

# Measuring angles with the IDEEA Calo

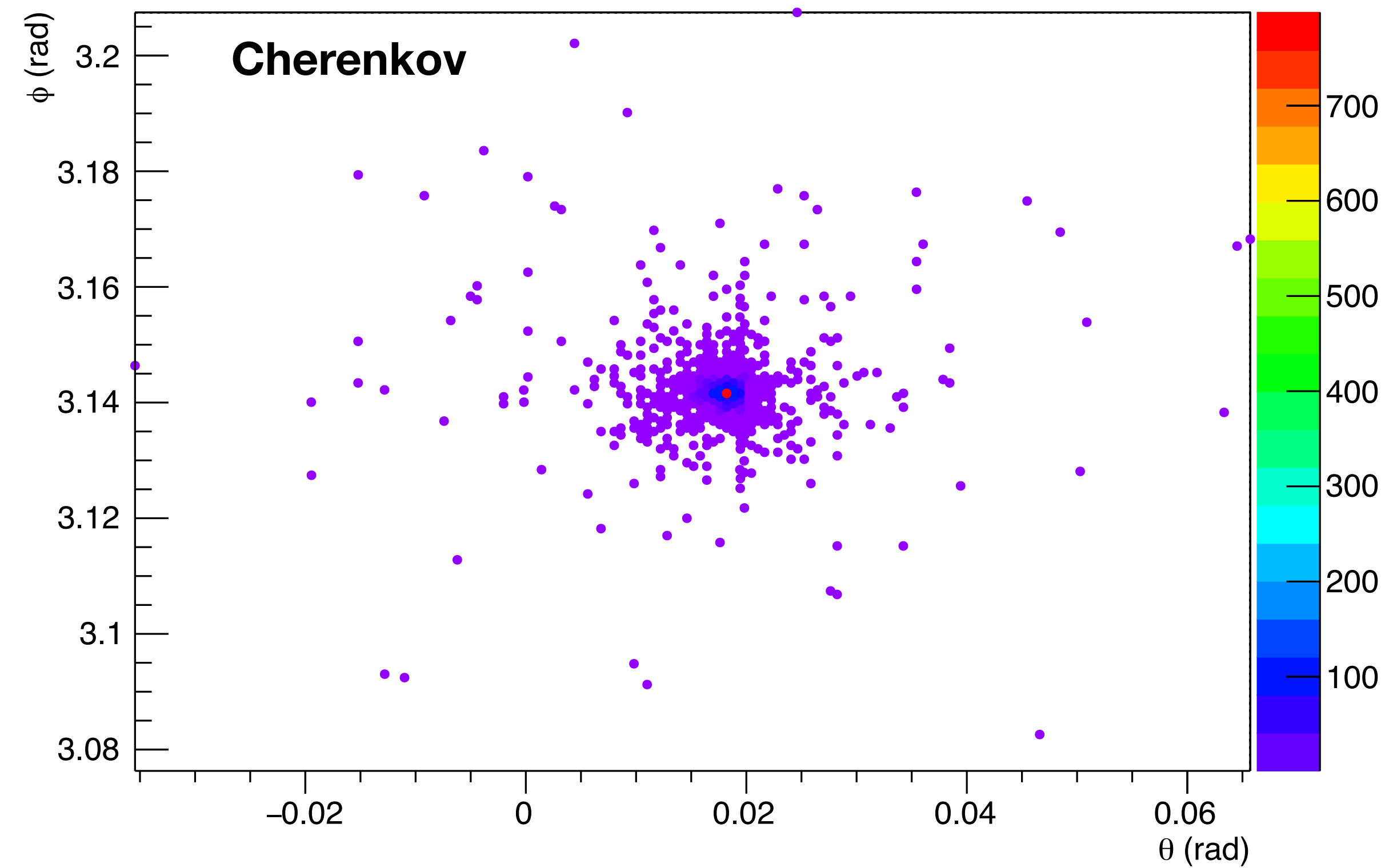
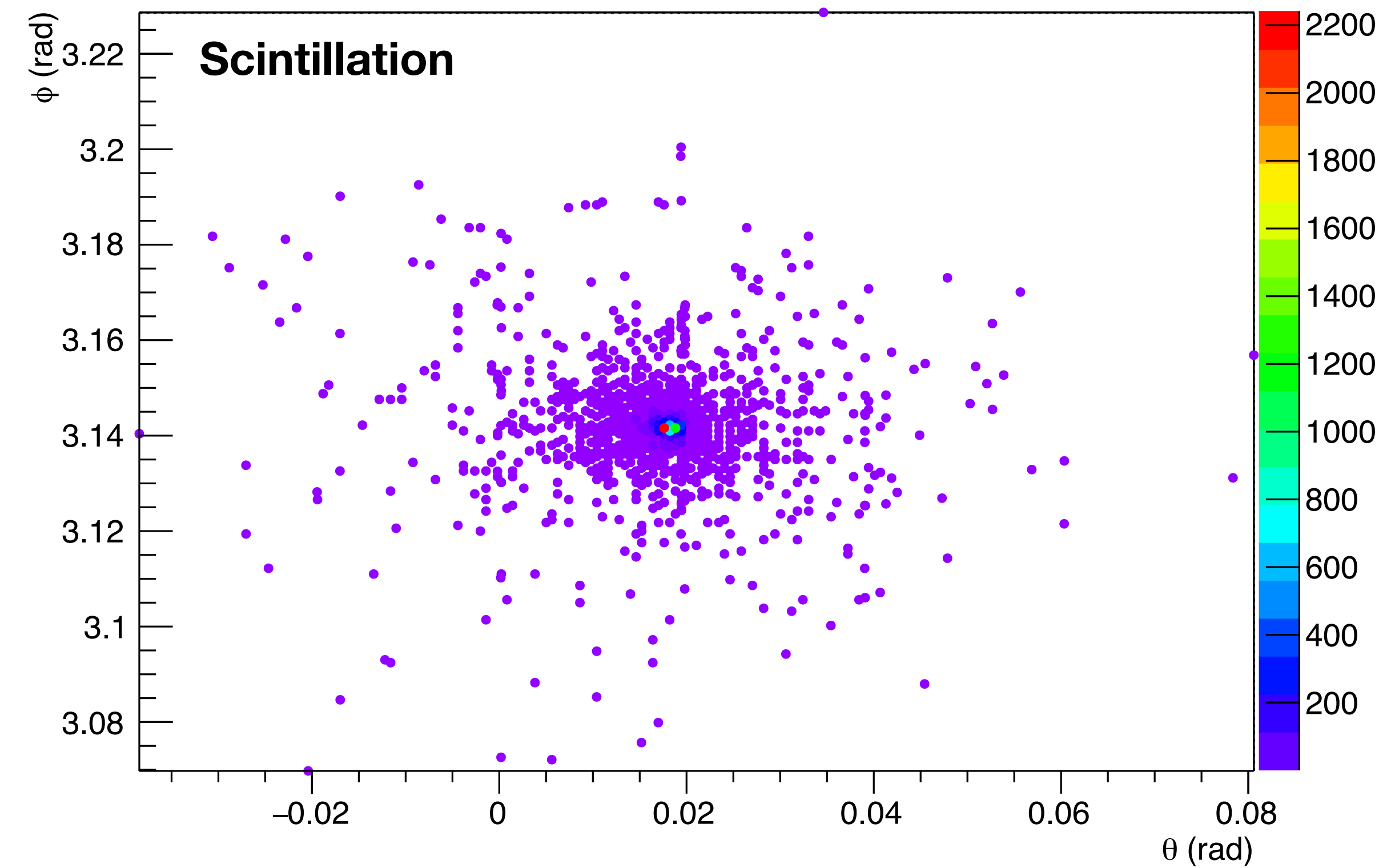
Preliminary results

Lorenzo Pezzotti

IDEA Dual-Readout meeting - 10/7/2020

- Goal: exploit the millimetrical 2D spatial resolution available when the signal from each fiber is independently sampled. Addressing: shower dimension ( $\Delta R$ ), number of hit fibers, signals distributions and angular resolution.

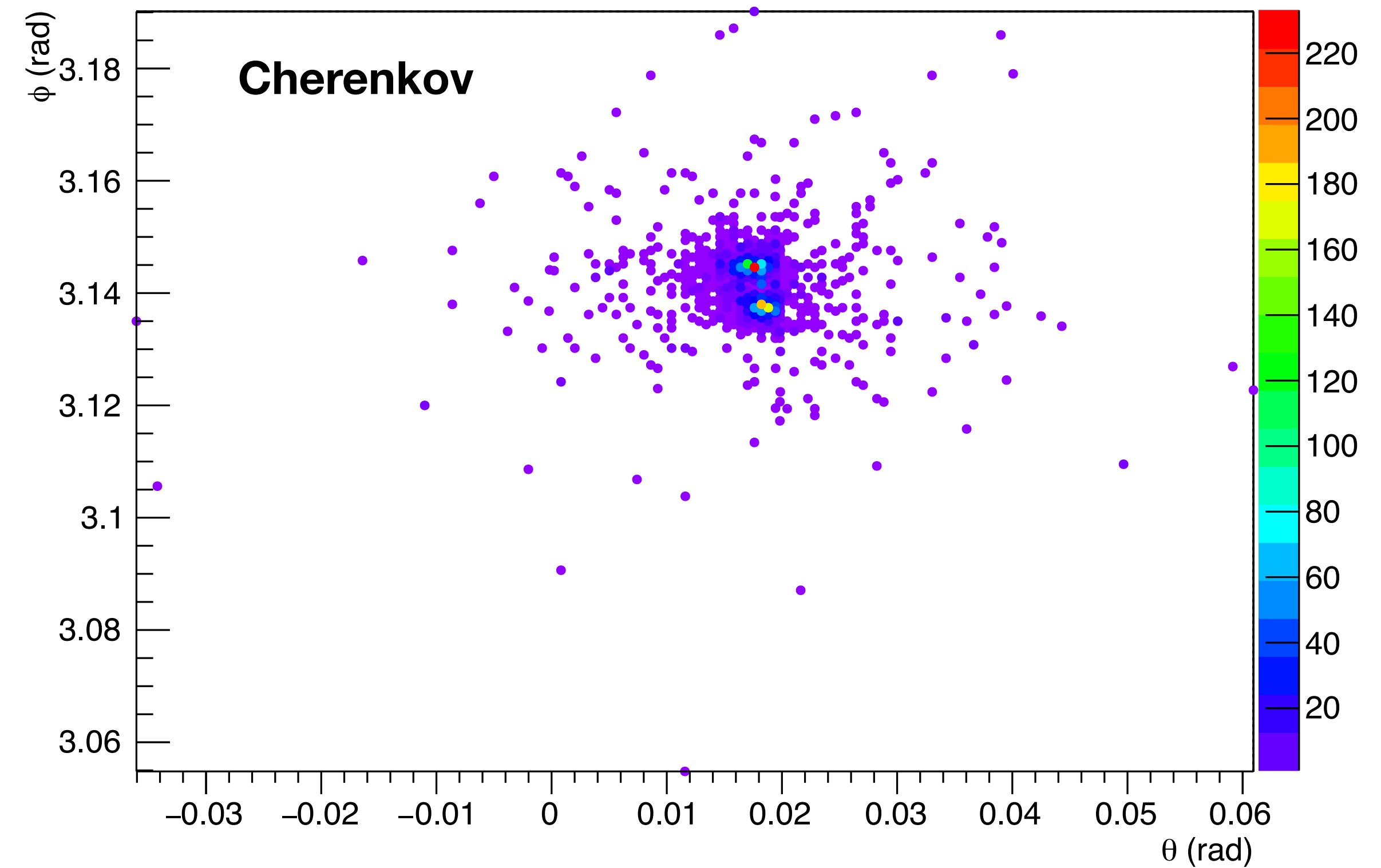
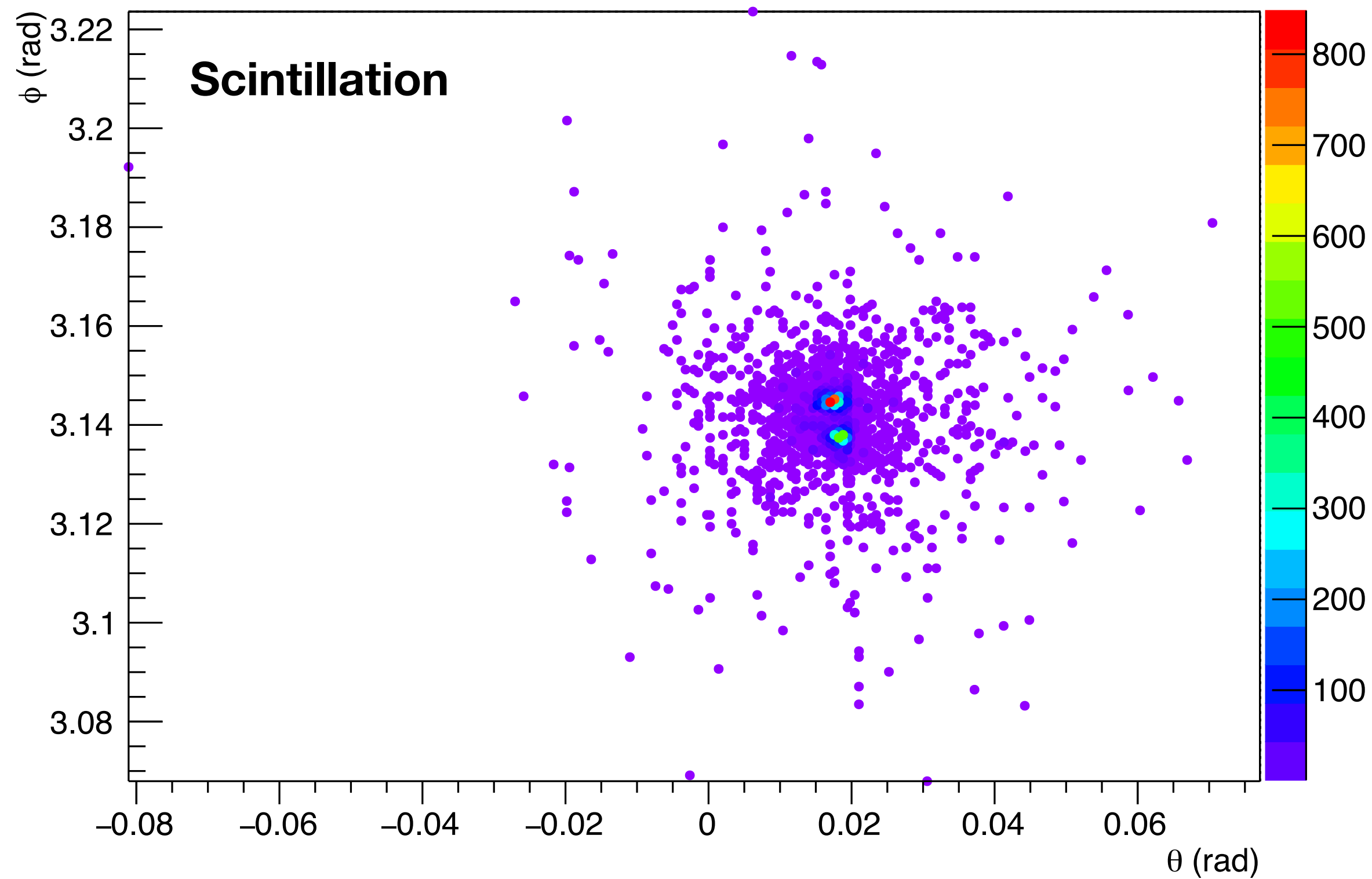
Event display from 40 GeV **electron** shot at  $(\theta, \phi) = (1 \text{ deg}, 180 \text{ deg})$ . Signals are photo-electrons (p.e.)



**Fiber dimension not to scale**

- Goal: exploit the millimetrical 2D spatial resolution available when the signal from each fiber is independently sampled. Addressing: shower dimensione ( $\Delta R$ ), number of hit fibers, signals distributions and angular resolution.

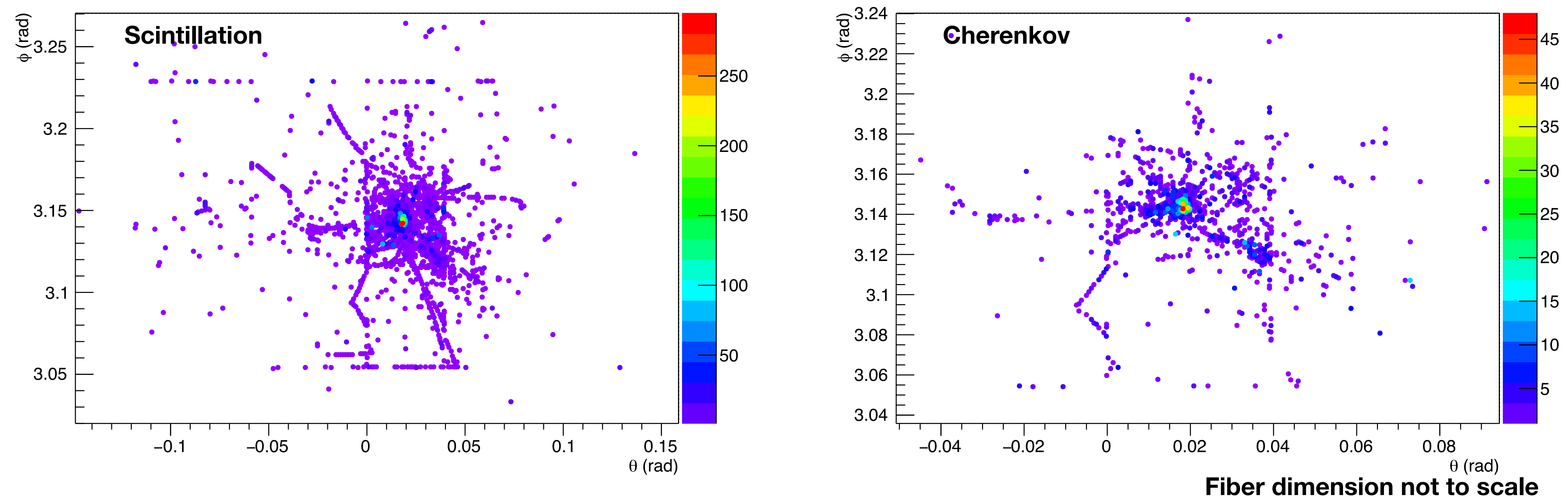
Event display from 40 GeV **neutral pion** shot at  $(\theta, \phi) = (1 \text{ deg}, 180 \text{ deg})$ . Signals are photo-electrons (p.e.)



Fiber dimension not to scale

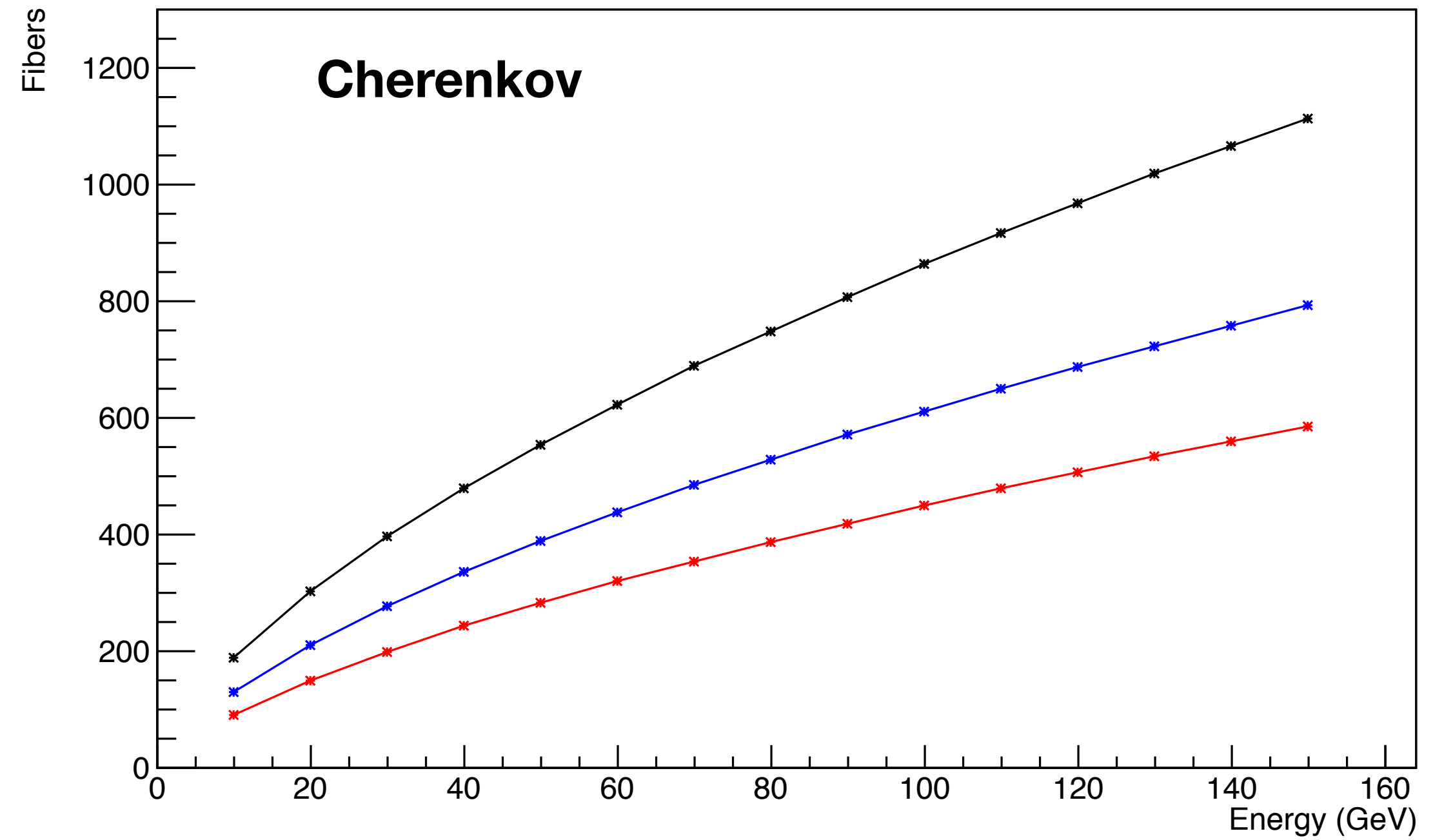
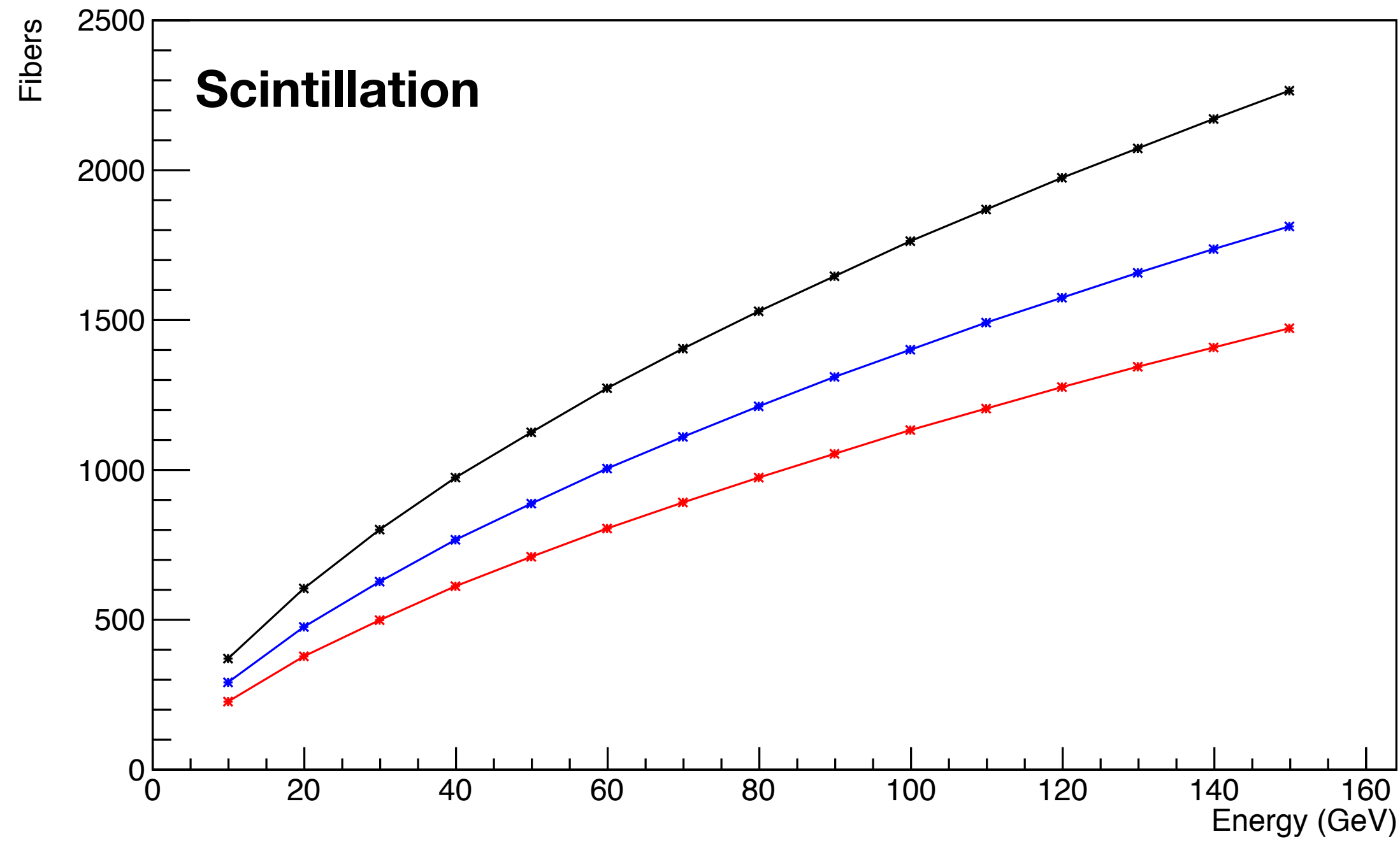
- Goal: exploit the millimetrical 2D spatial resolution available when the signal from each fiber is independently sampled. Addressing: shower dimensione ( $\Delta R$ ), number of hit fibers, signals distributions and angular resolution.

Event display from 40 GeV **charged pion** shot at  $(\theta, \phi) = (1 \text{ deg}, 180 \text{ deg})$ . Signals are photo-electrons (p.e.)



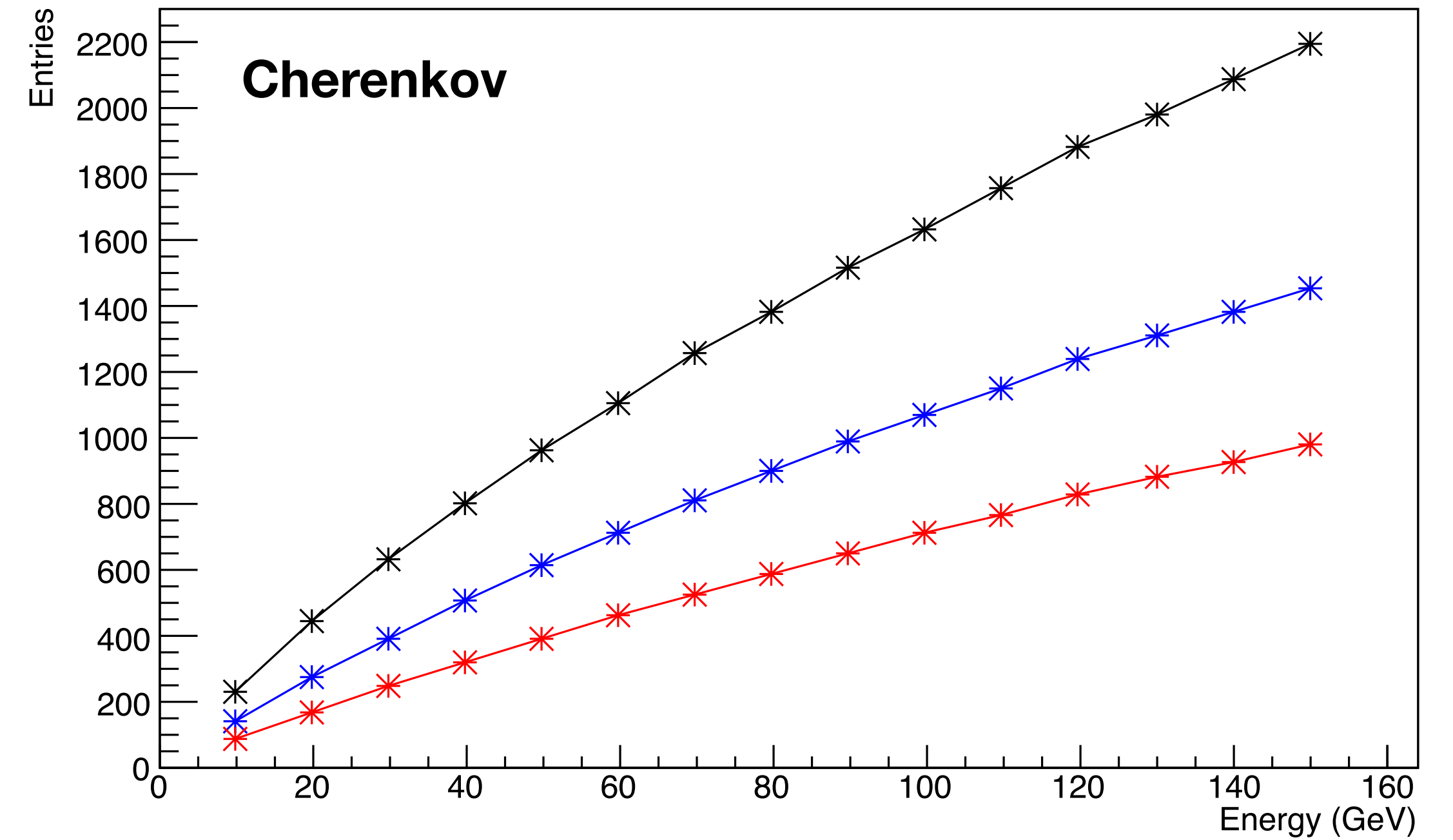
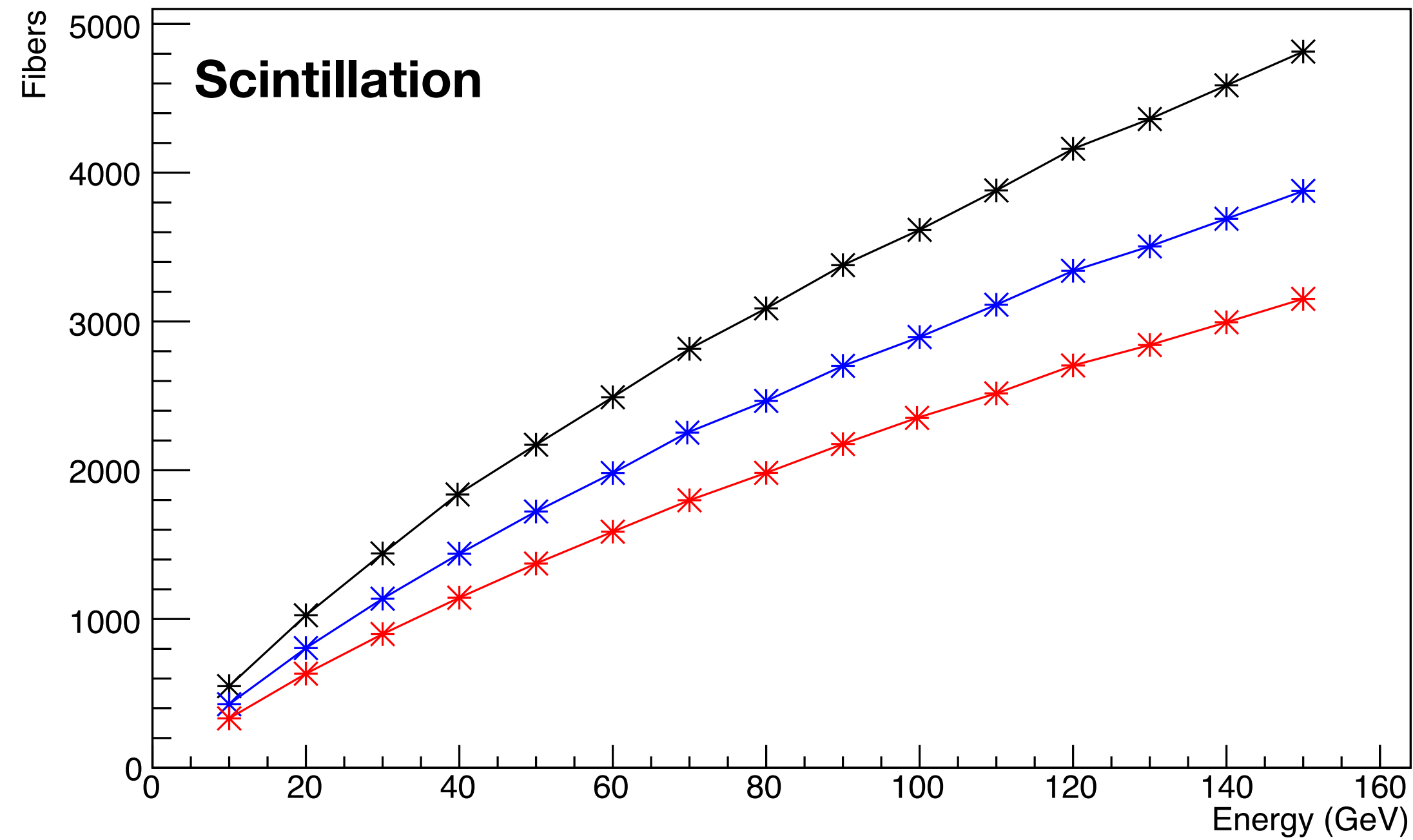
# Average number of hit fibers

- Results for **electrons** when applying 0-suppression, 1-suppression or 2-suppression.



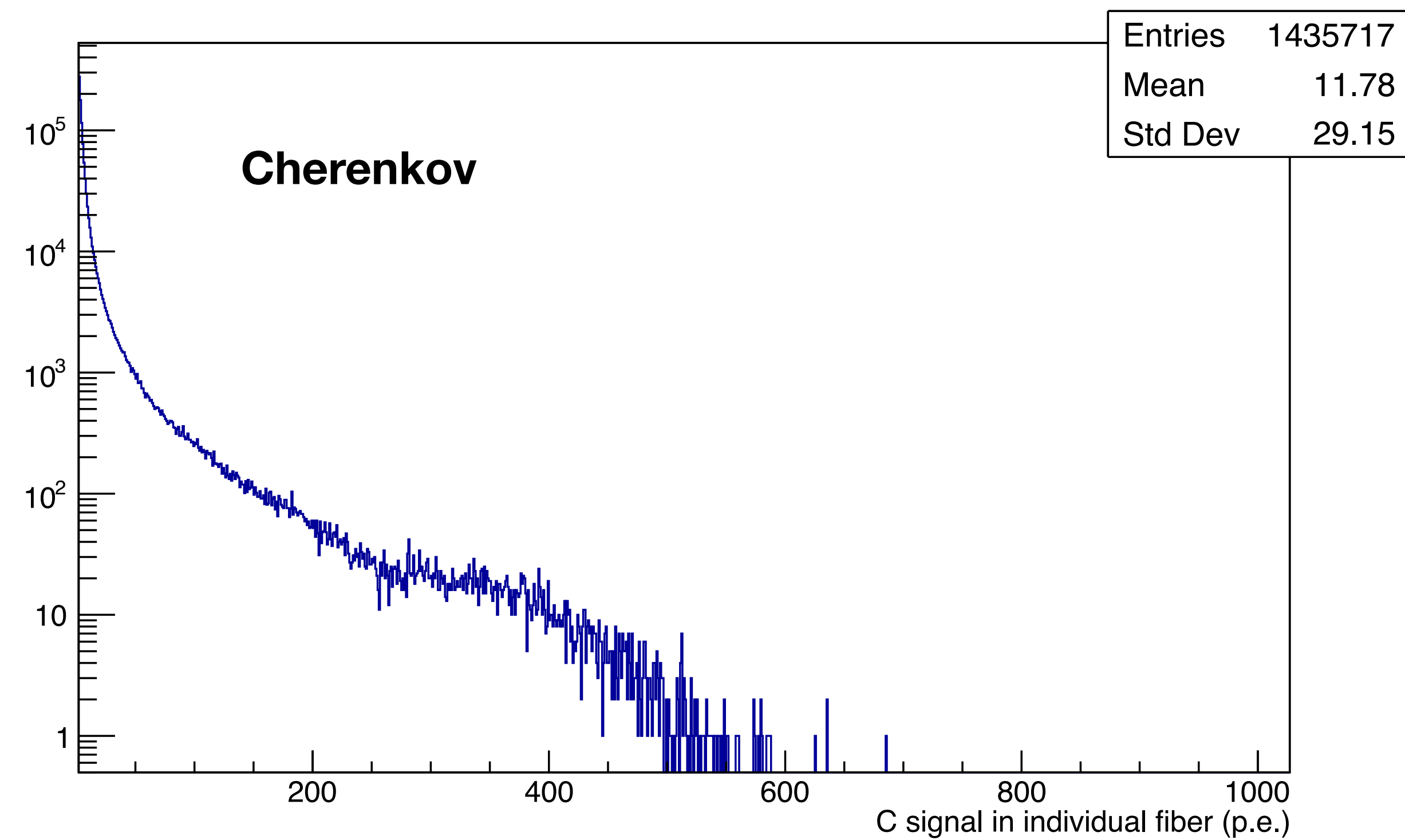
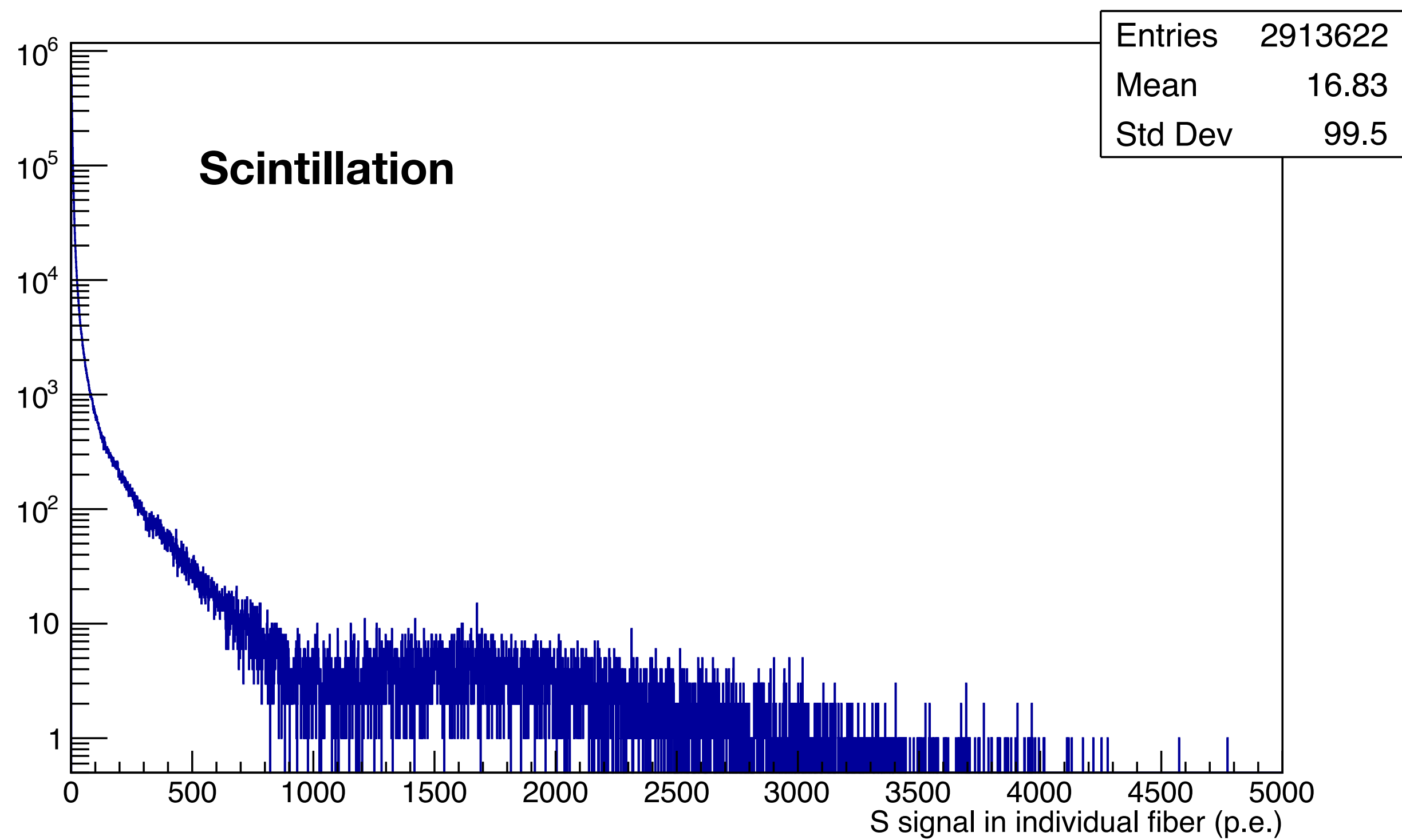
# Average number of hit fibers

- Results for **charged pion** when applying 0-suppression, 1-suppression or 2-suppression.



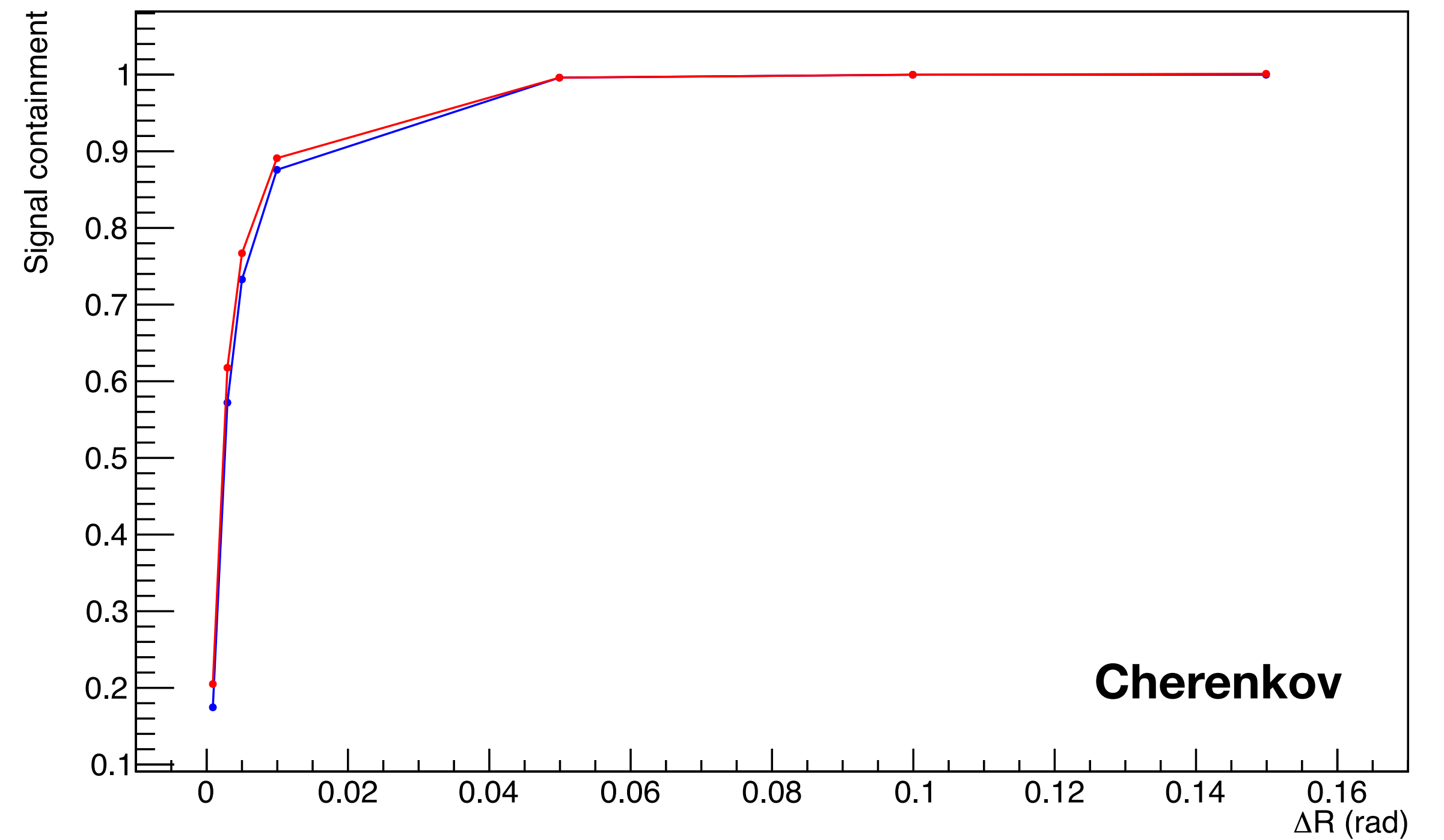
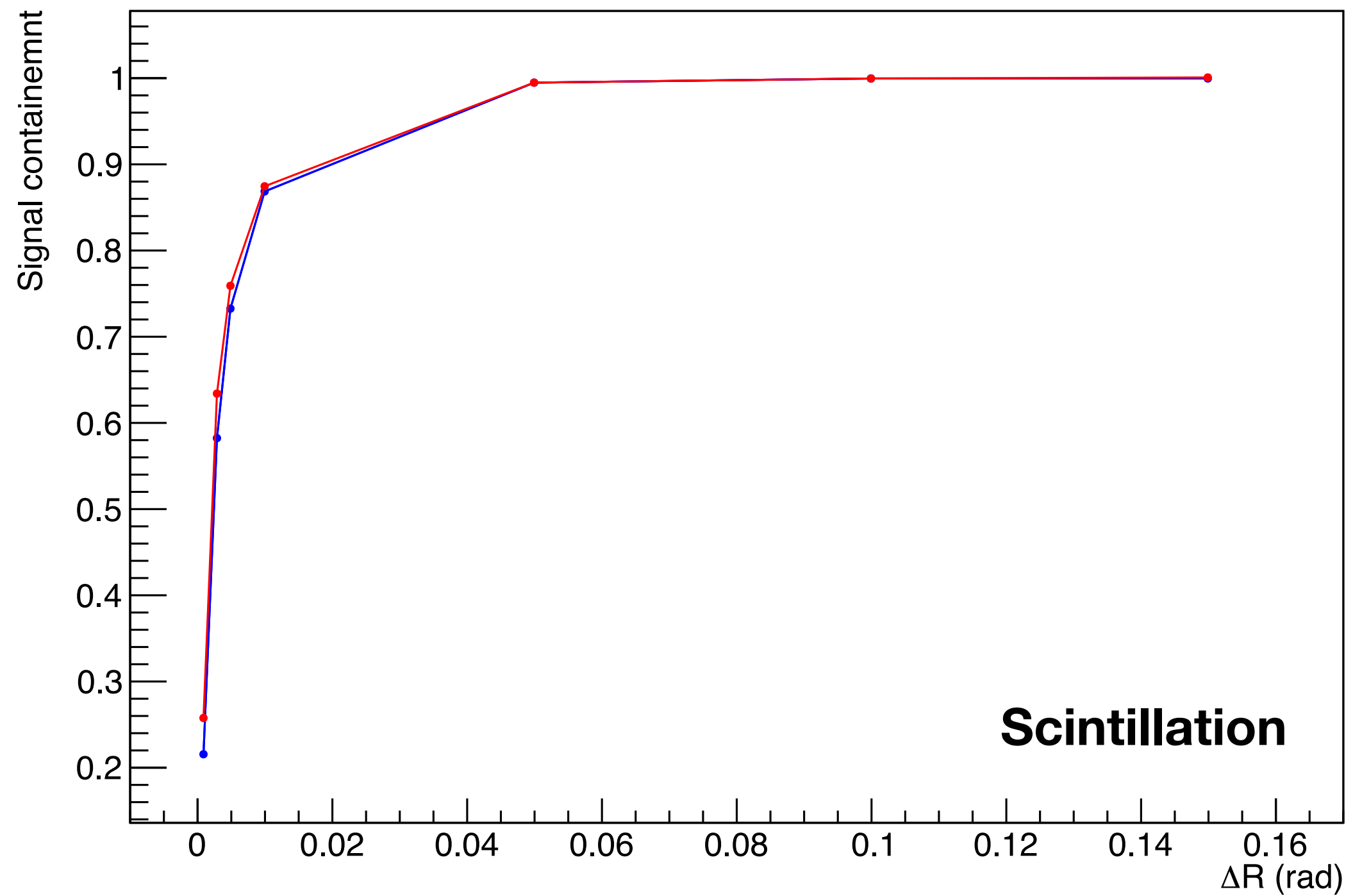
# Signals Distribution

- Results for 3000 events of 40 GeV **electrons**.  
Scintillation light yield is 410 p.e./GeV and Cherenkov light yield is 103 p.e./GeV.



# Shower containment ( $\Delta R$ )

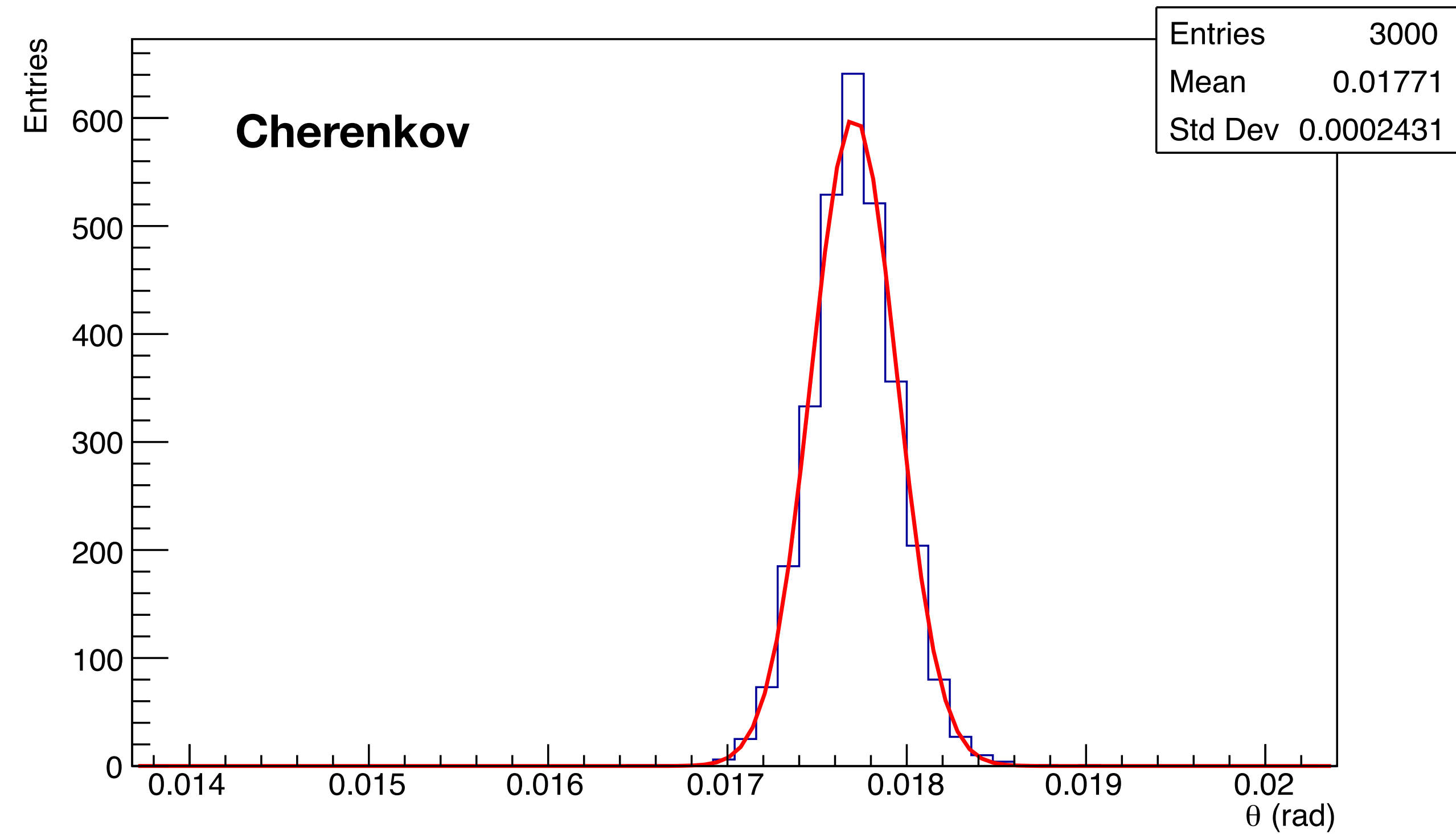
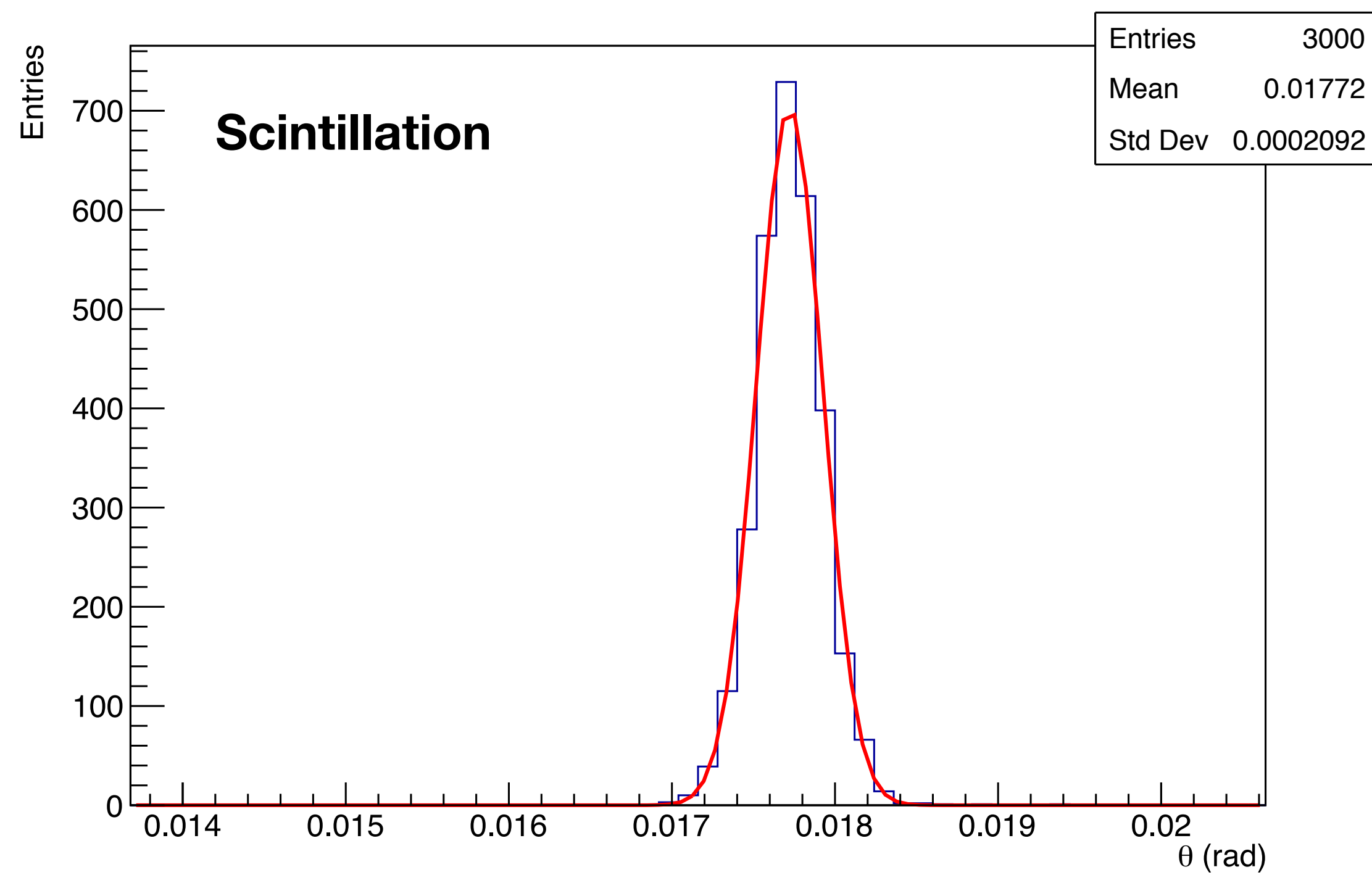
- Results for 3000 events of 10 GeV electrons and 150 GeV electrons.





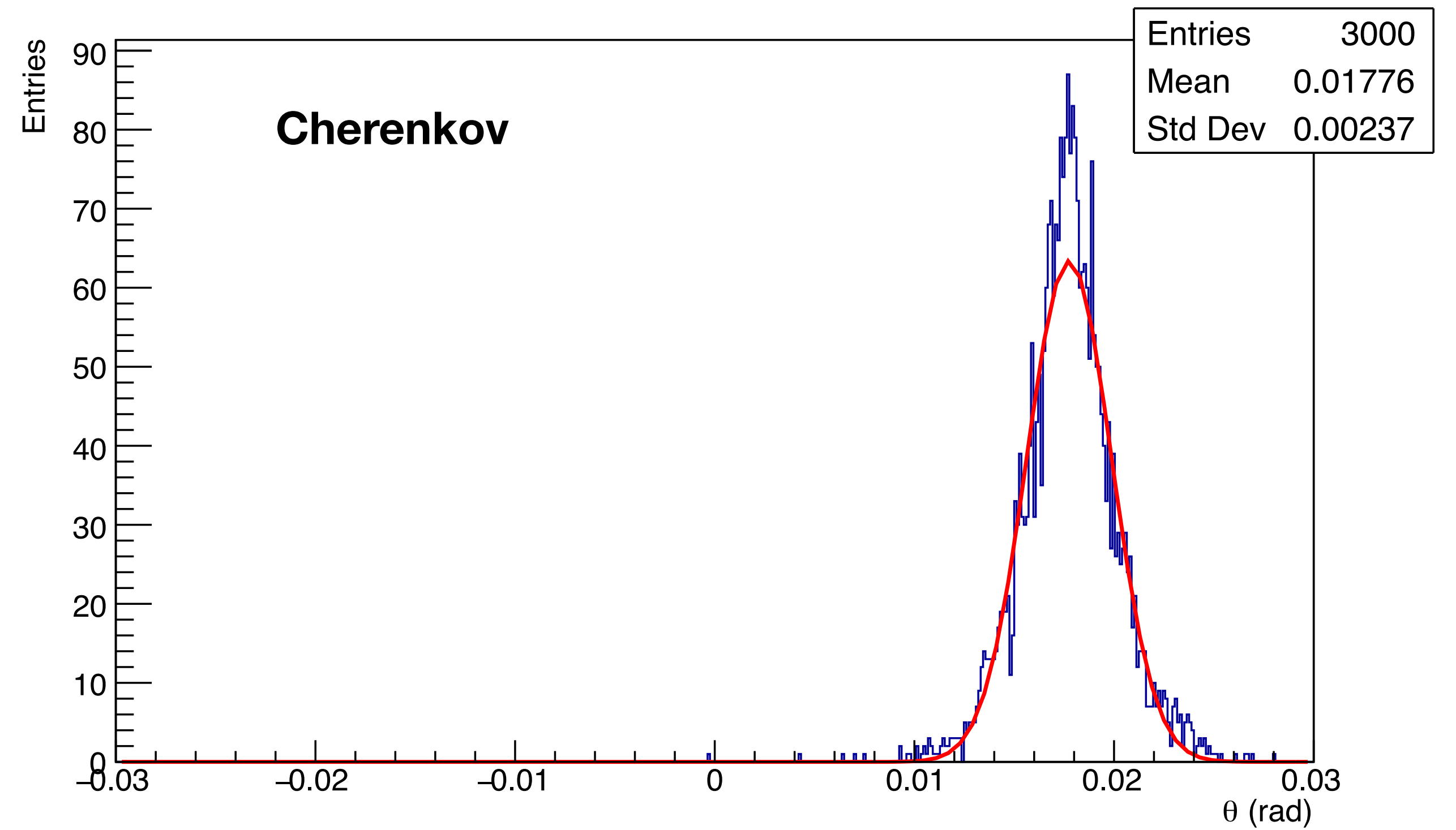
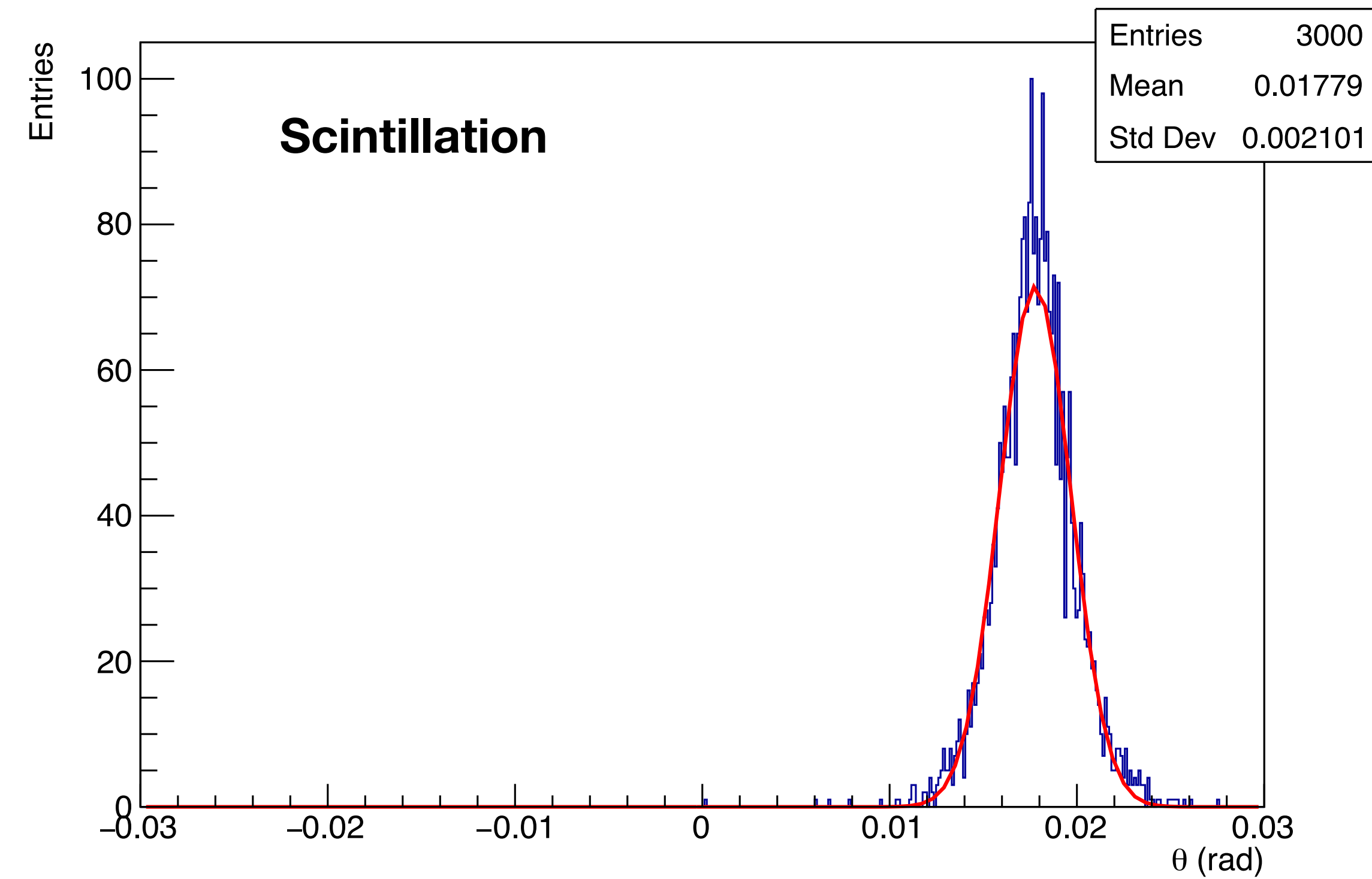
# Angle reconstruction

- Results for 3000 events of 40 GeV **electrons** shot at  $(\theta, \phi) = (1 \text{ deg}, 1 \text{ deg})$



# Angle reconstruction

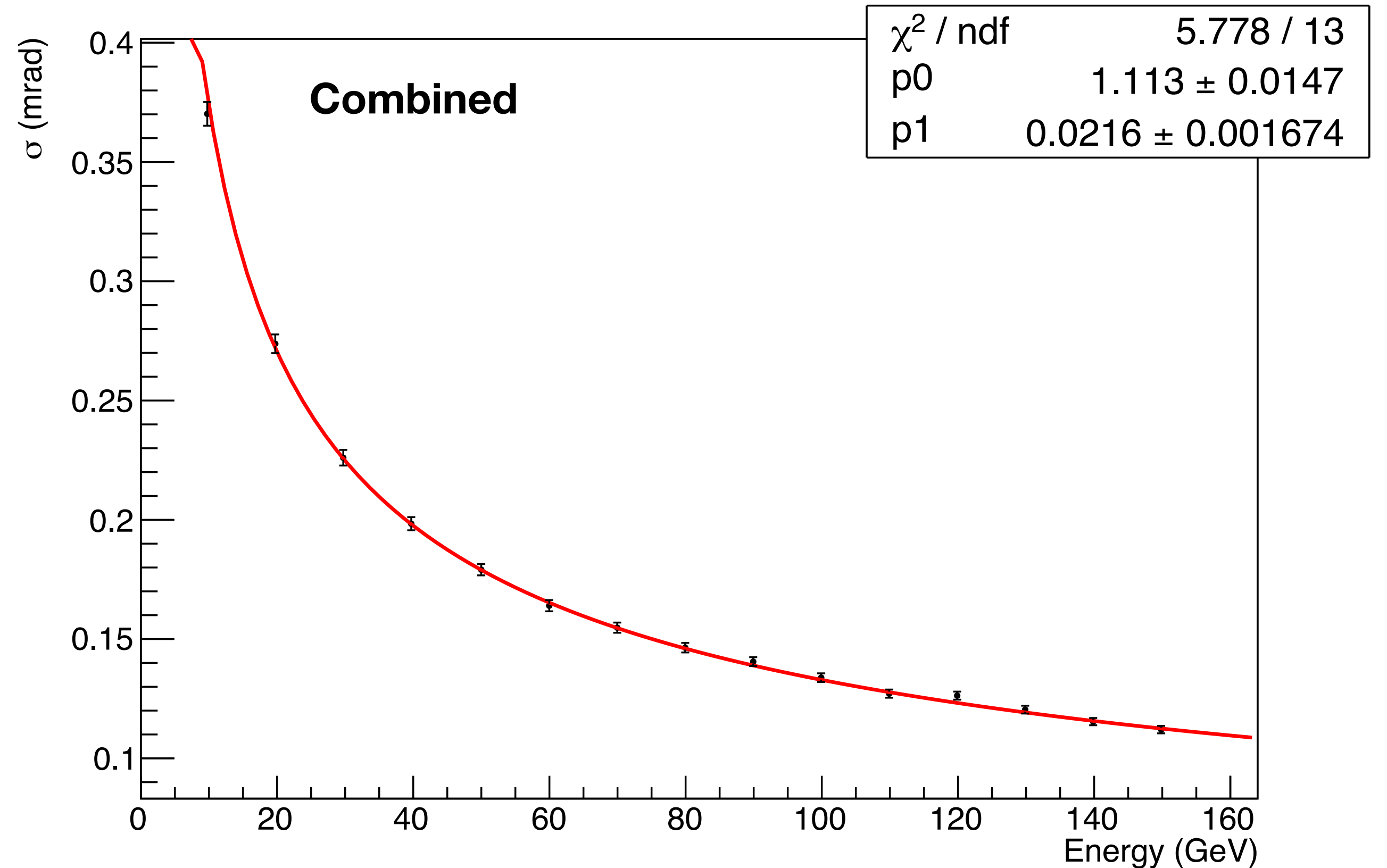
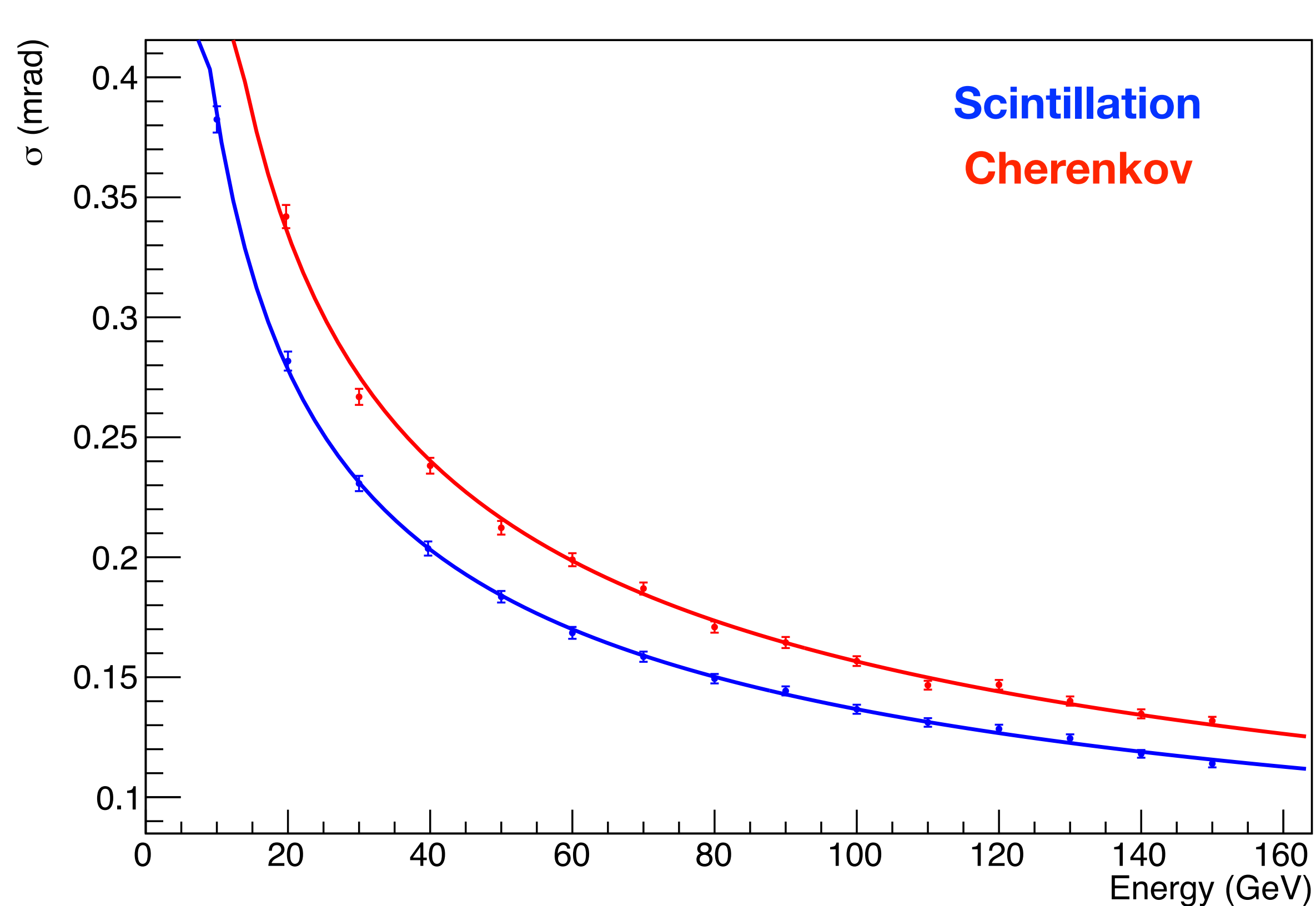
- Results for 3000 events of 40 GeV **charged pions** shot at  $(\theta, \phi) = (1 \text{ deg}, 1 \text{ deg})$   
Angular resolution for charged hadrons is about a factor 10 worse than the electron one.



# Angular resolution

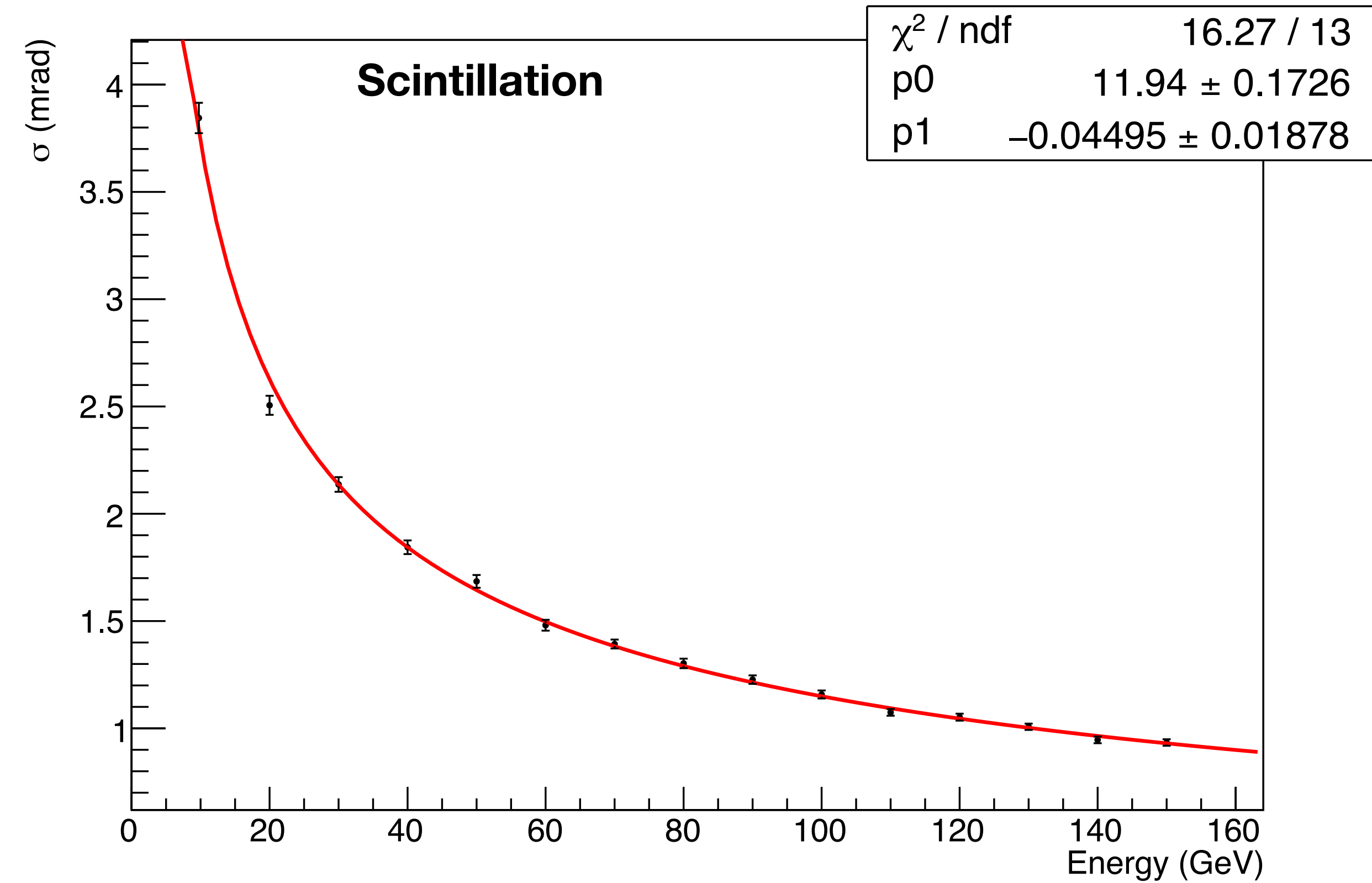
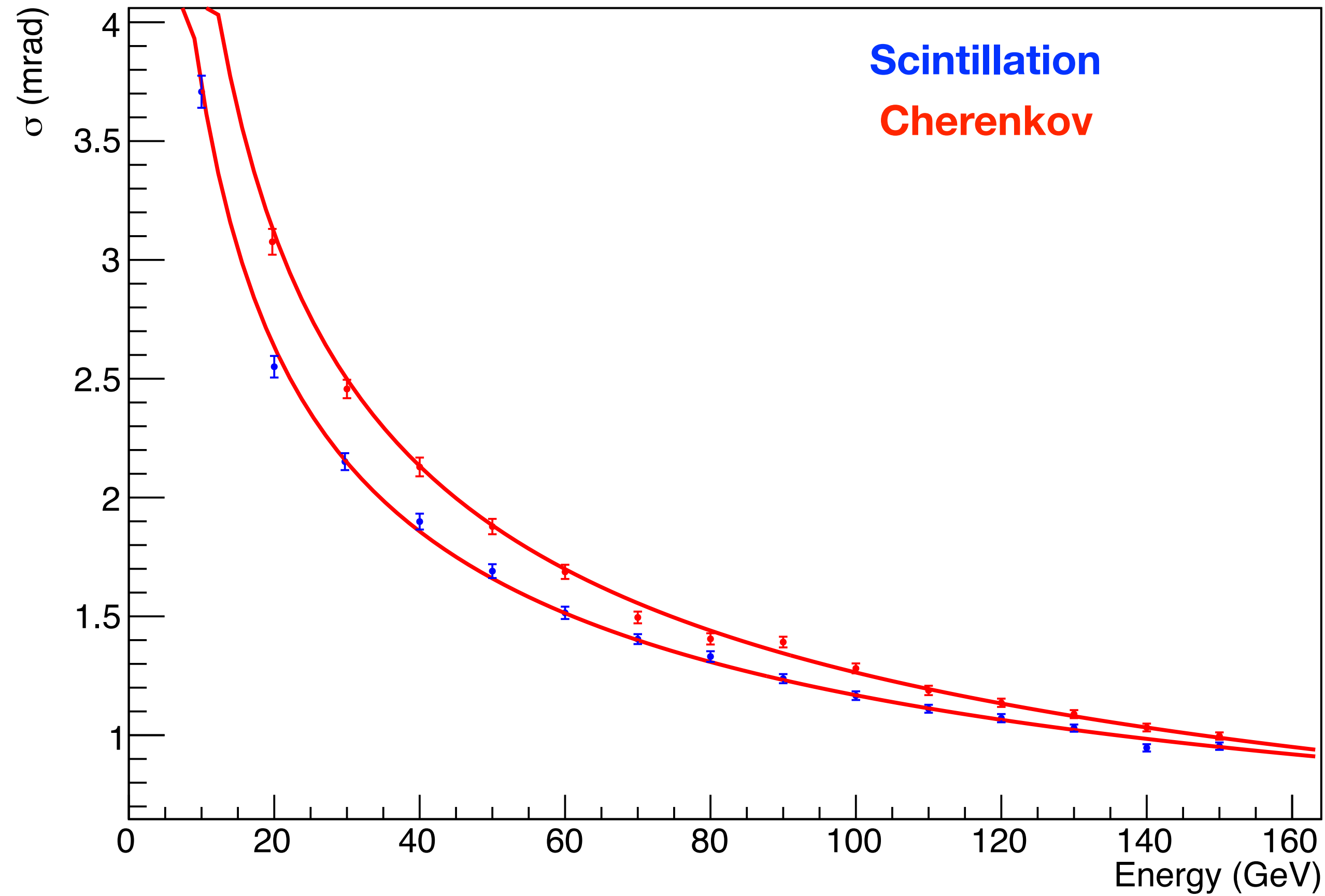
- Using 3000 **electron** events, and  $\theta$  expressed in mrad. Similar resolution found for photons.

$$\sigma = \frac{1.1}{\sqrt{E}} + 0.02$$



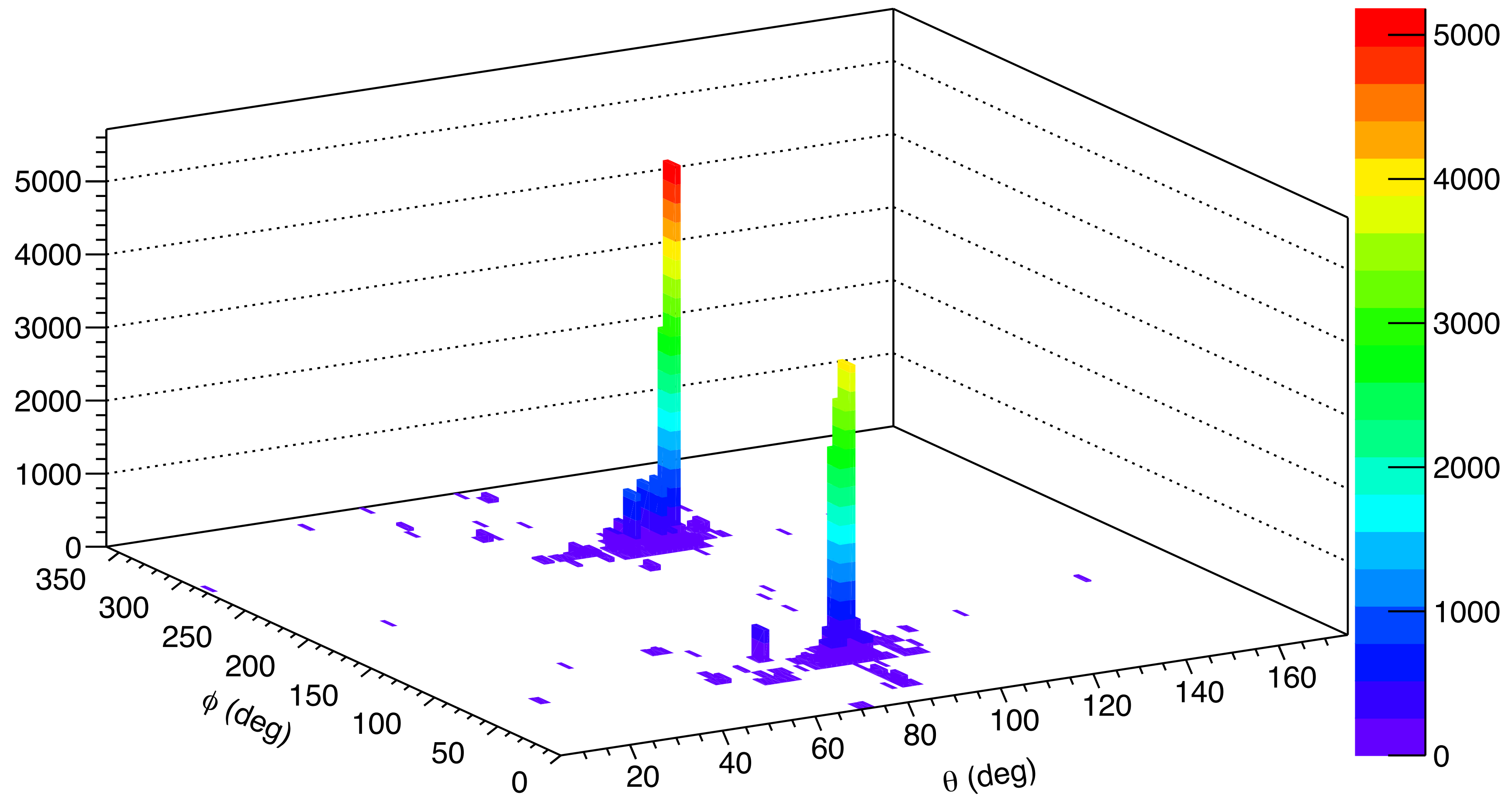
# Angular resolution

- Using 3000 **charged pions** events, and  $\theta$  expressed in mrad.  $\sigma = \frac{11.9}{\sqrt{E}}$



# Jets

- 2j event at 90 GeV. Event display with TOWER GRANULARITY. About 100 entries used as input to fastjet.



# Jets

- 2j event at 90 GeV. Results with SINGLE FIBER GRANULARITY. About 3500 entries -> **A proto-clustering** step before the fastjet is needed.

