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OUTLINE

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- *Outline for 'charm meeting slides'*
- *List of things to do*

Slide1a, b... Introduction to this analysis

- **Aim: Decay rate asymmetry in $D^0 \rightarrow K_S \pi^0$ and $D^0 \rightarrow K_L \pi^0$**
 - expressions here
- **Motivation: importance in interpreting $D^0 - \bar{D}^0$ results**
 - explanation here
- **Experimental situation:**
 - previous measurement (at Belle), reference here
 - expected asymmetry $\mathcal{O}(5 \%)$
explanation here

- my aim: in bins of p_{K^0} to reduce systematics
done from scratch in an entirely new way

Slide 2a, b.. What exactly is measured and how

- Show following derivation step by step:

$$- \text{Asymmetry} = \frac{\Delta\Gamma}{2\Gamma_{av}} = \frac{\Delta\mathcal{B}}{2\mathcal{B}_{av}} = \langle A \rangle = \frac{\int_b \frac{1}{\epsilon_{KS\pi}(p)} [\eta_{KL\pi}^{rec}(p)/r(p) - \eta_{KS\pi}^{rec}(p)] dp}{\int_a \frac{1}{\epsilon_{KS\pi}(p)} [\eta_{KL\pi}^{rec}(p)/r(p) + \eta_{KS\pi}^{rec}(p)] dp}$$

- State what assumptions were made:
- State which quantities will be extracted:

Slide 3a, b... How signal MC and data are produced

- Signal MC is produced using evtgen
 - which decays are produced and how
- MC sample scaled to 10 times as much statistics of signal events as expected in data:
 - $N_{D^0 \rightarrow K_S \pi^0}^{data} = [\int dt \mathcal{L}] \times \sigma_{c\bar{c}} \times D(c \rightarrow D^* \text{anything} + cc) \times \mathcal{B}(D^{*+} \rightarrow D^0 \pi^+)$
 $\times \mathcal{B}(D^0 \rightarrow K_S \pi^0)$
 - $\epsilon_{D^0 \rightarrow K_S \pi^0}$ can be used to find the scale factor between MC and data
- $[\int dt \mathcal{L}] = 32.407 fb^{-1}$ data from expt 7, 9, 11, 13 is used for cross check

Slide 4a, b... Reconstruction and event selection

- π^0 candidates
 - cuts
 - mass plots from 2 modes ($D^0 \rightarrow K_S \pi^0$) and ($D^0 \rightarrow K_L \pi^0$) compared
- K_S candidates
 - cuts and selections
 - mass plots from 2 modes ($D^0 \rightarrow K_S \pi^0$) and ($D^0 \rightarrow K_S \pi \pi$) with fits compared
- K_L candidates
 - reconstruction technique
 - choosing between solutions is studied in detail

- mass plots from 2 modes ($D^0 \rightarrow K_L \pi^0$) and ($D^0 \rightarrow K_L \pi \pi$) compared
- K^{*-} candidates
 - cuts
 - mass plots from 2 modes ($D^0 \rightarrow K_S \pi \pi$) and ($D^0 \rightarrow K_L \pi \pi$) with fits, compared
- D^0 candidates
 - cuts and constraints
 - mass plots from all 4 modes ($D^0 \rightarrow K \pi \pi$) and ($D^0 \rightarrow K \pi \pi$) with fits, compared
- D^{*+} candidates $M_{D^{*+}}$ and ΔM
 - cuts

- plots from all 4 modes ($D^0 \rightarrow K\pi\pi$) and ($D^0 \rightarrow K\pi\pi$) with fits, compared

Slide 5a, b... Study in signal MC

- **choosing between 2 solutions for K_L momentum**
 - fom study for solution 1, 2 and both solutions together
3 plots goes here
- **Both solutions yielding 'good' solutions simultaneously?**
 - 4 diagnostic plots goes here

Slide 6 Study in signal MC continues....

rules for MC truth, matching with generated info:

- K_S modes
 -
- K_L modes
 - direction resolution plots

Slide 7a, b... Study in signal MC continues....

efficiency in bins of momentum, 1-D efficiency functions

- **2 plots from $\epsilon_{\pi^0}(p_{\pi^0})$ compared**
- **4 plots from $\epsilon_{\pi_s}(p_{\pi_s})$ compared**
- **4 plots from $\epsilon_{K^0}(p_{K^0})$ compared**
- **4 plots from $\epsilon_{\pi^\pm}(p_{\pi^\pm})$ from 2 calibration modes compared**

Slide 8a, b... Study in signal MC continues....

- factorizability and correlation in efficiency functions
 - pair wise scatter plots of momenta, compared for 4 modes
- Dependence of relative efficiency on different variables
 - pair wise scatter plots including other variables, compared for 4 modes
- Lab momenta spectra for K^0 for 4-modes
- Resolution function for K^0 momenta for 4-modes

Slide 9a, b... cross check with data expt7, 9, 11, 13

- for cross check with MC
 - how the signal shape in data compare with MC
 - how the background shape look like
- form study for K_L momentum solutions can be repeated
 - signal from signal MC and background from data
- Lab momenta spectra for K^0 for 4-modes

Slide 10: future plans and list of references

- Background study
- Resolution smearing effects and systematics study
- Extracting required quantities from available data
- list of references goes here

Slide 11 list of things to do

- calculate expected statistics in expt7, 9, 11, 13 data for all 4 modes
 - I already have the numbers except $\sigma(c\bar{c})$
 - produce 10 times more number of sig MC events
- while this is being produced fix coding issues
 - write codes for all cc modes
- analyze and produce plots with improvement in fitting
 - if expt data can not be analysed I still have a coherent presentation
- once all the above steps are complete skim expt data

- **analyse expt data**