Study of Single Photon Resolution
with $D^{*0} \rightarrow D^0 \gamma$

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Outline

0. Introduction
1. Event Selection
   1. MC Study
3. Outlook
In $D^* \rightarrow D^0 \gamma$ decays, the $\gamma$s are mostly soft due to the available phase space. We use this information to study the single photon energy resolution at low energy.

\[ \sigma_\gamma = \frac{E_{\gamma}^{meas} - E_{\gamma}^{calc}}{E_{\gamma}^{calc}} \]

$E_{\gamma}^{meas}$ = Measured $\gamma$ energy decaying from $D^*$ candidates

$E_{\gamma}^{calc} = \frac{M_{D^*0}^{PDG} - M_{D^0}^{PDG}}{2(E_{D^0}^{Meas} - P_{D^0}^{Meas} \cdot \cos(\vec{P}_{D^0}, \vec{P}_{\gamma}))}$ → Calculated energy from the kinematics.

Assume that the tracking error is negligibly small.
Event Selection

- Charged Tracks: K: KMicroTight, π: GoodTracksTight
- Reconstruct $D^0 \rightarrow K^- \pi^+$ and C.C.
- Require Kaons and Pions coming from single vertex.
- Photons: GoodPhotonLoose
- Minimum $\gamma$ energy: 30 MeV
- Reconstruct $D^{*0} \rightarrow D^0\gamma$
- Multiple Candidate in an event is allowed
- Fox-Wolfram Moment (R2) < 0.9
- MC sample used for this study: $B^- \rightarrow D^{*0}\pi^-$ and $B^+ \rightarrow X$ (10K Events)
Invariant mass of $D^0 \rightarrow K\pi$ and $D^{*0} - D^0$. 

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Photon Energy Spectrum...

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Some Consistency Check....

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Single Photon Resolution for the entire energy Spectrum.

\[ \sigma_\gamma \text{ from the fit : } (3.9 \pm 0.3)\%. \]
Outlook

- We have established the method of extracting the single photon energy resolution. With more statistics we will calculate this quantity in different bins of the $\gamma$ energy spectrum.
- Cut Optimization to reduce background. Work in progress.
- Will use Continuum data for this study.
- A MC study using Continuum data will be done soon.