PØD-TPC1 CC inc update: T2P match optimization

Erez Reinherz-Aronis
Alex Clifton, Rajarshi Das, Walter Toki

Colorado State University
Reminder: Match method

• Tracker-to-PØD (T2P) match

  ▪ Tracker Trk at beginning of TPC1 (Z < -750 mm)
  ▪ Paired to a PØD Trk By: (match criteria)
    ○ PØD Trk last node Z > -1016 mm (“at the end of the PØD”)
    ○ Tracks time stamp is < ±100 ns
    ○ $\sin \theta$: between last and first nodes directions
    ○ $\Delta R^2 = \Delta X^2 + \Delta Y^2$ between last node and Tracker Trk extrapolation

  ▪ Note:
    Trk quality cuts are apply on both Tracker and PØD Trks
Tracker-to-PØD optimization

• Follow matching analysis flow
  • Beam and DQ checks apply

<table>
<thead>
<tr>
<th></th>
<th>Quality check</th>
<th>Position check</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tracker Trk</td>
<td>&gt; 18 nodes</td>
<td>Start of TPC1</td>
</tr>
<tr>
<td>PØD Trk</td>
<td>3D Trk</td>
<td>End in last 2 layers</td>
</tr>
</tbody>
</table>
Tracker-to-PØD optimization

- How does the output looks like:

  ![Graphs showing distributions and cuts for Tracker-to-PØD optimization.]

  - Magenta: Match
  - Red: unMatch
  - Additional pØd cuts:
    - Length < 3500
    - #Layers <= 80
  - Blue: Match
  - Black: unMatch
Tracker-to-PØD optimization

- How does the output looks like:

Magenta Match
Red unMatch

Additional pØd cuts:
Length < 3500
#Layers <= 80
Blue Match
Black unMatch
Tracker-to-PØD optimization

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δMatch / Match

- Looked back to the ‘FV optimization’ and found that there we used the ‘Figure of Merit’ minimize (δs/s)

- Better color resolution
δMatch / Match

- **Zoom-in**

- **Run 1**
  - $\Delta R < 46 \text{ mm} \ (34)$
  - $\sin \theta < 0.44 \ (0.30)$

- **Run 2**
  - $\Delta R < 46 \text{ mm} \ (36)$
  - $\sin \theta < 0.44 \ (0.32)$
## Summary

<table>
<thead>
<tr>
<th>Flux</th>
<th></th>
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<tbody>
<tr>
<td>D</td>
<td>26067</td>
</tr>
<tr>
<td>M</td>
<td>679852</td>
</tr>
<tr>
<td>R</td>
<td>1.019199</td>
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<tr>
<td>Err</td>
<td>0.006433</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>D</th>
<th>14616</th>
<th>exit last node</th>
<th>D</th>
<th>11114</th>
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<tbody>
<tr>
<td>M</td>
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<td>4688 node</td>
<td>M</td>
<td>307825</td>
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<tr>
<td>R</td>
<td>0.968324</td>
<td>0.899723</td>
<td>R</td>
<td>0.959729</td>
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<tr>
<td>Err</td>
<td>0.008154</td>
<td>0.012909</td>
<td>Err</td>
<td>0.009266</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>1726 exit side</th>
<th>D</th>
<th>3502</th>
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<tbody>
<tr>
<td>45764</td>
<td>M</td>
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<tr>
<td>1.002534</td>
<td>R</td>
<td>0.996638</td>
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<tr>
<td>0.024582</td>
<td>Err</td>
<td>0.017154</td>
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