


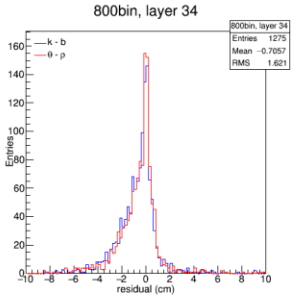


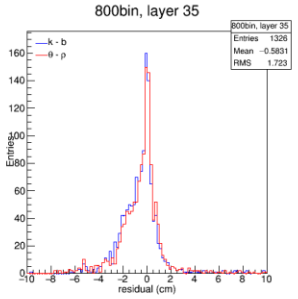


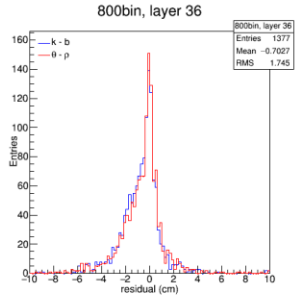


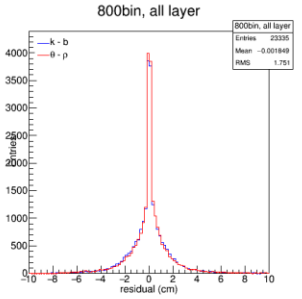




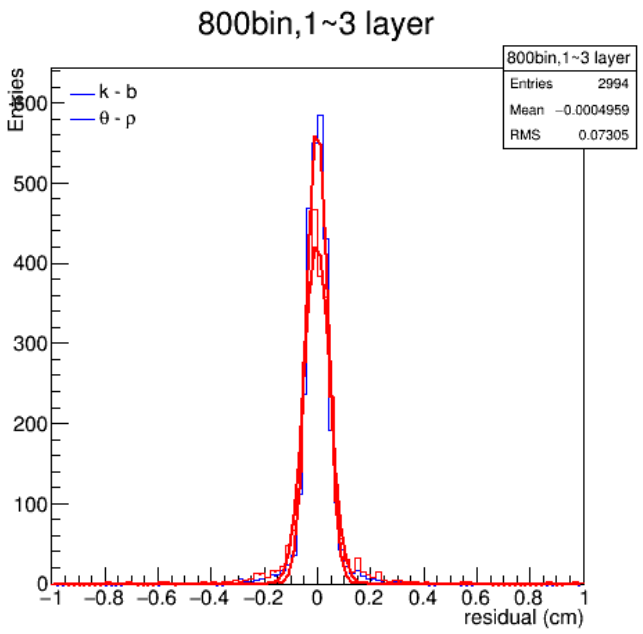


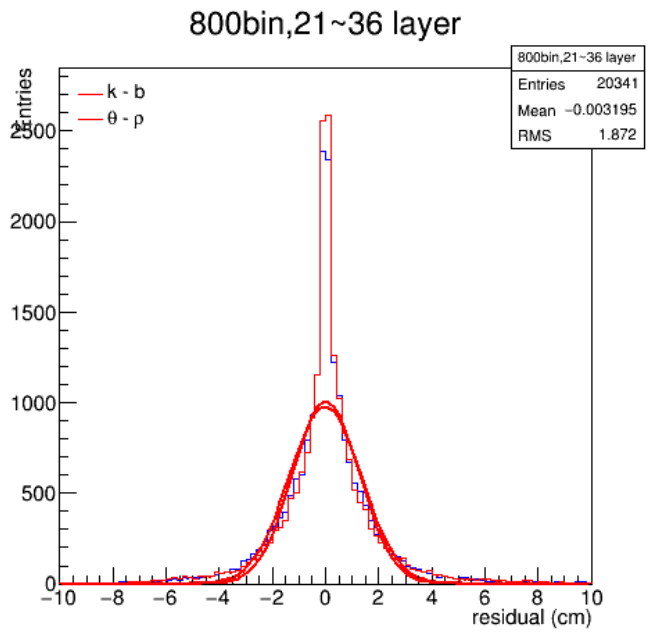


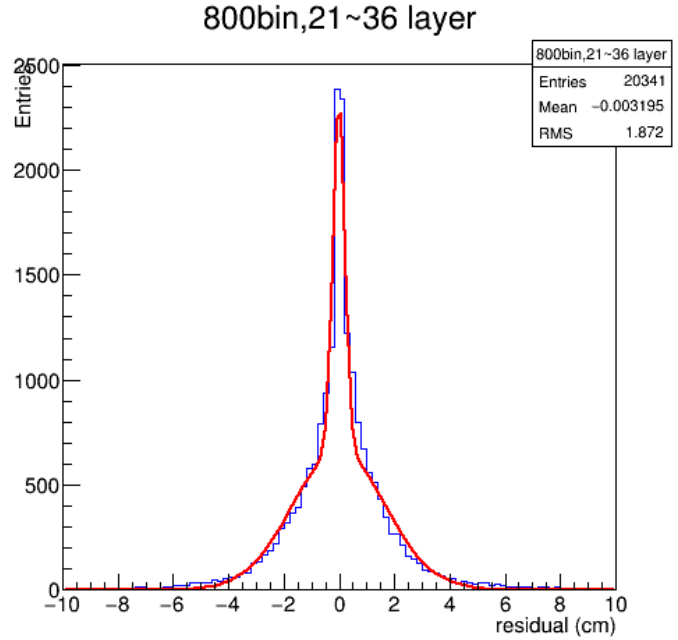




Fit the residual of Cgem and Mdc





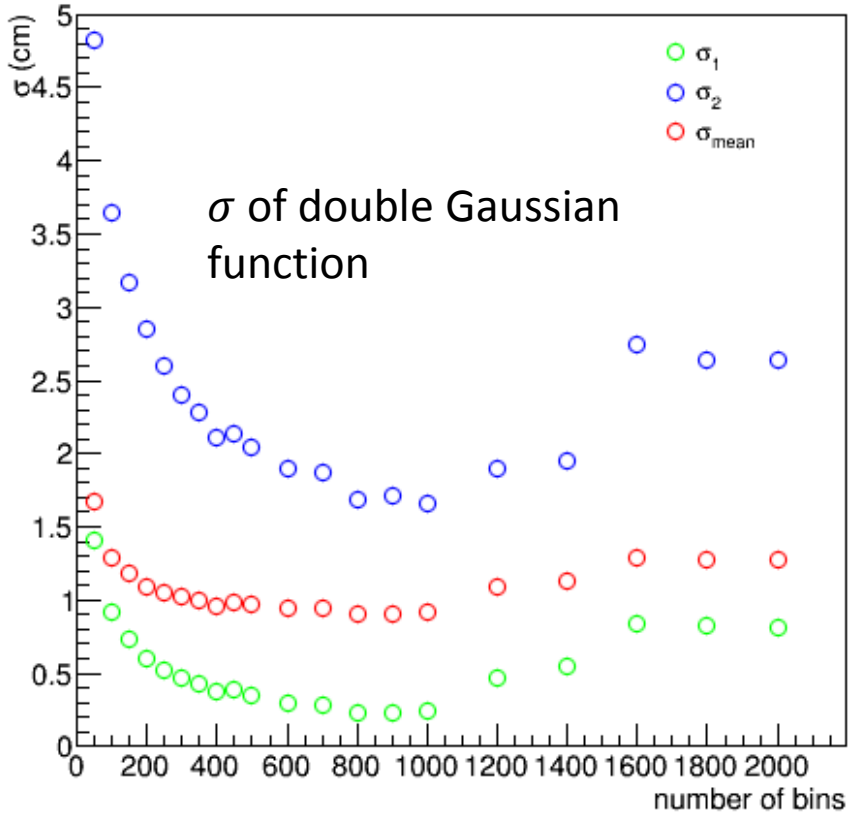


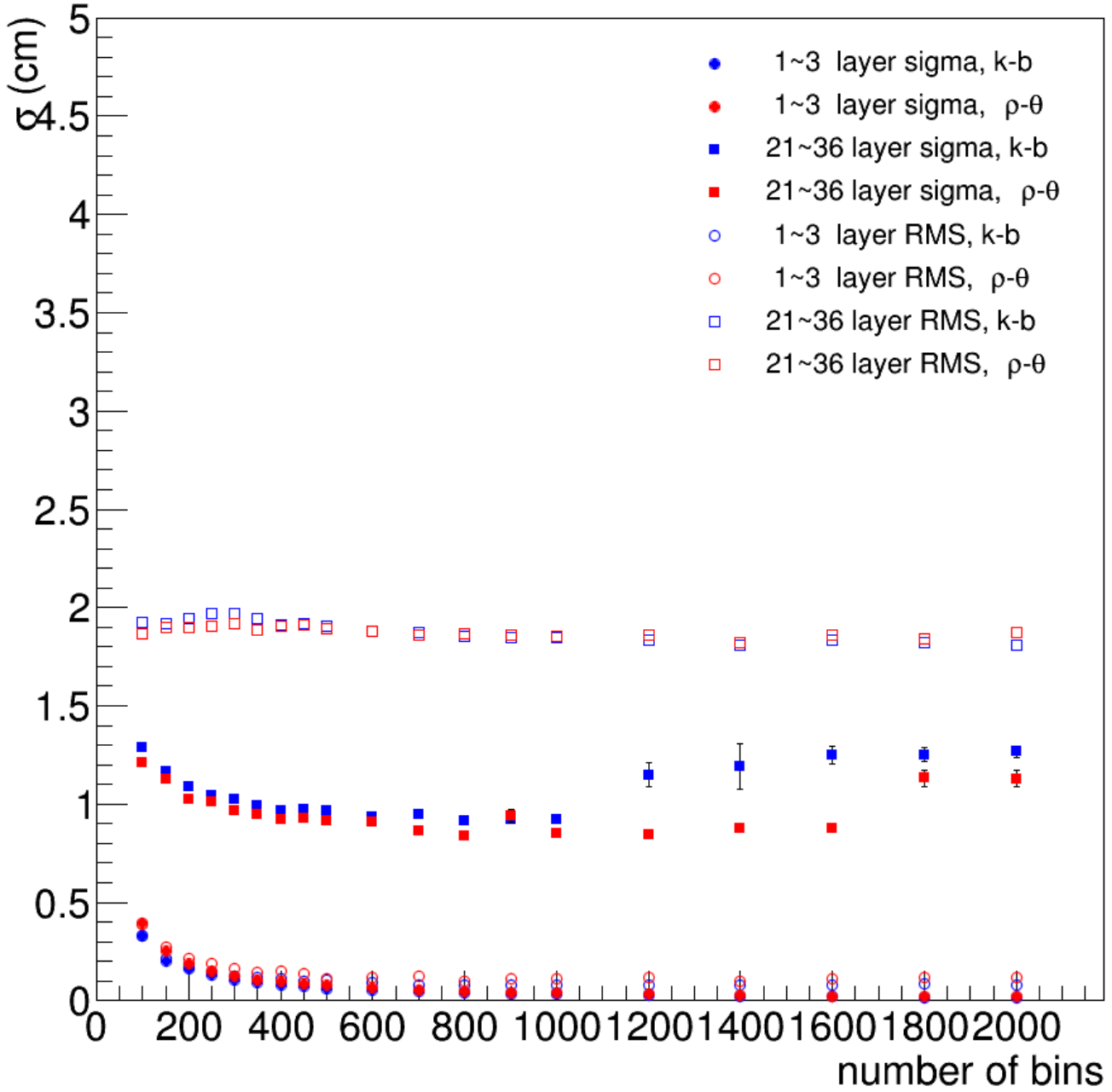
- Residual of Cgem can be fit with a Gaussian function, while Mdc is not that good.
- So we fit Mdc residual with double Gaussian function of same μ
- We calculate σ_{mean} of the double Gaussian function as:

$$\sigma_{mean} = \frac{c_1}{c_1 + c_2}\sigma_1 + \frac{c_2}{c_1 + c_2}\sigma_2$$

where c is the constant of the Gaussian function

σ & bin

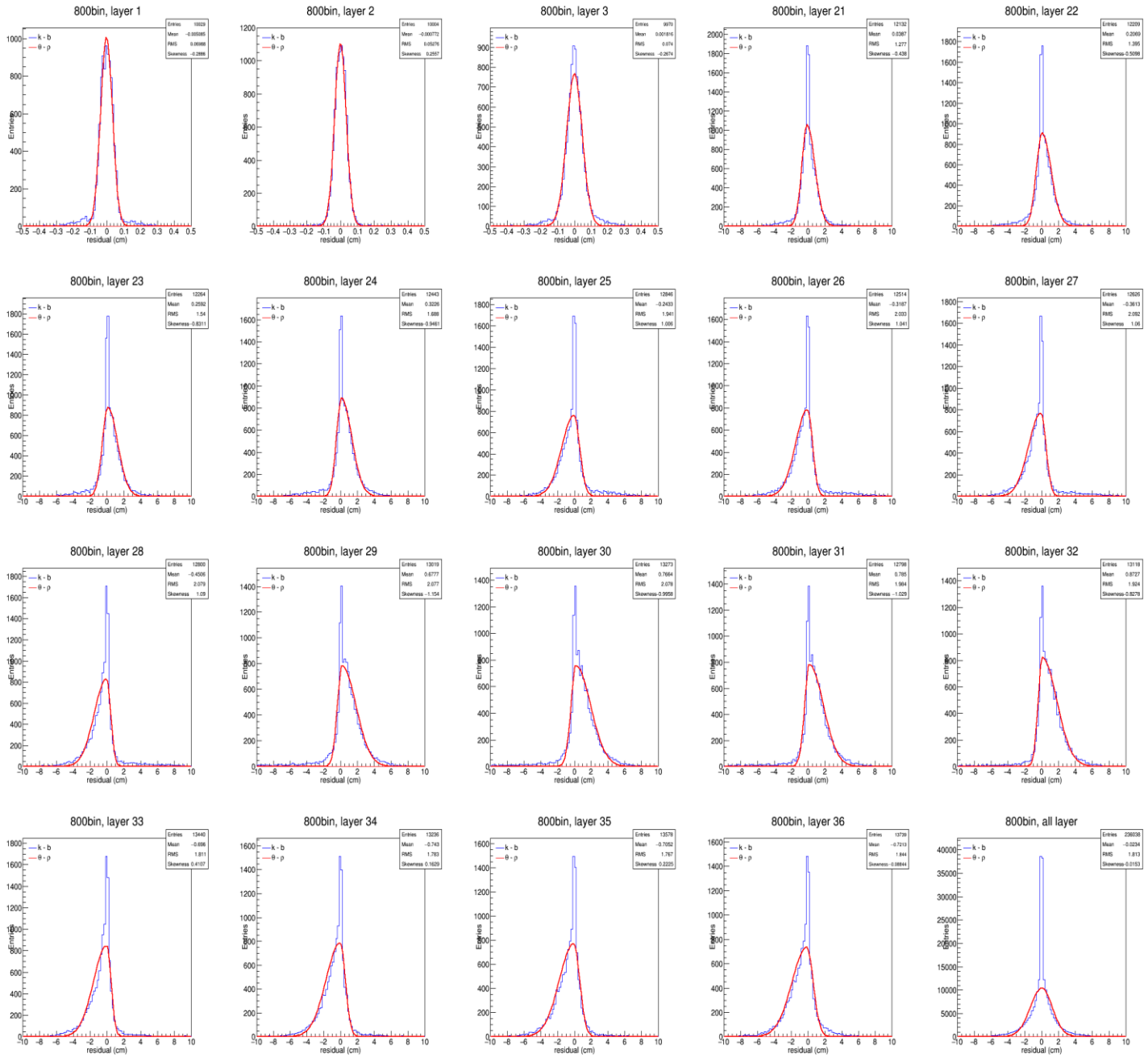




- For Mdc, binning at 800 comes the minimum of σ

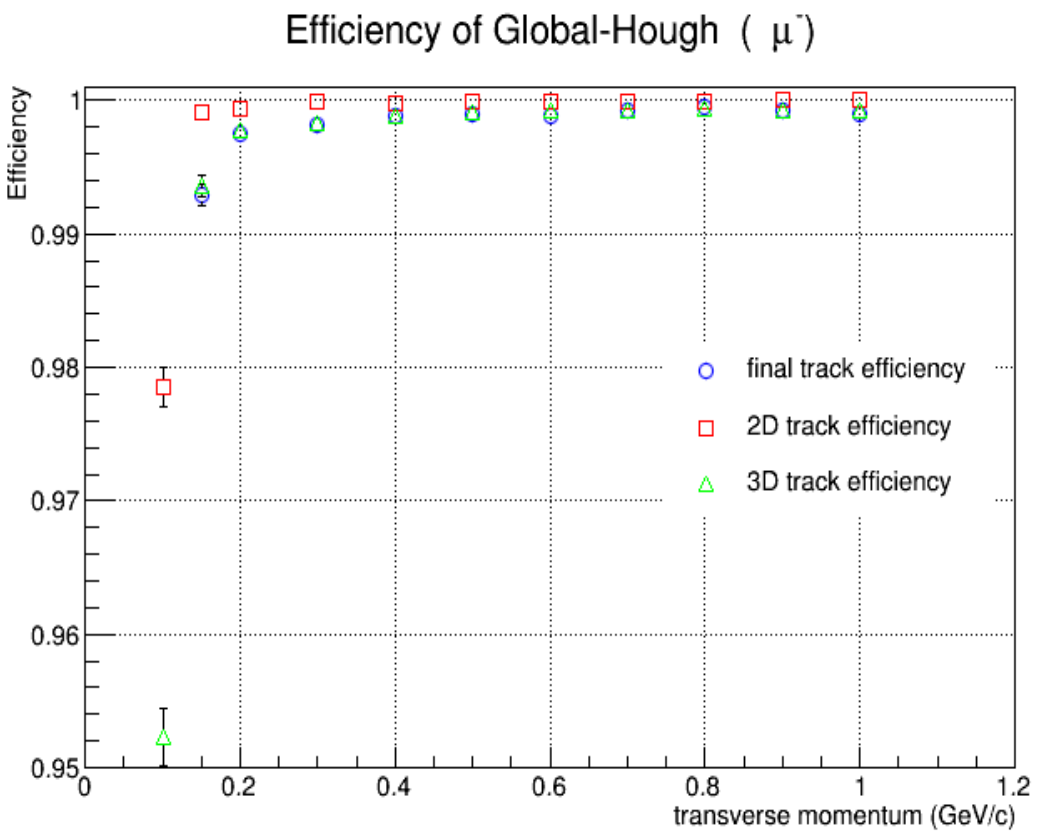
Fit the residual of each layer to get the cuts

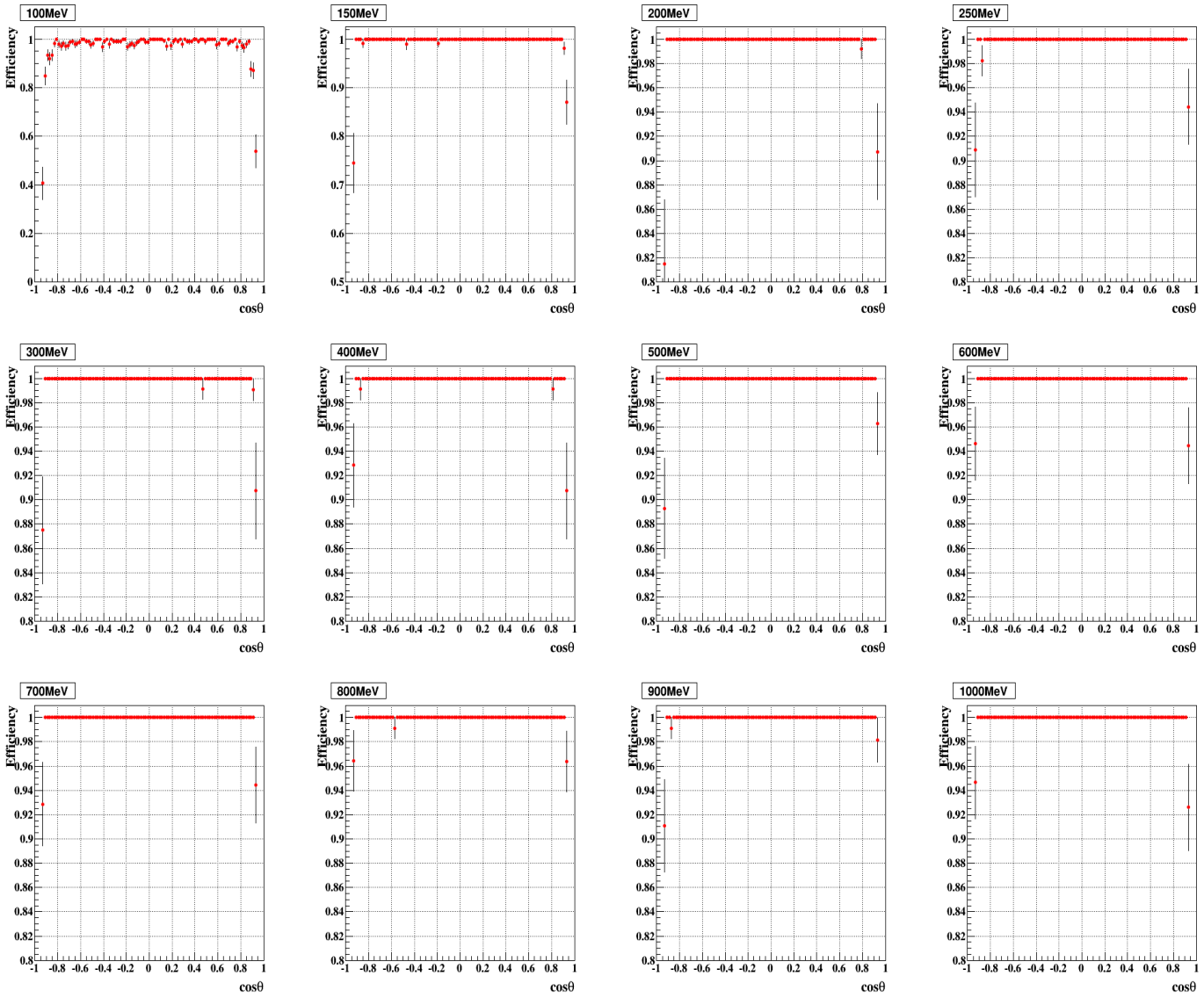
- For Cgem, we fit with Gaussian function
- For Mdc, we fit with a broken Gaussian function of different σ on each side and use the larger σ.
- For now, we take 5σ as the cuts.



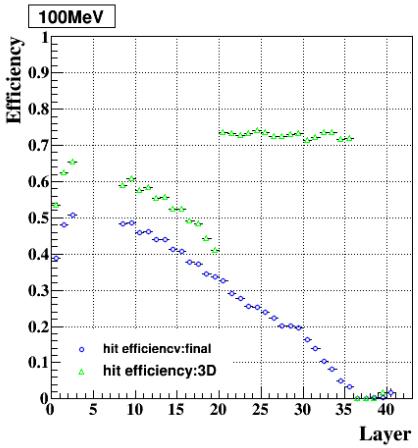
Tracking Efficiency

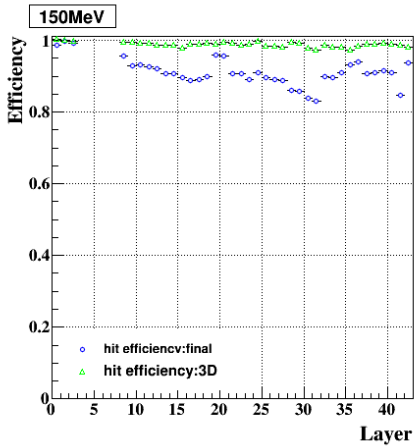
- Cut: |dr|<1 cm, |dz|<10 cm

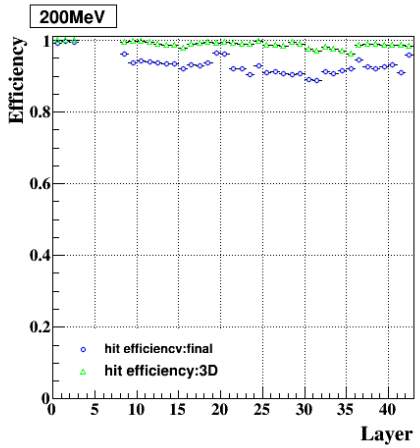


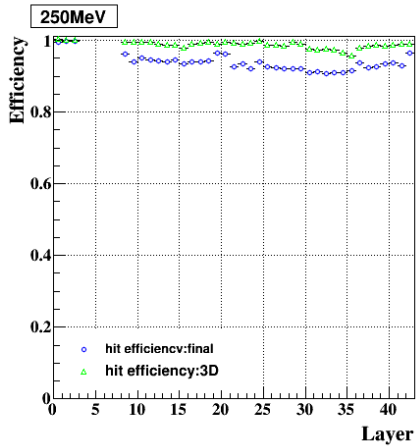


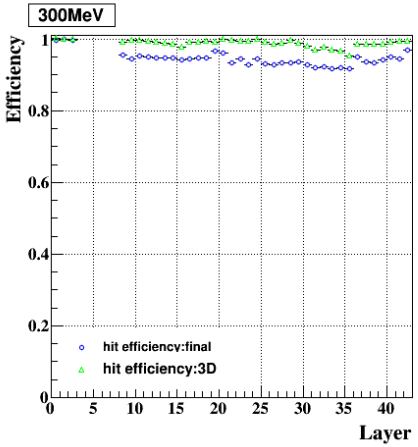
Hit efficiency

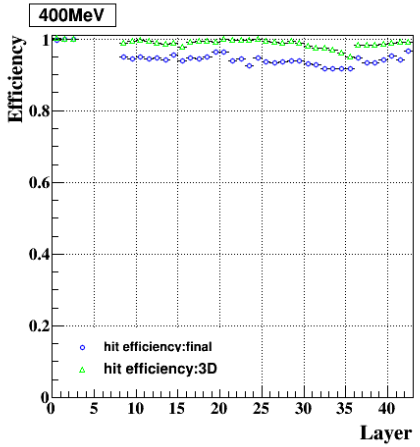


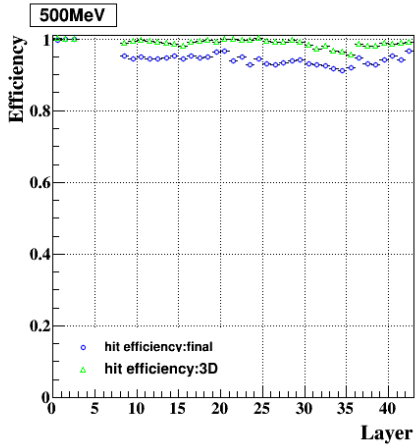


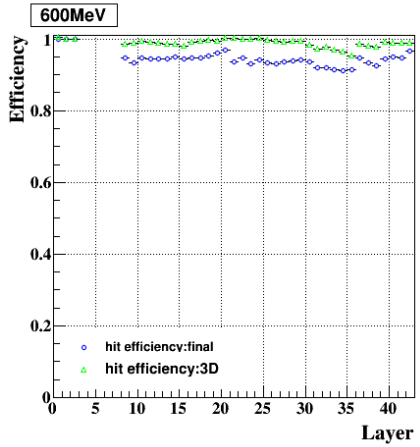


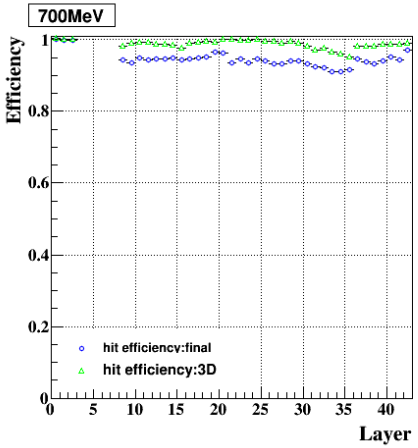


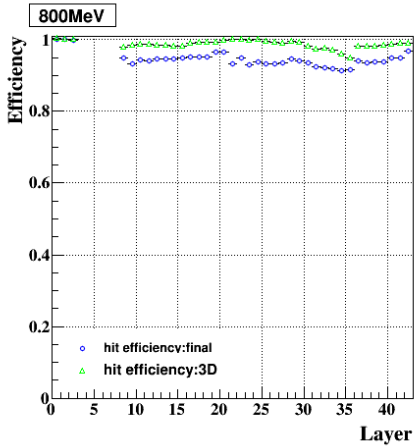


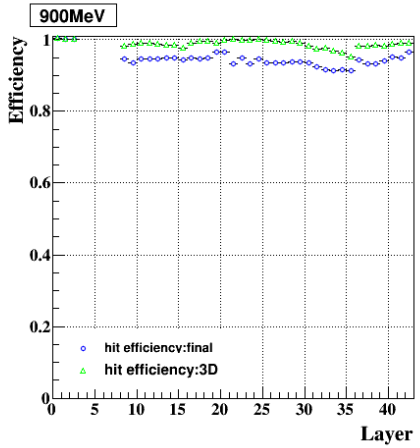


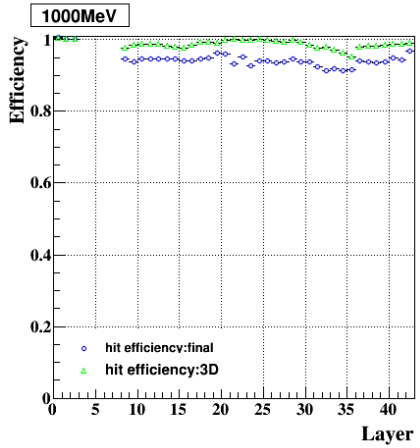




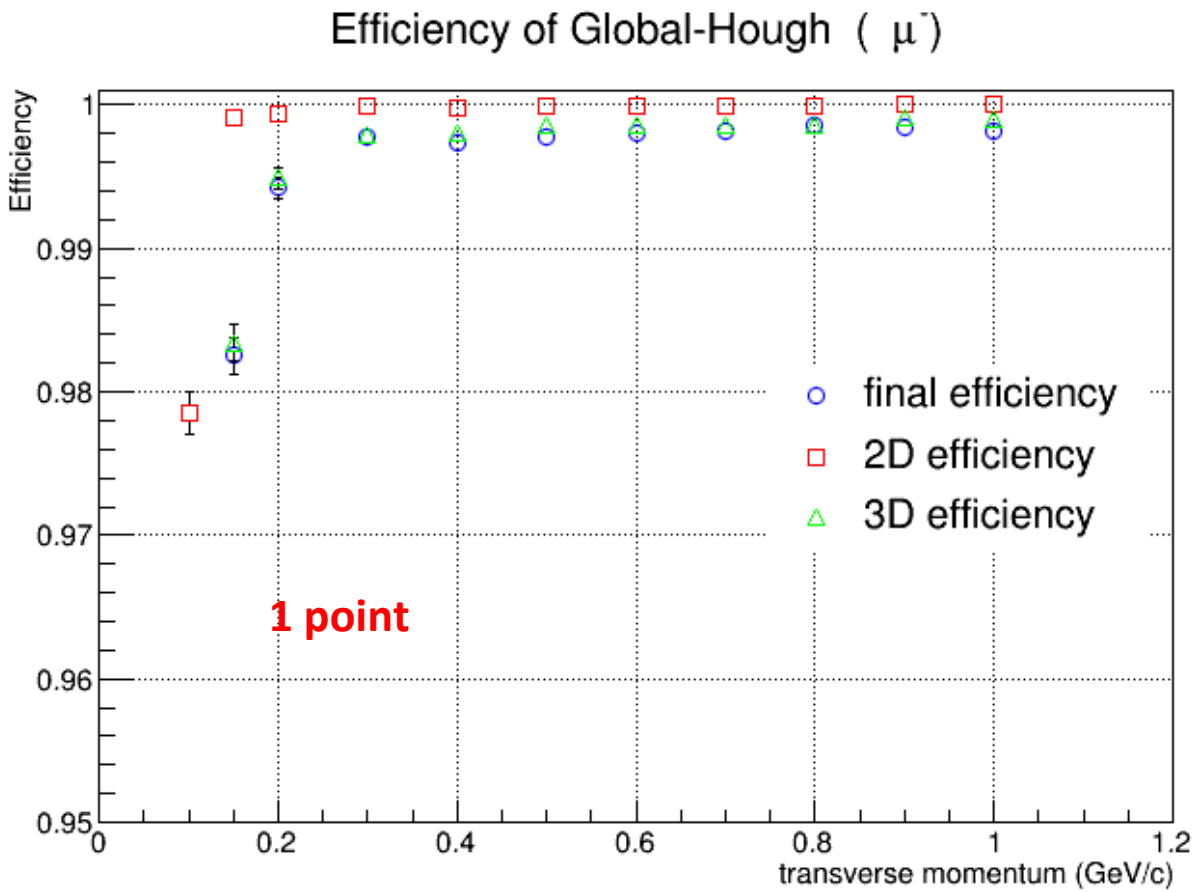


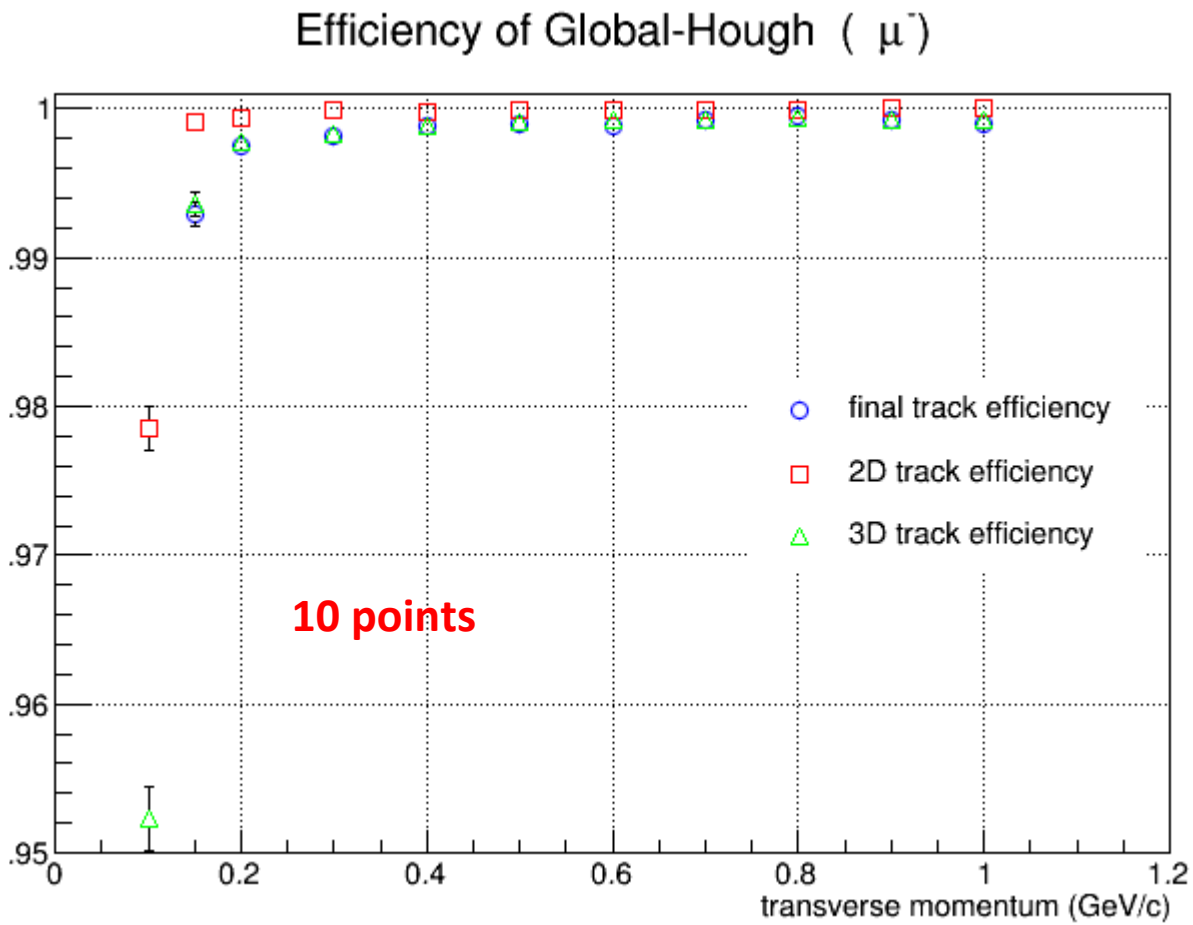




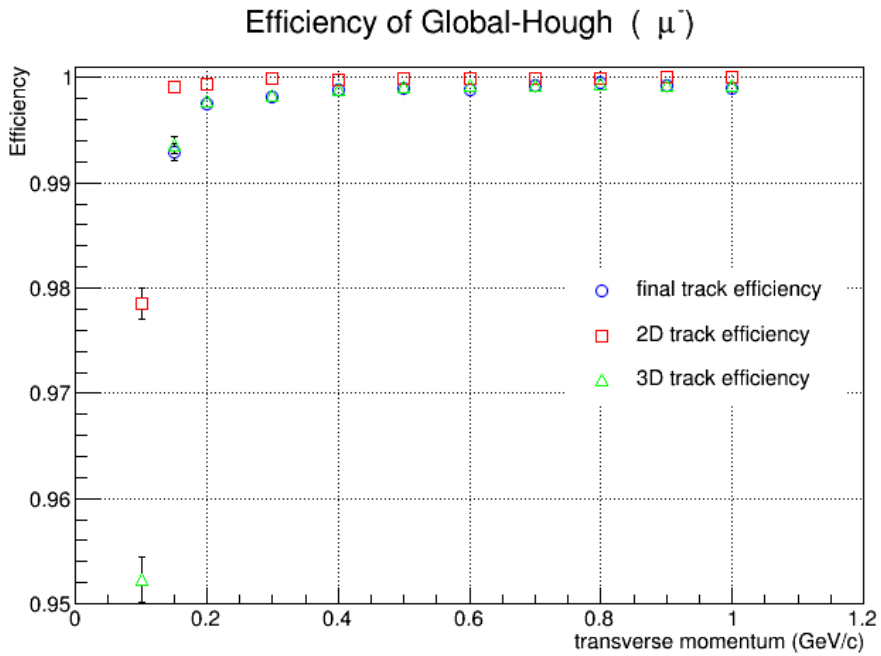


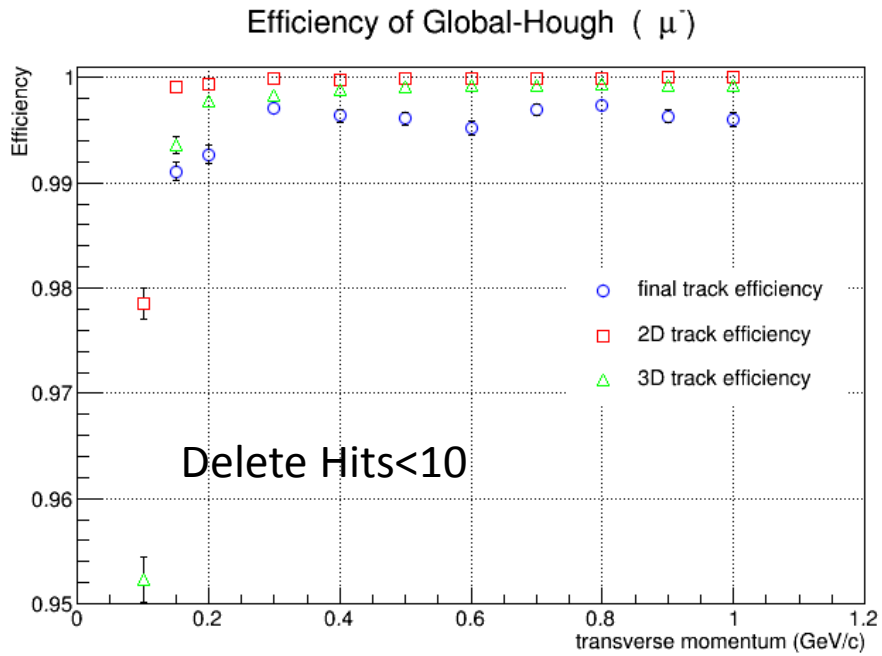
Set different points in each bin of Hough map in 3D reconstruction

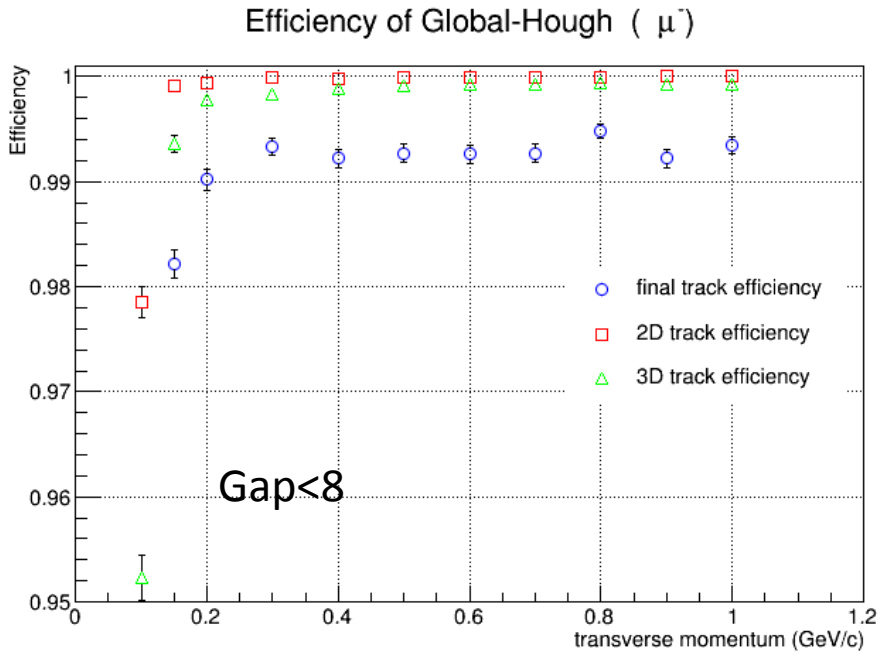


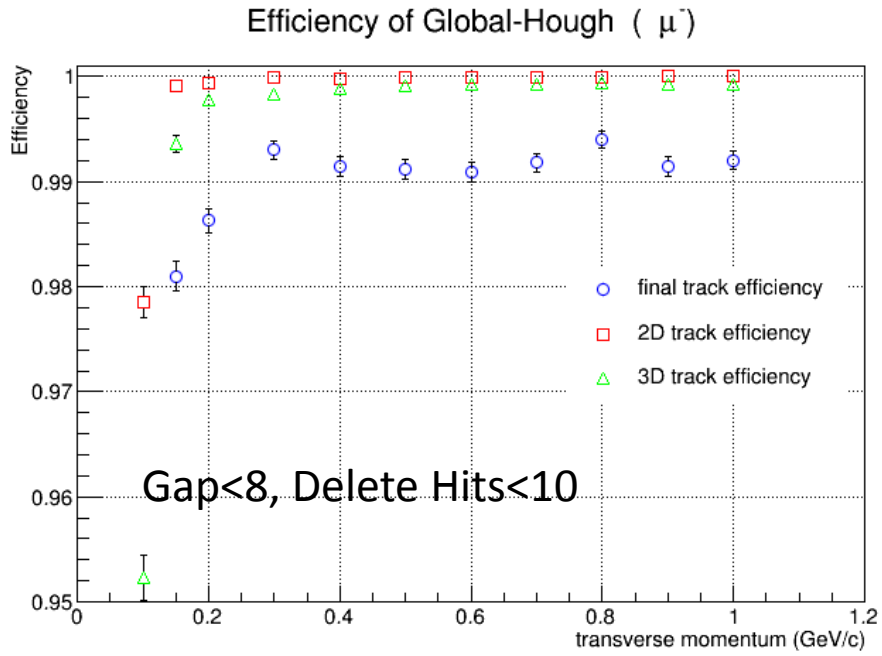


Several cuts









Next to do

1. Reconstruction of multi-track events need test
2. Pt <120 MeV need more research