# **Tracking Efficiency Using Mollers**

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## **Preliminaries**

- Since Moller kinematics are known so well, they can be used to calculate the tracking efficiency via a tag and probe method
- Use pass 3, run 5772, singles1 triggers for the data (probably can use pairs1)
- Use pass 3, pure Moller sample to compare against and "optimize" cuts

## **Ecal Cluster Pair Selection**

- Begin by requiring that the Ecal to have a pair of "good" clusters
  - have an event with two clusters whose cluster time -1.6 ns < delta t < 1.6 ns
  - have two clusters in opposite Ecal volumes i.e. top-bottom
  - □ have both clusters on the electron side
  - □ Cut on the cluster x position sum -175 mm < cluster x sum < -145 mm
  - Cut on cluster x difference abs(cluster x sum) > 80
  - □ cluster energy sum > .85 GeV and < 1.1 GeV
  - -100 MeV < cluster energy difference < 300 MeV</p>
  - No row 1
  - Ecal cluster y < 50 mm

## **Ecal Selection**

cluster pair time - cuts: fiducial, time

(geV) (GeV) time (ns) ٤00 E 60 40 25 > 150 Ecal cluster t 35 50 Cluster ( 100 pos 20 30 Cluster 50 25 0.8 15 60 20 0.6 15 -100 40 0.4 10 -150 0.2 20 -200 50 100 150 200 Cluster position - x (mm) 200 -150 -100 -50 0 0 2 0.2 0.4 0.6 0.8 1.2 1.4 Cluster energy (GeV) 00 20 100 120 Ecal cluster time (ns) 40 60 80 cluster x vs cluster x - cuts: fiducial, sum, diff cluster pair energy - candidates cluster pair time - candidates x position (mm) 20 24 (Aeg) 1.4 Cluster time (ns) 18 30 22 50 20 gy . 16 25 18 P 14 cond cluster 16 Cluste 0 20 12 14 70 -50 12 0.8 10 Š 15 60 10 0.6 -100 50 10 0.4 40 -150 0.2 30 -200 -200 -150 -50 50 100 -100 0 0 2020 30 40 50 60 70 80 90 10 Cluster time (ns) 1.2 1.4 Cluster energy (GeV) 0.2 04 0.6 0.8 First cluster x position (mm) 100

cluster pair energy - cuts: fiducial

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### **Candidates**

- Since Moller kinematics are known so well, they can be used to calculate the tracking efficiency via a tag and probe method
- If a pair of clusters passes all cuts, the tag cluster is chosen at random and a track is matched to it
  - Require that the track is an electron and E/p > .8
- A track-cluster match passing the E/p requirement is a candidate tag event
- A track is then attempted to match to the probe cluster and the efficiency is calculated as



efficiency = probe matches/candidates



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## **Tracking Efficiency**



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## **Invariant Mass**

- Calculate invariant mass using successful tag and probe events
- Invariant mass is fit to Crystal Ball function



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## **Conclusions**

- Tracking efficiency looks to be at the 90%-95% level and agrees reasonably well with MC
- Need to run over multiple runs in order to improve efficiency errors
- Better approach? Use tridents with the tag required to be proton? This is the tracking efficiency we actually want.