A First Look at Track Reconstruction with High Random Backgrounds

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Introduction

- Full MC comes from SLAC lcddata01 server
  - panpy-udscb-500-010301-LD-sim
  - panpy-udscb-500-010301-SD-sim

- Detectors: LDMAR01(LD), SDMAR01(SD)

- Analysis Platform: JAVA Analysis Studio V2.2.4
  \[\Rightarrow\] Thanks to Tony, Wolfgang, Mike.

- Machine Backgrounds
  - Synchrotron Radiation.
  - Neutron back shine.
  - Muon production at collimators.
  - Beam-Gas collision.
  \[\Rightarrow\] Thanks to Tom and Stan.

BUT, no full MC with ‘real’ machine background is available now, so random backgrounds hits are used in this study.

- Acceptance Cuts on true MC particles
  \[P_T > 0.5 \text{ GeV}, |\cos \theta| < 0.9\]
  \[R_{\text{origin}} < 130 \text{ cm}, Z_{\text{origin}} < 150 \text{ cm}, R_{\text{end}} > 3.6 \text{ cm}\.]
Hit Densities for the NLC LD Detector.

In this talk, random background hits are added according to the criteria. Factor 2 means 2% of above hit densities.
UDSCB Full and Fast MC at 500 GeV

Thanks to Bruce A. Schumm for expected momentum resolution.
LDMAR01

- $|\cos \theta| < 0.9$, no random backgrounds.
- Track Reconstruction Efficiency is 96.1%.
- $|\cos \theta| < 0.9$, random backgrounds (factor=2).
- Track Reconstruction Efficiency is 83.2%.
- $\Rightarrow$ Low Track Efficiency at Low $P_T$ and Low $\theta$. 
random backgrounds (factor = 0, 1, 2).
CCD Hits 1 : 10 : 20, TPC Hits 1 : 20 : 40.
Tracks are not well reconstructed when the number of hits combination exceed $2 \times 10^7$. 
- no random backgrounds.
- Number of reconstructed tracks is 29.
• random backgrounds(factor=2).

⇒ Only 21 tracks are reconstructed, some low $P_T$ tracks are not reconstructed.
UDSCB Full and Fast MC at 500 GeV

⇒ Thanks to Bruce A. Schumm for expected momentum resolution.
- $|\cos \theta| < 0.9$, no random background.
- $|\cos \theta| < 0.75$, no background (eff=98.3%).

$\implies$ Low track efficiency at $|\cos \theta| > 0.75$, need to improve track efficiency in forward region.
Track Reconstruction Efficiency

SDMAR01

- \(|\cos \theta| < 0.75\), random backgrounds (factor=2).
- Track Reconstruction Efficiency is 56.7%.
- random backgrounds (factor=0, 1, 2).
- CCD Hits 1 : 9 : 18, TPC Hits 1 : 5 : 10.
Tracks are not well reconstructed when the number of hits combination exceed $2 \times 10^7$. 
- no random backgrounds.
- Number of reconstructed tracks is 34.
random backgrounds(factor=2).

⇒ No tracks are reconstructed.
Very Preliminary Conclusions

⇒ SDMAR01: need to improve track reconstruction efficiency in the forward region.

⇒ Track momentum resolution and reconstruction efficiency is stable if random backgrounds hits factor(<1), that is,

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<th>LD - CCD Hits</th>
<th>TPC Hits</th>
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<tr>
<td>SD</td>
<td>&lt; 10 Times</td>
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⇒ Track reconstruction efficiency goes down when hits combination exceeds $2 \times 10^7$. If we expand the maximum hits combination number to $2 \times 10^8$, the track efficiency keeps stable for random background hits factor(=2),

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<th>LD: Eff = 83.2%</th>
<th>Eff = 95.8%</th>
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<td>SD: Eff = 56.7%</td>
<td>Eff = 97.8%</td>
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