Analysis done with 10,000 signal M.C. events produced by evtgen

**Analysis updates:**

- *cc mode of* $D^0 \rightarrow K_S \pi^0$ *added*
- *Improvement in fitting in* $D^0 \rightarrow K_S \pi^0$
- *New result from* $D^0 \rightarrow K_L \pi^0$
$D^0/\bar{D}^0 \rightarrow K_S \pi^0$

**Reconstruction Procedure:**

- $\pi^0$ made from mdstpi0
- $\pi^\pm$ made from mdstcharged
- $K_S$ made from mdstvee2
  - track, kind and mass cut ($0.486\text{GeV} < M_{K_S} < 0.510\text{GeV}$)
- $D^0/\bar{D}^0$ made from $K_S$ and $\pi^0$
  - flavour of $D^0$ tagged by charge of $\pi_{slow}$
  - mass cut ($1.75\text{GeV} < M_{D^0} < 1.90\text{GeV}$)
- $D^{*\pm}$ made from $D^0/\bar{D}^0$ and $\pi_{slow}^\pm$
signal region is defined by
\[ 0.144 < \delta M = M_{D^{*\pm}} - M_{D^0}/M_{\bar{D}^0} < 0.147 \]
Reconstructing $D^0 / \bar{D}^0 \rightarrow K_S \pi^0$
Reconstructing $D^0/\bar{D}^0 \rightarrow K_S\pi^0$ conti....

\begin{align*}
\text{D0 mass} & \quad \text{D0 mass after mass cut} \\
\text{D0 to K0S Pi0, D0bar to K0S Pi0 and D0+D0bar to K0S Pi0} & \\
\text{D0 mass} & \quad \text{D0 mass after mass cut}
\end{align*}
Reconstructing $D^0/\bar{D}^0 \rightarrow K_S\pi^0$ conti....
\[ D^0/\bar{D}^0 \rightarrow K_S\pi^0 \text{ continues...} \]

Fitting Procedure:

- fitting functions has changed and improvement made

- \( M_{K_S} \) distribution before cut on \( M_{K_S} \) fitted as follows
  - background fitted to 1st order polynomial
    offset fixed at 0.4700
  - signal fitted to ’Double Gaussian’

- \( M_{D^0} \) distribution before cut on \( M_{D^0} \) fitted as follows
  - background fitted to falling exponential
    offset fixed at 1.5
  - signal fitted to ’Crystal Ball’ function
• $\delta M$ distribution before cut on $\delta M$ fitted as follows

  - background fitted to threshold function
    offset fixed at $M_{\pi^+} = 0.13957 GeV$
  - signal fitted to 'Double Gaussian'
Fitting $M_{K_S}$

MINUIT $\chi^2$ Fit to Plot 10a.0

- K0S mass
- Fit: vert. watch
- Plot Area Total/Fit 11084 / 11584
- C.L. = 55.2%
- $\chi^2 = 10.7$ for 20 - 8 d.o.f.

Function 1: Polynomial of Order 1
- AREA 5458.3
- MEAN 0.47000
- DELM -0.74568E-05
- SIG2/509.0 2.4859

Function 2: Two Gaussians (sigma)
- AREA 5458.3
- MEAN 0.47000
- DELM -0.74568E-05
- SIG2/509.0 2.4859

MINUIT $\chi^2$ Fit to Plot 12a.0

- K0S mass
- File: vert. watch
- Plot Area Total/Fit 11468 / 11468
- C.L. = 56.7%
- $\chi^2 = 10.6$ for 20 - 8 d.o.f.

Function 1: Polynomial of Order 1
- AREA 5458.3
- MEAN 0.47000
- DELM -0.74568E-05
- SIG2/509.0 2.4859

Function 2: Two Gaussians (sigma)
- AREA 5458.3
- MEAN 0.47000
- DELM -0.74568E-05
- SIG2/509.0 2.4859

MINUIT $\chi^2$ Fit to Plot 14a.0

- K0S mass
- File: vert. watch
- Plot Area Total/Fit 23076 / 23076
- C.L. = 34.3%
- $\chi^2 = 13.4$ for 20 - 8 d.o.f.

Function 1: Polynomial of Order 1
- AREA 5458.3
- MEAN 0.47000
- DELM -0.74568E-05
- SIG2/509.0 2.4859

Function 2: Two Gaussians (sigma)
- AREA 5458.3
- MEAN 0.47000
- DELM -0.74568E-05
- SIG2/509.0 2.4859
Fitting $M_{D^0}/M_{ar{D}^0}$

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<tr>
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<td>Errors Function 1: Exponential</td>
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Results from $D^0 \rightarrow K_L \pi^0$

Two solutions for $p_{KL}$ from $D^0$ mass constraint studied:

- calculated figure of merit (fom) in $M_{D^*+}$
  \[ fom = \frac{S}{\sqrt{S+B}}, \quad S = \int_{2.006531}^{2.013471} f_s(x) \, dx, \quad B = \int_{2.006531}^{2.013471} f_b(x) \, dx \]
  \[ f_s = \text{Gaussian} \quad f_b = \text{threshold function} \]

- statistics:

<table>
<thead>
<tr>
<th>Solutions</th>
<th>Signal</th>
<th>Background</th>
<th>fom</th>
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<td>2</td>
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<td>Both</td>
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Solutions for $p_{KL}$

- **sol1 for K0L mom**
  - ID: 10
  - Entries: 61738
  - Mean: 5.982
  - RMS: 4.568
  - UDFLW: 0.
  - OVFLW: 7926.

- **sol2 for K0L mom**
  - ID: 20
  - Entries: 61738
  - Mean: 5.894
  - RMS: 4.540
  - UDFLW: 0.
  - OVFLW: 5661.

- **sol1 + sol2 for K0L mom**
  - ID: 30
  - Entries: 123476
  - Mean: 5.937
  - RMS: 4.554
  - UDFLW: 0.
  - OVFLW: 0.1359E+05
Results from sol1, sol2 and two sols together

- D0 to K*0 P0

- kingmass

- dzermass

D*+ mass from sol1

D*+ mass from sol2

D*+ mass from both sol
focusing $M_{D^{*+}}$ for sol1, sol2 and two sols together for calculating fom