## $\mathrm{Br}(\mathrm{H} \rightarrow \gamma \gamma)$ measurement

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## $\mathrm{E}_{\gamma}$ deposite in Ecal (AAborpFoscollecion)

Reconstruction energy (deposit E)
ilc17_slc6_arbor25May15.sh

## CalibrECAL:

48.19
98.38

$$
E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20},\right.
$$

$$
+b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right)
$$

$\chi^{2}$-minimized
$\chi^{2}=\sum_{\text {evenss }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}$

$$
\frac{\sigma}{E_{\text {meas }}^{e n}}=0.1784 \approx \frac{17.84 \%}{\sqrt{E}}
$$



## $E_{\gamma}$ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$
\begin{array}{ll}
E_{\text {meas }}^{\text {en }}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 22}\right. \\
+b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right)
\end{array}
$$

## $E_{\gamma}$ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)


## $\mathrm{E}_{\gamma}$ deposite in Ecal (AAborposocoloestion)

Reconstruction energy (deposit E)

$$
\begin{array}{ll}
E_{\text {meas }}^{\text {en }}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
+b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) & \\
\chi^{2} \text {-minimized } \\
\chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{\text {en }}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2} &
\end{array}
$$

## E deposite in Ecal (ArborPFOsCollection) Reconstruction energy (deposit E)



## $E_{\gamma}$ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2} \\
& \frac{\sigma}{E_{\text {meas }}^{e n}}=0.03957 \approx \frac{39.57 \%}{\sqrt{E}}
\end{aligned}
$$

## $\mathrm{E}_{\gamma}$ deposite in Ecal (AAborposocoloestion)

Reconstruction energy (deposit E)


## $E_{\gamma}$ deposite in Ecal (EcalSiliconCollection)

Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right)
\end{aligned}
$$

$$
\chi^{2} \text {-minimized }
$$

$$
\chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
$$



No. of hit


## $\mathrm{E}_{\nu}$ deposite in Ecal (Atbopfoscoliefion)






## back up

init_ilcsoft_ArborDHCAL_6_ILD.sh

## Optimization

- 1 energy deposit

$$
\begin{aligned}
& E_{\text {meas }}^{\text {en }}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right)+b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) \\
& \chi^{2}=\sum_{\text {everus }}\left(\left(E_{\text {meas }}^{\text {en }}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2} \quad \chi^{2} \text {-minimized }
\end{aligned}
$$

- 2 number of hit

$$
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right)+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
$$

- 3 combining the two measurements

$$
\begin{aligned}
& E=\lambda E_{\text {meas }}^{e n}+(1-\lambda) E_{\text {meas }}^{\text {hit }} \\
& \chi^{2}=\sum_{\text {evenss }}\left(\left\{\lambda\left(E_{\text {mean }}^{\text {en }}-E_{\text {meas }}^{e n}\right)+(1-\lambda)\left(E_{\text {mean }}^{\text {hit }}-E_{\text {meas }}^{\text {hit }}\right)\right\} / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2} \quad x^{2} \text {-minimized }
\end{aligned}
$$



Todal enegy


Total energy of hits


Sum of clusterized hits energy in EcalBushes




Sum of clusterized hits energy in EcalBushes


## $E_{\gamma}$ deposite in Ecal (EcalSiliconCollection)






## $\mathrm{E}_{\gamma}$ deposite in Ecal EEasalicioncolilection)

Reconstruction energy

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2} \\
& a=88.0481 \\
& f_{1}=0.5434 \\
& b=198.438 \\
& f_{2}=0.5192 \\
& \frac{\sigma}{E_{\text {meas }}^{e n}}=0.0309 \approx \frac{19.54 \%}{\sqrt{E}}
\end{aligned}
$$

## $\mathrm{E}_{\gamma}$ deposite in Ecal (Ecalcolection)

Reconstruction energy


## No. of hit in Ecal

No. of hit in the first 20 odd layers


No. of hit in the last 10 odd layers


No. of hit in the first $\mathbf{2 0}$ even layers


No. of hit in the last 10 even layers


## No. of hit in Ecal (EcalsiliconCollection)

Reconstruction energy

$$
\begin{aligned}
& E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
&+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{\text {hit }}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2} \\
& \gamma=0.0423 \\
& \delta=0.1166 \\
& \frac{\sigma}{E_{\text {reco }}}=0.03998 \approx \frac{31.61 \%}{\sqrt{E}}
\end{aligned}
$$



## No. of hit in Ecal (Ecalcollection)

Reconstruction energy

$$
\begin{aligned}
& E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even20 }}\right) \\
& +\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {evens }}\left(\left(E_{\text {meas }}^{\text {hit }}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2} \\
& \gamma=0.0466 \\
& \delta=0.1285 \\
& \frac{\sigma}{E_{\text {meas }}^{\text {hit }}}=0.05038 \approx \frac{31.86 \%}{\sqrt{E}}
\end{aligned}
$$

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## $\mathrm{E}_{\gamma}$ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
$$

## $\mathrm{E}_{\gamma}$ deposite in Ecal (ArborPFoscollection)

## Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 2}\right. \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)
\end{aligned}
$$

## $\mathrm{E}_{\gamma}$ deposite in Ecal (AAborpFoscolietion)

Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
$$

## $\mathrm{E}_{\gamma}$ deposite in Ecal (AbborfFosocolection)

Reconstruction energy (deposit E)


## $\mathrm{E}_{\gamma}$ deposite in Ecal (AAborposocoloestion)

Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
$$

## $\mathrm{E}_{\gamma}$ deposite in Ecal (AAborposocoloestion)

Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd10 }}+\left(1-f_{2}\right) E_{\text {evenl0 }}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
$$

## $E_{\gamma}$ deposite in Ecal (ArborPFOsCollection)

Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{\text {en }}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {evern20 }}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {evern10 }}\right) \\
& \quad \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {evens }}\left(\left(E_{\text {meas }}^{\text {en }}-E_{\text {MC }}\right) / \frac{16 \%}{\sqrt{E_{\text {MC }}}}\right)^{2}
\end{aligned}
$$



## $\mathrm{E}_{\gamma}$ deposite in Ecal (AAborposocoloestion)

Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
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Reconstruction energy (deposit E)

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\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
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Reconstruction energy (deposit E)

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\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) \\
& \quad \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
$$



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Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
$$

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Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right)
\end{aligned}
$$

$\chi^{2}$-minimized
$\chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}$


## $\mathrm{E}_{\gamma}$ deposite in Ecal (AAborposocoloestion)

Reconstruction energy (deposit E)

$$
\begin{aligned}
& E_{\text {meas }}^{e n}=a\left(f_{1} E_{\text {odd } 20}+\left(1-f_{1}\right) E_{\text {even } 20}\right) \\
& +b\left(f_{2} E_{\text {odd } 10}+\left(1-f_{2}\right) E_{\text {even } 10}\right)
\end{aligned}
$$

$\chi^{2}$-minimized

$$
\chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{e n}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
$$



## $\mathrm{E}_{\gamma}$ deposite in Ecal (AAborposocoloestion)

Reconstruction energy (deposit E)


## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{aligned}
& E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even20 }}\right) \\
& +\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{\text {hit }}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{aligned}
& E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even20 }}\right) \\
& +\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {evens }}\left(\left(E_{\text {meas }}^{\text {hit }}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{aligned}
& E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd 20 }}+N_{\text {even20 }}\right) \\
& +\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {evens }}\left(\left(E_{\text {meas }}^{\text {hit }}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{array}{ll}
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) & \\
+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{array}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{array}{ll}
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{array}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{array}{ll}
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) & \\
+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right) & \\
\chi^{2} \text {-minimized }
\end{array}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{array}{ll}
\begin{array}{l}
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{array} & \chi^{2}=\sum_{\text {evens }}\left(\left(E_{\text {meas }}^{\text {hit }}-E_{\text {MC }}\right) / \frac{1600}{\sqrt{E_{M C}}}\right) \\
\chi^{2} \text {-minimized }
\end{array}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{array}{ll}
\begin{array}{l}
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{array} & \chi^{2}=\sum_{\text {evens }}\left(\left(E_{\text {meas }}^{\text {hit }}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{8000}
\end{array}
$$

## No. of hit in Ecal (ArborPFOsCollection)

$$
\begin{aligned}
& E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
& +\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {evens }}\left(\left(E_{\text {meas }}^{\text {hit }}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{array}{ll}
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{array}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{aligned}
& E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
& +\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{aligned}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{array}{ll}
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{array}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{aligned}
& E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
& +\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{aligned}
$$

## No. of hit in Ecal (ArborPFOsCollection)

$$
\begin{aligned}
& \text { Reconstruction energy (No. of hit) } \\
& E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
& +\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right) \\
& \chi^{2} \text {-minimized } \\
& \chi^{2}=\sum_{\text {evens }}\left(\left(E_{\text {meas }}^{\text {hit }}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
\end{aligned}
$$

## No. of hit in Ecal (ArborPFOsCollection)

$$
\begin{array}{lll} 
& & \text { Reconstruction energy (No. of hit) } \\
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right) & \\
\chi^{2} \text {-minimized }
\end{array}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{array}{lll}
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{array}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy ( $N o$. of hit)

$$
\begin{array}{lll}
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) & \\
+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{array}
$$

## No. of hit in Ecal (ArborPFOsCollection)

Reconstruction energy (No. of hit)

$$
\begin{array}{lll}
E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) & \\
+\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{array}
$$

## No. of hit in Ecal (ArborPFOsCollection)

$$
\begin{aligned}
& E_{\text {meas }}^{\text {hit }}=\gamma\left(N_{\text {odd } 20}+N_{\text {even } 20}\right) \\
& +\delta\left(N_{\text {odd } 10}+N_{\text {even } 10}\right)
\end{aligned}
$$

$$
\chi^{2} \text {-minimized }
$$

$$
\chi^{2}=\sum_{\text {events }}\left(\left(E_{\text {meas }}^{\text {hit }}-E_{M C}\right) / \frac{16 \%}{\sqrt{E_{M C}}}\right)^{2}
$$

$$
\frac{\sigma}{E_{\text {meas }}^{e n}}=0.08167 \approx \frac{81.67 \%}{\sqrt{E}}
$$



