By mixing with Dipole

SLD Physics Meeting
5/26/00
Julia Thom
S. Willocq

- Dipole with Vxalone trades: performance, cut tuning
- Status of analysis
Implementation of vxalve-trks:

1) Track selection
   a) usual qual. trk selection \(\rightarrow\) qual. list
   b) \text{bbgtvxo}\}
       \text{bbvlink}\}
       \text{list of vxo trks}
   \text{battvxo}
   c) 2VTOP 3 finds B, D vertex
       using qual. tracks only
   d) attach \text{vxo}\ to existing vertices
       using L/D

2) Basic topological selection (Hans...)

3) Dipole selection \(Q^\text{tot} = 0 \quad Q_B = Q_D\)
   min. sep., etc...

as usual: \(S = \sqrt{N_{\text{mip}}} \cdot f_8, (1-2\eta)\)
65 MeV basic top. selection

\[ Q_{\text{true}} = 0 \]

\[ Q_{\text{true}} \neq 0 \]

<table>
<thead>
<tr>
<th>ID</th>
<th>1000000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entries</td>
<td>263480</td>
</tr>
<tr>
<td>Mean</td>
<td>0.5040</td>
</tr>
<tr>
<td>RMS</td>
<td>0.9115</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ID</th>
<th>1000000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entries</td>
<td>194484</td>
</tr>
<tr>
<td>Mean</td>
<td>0.4998</td>
</tr>
<tr>
<td>RMS</td>
<td>1.254</td>
</tr>
</tbody>
</table>
How many VXalone tracks per event?

No. VXalone tracks vs. Decay Length

![Graph showing the relationship between VXalone tracks and decay length.](image)

- **Entries**: 92083
- **Mean**: 0.3155
- **RMS**: 0.2930
- **ALLCHAN**: 6.178

Standard cuts:
- Min. Dist IP - vxo track: 500 µ
- VxO - Impact parameter xy, t

→ Regain VxO tracks at hi/lo decay length
new cuts:

No. VXalone tracks vs. Decay Length

\[ \langle \# \rangle = 0.23 \]

top. selection

Basic topological selection

Using:
- BBG, TVX0P.
- Implow = -1
- Imphigh = 1
- Maxdmu Z = 8
- E_Cut = 1.5
- BBVCVX0P.
- Lodimin = 0.025

Dipole selection

\[ \langle \# \rangle = 0.14 \]

Avg. no. VXalone tracks

Dipole analysis selection

Why does \#VX0 drop with Dipole selection?
VXO's at small decay length

4 bins of B decay length

0-500μm

500-1mm

1mm-3mm

>3mm

Events with VXO's

No VXO's attached
\[\# \text{vtx0 tracks:} \]

**Basic top. selection:**

\[Q > 0 \quad \langle \# \rangle = 0.27\]

\[Q = 0 \quad \langle \# \rangle = 0.17\]

\[\text{~60\% of b hadrons are neutral} \quad \Rightarrow \text{Q = 0 sample has mostly correct rec. charge} \quad \Rightarrow \text{less likely to add vtx0 track.}\]

**Dipole selection:**

\[\langle \# \rangle = 0.14\]

a) add. cut \[p_T(\text{vtx0}) < 4 \text{ GeV}\]

b) \[Q_{\text{qual+vtx0}} = 0 \quad \& \quad Q_{B}^{\gamma \mu + \text{vtx0}} \neq Q_{D}^{\gamma \mu + \text{vtx0}}\]

\[
\begin{array}{c}
B^{-1} \\
D^{+1} \\
v\text{x0}^{+1}
\end{array}
\]
Full dipole analysis cuts

Dipole events with 1 or more VXalone trks

Decay Length Bs (cm)

Decay Length Bd (cm)

(points) qual tks only $\rightarrow$ for $(Q_D - Q_B)$
(histo) qual+VX tks $\rightarrow$

$TT = 0.709 \quad \text{qual.} \quad TT = 0.764 \quad \text{qual.+VX}$
rel. $\epsilon = 1.0 \quad \epsilon = 0.756$

10% higher significance
performance of $v_{x0}$ tracks

for: Neutral topological vertices

$B_s$ fraction

points no VX trks

$\frac{f_{B_s}}{f_{B_s}} = 16.0\%$

histo with VX trks

$\frac{f_{B_s}}{f_{B_s}} = 15.3\%$

$\epsilon = 57.9\%$

$\epsilon = 53.9\%$
**bottom line**

full dipole cuts

<table>
<thead>
<tr>
<th></th>
<th>Qual + Ths</th>
<th>Qual + VXO</th>
</tr>
</thead>
<tbody>
<tr>
<td>B_s fract.</td>
<td>17.6%</td>
<td>18.4%</td>
</tr>
<tr>
<td>B_s right</td>
<td>82.1%</td>
<td>82.1%</td>
</tr>
</tbody>
</table>

⇒ extra 4.5% in significance

(events w. ≥ 1 VXO track \( \Gamma = 75\% \))

may do better: Tom's VXO-track attachment exploit linked tracks?

Aaron's latest

analysis frozen
Moving on to get Amplitude fits running

- Data / MC checks

- Parametrizations
  using Dan's new boost reco
  - 16% improvement in tail resol.
  - 3% in core res
  - better centered
  using Tracy's fake D-tracks
  10% -ish improvement in decay length residual
  crosscheck: $\sigma_+ (MC) = \sigma_+ (calc.)$?

- Amplitude fits for MC
Charge dipole (cm) \( = (Q_D - Q_B) \cdot \Delta BD \)
\[ \sigma = \sqrt{\left( \frac{\delta_{x}}{\beta y c} \right)^{2} + t^{2} \left( \frac{\delta_{y}}{\beta y} \right)^{2}} \]

Try to parametrize offsets and fold in correctly
\[ \Delta m_s = 10.39 \pm 0.26 \text{ ps}^{-1} \]

\[ \Delta m = 0.5 \text{ ps}^{-1} \]

\[ \Delta m = 10.0 \text{ ps}^{-1} \]
Summary: so far looking ok
lots of work ahead