Measurements of $D^0$-Tagged Jet Spectra and Radial Profiles in Au+Au collisions from STAR

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- Heavy-flavor tagged jets are unique probes of heavy-quark energy loss and diffusion in heavy-ion (HI) collisions
- STAR 2014 data with Heavy Flavor Tracker (HFT) enables clean reconstruction of charm-hadron decays
\[ s \mathcal{P}_n (m_{K\pi}, i) = \frac{\sum_{j=1}^{N_T} \sqrt{V_{nj}} f_j (m_{K\pi}, i)}{\sum_{k=1}^{N_T} N_k f_k (m_{K\pi}, i)} \]

Unbinned max. likelihood fit
- \( n = n \)-th fit component (sig/bkg)
- \( N_k = k \)-th yield (T=2)
- \( f_k (m_{K\pi}, i) \) = per-event PDF value with \( k \)-th hypothesis
- \( V = \text{cov. matrix} \)

Inclusion of reconstruction efficiency
\[ s \mathcal{P}_n (m_{K\pi}, i) \rightarrow s \mathcal{P}_n (m_{K\pi}, i) / e(m_{K\pi}, i) \]

Signal Distributions:
- Fill jet \( p_T \) and \( r \) histograms with all event weights

Anti-\( k_T \) (full) jets with \( R=0.4 \), tagged with \( D^0 \rightarrow K^{-}\pi^+ \) (+c.c.):
- Two alternative methods to subtract combinatorial \( K^+\pi^- \) subtraction (like-sign subtraction)
- \( s \mathcal{P} \) plot vs. \( K^+\pi^-+K^\pi \) subtraction

Jet \( p_T \) and \( r \) corrected via Bayesian unfolding

**Instrumental Response:**
- PYTHIA 8 + GEANT3 + HI background
- Full response matrix includes both effects

**Signal Distributions:**
- Fill jet \( p_T \) and \( r \) histograms with all event weights

**Inclusion of reconstruction efficiency**
\[ s \mathcal{P}_n (m_{K\pi}, i) \rightarrow s \mathcal{P}_n (m_{K\pi}, i) / e(m_{K\pi}, i) \]

**Anti-\( k_T \) \( R=0.4 \)**
- \( D^0 \ p_T > 5 \text{ GeV}/c \)
- Charged const. \( p_T > 0.2 \text{ GeV}/c \)
- Neutral const. \( E_T > 0.2 \text{ GeV} \)

**\( p_T \) fluctuations after \( \rho A \) subtraction in HI collisions:**
- Single-particle jet embedded in data
- \( \Delta p_{T,SP \, \text{Jet}} = p_T^{\text{reco}} - p_T^{\text{gen}} - \rho A \)
**Results:** $D^0$-Tagged Jet Spectra and $R_{CP}^*$

**STAR Preliminary**

*Fragmentation from PYTHIA 8*

(Mid-)central spectra suppressed w.r.t. peripheral spectrum
Results: $D^0$ Radial Profiles in Jets

STAR Preliminary
Au+Au $\sqrt{s_{NN}} = 200$ GeV
anti-$k_T$, $R = 0.4$
$p_{T,D^0} > 5$ GeV/c
$p_{T,jet} > 5$ GeV/c

Ratio consistent with unity. Slight trend in ratios also similar with measurements at the LHC and theory predictions with diffusion.
Summary

First measurement of $D^0$-tagged jets in heavy-ion collisions @ RHIC
- (Mid-)central spectra suppressed w.r.t. peripheral spectrum
- $D^0$ radial profiles in (mid-)central consistent with no modification, relative to peripheral, within uncertainties

Outlook
- Further studies of $D^0$-tagged jet fragmentation in heavy-ion collisions at RHIC
- Extend measurement to low $D^0$ $p_T$ region to improve kinematic acceptance