



# Shower shapes in the ECL

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MANTRA meeting

Dipartimento di Fisica  
Università degli Studi di Torino

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# Highlights

- The main channel is:

$$e^+e^- \rightarrow p\pi^-\bar{n}$$

- $u\bar{u}$  cocktail chunk1 + chunk2
- Recoil from system  $p\pi^-$

Usual cuts and selections have been applied:

- (a) Standard selection on protonID(0.9), pionID(0.1), p and  $\pi^-$  from IP
- (b)  $0.8 \text{ GeV} < m_{\text{Recoil}} < 1.2 \text{ GeV} \ \&\& \ \alpha < 0.35 \text{ rad} (\sim 20 \text{ deg})$
- (c)  $\text{nbar\_isFromECL} == 1 \ \&\& \ \text{nbar\_clusterE} < 3$

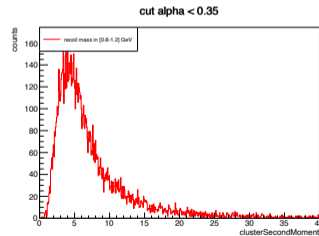
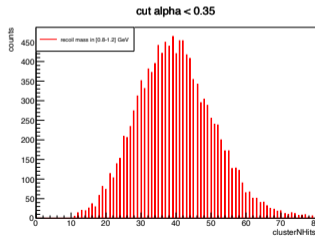
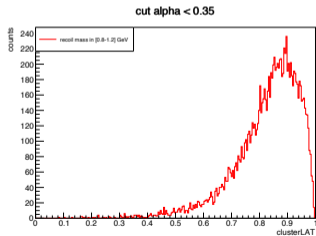
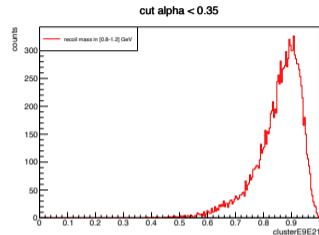
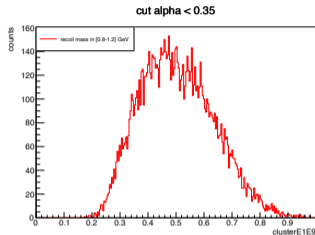
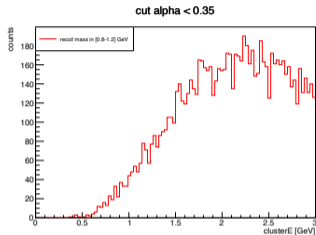
$\alpha$  is the angle between the recoil vector direction and the closest  $\bar{n}$  cluster

Is there a better selection on  $\alpha$ ?

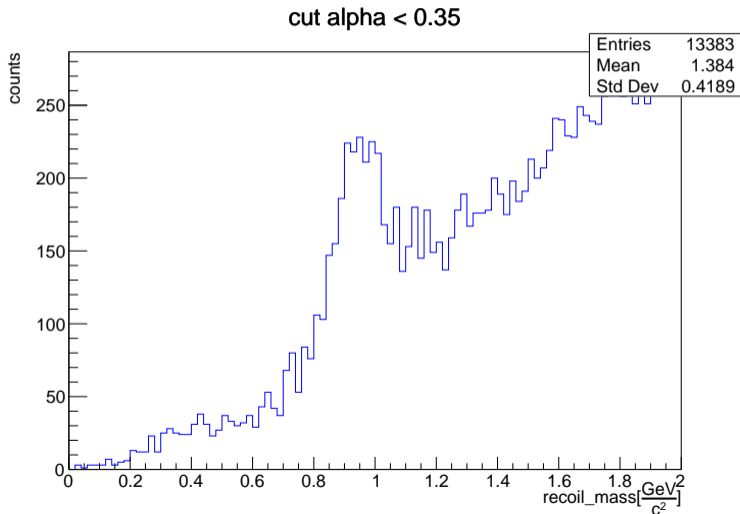
# Shower shapes distribution - signal sample



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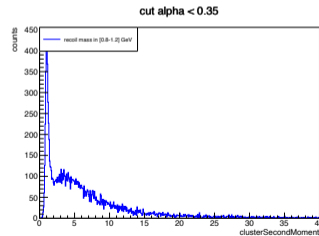
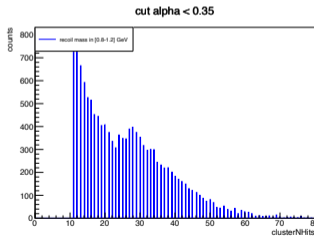
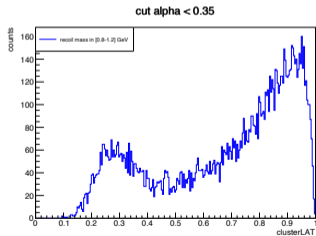
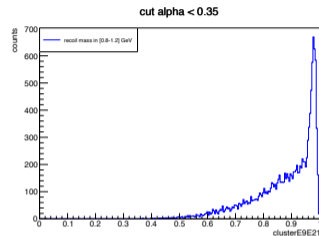
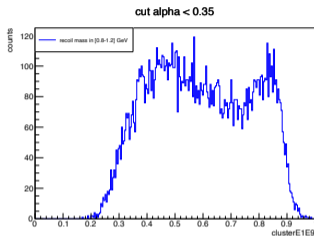
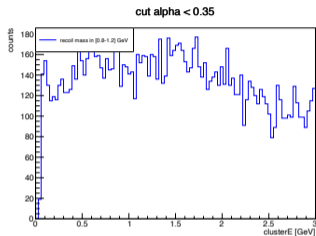
# Recoil mass distribution - chunk1 + chunk2



# Shower shapes distribution ( $\alpha < 0.35$ rad)



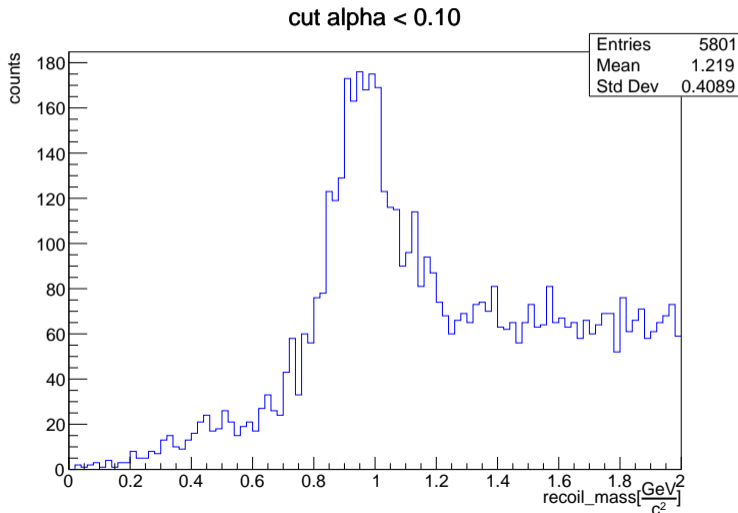
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# Recoil mass distribution ( $\alpha < 0.10$ rad)



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# TopoAna list of channels ( $\alpha < 0.10$ rad)



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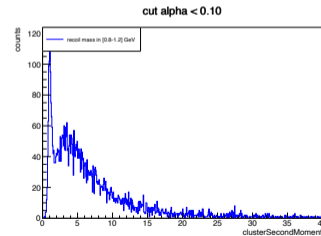
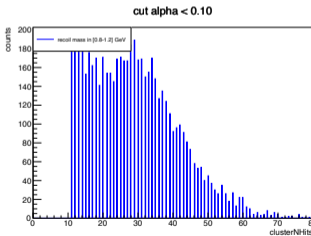
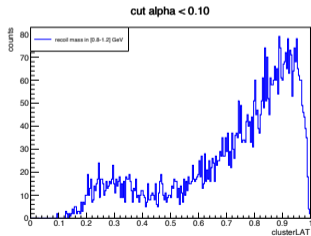
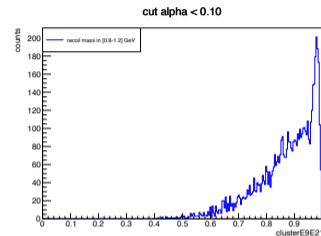
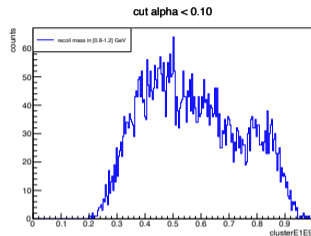
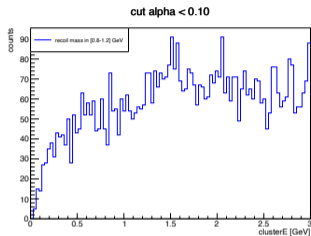


rowNo	decay tree	decay final state	iDcyTr	nEtr	nCEtr
1	$e^+e^- \rightarrow \pi^- \bar{n} p$	$\pi^- \bar{n} p$	14	283	283
2	$e^+e^- \rightarrow \pi^- \bar{n} p \gamma^I$	$\pi^- \bar{n} p \gamma^I$	10	251	534
3	$e^+e^- \rightarrow \pi^0 \pi^- \bar{n} p$	$\pi^0 \pi^- \bar{n} p$	2	112	646
4	$e^+e^- \rightarrow \pi^0 \pi^- \bar{n} p \gamma^I$	$\pi^0 \pi^- \bar{n} p \gamma^I$	6	110	756
5	$e^+e^- \rightarrow \pi^- \bar{n} p \gamma^I \gamma^I$	$\pi^- \bar{n} p \gamma^I \gamma^I$	9	83	839

# Shower shapes distribution ( $\alpha < 0.10$ rad)



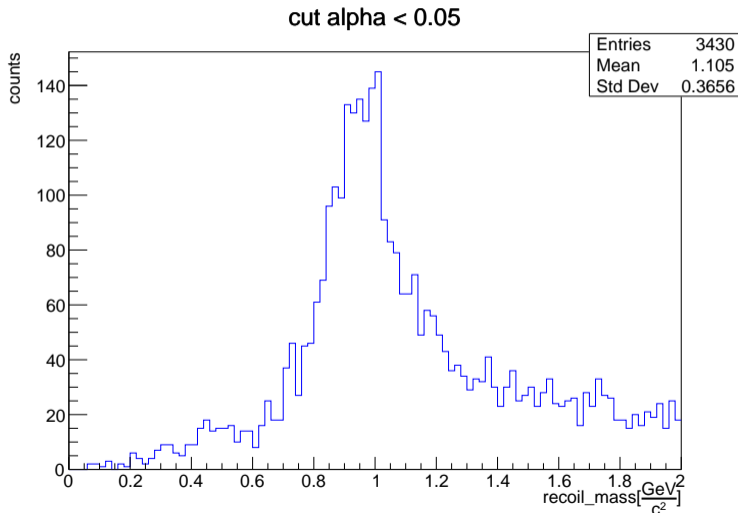
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# recoil mass distribution ( $\alpha < 0.05$ rad)



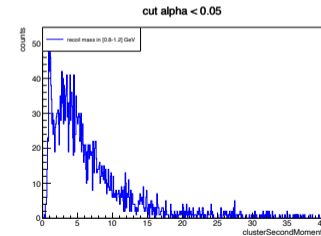
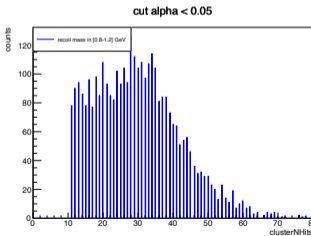
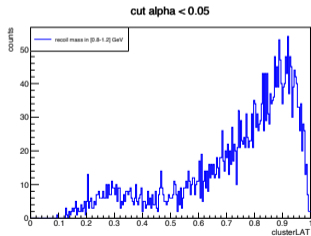
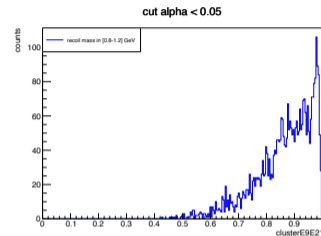
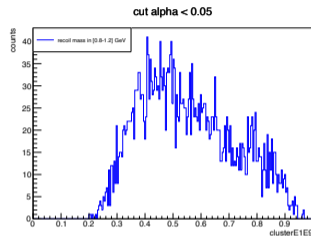
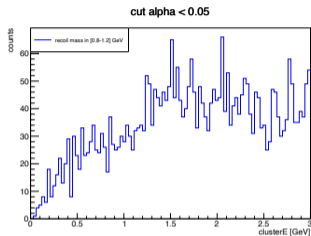
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# Shower shapes distribution ( $\alpha < 0.05$ rad)



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# Thank you for your attention

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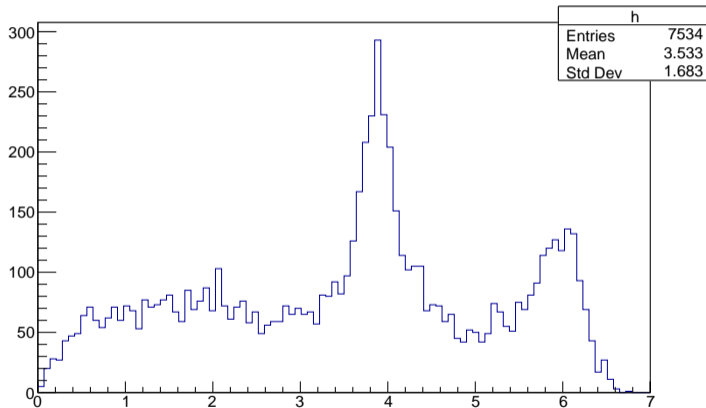
# $\bar{n}$ clusterE chunk1 I



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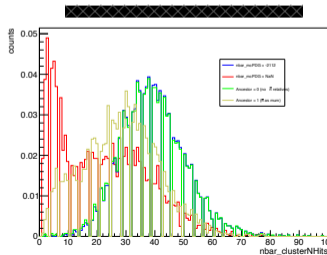
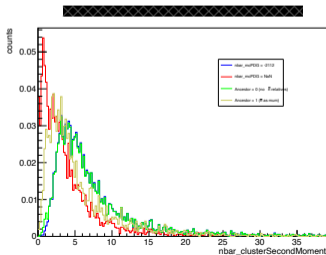
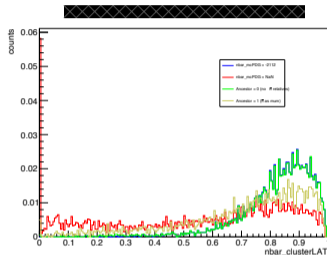
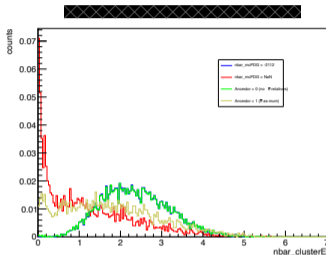
nbar\_clusterE (nROE\_Charged\_bo\_bc == 0 && pL\_dr < 1 && pL\_abs\_dz < 3 && p\_PDG == 2212 && pL\_PDG == -211 && nbar\_isFromECL && nbar\_clusterNHits > 10)



# Cluster variables - signal sample



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# Recommended PID selections I

PID probability defined as:

## protonID

[\[source\]](#)

proton identification probability defined as  $\mathcal{L}_p / (\mathcal{L}_e + \mathcal{L}_\mu + \mathcal{L}_\pi + \mathcal{L}_K + \mathcal{L}_p + \mathcal{L}_d)$ , using info from all available detectors

## pionID

[\[source\]](#)

pion identification probability defined as  $\mathcal{L}_\pi / (\mathcal{L}_e + \mathcal{L}_\mu + \mathcal{L}_\pi + \mathcal{L}_K + \mathcal{L}_p + \mathcal{L}_d)$ , using info from all available detectors