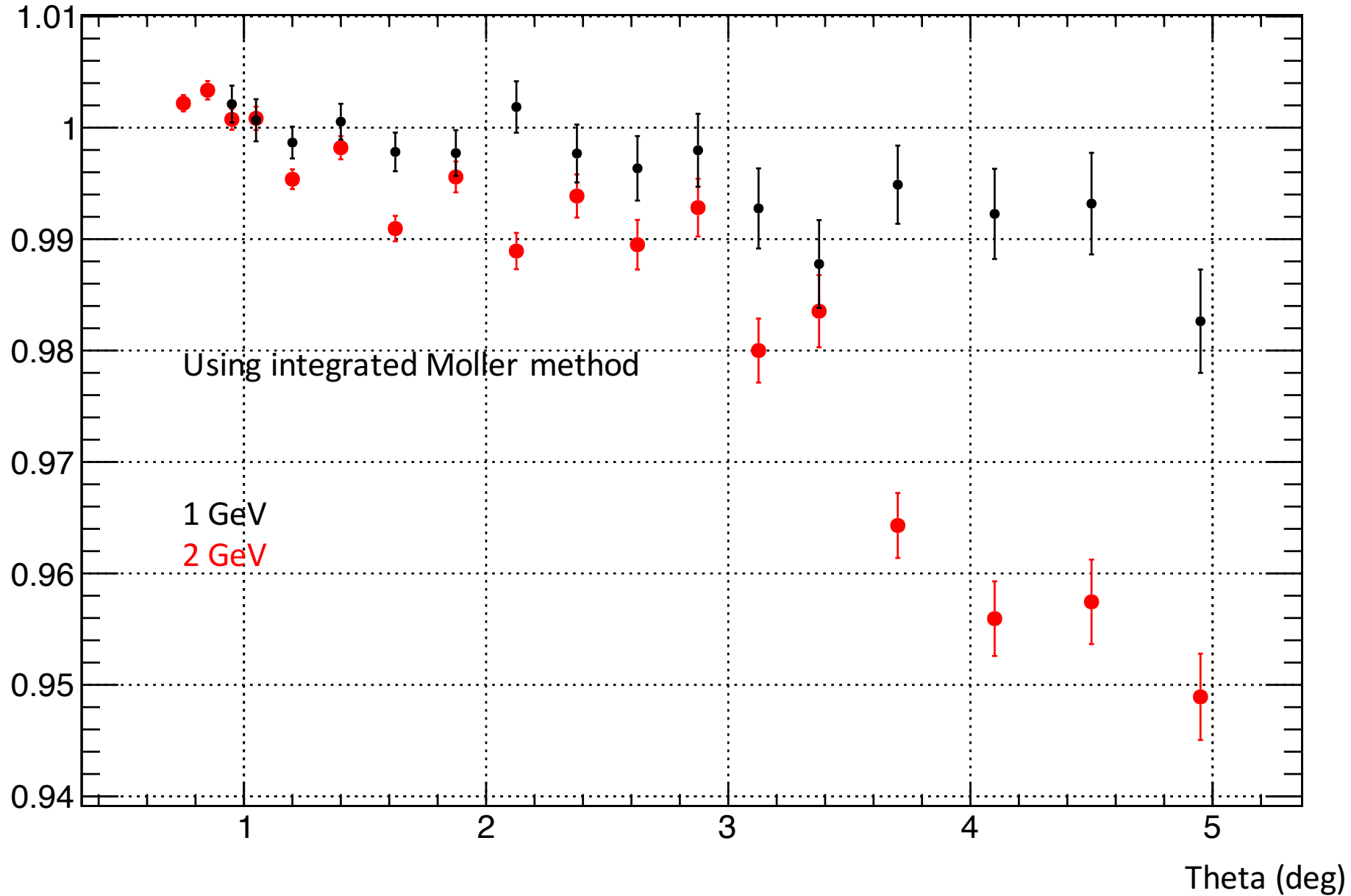


# Graph

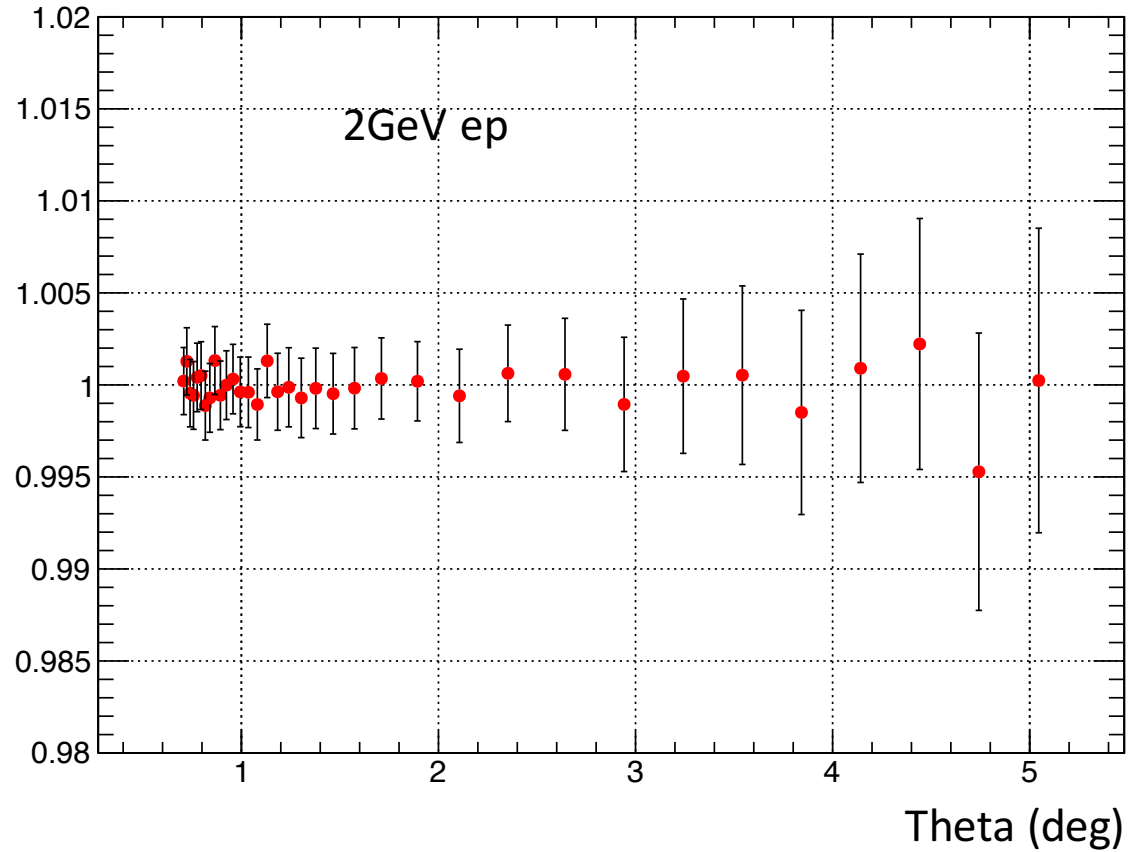
$(ep/ee)_{sim} / (ep/ee)_{data}$



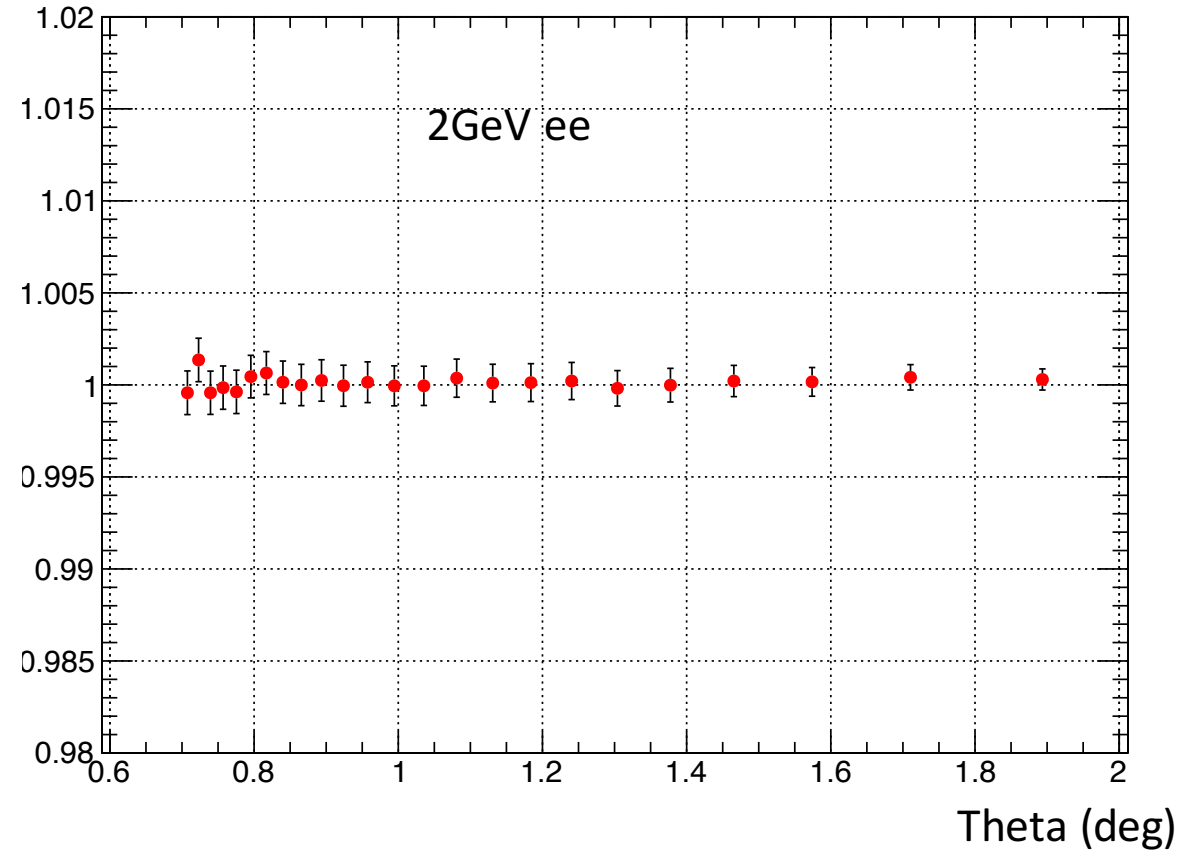
# Target profile: delta function at 0 cm vs delta functions at +/- 2cm

Extended target effect should be negligibly small

Graph

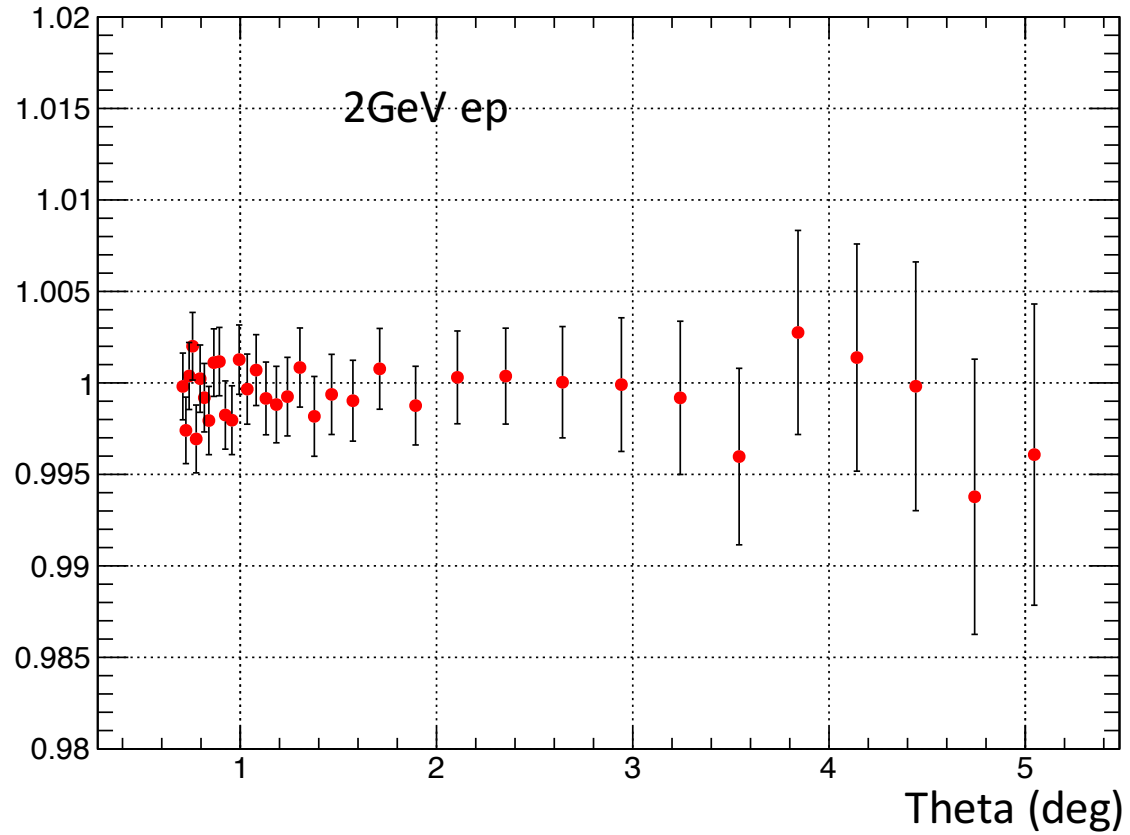


Graph

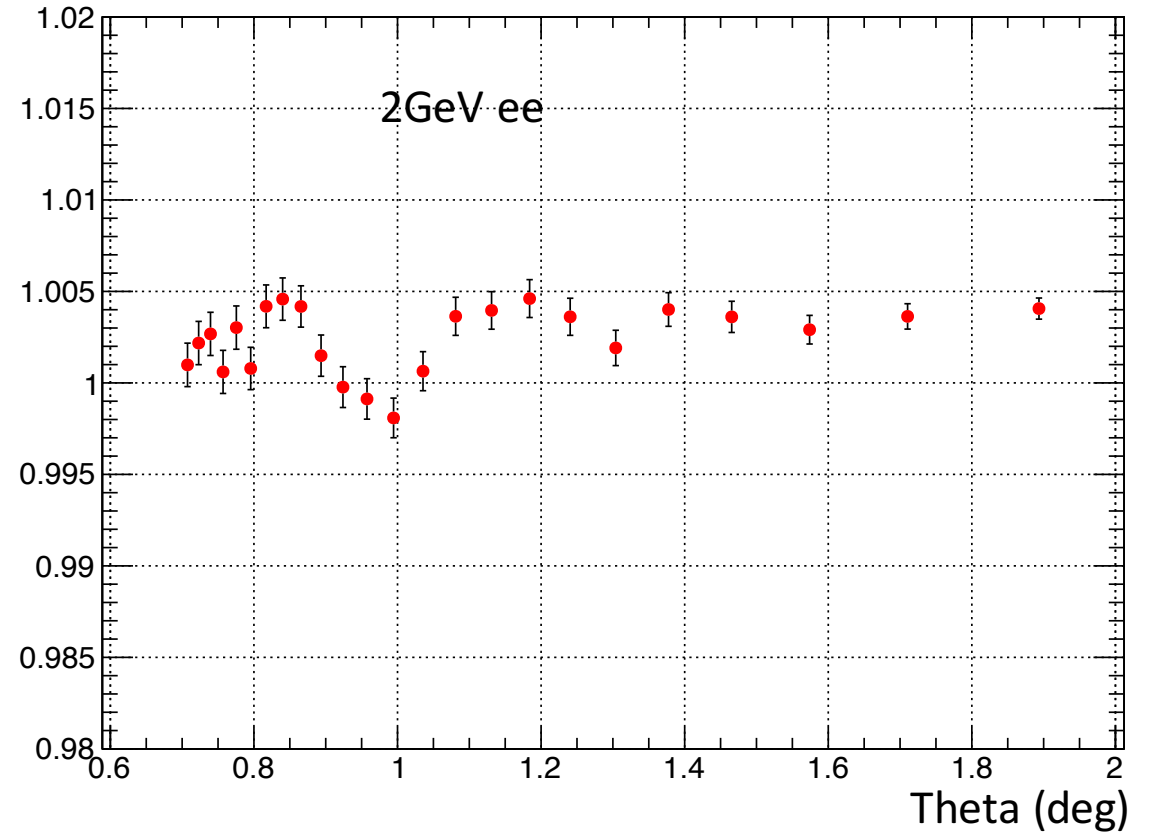


# Target profile: delta function at 0 cm vs delta functions at +/- 10cm

Graph

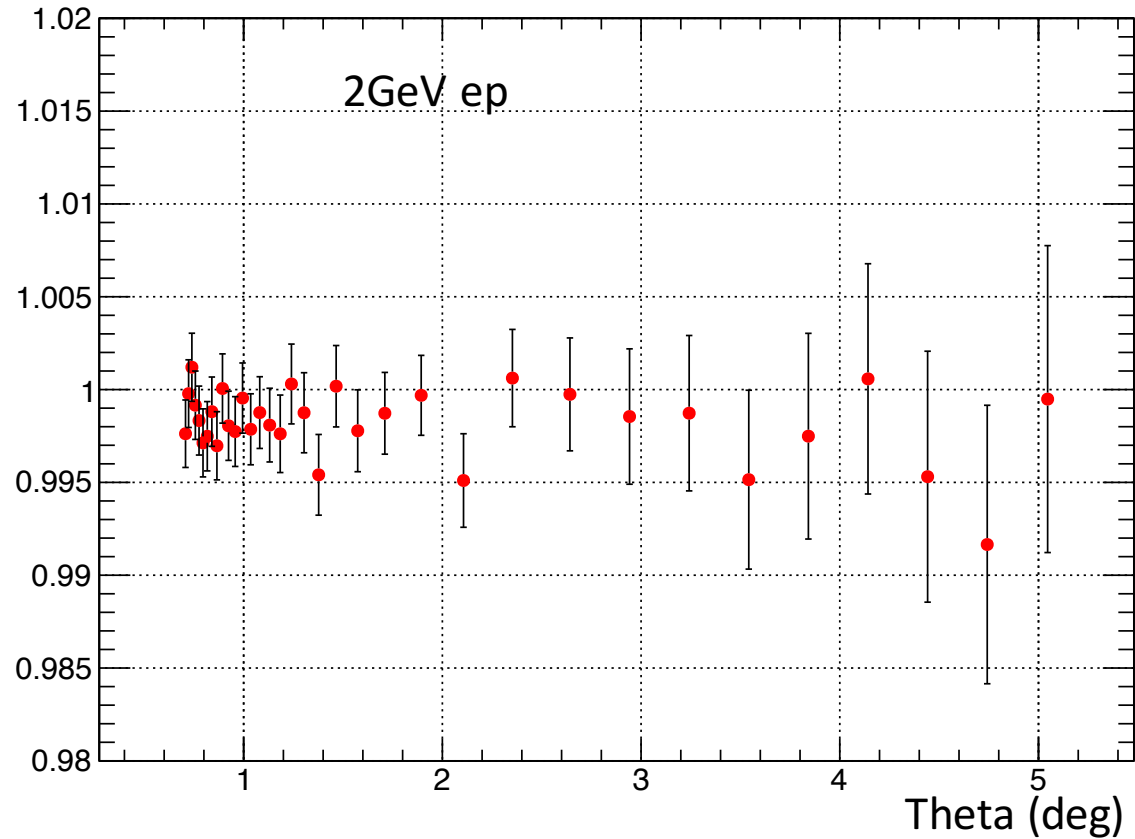


Graph

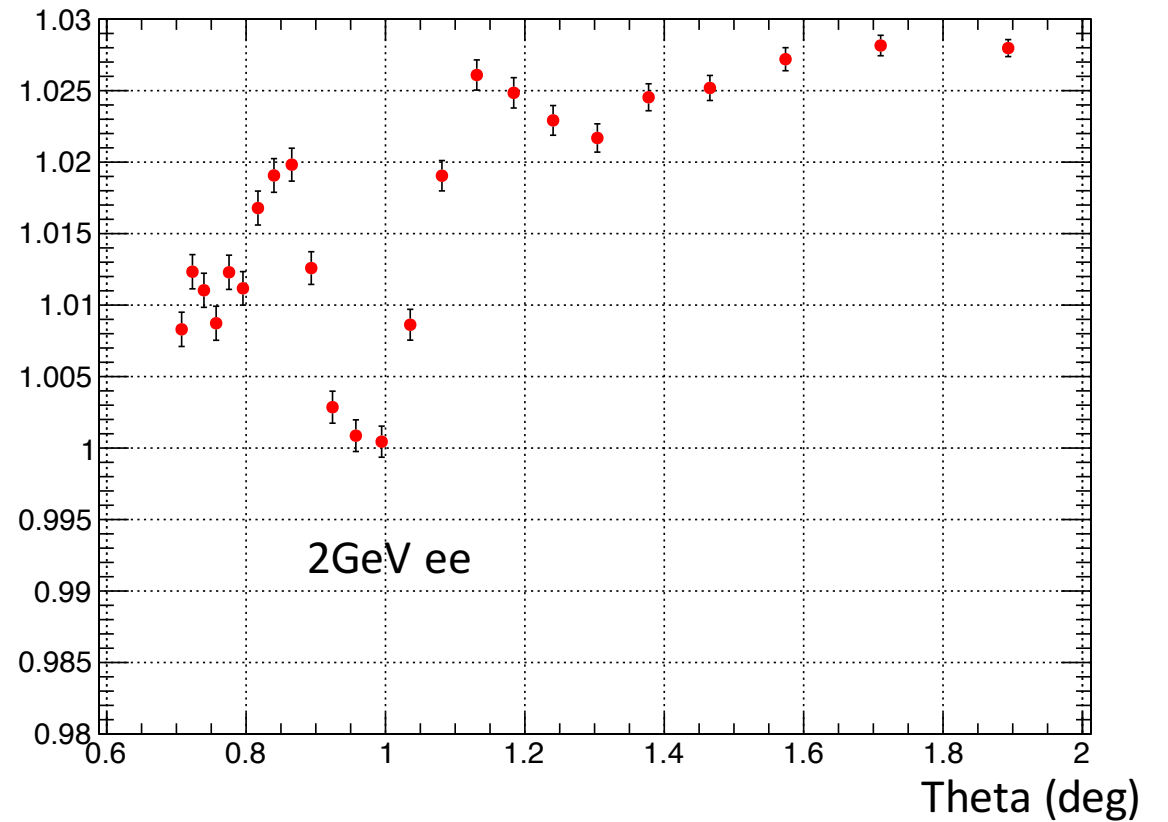


# Target profile: delta function at 0 cm vs delta functions at +/- 20cm

Graph



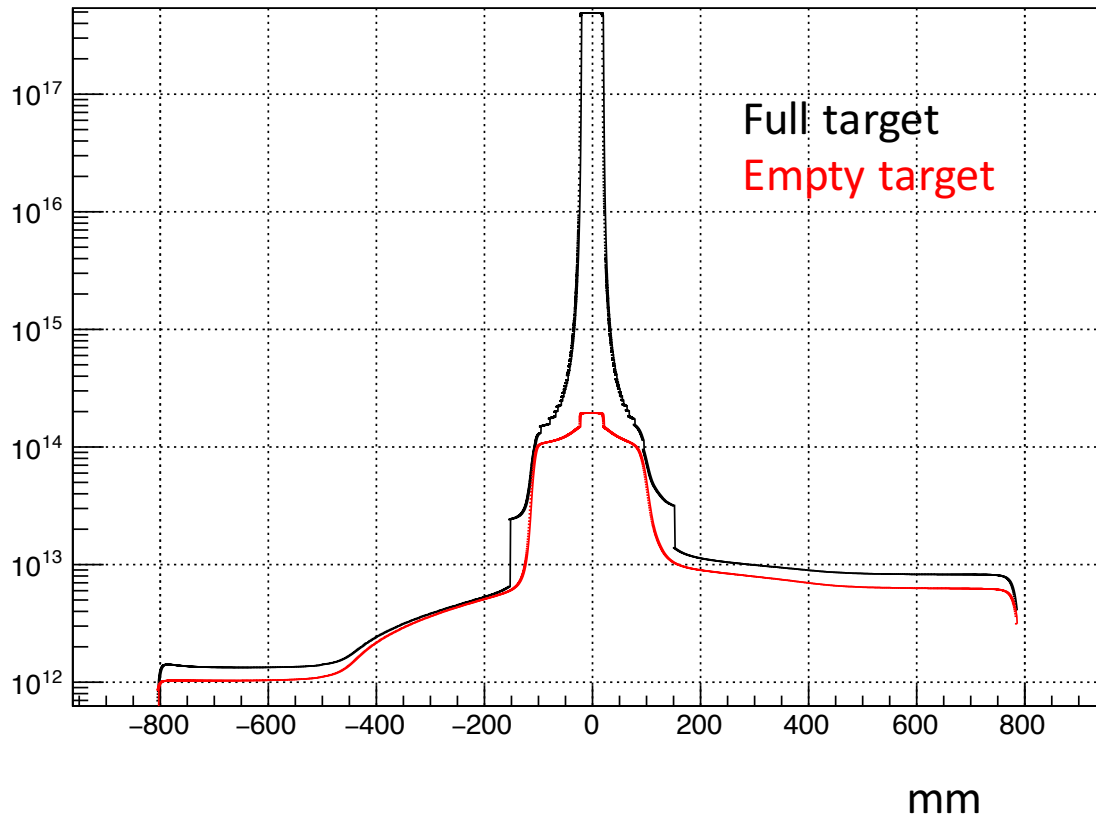
Graph



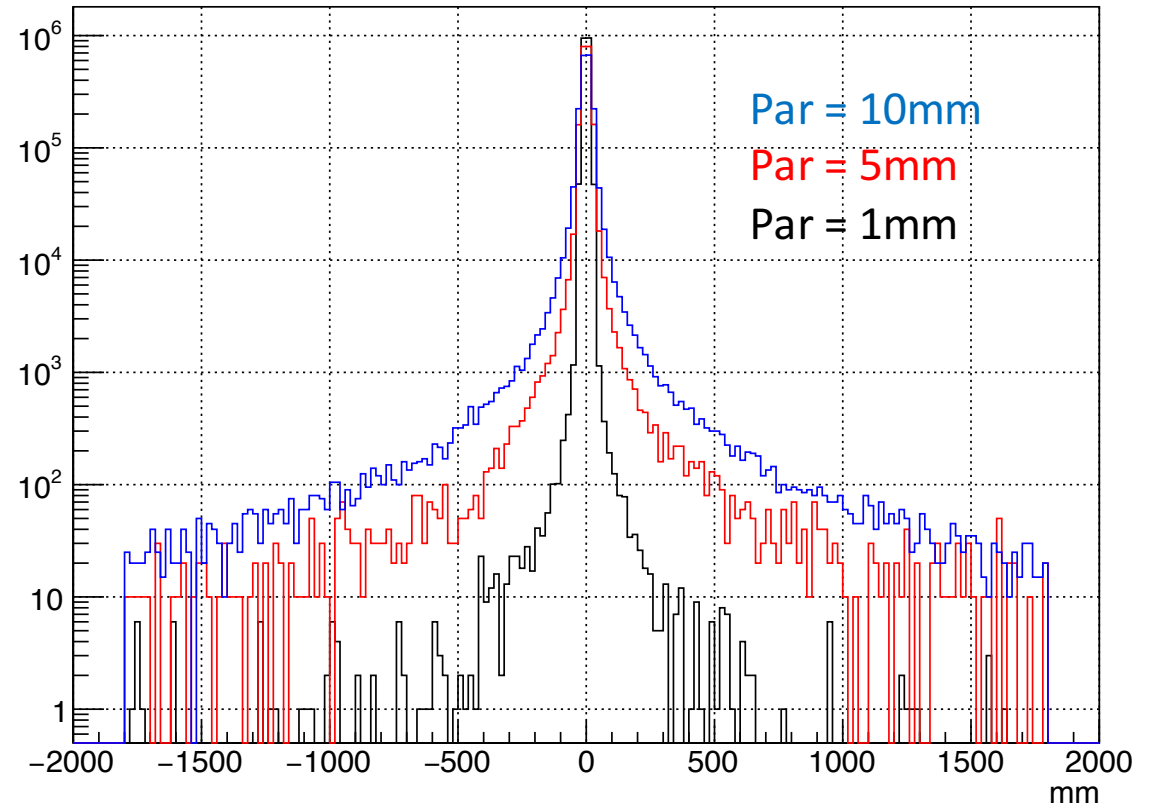
# Target profile

Assume uniform distribution inside target, tail decay as  $1/(R + \text{par})^2$

From Yang's COMSOL simulation



vz1

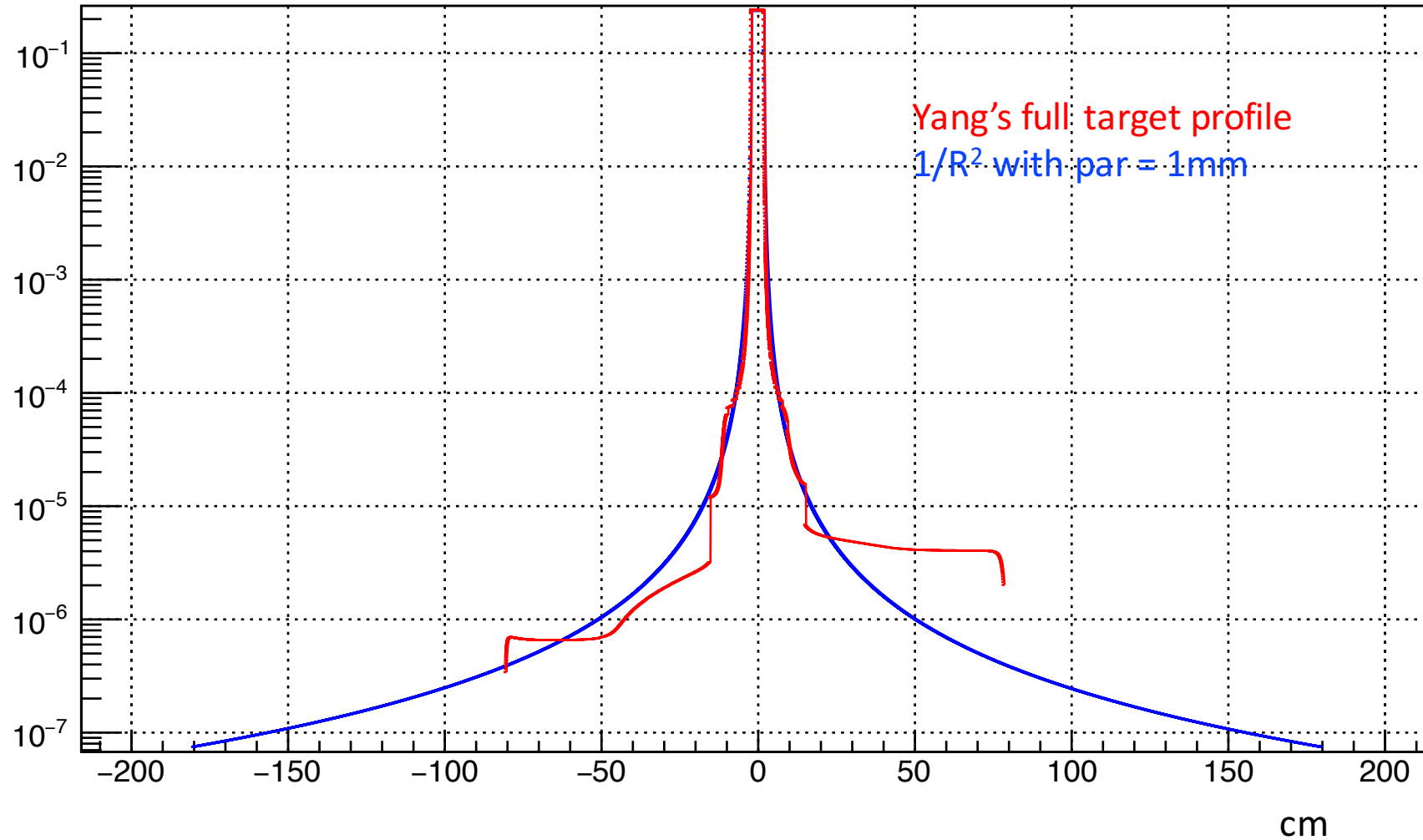


If using Yang's profile, the residual gas almost has no effect, compared to uniform +/- 2 cm profile

# Target profile comparison

Profiles normalized by integrals from -75 cm to 75 cm

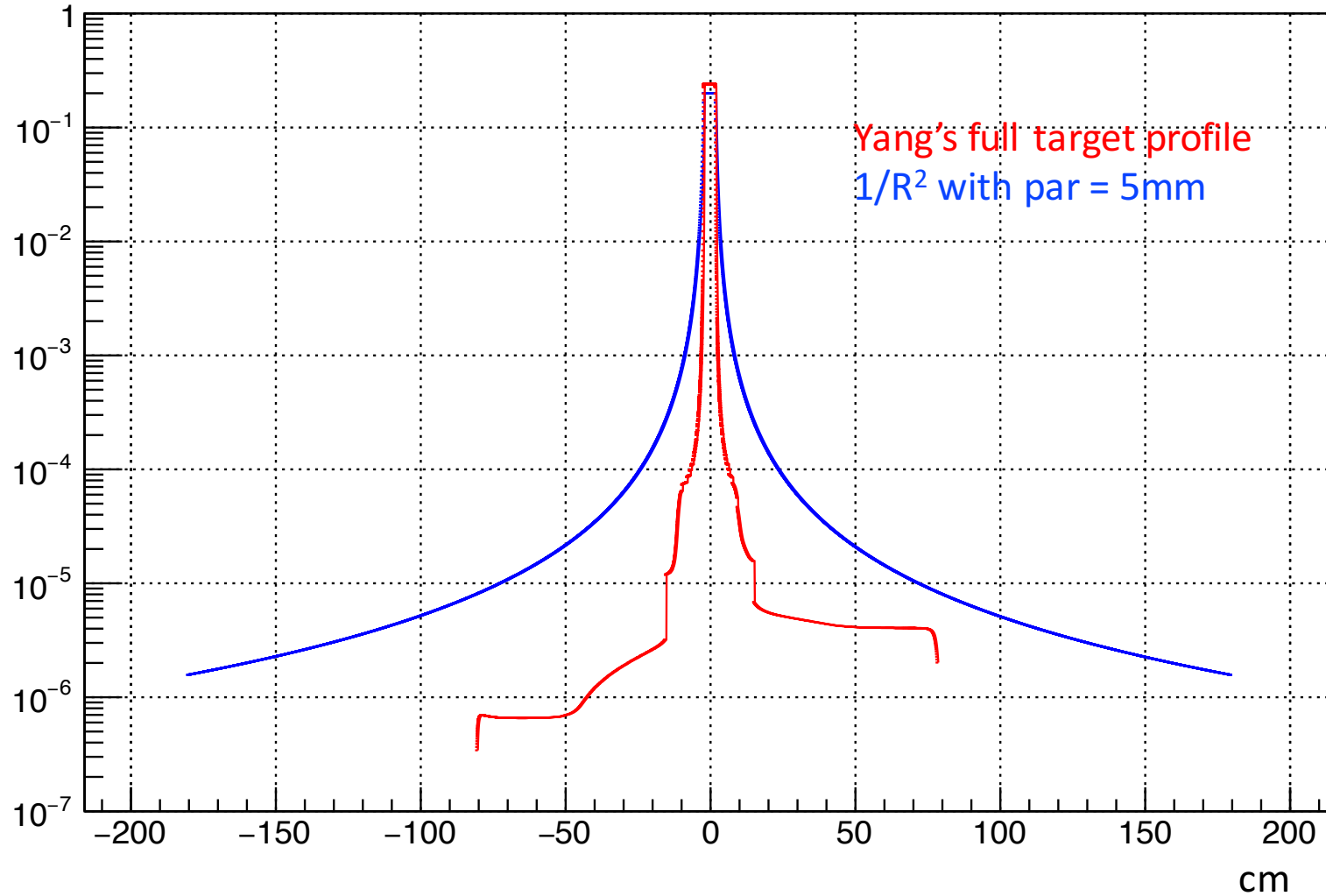
Graph



# Target profile comparison

Profiles normalized by integrals from -75 cm to 75 cm

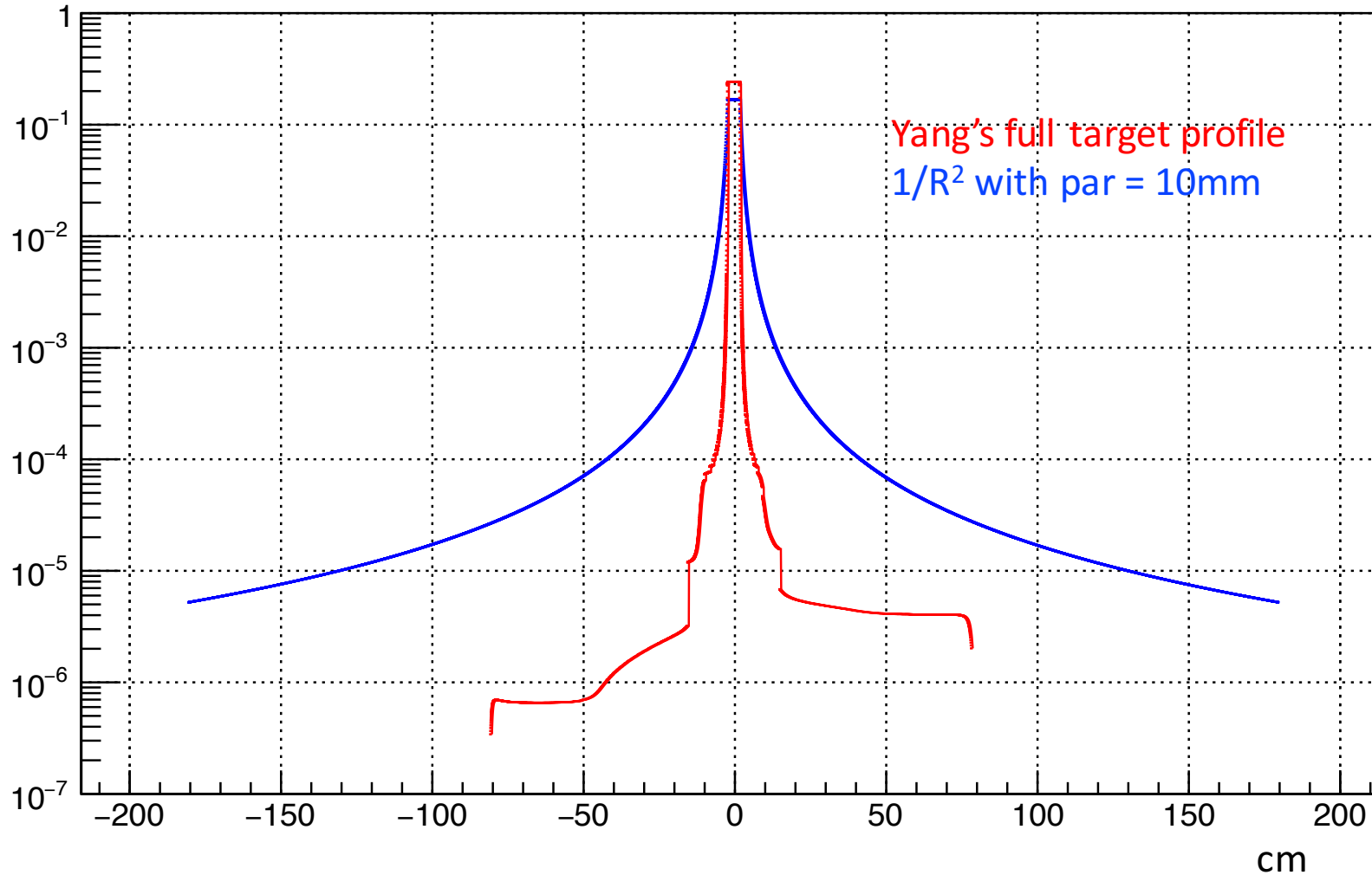
Graph



# Target profile comparison

Profiles normalized by integrals from -75 cm to 75 cm

Graph

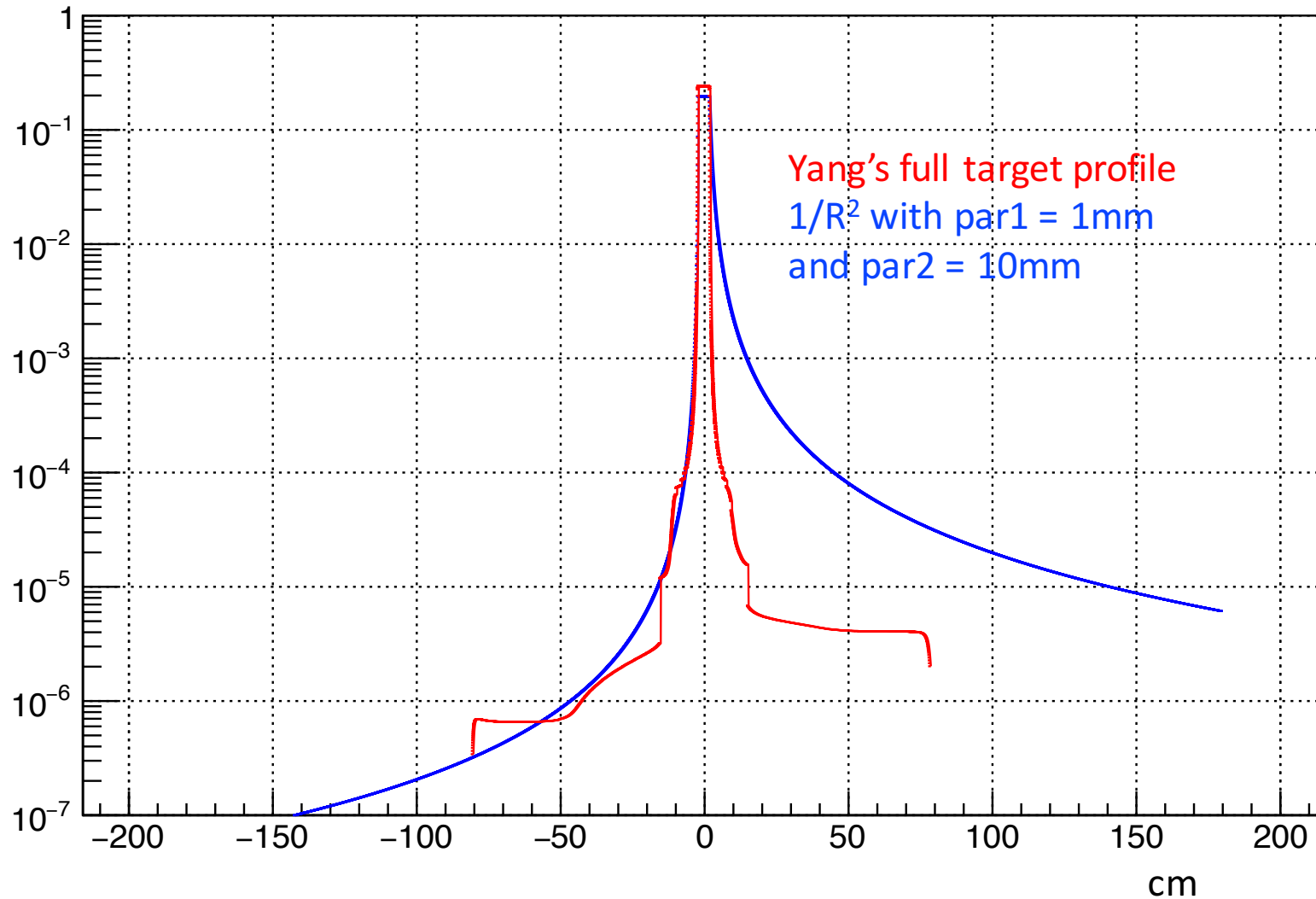




# Target profile comparison

Profiles normalized by integrals from -75 cm to 75 cm

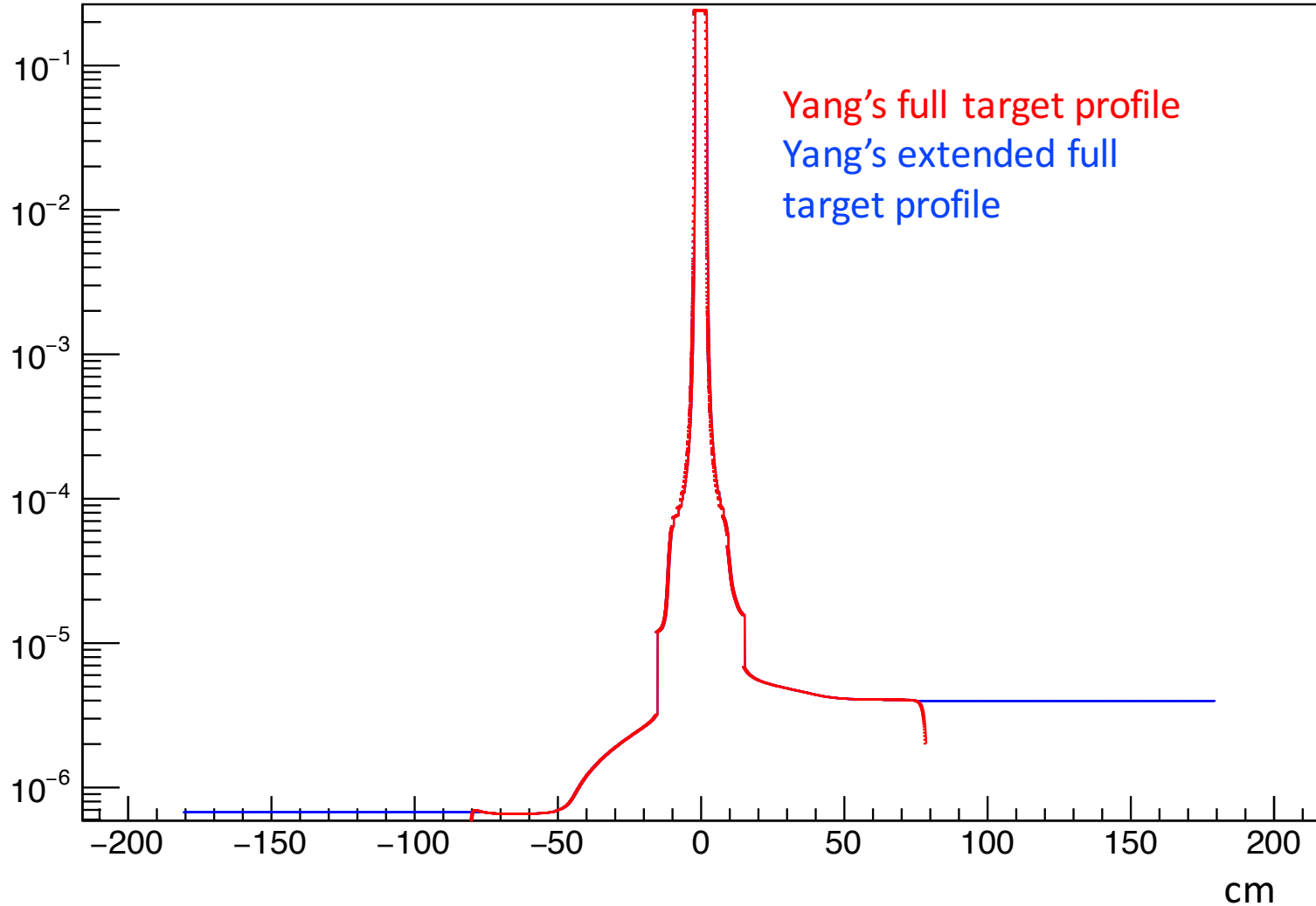
Graph



# Target profile comparison

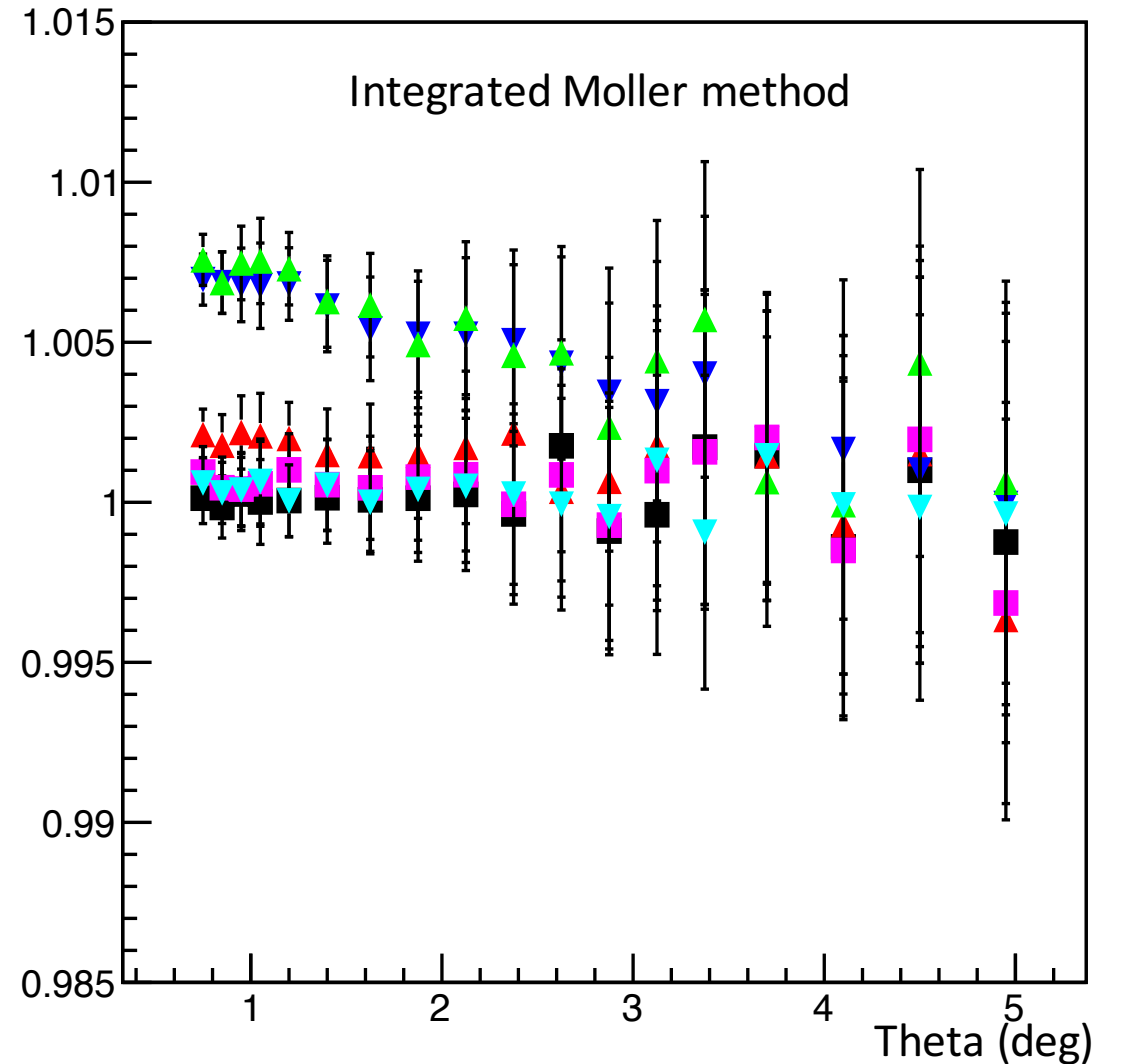
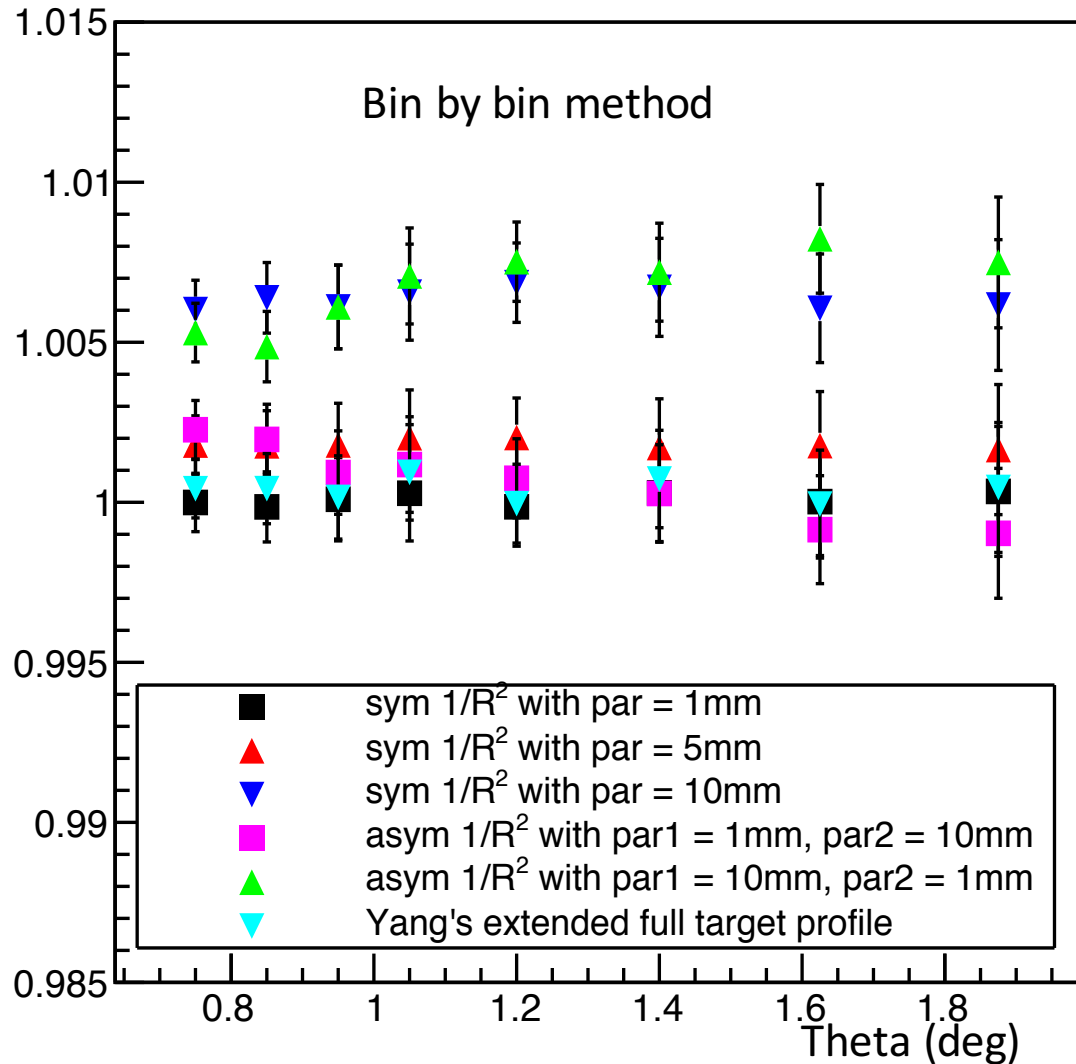
Profiles normalized by integrals from -75 cm to 75 cm

Graph



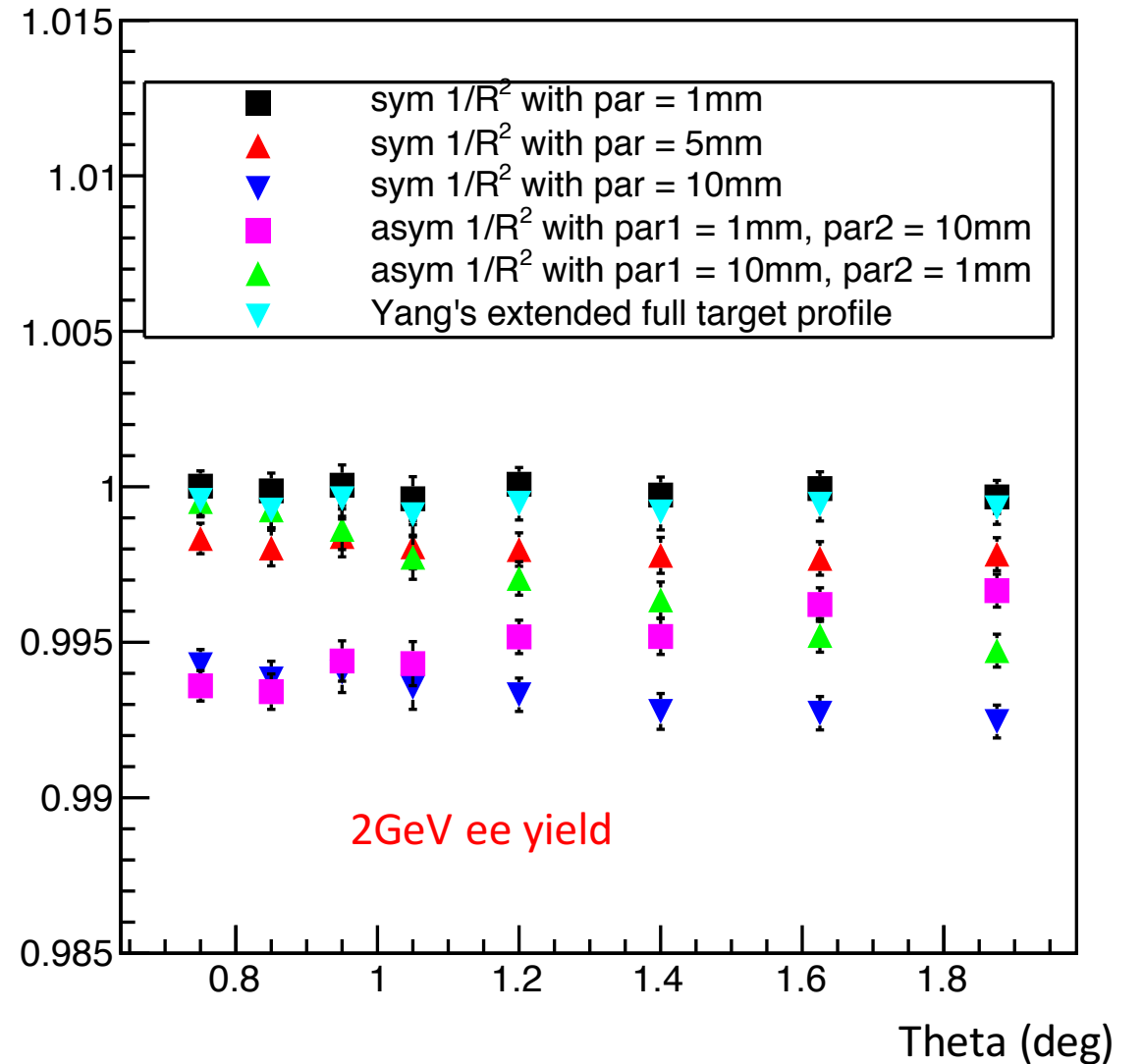
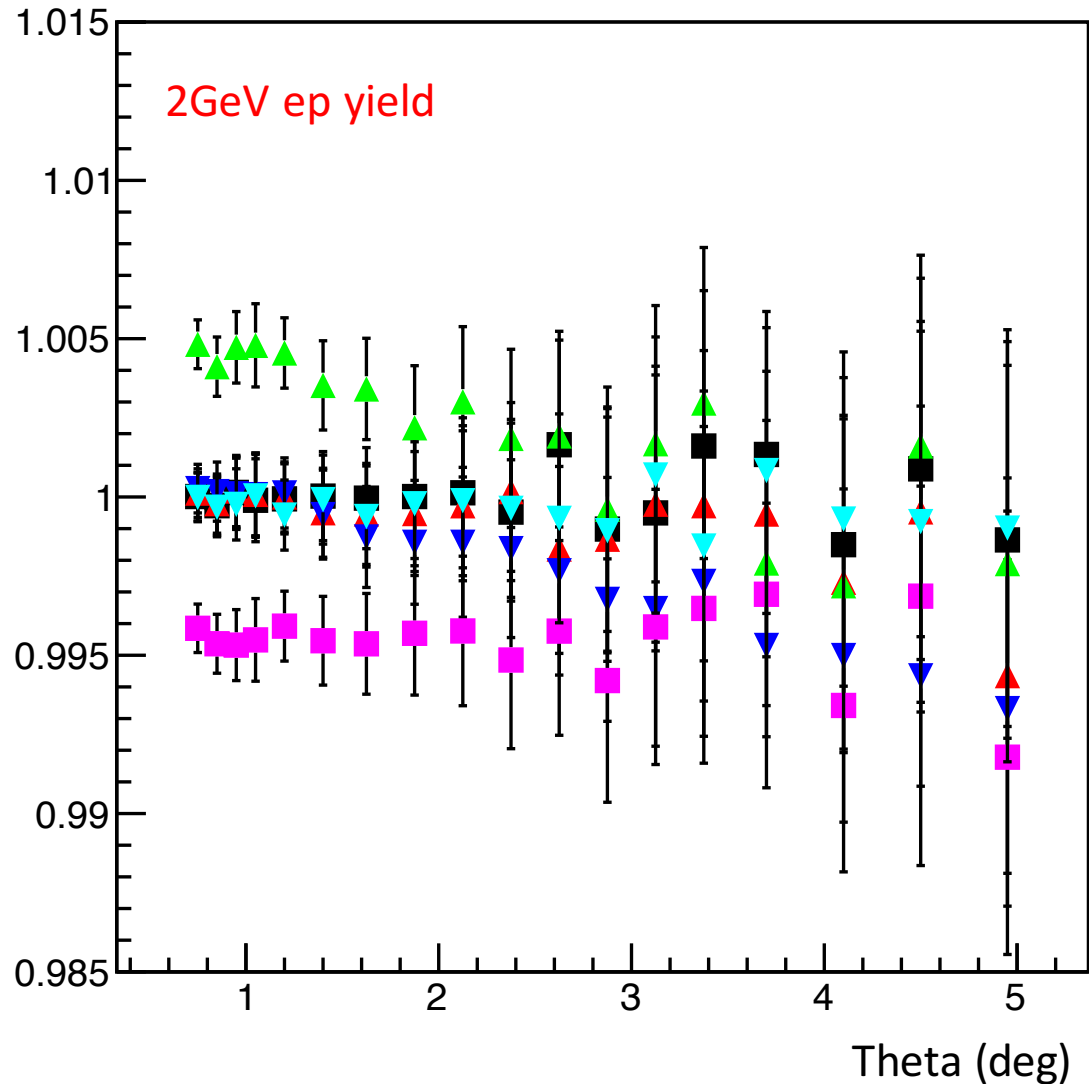
# ep/ee ratio from different profile

Ratios normalized to the case with uniform +/- 2cm within the target cell



# Yields from different profile

Yields normalized to the case with uniform +/- 2cm within the target cell



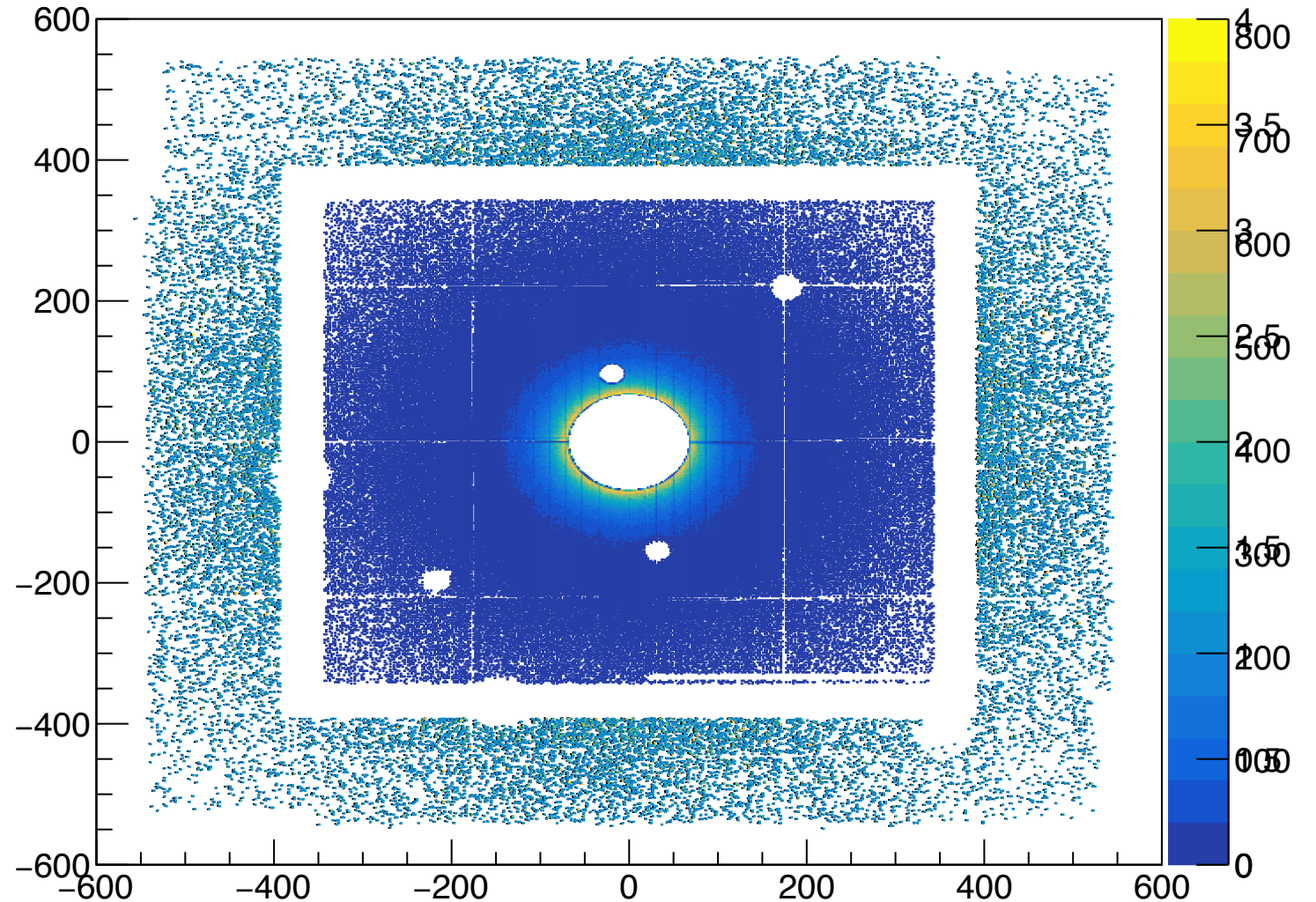
# Conclusion

- +/- 2cm Extended target effect can be neglected
- With difference profiles, the effect on large angle ( $>3.5$  deg) is very small, so our discrepancy at large angle seem unlikely comes from residual gas effect
- With uniform +/- 2cm, we actually get the minimum ep/ee ratio
- The discrepancy at small angle is that the ep/ee from simulation (using uniform +/- 2cm) is larger than ep/ee ratio from data
- So the discrepancy at small angle cannot not be explain by residual gas effect alone

# Separation of PWO and LG

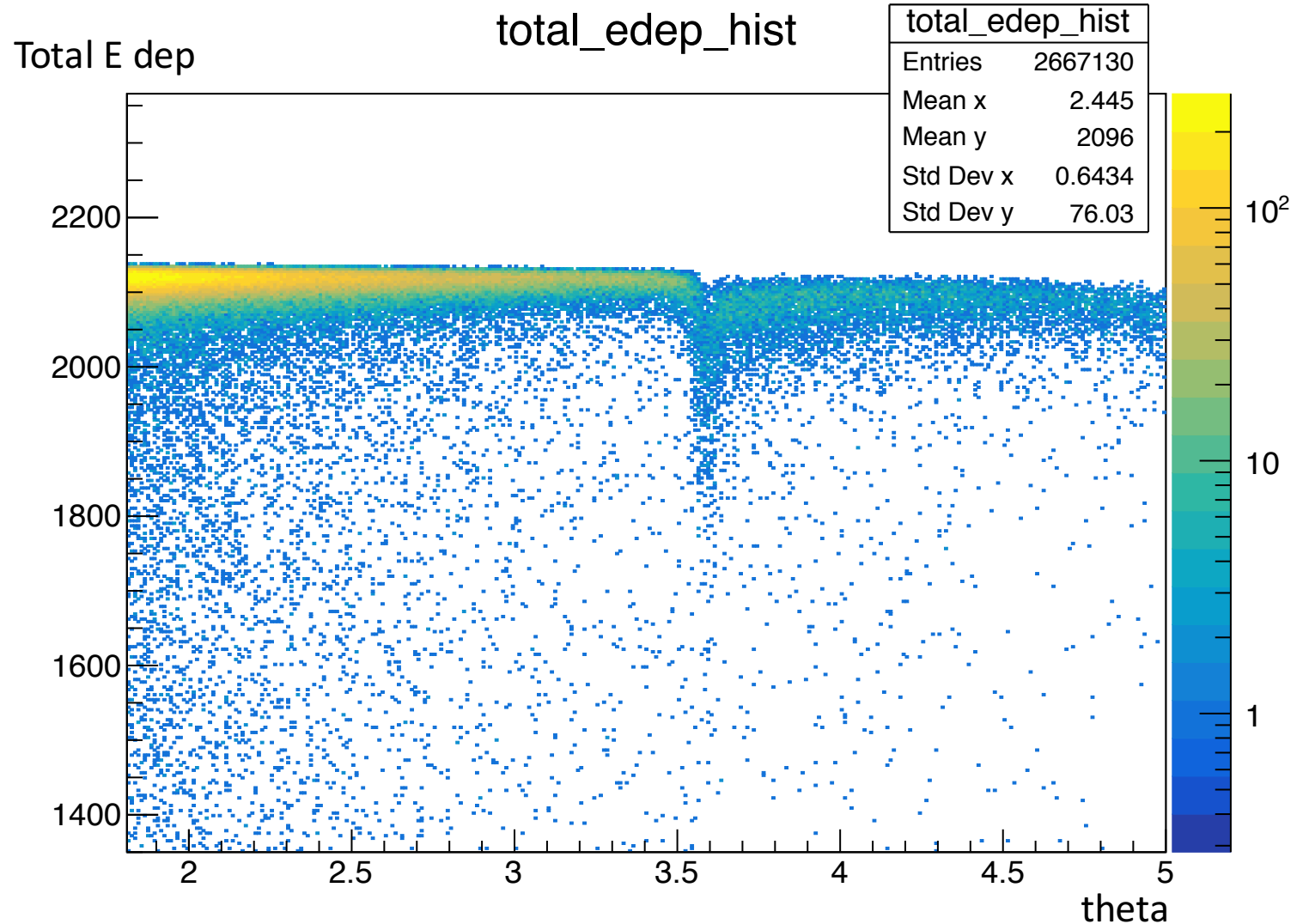
signal\_gem\_hit\_pos\_ep

- Separate HyCal into two regions, PWO only and LG only
- Check the consistency in the phi overlap region between these two regions



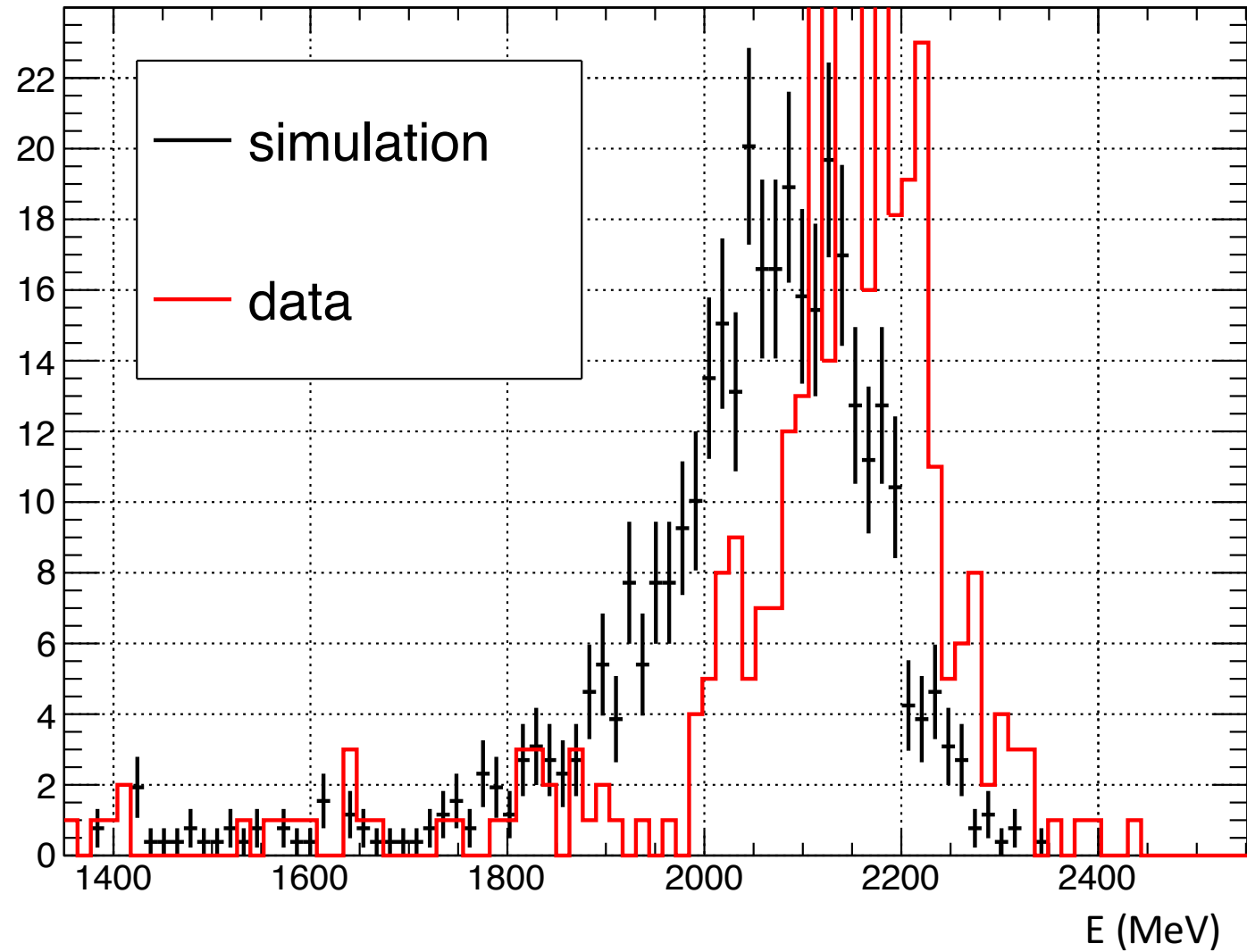
# Still a small energy leak tail near transition

- Total E dep is the total energy deposition of a ep event on HyCal, recorded by Geant4, so not going through digitization and reconstruction
- Energy still seem to leak more compared to the data
- $-20 < x < 20$  mm



# Reconstructed ep cluster energy at $3.55 < \theta < 3.6$ deg

sim\_cluster\_E\_theta

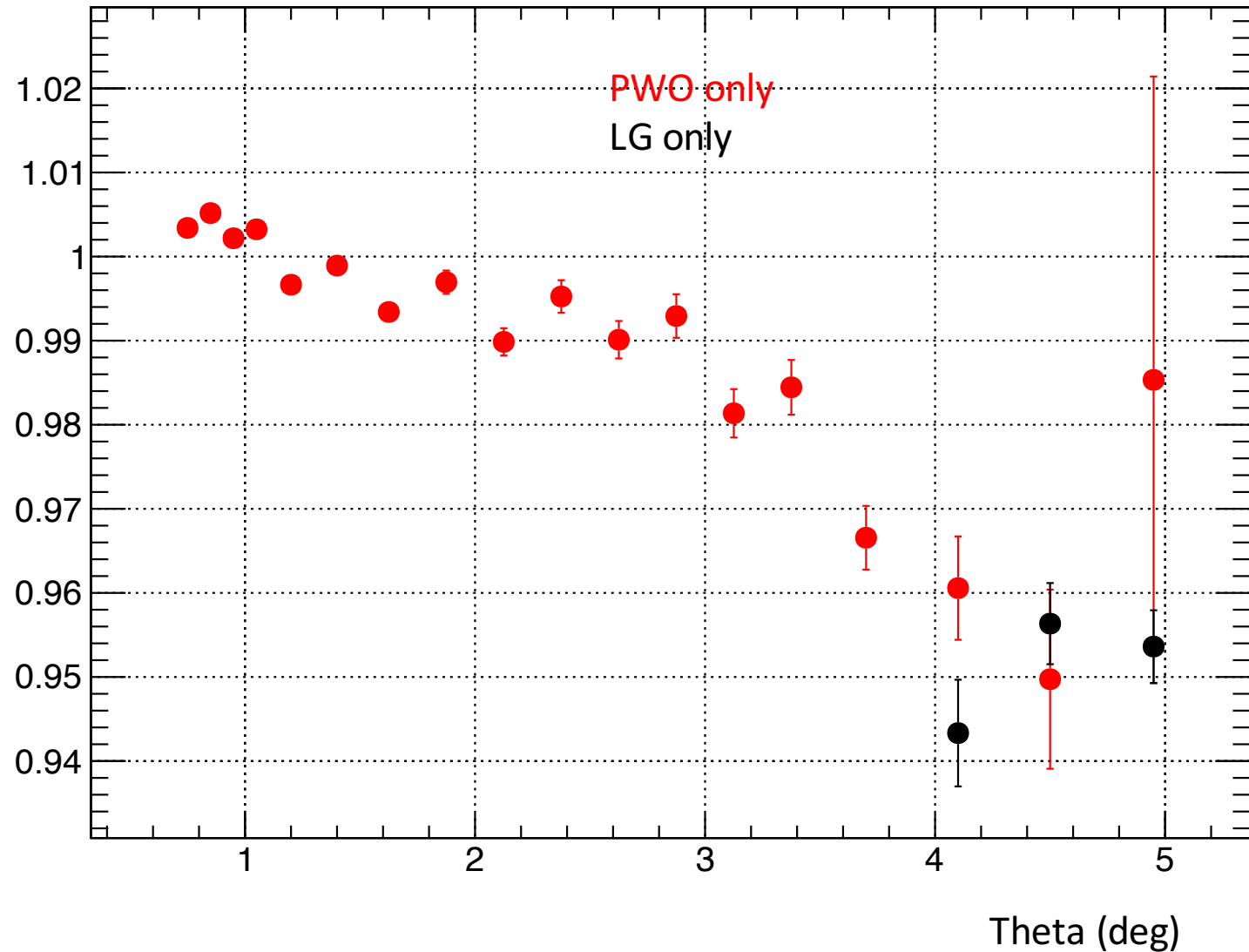




# ep/ee super ratio

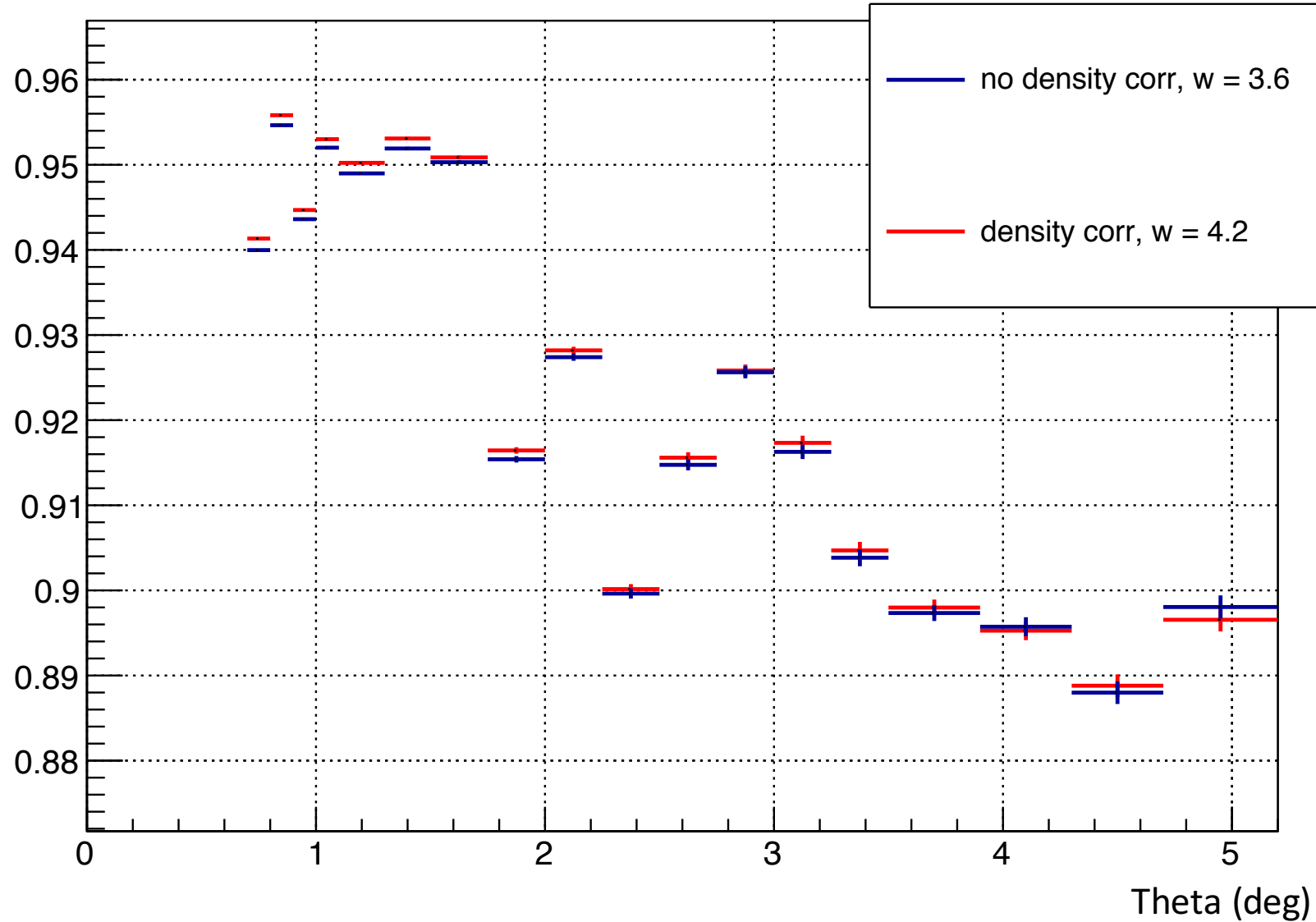
$(ep/ee)_{sim} / (ep/ee)_{data}$  Graph

- Using the integrated Moller method
- GEM efficiency calculated for each region separately
- LG result seems consistent with the PWO result



# Density correction

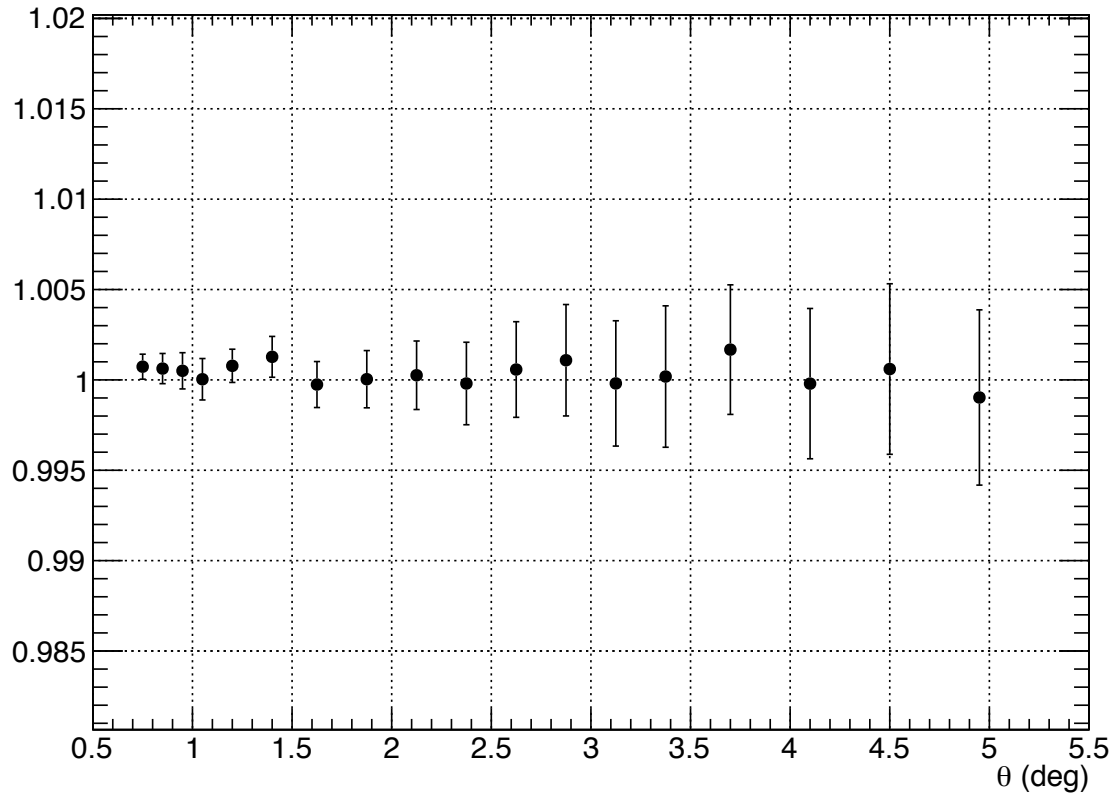
gem\_efficiency\_ep



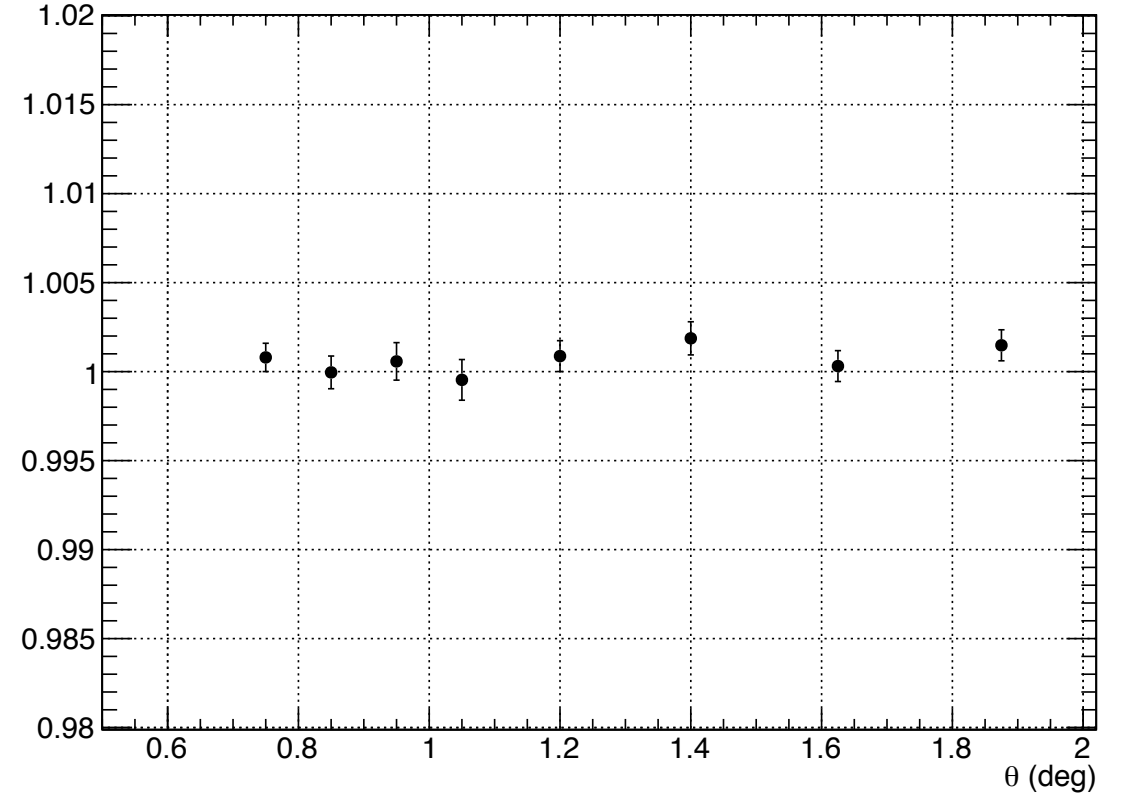
# Relative ep and ee yield

Yield with density correction over yield without density correction, GEM efficiencies applied

Graph

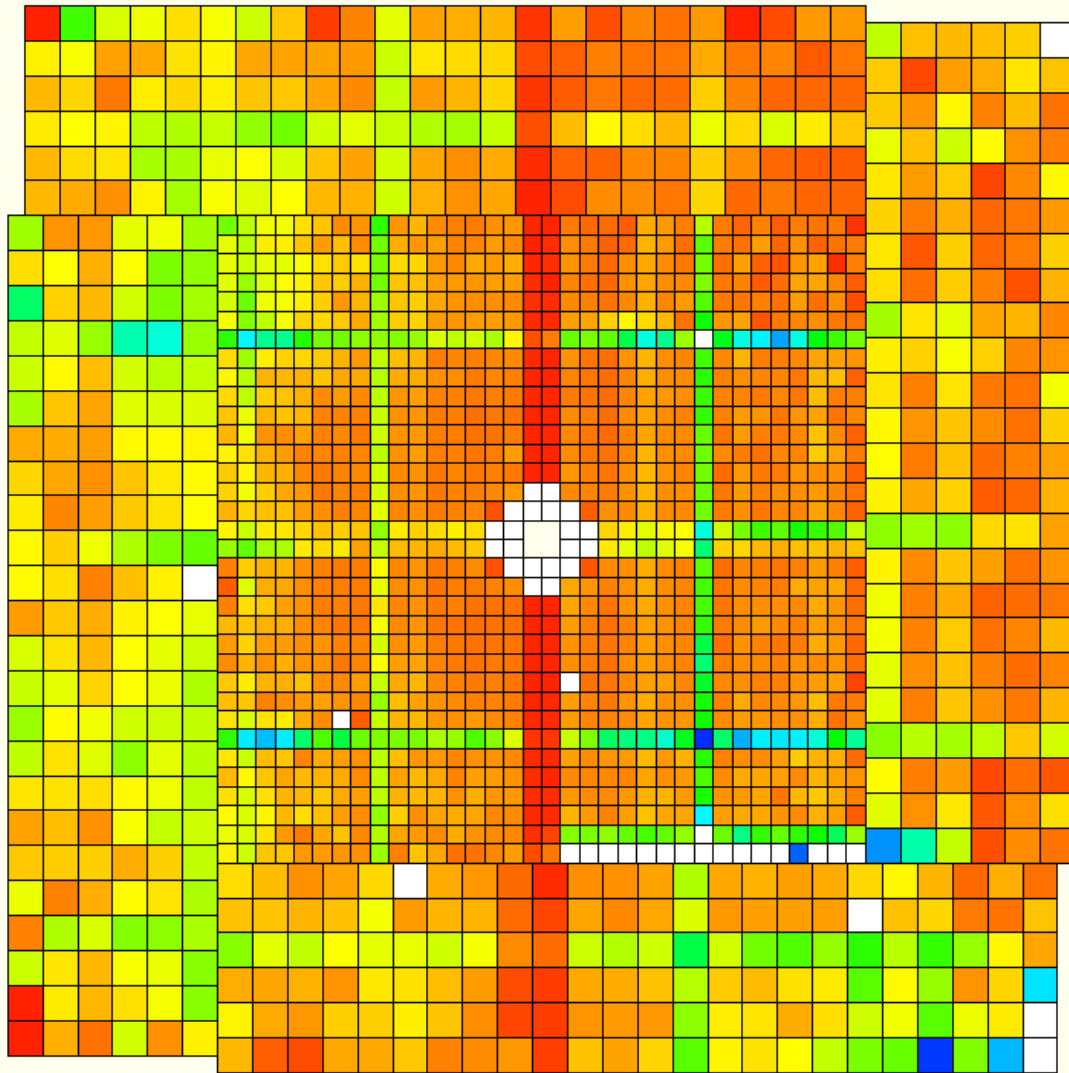


Graph

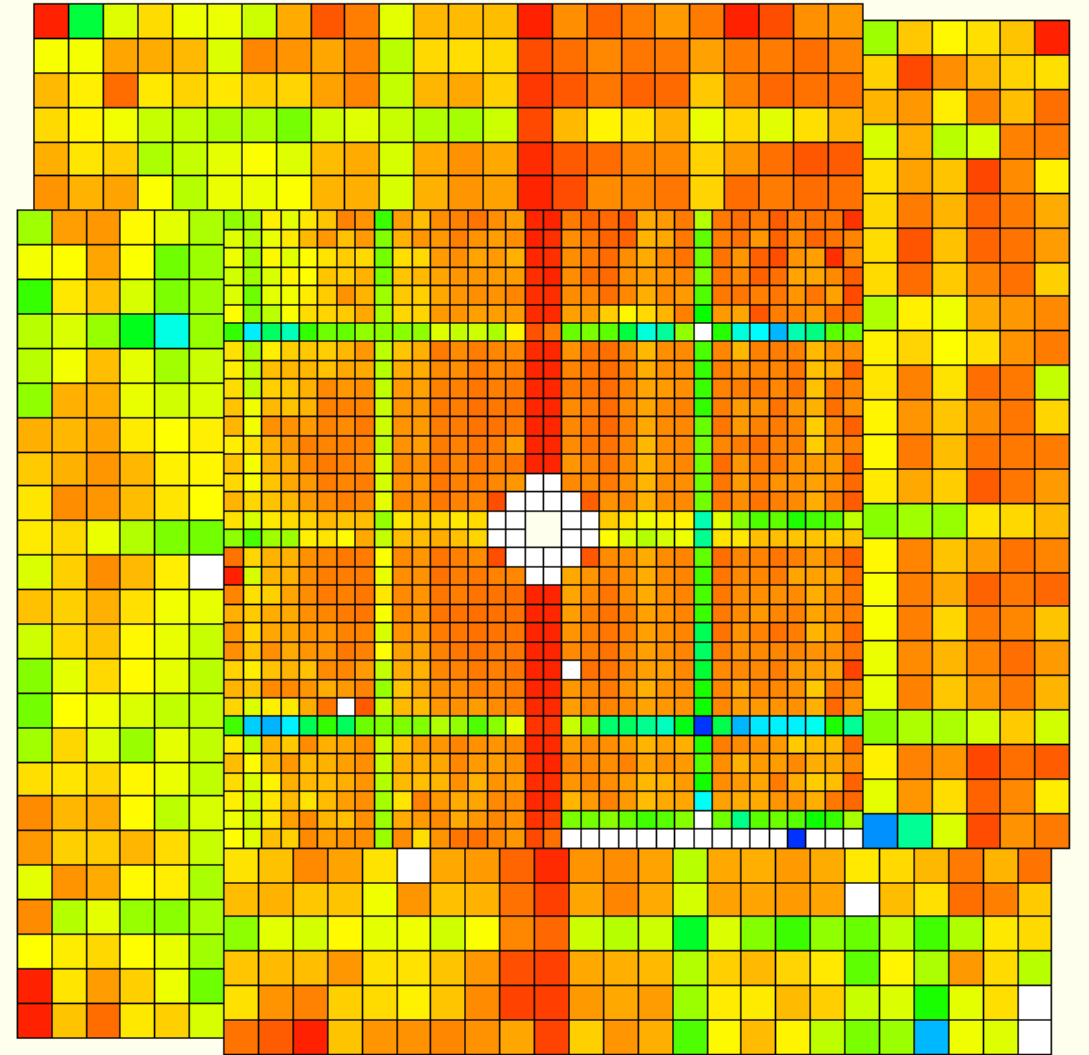


# GEM efficiency in 2D bins

With density correction



Without density correction



# Threshold dependency of GEM efficiency

Graph

