Preshower Study

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-- Update --

- Code scheme
- Ring Fit for cluster to hit association
HepAList<EmcCand>* “Unique”

Fakes “neutral” TrkRecoTrks

EmcMakeNeutralTracks

HepAList<TrkRecoTrk>* “EmcNeutralTracks”

Makes DrcTrack from TrkRecoTrks

DrcMakeNeutralTracks
clone of DrcReco/DrcMakeTracks

(DrcTrackList* “Neutral”)

DrcRecoHitList* “Default”

DrcPidInfoList* “Neutral”

DrcAssociateNeutral
clone of DrcReco/DrcAssociate

DrcRecoHit to DrcTrack association

DrcIdentifyNeutral
clone of DrcReco/DrcIdentify
settings like DrcSecondPass

DrcAbsThetaMeas

New

Arrows from DrcIdentifyNeutral:

- DrcRecoHit to DrcTrack
- DrcAbsThetaMeas

Class DrcAbsThetaMeas

- fitted Cherenkov angle with error
- number of photons
- number of bkg photons
- chi2 and ndof
- “failed” tag: fit failed or not

Ring Fit

DrcAbsThetaMeas

Add DrcAbsThetaMeas to DrcPidInfo

Works in “refit” mode, but not in “cache”
Preshower Selection: Compare current selection with “ring fit”

**Current selection:**

DrcAssociateNeutral gives several DrcSolutions for each cluster

**Selection on ntuple level:**

- Each DrcSolution: $\Theta_c$ and $\Delta T$
- select best solution for each cluster-hit pair
- don’t use solutions for hits already assigned to charged tracks
- apply selections to solutions based on $\Theta_c$ and $\Delta T$
- use number of remaining solutions to identify a preshower

**Ring Fit:**

DrcIdentifyNeutral gives DrcAbsThetaMeas

**Selection on ntuple level:**

- successful fit ( “failed” tag = false)
- #photons > 20

Access to all DIRC related objects on ntuple level via DrcPidInfo
“Ring Fit” Selection

Cluster sample:
- mumu MC
- $E > 100\text{MeV}$
- bumps in barrel

“failed” tag assigned to cluster

Selected Preshowers
Cluster sample:
- mumu MC
- $E > 100\text{MeV}$
- bumps in barrel

#numer of Cherenkov photons for successful fit

Successful fit: number of photons

Selected Preshowers
Fitted Cherenkov angle for selected preshowers

<table>
<thead>
<tr>
<th>Current selection</th>
<th>Ring Fit</th>
<th>In cluster sample</th>
</tr>
</thead>
<tbody>
<tr>
<td># selected Preshowers:</td>
<td>8.7%</td>
<td>8.9%</td>
</tr>
<tr>
<td>#(true Conversion point in drc)</td>
<td>93%</td>
<td>80%</td>
</tr>
<tr>
<td>#(true Conversion point in emc + drc)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Fitted Cherenkov angle for selected non-preshowers

#### Current Selection: non-Preshower

<table>
<thead>
<tr>
<th>Distribution</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>emc</td>
<td>70.62</td>
</tr>
<tr>
<td>drc</td>
<td>3.79</td>
</tr>
<tr>
<td>pre</td>
<td>0.46</td>
</tr>
<tr>
<td>TMc</td>
<td>2.89</td>
</tr>
<tr>
<td>TMn</td>
<td>0.02</td>
</tr>
<tr>
<td>noTM</td>
<td>22.22</td>
</tr>
</tbody>
</table>

#### Ring Fit: non-Preshower

<table>
<thead>
<tr>
<th>Distribution</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>emc</td>
<td>69.87</td>
</tr>
<tr>
<td>drc</td>
<td>4.84</td>
</tr>
<tr>
<td>pre</td>
<td>0.61</td>
</tr>
<tr>
<td>TMc</td>
<td>2.46</td>
</tr>
<tr>
<td>TMn</td>
<td>0.02</td>
</tr>
<tr>
<td>noTM</td>
<td>22.21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Selection Type</th>
<th>Current selection</th>
<th>Ring Fit</th>
<th>In cluster sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>#selected non-Preshowers:</td>
<td>91.3%</td>
<td>91.1%</td>
<td>---</td>
</tr>
<tr>
<td>#(true Conversion point in drc)</td>
<td>5%</td>
<td>6%</td>
<td>13%</td>
</tr>
<tr>
<td>#(true Conversion point in emc + drc)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Conclusion

Preshower selection using “ring fit”:

- code exists in BaBar framework
- DrcAbsThetaMeas object contains all necessary info
- preshower identification performance less good than current selection method
- but can be probably improved by using DrcReco/DrcCleanAssociation (removes association ambiguities before the ring fit)