Measurement of charged jet cross-section and properties in proton-proton collisions at 2.76 TeV with ALICE

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Jet is a collimated spray of hadrons produced from the fragmentation of hard scattered partons in high energy collisions.

Jet production is well understood in pp collisions and pQCD – a powerful tool to study QGP properties.

Event selection:
- pp 2.76 TeV minimum bias events

Vertex selection:
- |Z vertex| < 10 cm

Track selection:
- Charged tracks using ITS and TPC
- |\eta| track < 0.9, \pT track > 0.15 GeV/c, |\phi| track < 2 \pi

Jet reconstruction:
- Algorithm: FastJet anti-\kt (pT scheme)
- R = 0.4, |\eta| jet < |\eta| track - R
- Jet \pT range: 10 GeV/c < \pT,jet,ch < 70 GeV/c

1. Charged jet production cross sections

\frac{d^2\sigma}{dp_T, d\eta}(p_T^{\text{jet,ch}}) = \frac{1}{L} \frac{dN_{\text{jet}}}{d\eta} (p_T^{\text{jet,ch}})

\begin{align*}
\text{ALICE Preliminary} \\
\text{pp @ s = 2.76 TeV}
\end{align*}

- Production cross sections measured with R = 0.2, 0.3, 0.4 and 0.6

2. Charged particle multiplicity (N_{ch}) in jets

- <N_{ch}> distributions for R = 0.4 compared to MC models (left) and with that of 7 TeV
- <N_{ch}> increases with increasing jet \pT
- <N_{ch}> shows no \sqrt{s} dependency within the measured jet \pT range

3. Average charged jet size (R_{80})

- Average radius containing 80% of the total jet \pT

- <R_{80}> is measured for R = 0.4. <R_{80}> decreases with increasing jet \pT
- <R_{80}> shows no \sqrt{s} dependency within the measured jet \pT range

4. Transverse momentum density (p_T^{sum})

- \frac{dp_T^{sum}}{dr} |r| = \frac{1}{\delta r} \frac{1}{N_{\text{jet}}} \sum_{i=1}^{N_{\text{jet}}} p_T^{i} |r - r_i/2| / |\delta r/2|

- <p_T^{sum}> measured for R = 0.4 in four jet \pT bins
- <R_{80}> and <p_T^{sum}> measurements show collimation for higher \pT jet
- Pythia and Herwig agree within 10% and Phojet within 15% with data for jet shape observables

Summary
- Charged cross-sections have been measured for R = 0.2, 0.3, 0.4 and 0.6
- <N_{ch}> is measured for R = 0.4. <N_{ch}> increases with increasing jet \pT
- <R_{80}> is measured for R = 0.4. <R_{80}> decreases with increasing jet \pT
- <N_{ch}> and <R_{80}> shows no \sqrt{s} dependency within the measured jet \pT range
- <p_T^{sum}> for R = 0.4 in four jet \pT bins - compared to models (left) and data (right)
- <p_T^{sum}> is greater around the jet axis and decreases with R
- Higher slope for higher jet \pT bin

Outlook
- Measurement of these observables for R = 0.2 and 0.6
- Lower the kinematic reach upto 5 GeV/c
- Measurements of jet shape observables in heavy-ion collisions

ALICE jet measurements

[1] ALICE Collaboration, Charged jet properties (pp, 7 TeV), PRD 91 (2015) 112012
[6] ALICE Collaboration, Centrality dependence of jet production (pPb, 5.02 TeV) EPJC 76 (2016) 271
[7] ALICE Collaboration, Centrality dependence of jet production (pPb, 5.02 TeV) EPJC 76 (2016) 271

Analysis details
- Event selection: pp 2.76 TeV minimum bias events
- Vertex selection: |Z vertex| < 10 cm
- Track selection:
  - Charged tracks using ITS and TPC
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- Jet reconstruction:
  - Algorithm: FastJet anti-\kt (pT scheme)
  - R = 0.4, |\eta_{jet}| < |\eta_{track}|-R
  - Jet \pT range: 10 GeV/c < \pT_{jet,ch} < 70 GeV/c

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