Overview
• Mixing in neutral mesons: mass/ﬂavor eigenstates
  \[ |D(\phi)| = \rho |D(\phi)| + (1-\rho) |\bar{D}(\phi)|, \quad \rho^2 + |\phi|^2 = 1 \]
• For \( D^0 \rightarrow K\pi \)
  \[ (\phi) = \left( \begin{array}{c} \cos \phi \sin \phi \\ -\sin \phi \cos \phi \end{array} \right) \]
• Time dependent WS/RS ratio for \( D^0(+/-) \) and \( \bar{D}^0(+/-) \)

This Measurement [1]
• Charm decay reconstruction
  Prompt Decays

| Width (MeV) | K^0 [1.025 > N(D^*)] + A_{Mix} [10, 9]
<table>
<thead>
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<tbody>
<tr>
<td>20000</td>
<td>49.3 ± 0.7</td>
</tr>
<tr>
<td>40000</td>
<td>48.5 ± 0.7</td>
</tr>
<tr>
<td>80000</td>
<td>47.7 ± 0.7</td>
</tr>
<tr>
<td>160000</td>
<td>47.0 ± 0.7</td>
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</tbody>
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• Double tagged: \( \phi^+ \) and \( \phi^- \) tag the \( D^0 \) at production
• Complements prompt \( D^0 \rightarrow D^*\pi^- \) measurement [3]

Yield Extraction
• Binned Maximum Likelihood Fit
• Signal: 3 Gaussian Core + 1 Johnson S_\theta [8]
• Background: Empirical shape
• Strategy: Fit full RS sample, fix signal shape, fit RS and WS in each of 5 decay time bins

Detection Asymmetries
\[ A_{Mix} = 0.05 \pm 0.01 \% \text{ from [9]} \]
\[ A_{Mix} \text{ directly from DT data} \]
\[ A(K^+) = [0.90 \pm 0.18 \pm 0.10] \%

CPV Fit Strategy
• Fit by minimizing
  \[ \chi^2 = \sum_{i,j} \left( \frac{N_{i,j} - \tilde{N}_{i,j}}{\sigma_{i,j}} \right)^2 + \chi_{\text{peaking}} + \chi_{\text{background}} \]
  \[ r_{\text{peaking}} = \text{measured WS/RS ratio}, \quad \sigma_{\text{peaking}} \]
  \[ r_{\text{background}} = \text{expected value from } \chi_{\text{background}} \text{ averaged over bin} \]

Systematic Uncertainties

References