ECAL Summary 6

ECAL Energy Resolution Update
Update

• Added fiber holes to all the ecal blocks
• Input 2 – 4 GeV electrons to check energy deposit variation: avg electron energy 3 GeV
• Default lead thickness is 0.05 cm
• It is interesting to note that with 0.034 cm lead, there is more energy deposit in the scintillator
  - But more energy leakage in the shower
Fiber Holes in the G4 Geometry
With No Holes: Sampling Fraction

Shower Sampling Fraction

```
Entries 65077
Mean 0.1998 ± 2.553e-05
RMS 0.006513
```

Pre-Shower Sampling Fraction

```
Entries 65077
Mean 0.2907 ± 0.0002927
RMS 0.07466
```
Update to Analysis

Shower Sampling Fraction

Entries: 22770
Mean: 0.2727 ± 3.863e-05
RMS: 0.005829

Pre-Shower Sampling Fraction

Entries: 22770
Mean: 0.3028 ± 0.000501
RMS: 0.0756
Energy Deposit in Lead

With no fiber holes
With fiber holes

Shower Lead Edep

Entries | 9168
Mean    | 1988 ± 4.265
RMS     | 408.3

Entries | 26126
Mean    | 2189 ± 2.771
RMS     | 448
Energy Deposit in Scintillator

Shower Scint Edep

With no fiber holes
Mean $544.3 \pm 0.7151$
RMS $115.6$

With fiber holes
Mean $744.4 \pm 1.611$
RMS $154.2$
Scint. Energy Deposit Z Profile

Shower Scint Edep Z

Entries: $1.324548e+07$
Mean: $-4.591 \pm 0.002708$
RMS: 9.855

Entries: 5593229
Mean: $-4.056 \pm 0.004263$
RMS: 10.08

With no fiber holes
With fiber holes
Average Energy Deposit for Electrons 2 – 4 GeV

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Shower (Lead + Scint)</td>
<td>2733</td>
<td>2732</td>
</tr>
<tr>
<td>Shower (Lead)</td>
<td>2189</td>
<td>1988</td>
</tr>
<tr>
<td>Shower (Scint)</td>
<td>544</td>
<td>744</td>
</tr>
<tr>
<td>PreShower (Lead)</td>
<td>170</td>
<td>169</td>
</tr>
<tr>
<td>PreShower (Scint)</td>
<td>67</td>
<td>69</td>
</tr>
</tbody>
</table>

• With holes shower lead had 201 MeV less energy deposited
  – This 201 MeV energy is now deposited in the Scint
Energy Leakage in ECAL

Definition,

- Leakage = (total edep in PS + toal edep in SH)/(incident electron energy)
  - Where total edep in PS and Sh are total energy deposit in the active and passive layers
- If all the energy is deposited in the ECAL ratio would be close to unity
Energy Leakage in ECAL with thin Lead

Momentum Fraction Deposit in ECAL (Calibrated E/Pf)

With no fiber holes
With fiber holes