

## Comparison of shower profiles:

### GEANT4 (4.8.2)- EGS5

Simple/ideal high resolution calorimeter of CsI:

30 radiation lengths, segmented in 1/2 rad length (1.85/2. cm)

16 cm segmented in 0.04 cm

#### GEANT4 Dist cut = 1mm

Energy thresholds (MeV): gamma 0.038 e- 0.692 e+ 0.658

#### EGS5

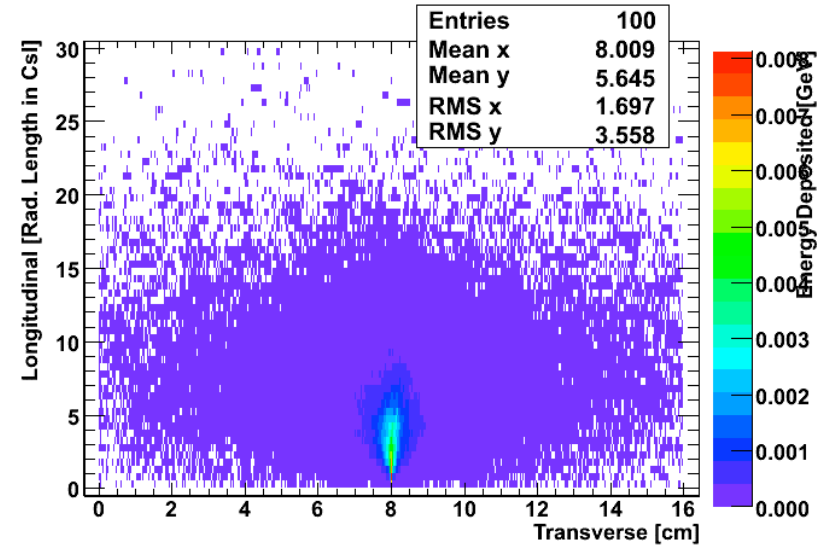
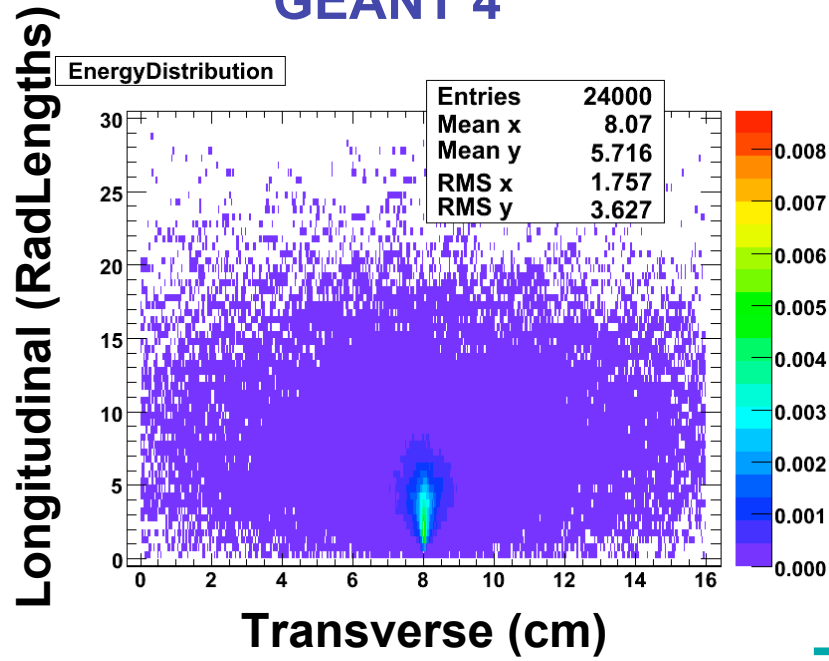
Energy thresholds (MeV): gamma 0.04 e-/e+ 0.70

**Conclusion: Shower profiles agree well at the energies checked: 1, 100, 500 GeV**

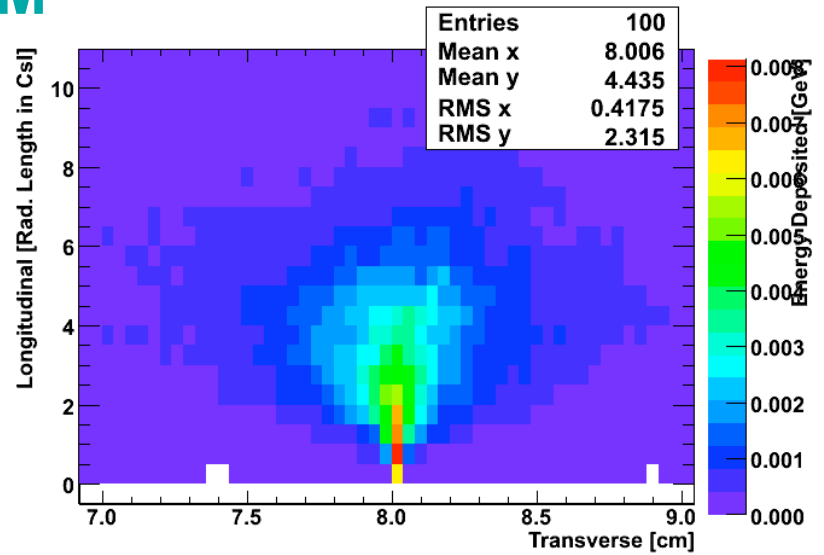
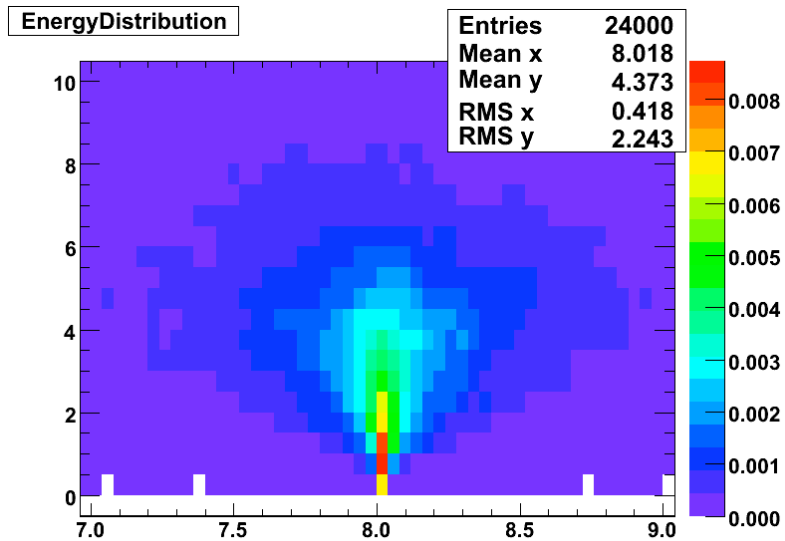
# Electrons 1 GeV

GEANT 4

EGS 5



ZOOM



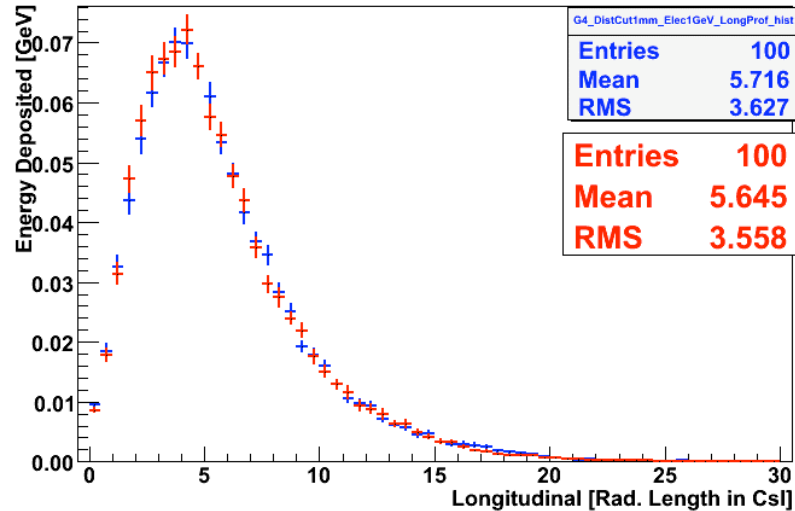
# Electrons 1 GeV

Projection of profiles

GEANT 4

EGS 5

Longitudinal

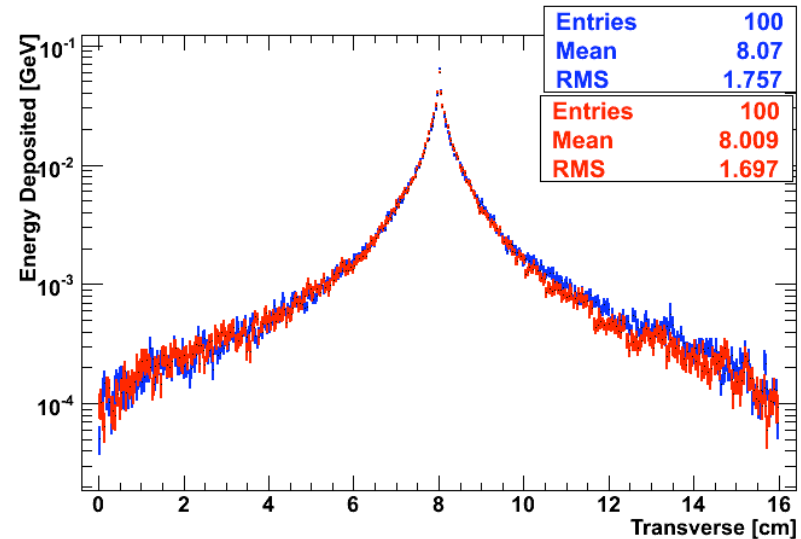


Relative Changes:

$$\text{mean} = (5.716 - 5.645) / 5.716 = 1.2 \text{ e-2}$$

$$\text{RMS} = (3.627 - 3.558) / 3.627 = 1.9 \text{ e-2}$$

Transverse



Relative Changes:

$$\text{mean} = (8.07 - 8.009) / 8.009 = 0.8 \text{ e-2}$$

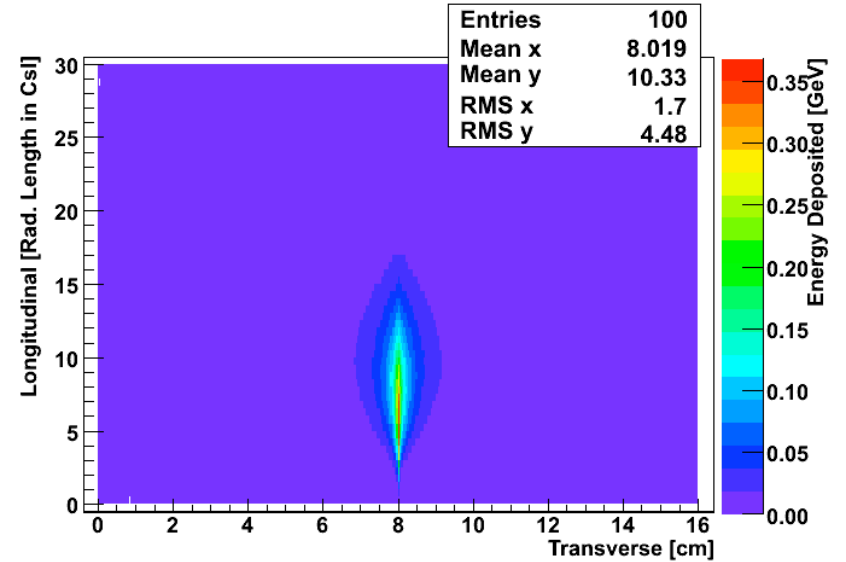
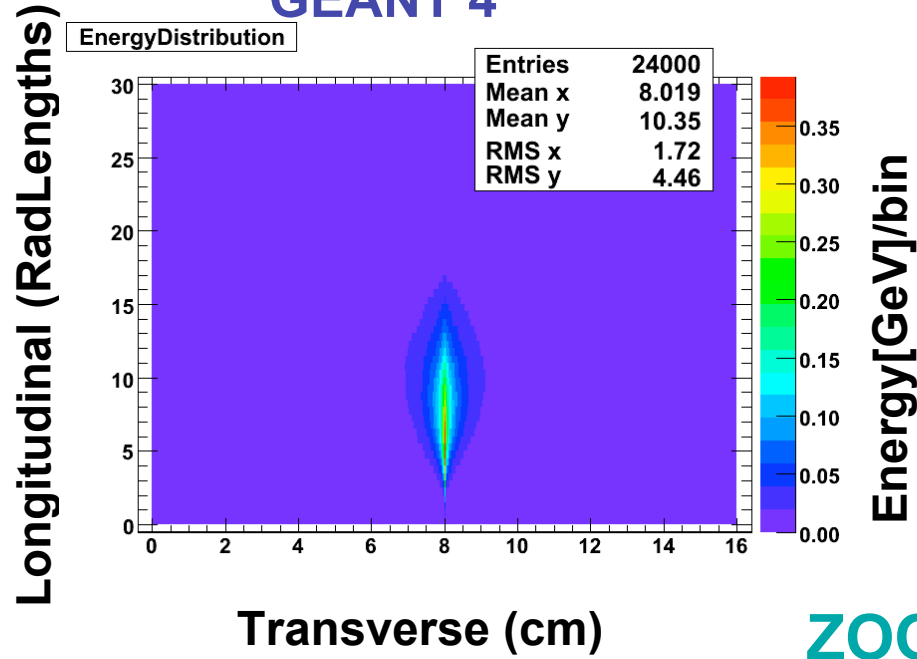
$$\text{RMS} = (1.757 - 1.697) / 1.757 = 3.4 \text{ e-2}$$

**Differences GEANT-EGS are NOT significant. Excellent agreement.** (see presentation on uncertainties in shower profile for 100 Evts)

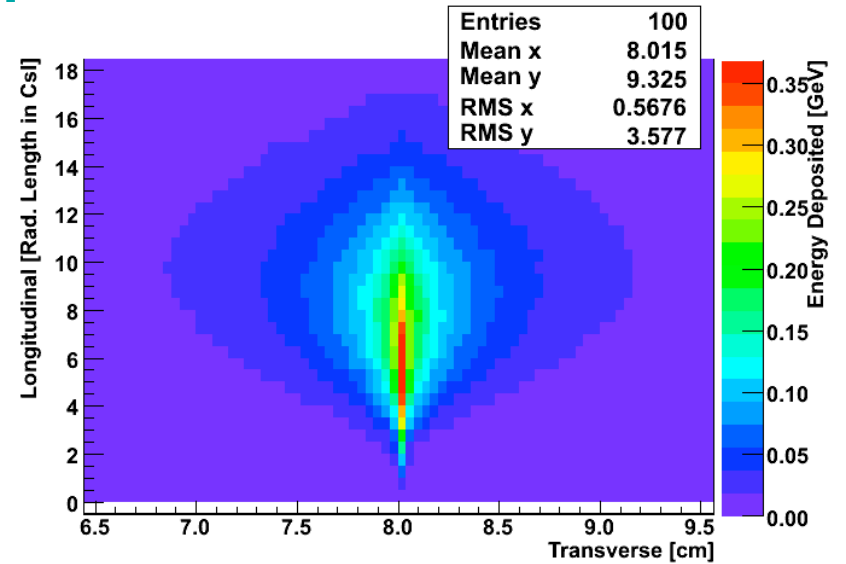
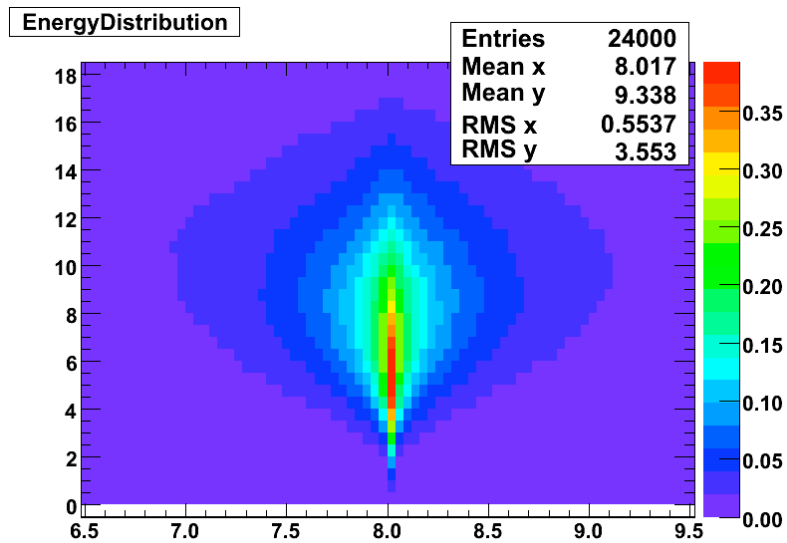
# Electrons 100 GeV

GEANT 4

EGS 5



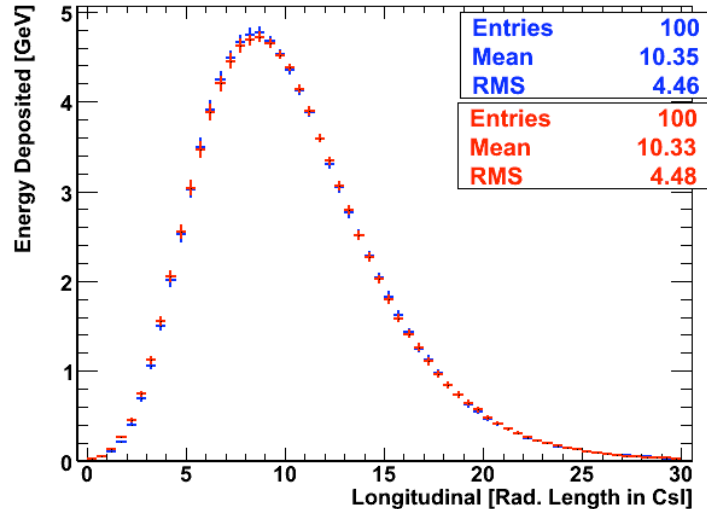
ZOOM



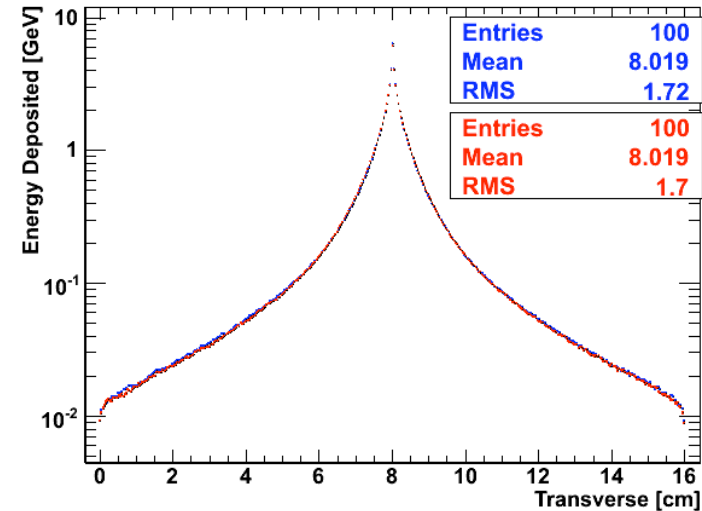
# Electrons 100 GeV

## Projection of profiles

### Longitudinal



### Transverse



Relative Changes:

$$\text{mean} = (10.35 - 10.33) / 10.35 = \mathbf{0.2 \text{ e-}2}$$

$$\text{RMS} = (4.46 - 4.48) / 4.46 = \mathbf{-0.5 \text{ e-}2}$$

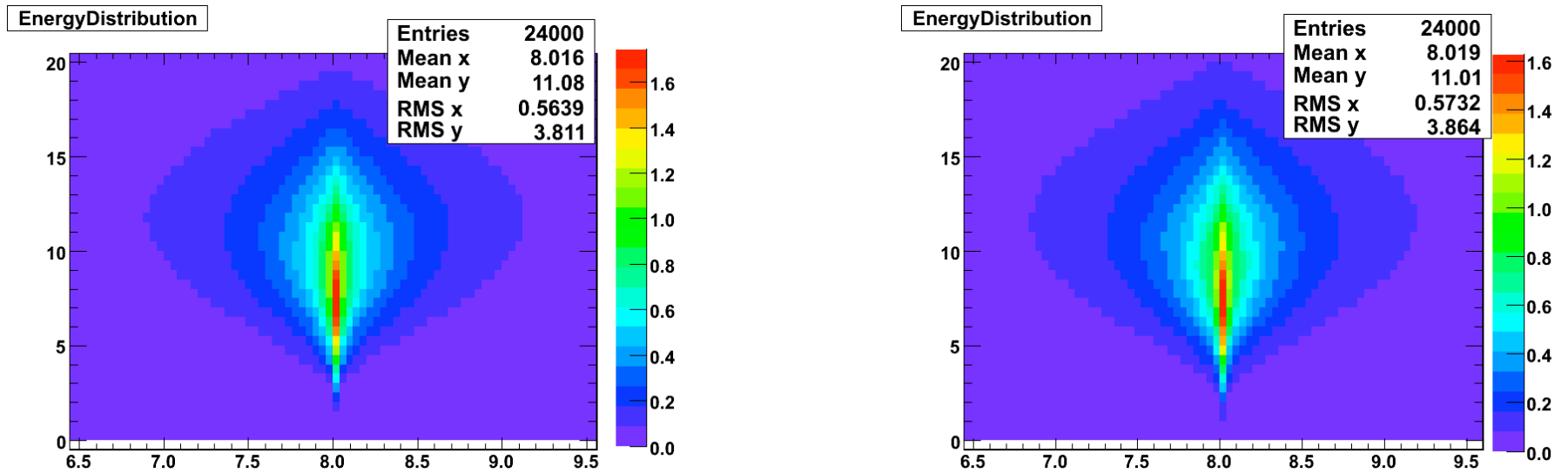
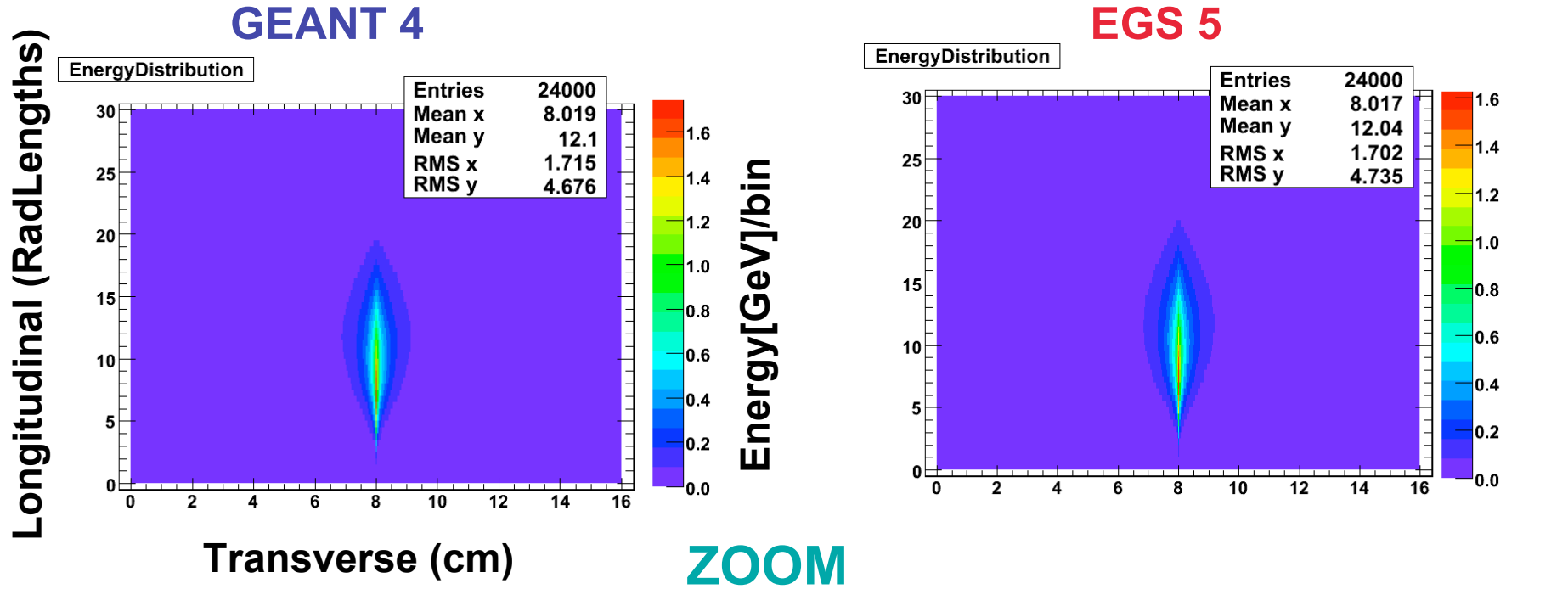
Relative Changes:

$$\text{mean} = (8.019 - 8.019) / 8.019 = \mathbf{0.0 \text{ e-}2}$$

$$\text{RMS} = (1.72 - 1.7) / 1.757 = \mathbf{1.1 \text{ e-}2}$$

**Differences GEANT-EGS are NOT significant. Excellent agreement.** (see presentation on uncertainties in shower profile for 100 Evts)

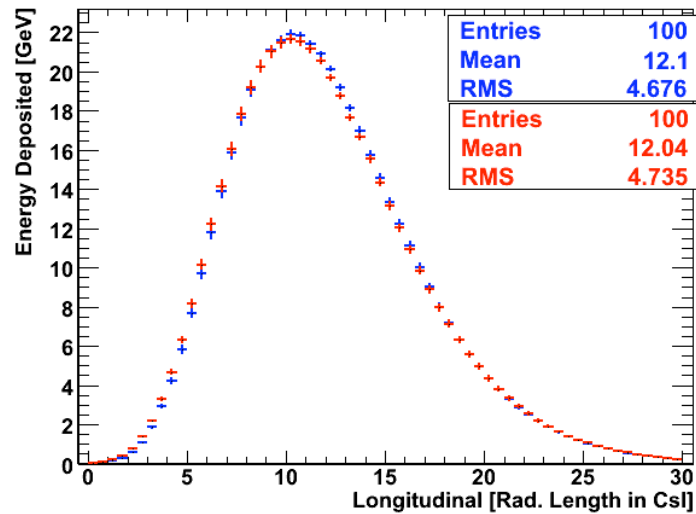
# Electrons 500 GeV



# Electrons 500 GeV

## Projection of profiles

### Longitudinal

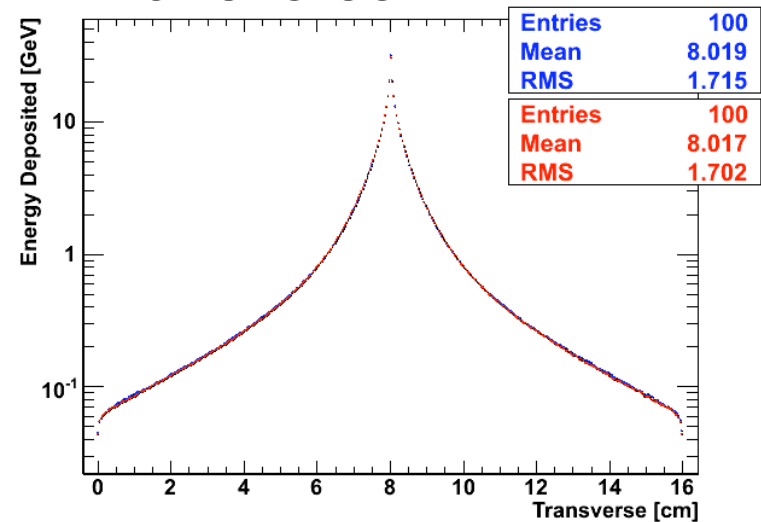


Relative Changes:

$$\text{mean} = (12.1 - 12.04) / 12.1 = \mathbf{0.5 \text{ e-2}}$$

$$\text{RMS} = (4.676 - 4.735) / 4.676 = \mathbf{-1.2 \text{ e-2}}$$

### Transverse



Relative Changes:

$$\text{mean} = (8.019 - 8.017) / 8.019 = \mathbf{0.0 \text{ e-2}}$$

$$\text{RMS} = (1.715 - 1.702) / 1.715 = \mathbf{0.8 \text{ e-2}}$$

**Differences GEANT-EGS are NOT significant. Excellent agreement.** (see presentation on uncertainties in shower profile for 100 Evts)

## Conclusions

Agreement GEANT-EGS in EM shower profile is **excellent** for the energies checked (1,100, 500 GeV)

Differences Data-MC are **NOT** due to physics in GEANT4

## Outlook

- Make calorimeter more “realistic/coarse” in terms of dimensions (8 segments of 1.99 cm in long, 12 segments of 2.67 cm in trans), adding 2 mm gaps in between detectors
- Add (1.5 rad length) 36 foils of W in front of calorimeter, and define sensitive elements of Si. The purpose of that is mainly to check “backsplash”
- Make a scan on Energies: 0.1,1,100, 280, 500 (GeV)  
Angles : 0, 30, 60, 80 *Check backsplash at large angles !!!!*