

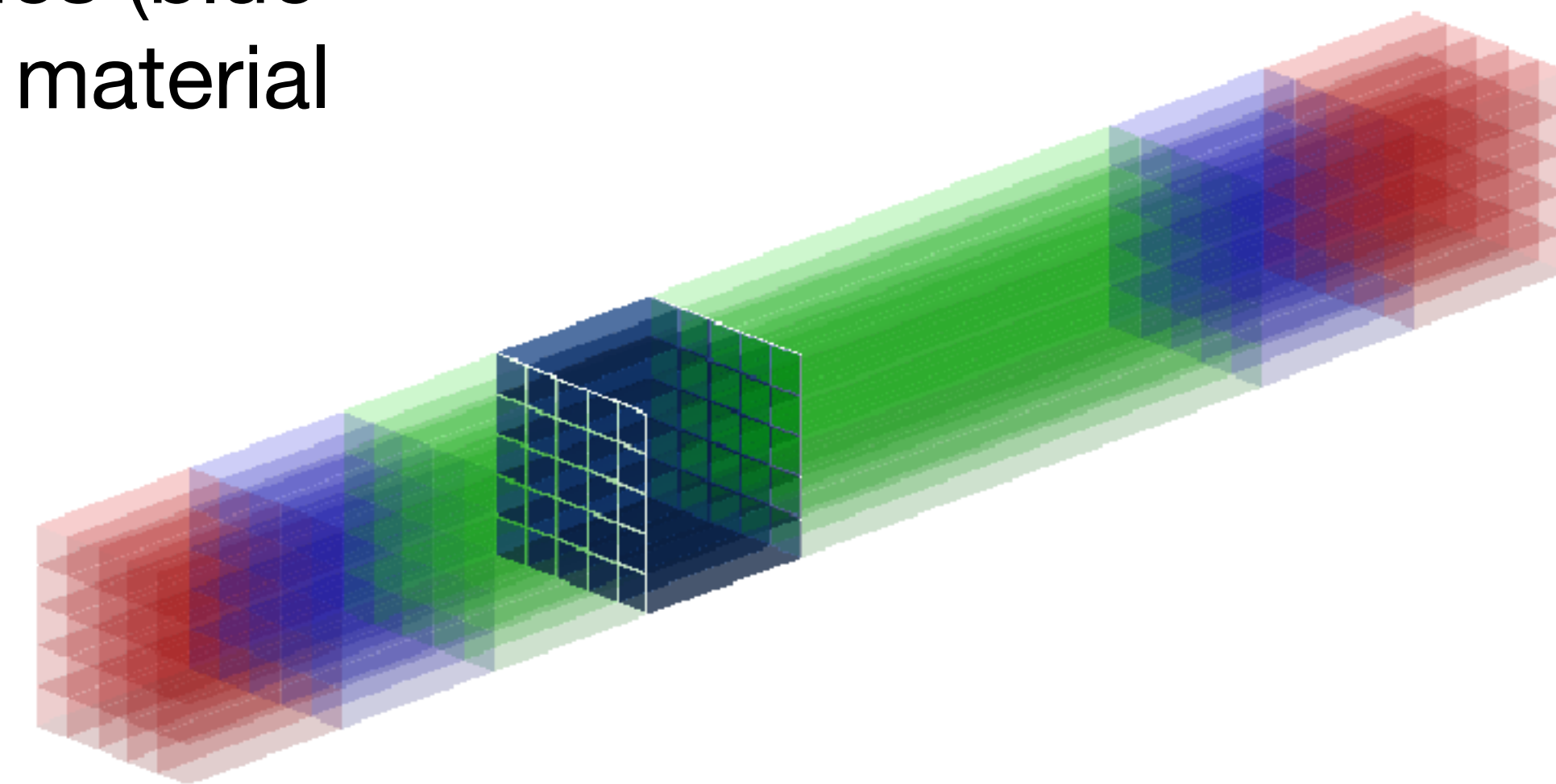
CalVision: Crystal Calorimeter

Adding Silicone Cookies

Nov 25, 2024

General Information

- Material added:
 1. Silicone cookies between crystal and the photodetectors (at the two ends)
 2. Polystyrene for the mat between the two crystals
- Geometry: exaggerated dimension (50 mm) for silicone cookies (blue blocks), photodetectors (red blocks), and Polystyrene for the material between the two crystal segmentation (blocks)
- Used array of 5 PbWO₄ crystals. For the analysis:
 - photodetector thickness = 0.1 mm (as in the xml file);
 - silicone cookies = 1 mm thickness (should be asked)
 - Polystyrene mat between the two crystals = 0.1 mm (should be asked)



Files to Modify to add Cookies

- Files to modify to add the silicone cookies:

1. XML files:

- A. Add material name, matrix properties and segmentation in DRConly.xml;

- B. Define cookie thickness, and material for the **MiddleMat** in SCEPCALConstants.xml

- C. Modify slice material number in SCEPCAL_DRCrystal-twoseg.xml

- D. Add cookie and **MiddleMat** vis in SCEPCAL_ECAL.xml

2. Resolution.C: **mapped** cookies and changed **ecalhit** assignment

ddsim Simulation Spew

Added Air and material between the two crystals with a random thickness

```
DRCrys layer 0xcaf1920 , repeat 0 half thickness = 10.125, z = 0.01
  slice = 1 , half thickness = 0.005, material: killMedia1, placed at -10.12
  slice = 2 , half thickness = 0.05, material: E_Silicone, placed at -10.065
  slice = 3 , half thickness = 2.5, material: E_PbW04, placed at -7.515
  slice = 4 , half thickness = 0.005, material: Air, placed at -5.01
  slice = 5 , half thickness = 0.005, material: DR_Polystyrene, placed at -5
  slice = 6 , half thickness = 0.005, material: Air, placed at -4.99
  slice = 7 , half thickness = 7.5, material: E_PbW04, placed at 2.515
  slice = 8 , half thickness = 0.05, material: E_Silicone, placed at 10.065
  slice = 9 , half thickness = 0.005, material: killMedia1, placed at 10.12
```

Resolution.C Spew

Energy deposition in various number of detector in a random event:

hits Edeposit=9.94437, beamE=10: **sum EDeposit/beamE=0.994437**

cal total energy deposit 8.3436

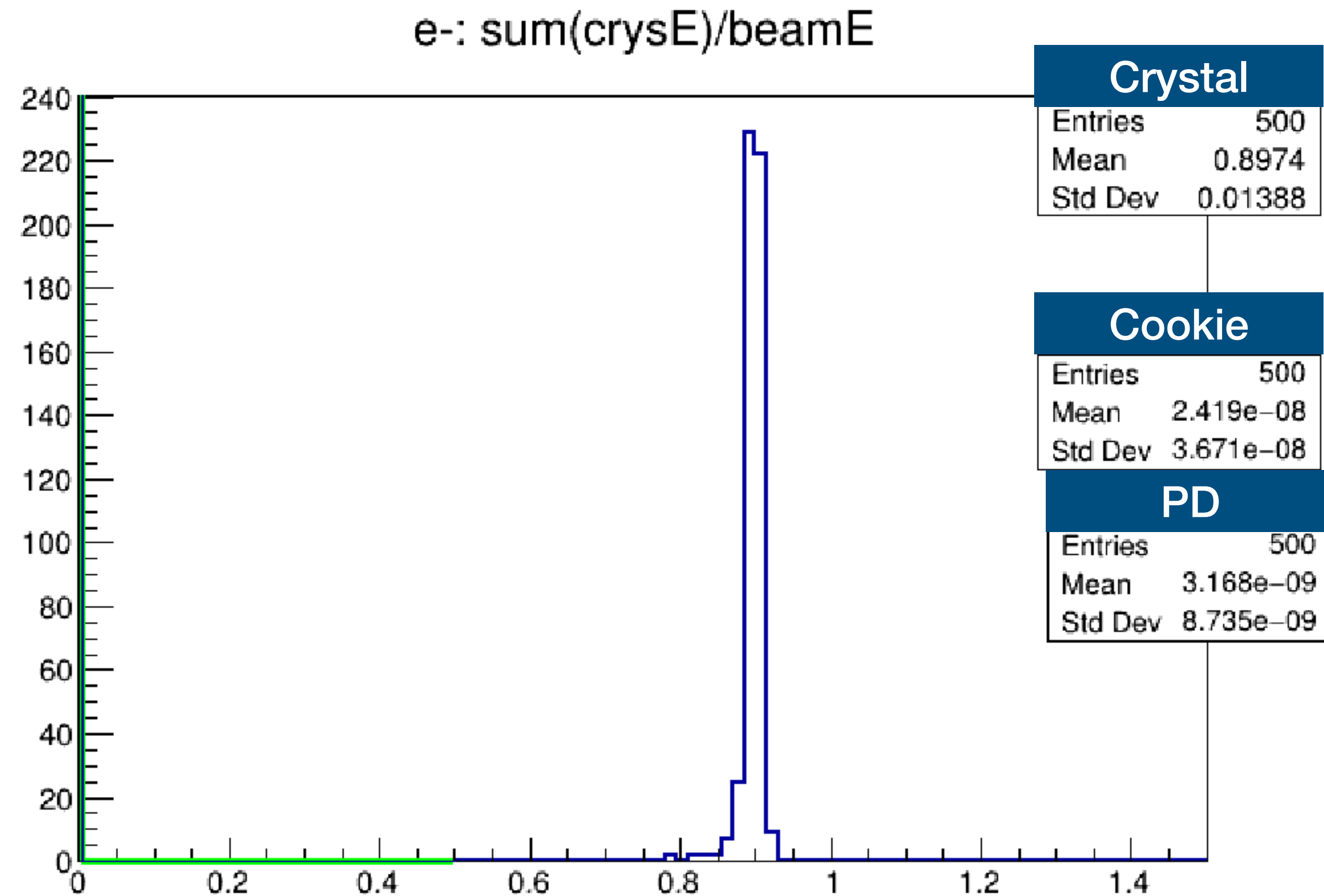
cal EM total energy deposit 7.23699

air=1.11826e-05, ecalPD=2.15416e-07,
ecalcookie=1.68956e-06, crys=8.34187
edgeE=1.60077

ecal: totncer=7235.27, totnscint=8341.87

Running Resolution.C

- Histogram of energy deposited in silicone cookies and total energy deposited in PbWO4 crystals
- 500 events with 10GeV electron and pion
- Running the code with gendet==3



Questions and Possible Next Step

Questions:

1. What should be the type and thickness for the material for the MiddleMat?
2. What should be used for the cookie's thickness?

Possible next step:

1. Electron Resolution as a function of the MiddleMat material

Backup Slides

Old VIS; without material between two crystals

- Adding Silicone cookies between crystal calorimeter and the photodetectors
- Geometry in the figure below: exaggerated dimension (50 mm) for silicone cookies (blue blocks) and photodetectors (red blocks)
- For visualization purposes array of 5 crystals are shown in the figure below
- For the real analysis:
 - photodetector thickness = 0.1 mm (as in the xml file);
 - silicone cookies = 1 mm thickness for for now (should be asked)

