

Study of Energy Deposition in Hight Rate Calorimeter (PbWO4 Crystals Vs W Sci Fi)

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- Energy deposition in PbWO₄ crystal Calorimeter
- Geometry Design of W SciFi Calorimeter (In Progress)
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Introduction

- High Rate Calorimeters are being studied using DD4hep/epic tools.
- >> PbWO4 crystal calorimeter is simulated first for reference
- >> Two different sizes are under consideration: 10cm x 10cm x 20cm and 12cm x 12cm x 24cm
- >> Simulations of Baseline W/SciFi Calorimeter are being prepared too
- >> Study of Energy depositions in Fibers is in Progress

A Simulation Framework based on dd4hep Detector description toolkit

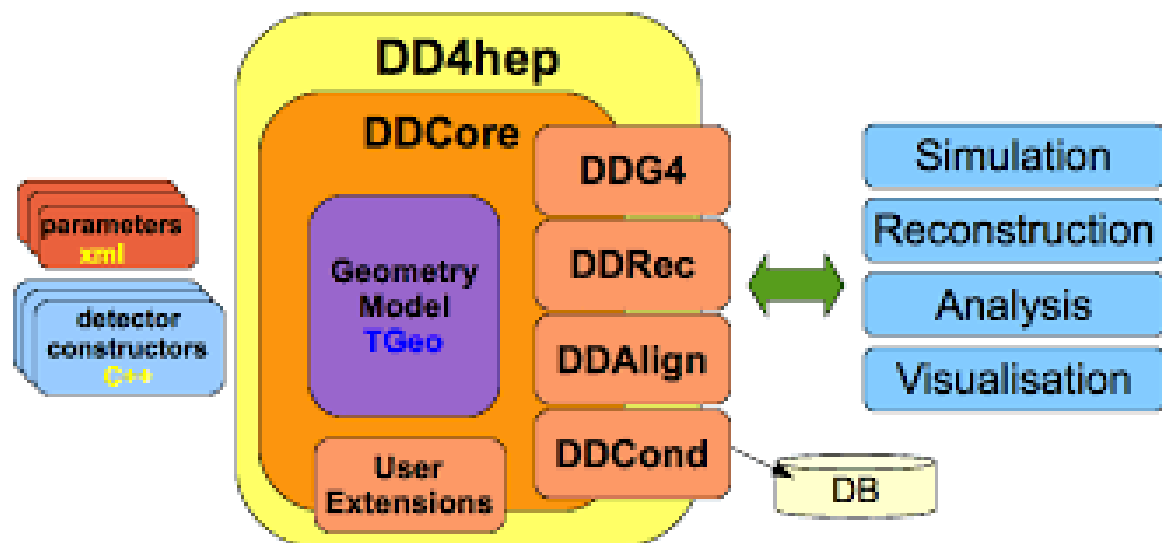
ROOT Macro for analysis/plotting (.edm4hep.root)

**DD4hep based
Geometry Design**

ddsim (Simulation)

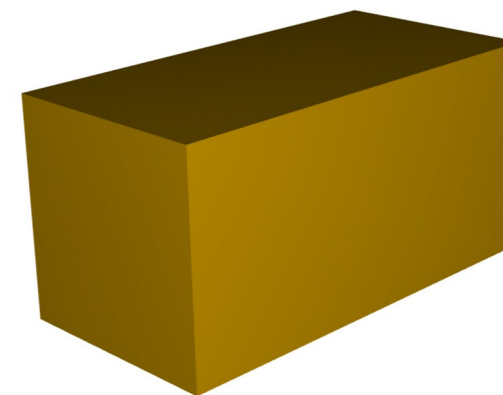
(eicrecon)reconstruction

Analysis – eicrecon.root

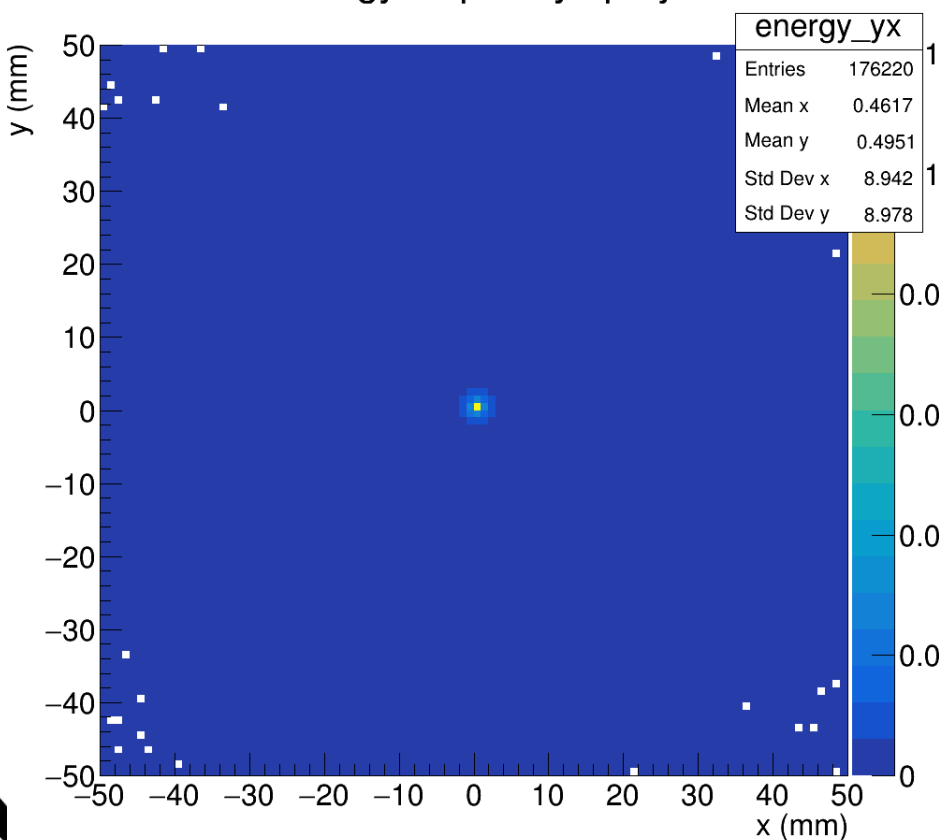


Energy Deposition in PbWO4 Calorimeter

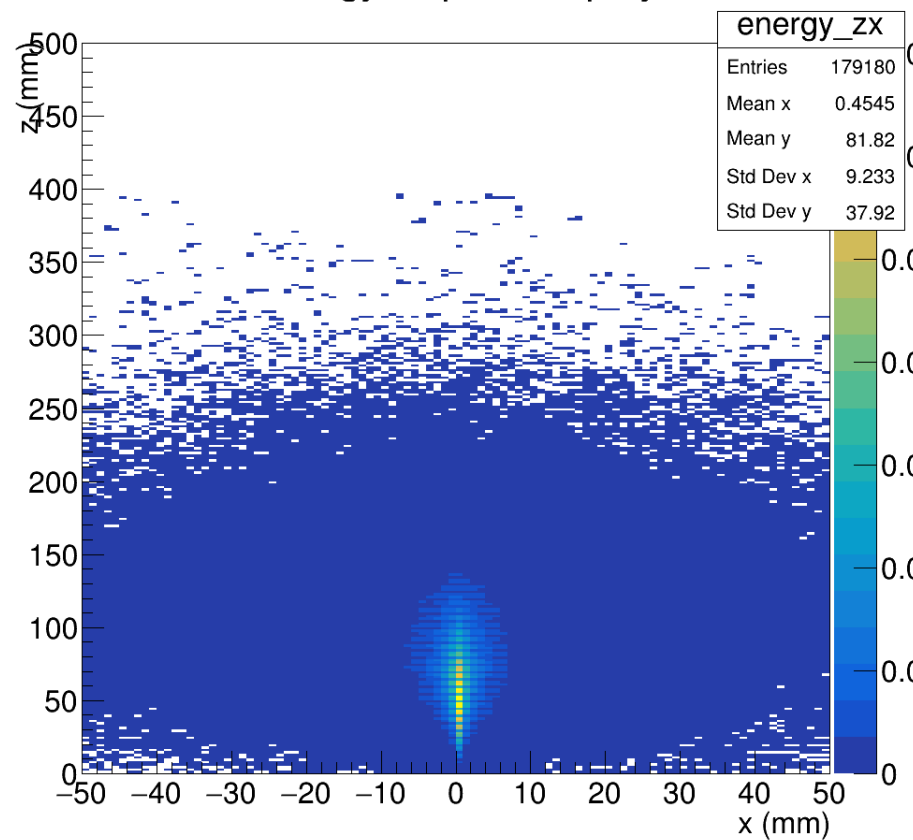
- 10 GeV Photon Gun (1000 Events) - 10cm x 10cm x 20cm



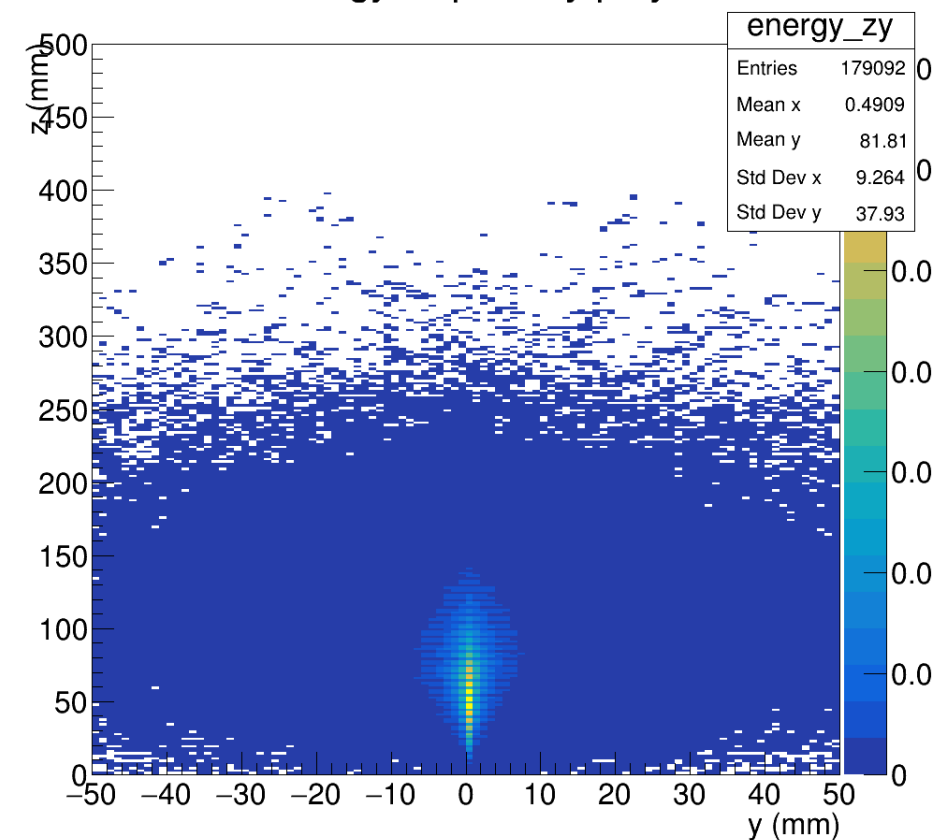
Total Energy Deposit yx projection



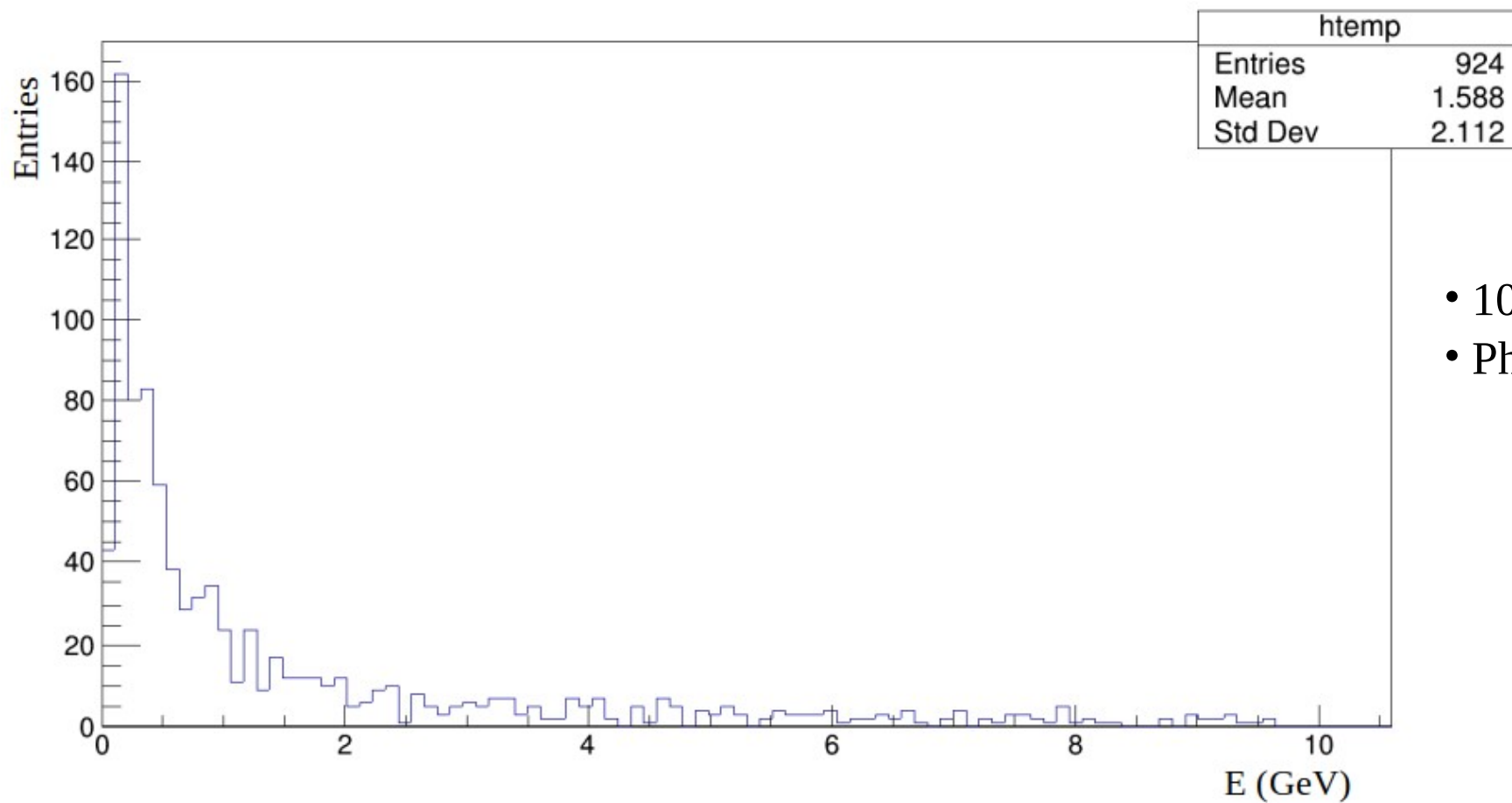
Total Energy Deposit zx projection



Total Energy Deposit zy projection



Bremsstrahlung Photon energy distribution



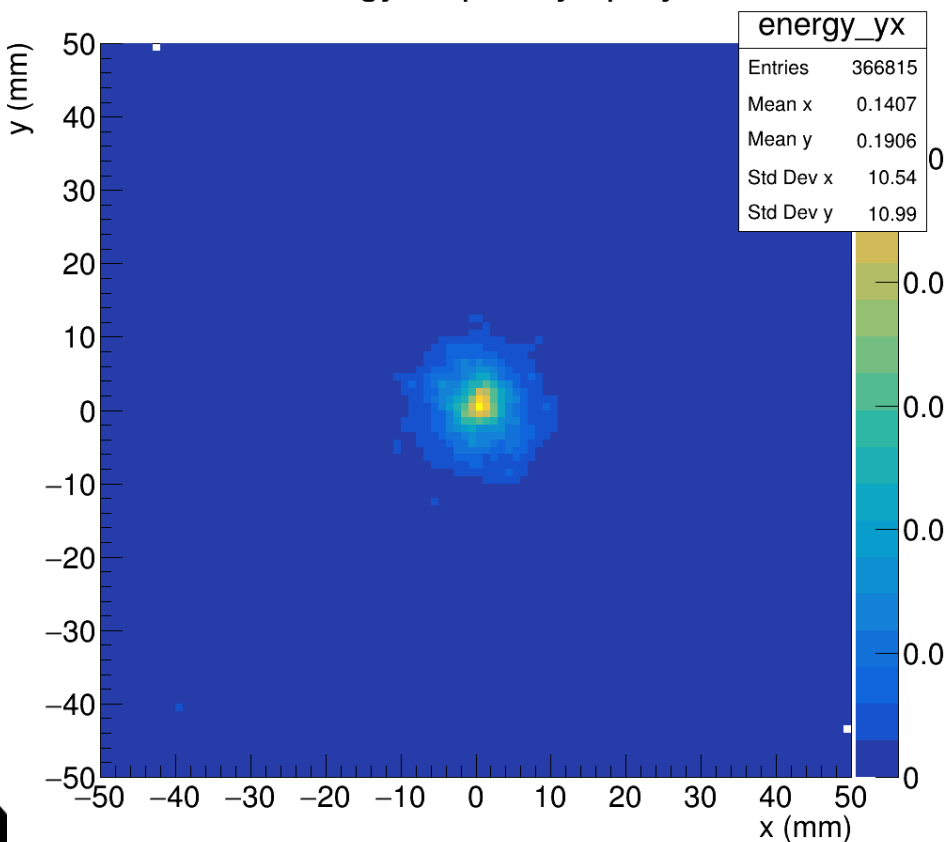
- 1000 bremsstrahlung events
- Photon energy of 100 MeV

Energy Deposition in PbWO4 Calorimeter using Bremsstrahlung Events

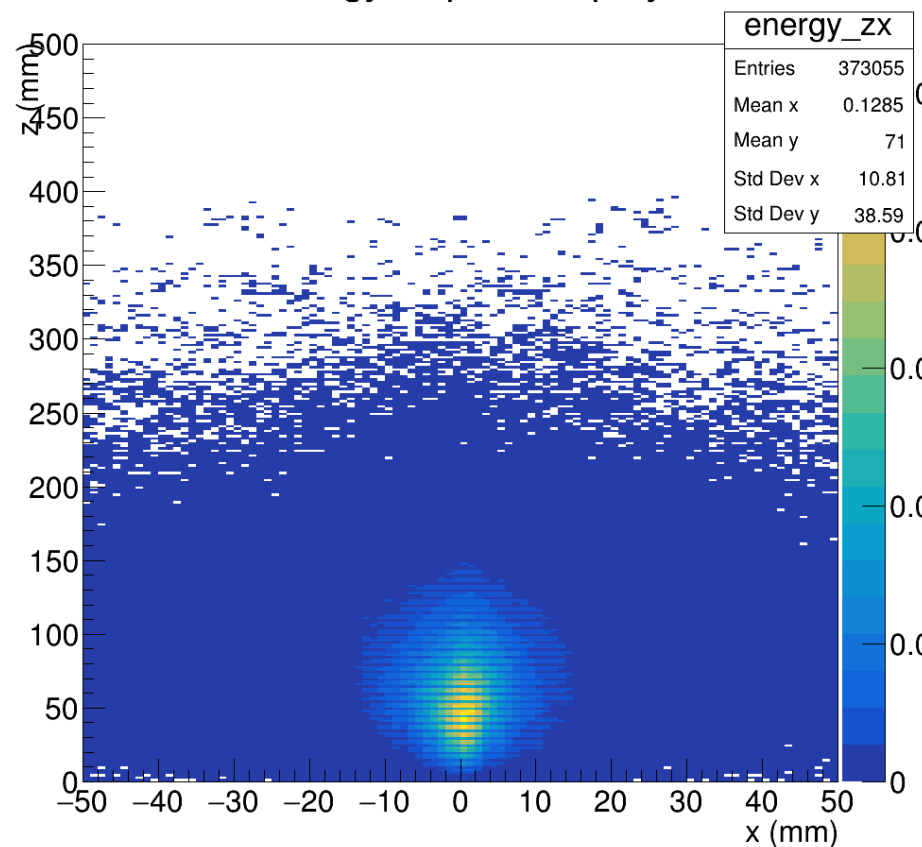
1000 bremsstrahlung events

10 GeV electrons, - Minimum Photon energy of 100 MeV - 10cm x 10cm x 20cm

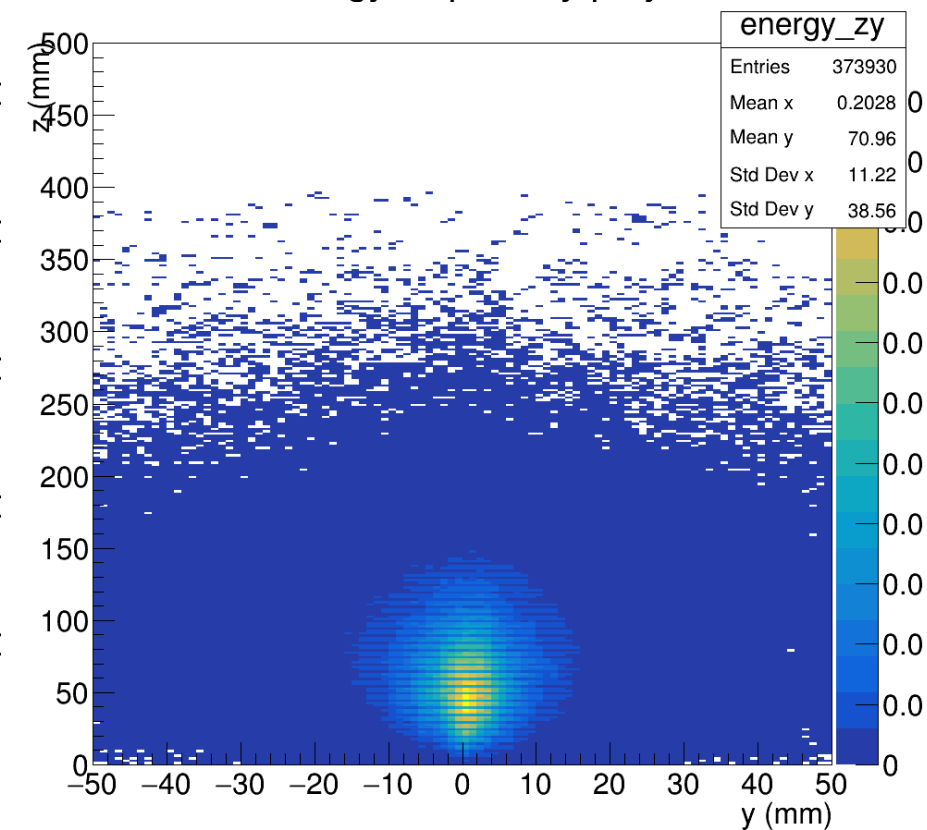
Total Energy Deposit yx projection



Total Energy Deposit zx projection

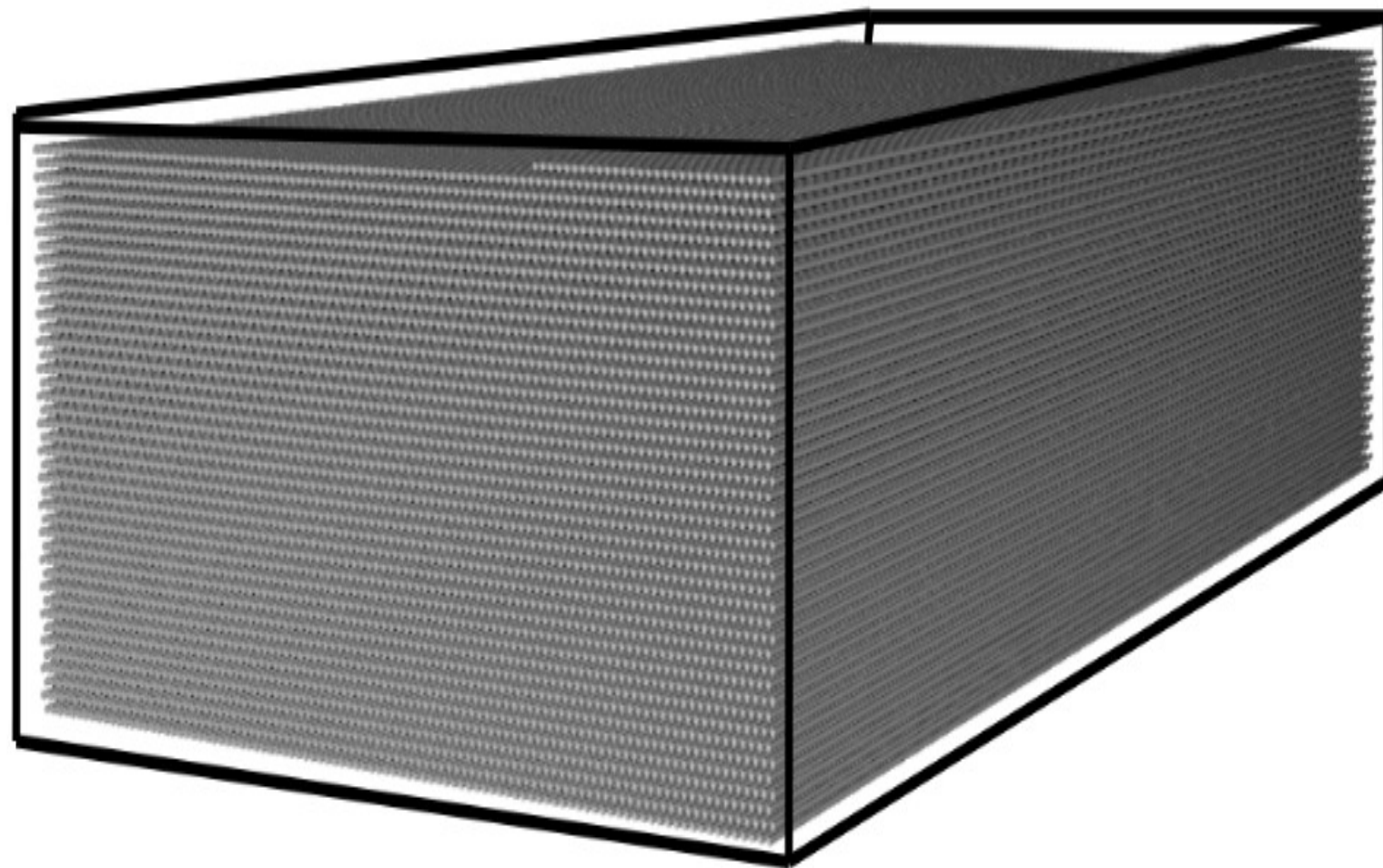


Total Energy Deposit zy projection



Geometry Design of W SciFi - Calorimeter in Progress

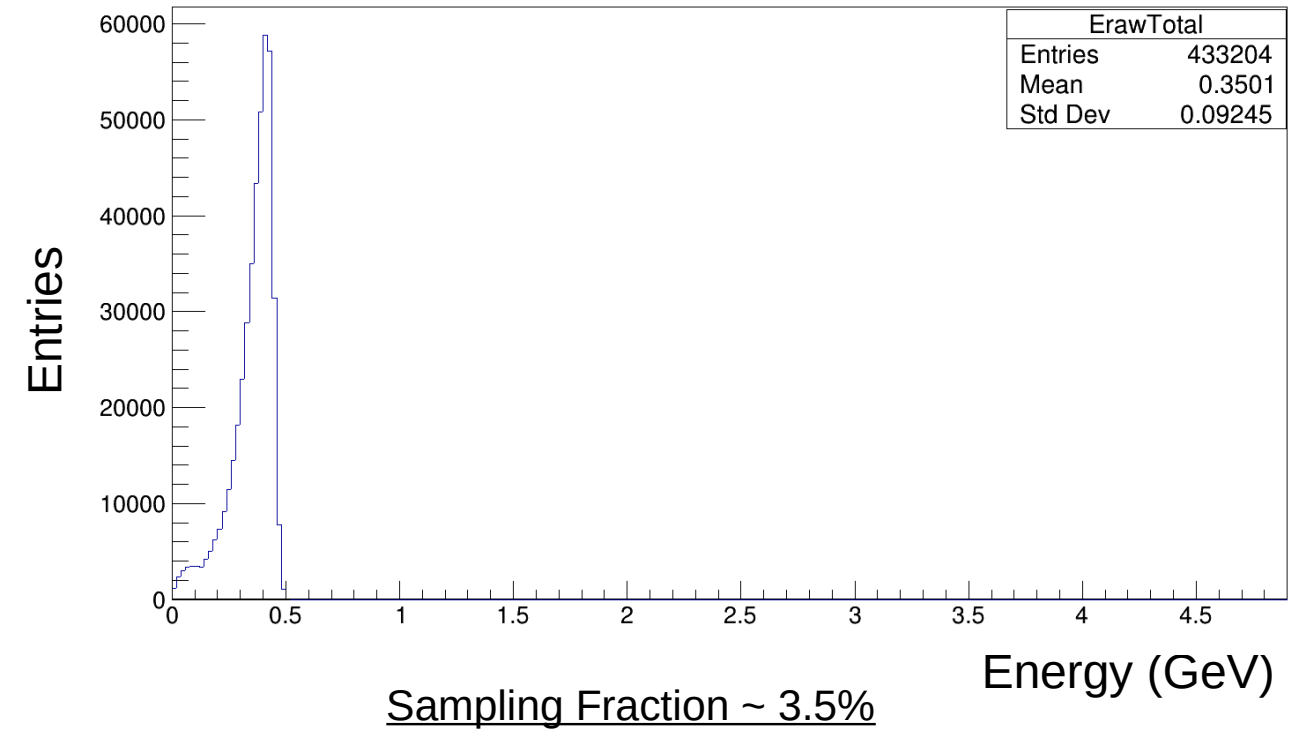
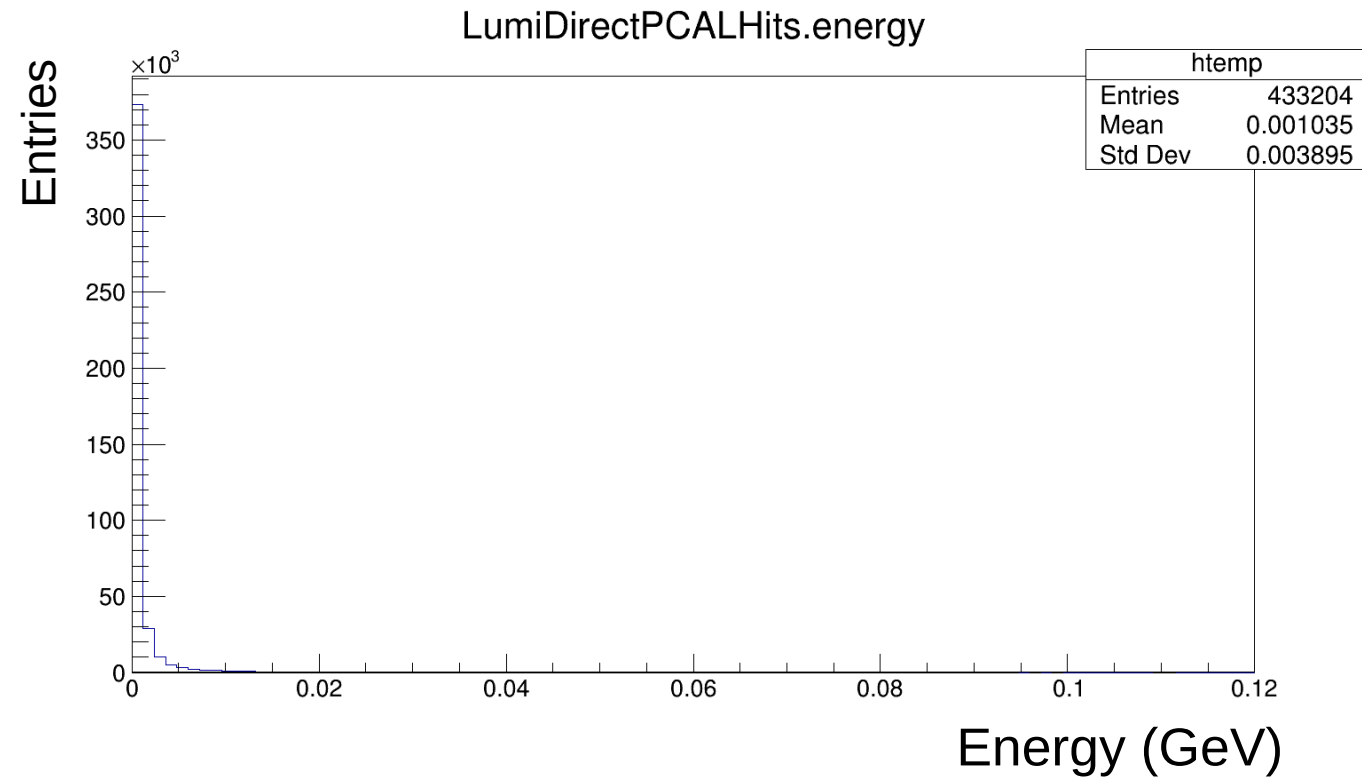
- >> Active Layer : Fiber (1mm)
- >> Absorbing Layer: Tungsten
 - Fibers are placed in a honeycomb and each fiber is fully contained in a regular hexagon



Simulation Distributions:

- 10 GeV Photons (1000 Events)
- 0.44 GeV energy deposited per event in the active layer (SciFi)
- 9.56 GeV energy deposited in absorber Layer (Tungsten)

- 0.001035 GeV avg energy per hit
- 433204 hits for 1000 events
- only 0.44 GeV energy deposition per event



Thank You!