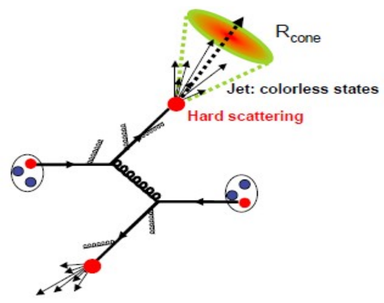
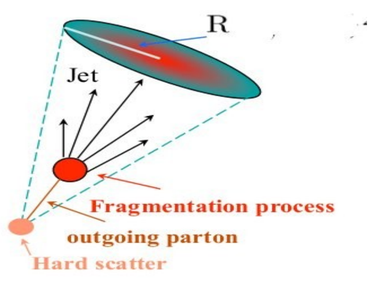
Measurement of charged jet cross-section and properties in proton-proton collisions at √s = 2.76 TeV with ALICE

Rathijit Biswas for the ALICE Collaboration, Bose Institute, Kolkata, India (e-mail : rathijit.biswas@cern.ch)

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





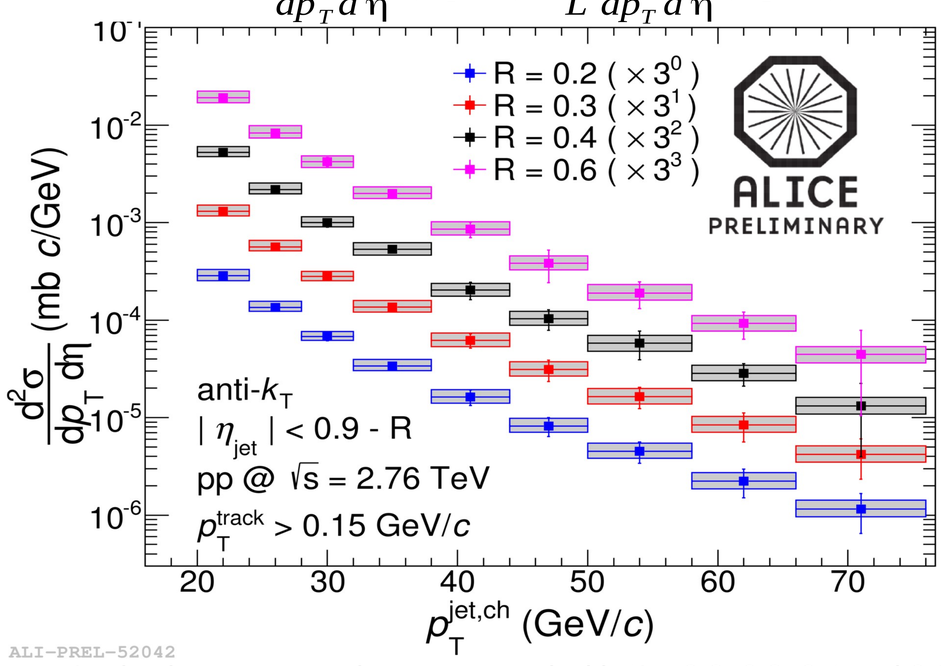
Jet production is well understood in pp collisions and pQCD – a powerful tool to study QGP properties.

Analysis details

- **Event selection :** pp@ √s = 2.76 TeV minimum bias events
- **Vertex selection :** $|z_{vertex}| < 10$ cm
- **Track selection :**
  - Charged tracks using ITS and TPC
  - $|\eta_{track}| < 0.9$, $p_T^{track} > 0.15$ GeV/c, $|\varphi_{track}| < 2\pi$
- **Jet reconstruction :**
  - Algorithm : FastJet anti-k_T (p_T scheme)
  - $R = 0.4$, $|\eta_{jet}| < |\eta_{track}| - R$
  - Jet p_T range : 10 GeV/c < $p_T^{jet, ch}$ < 70 GeV/c

1. Charged jet production cross sections

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



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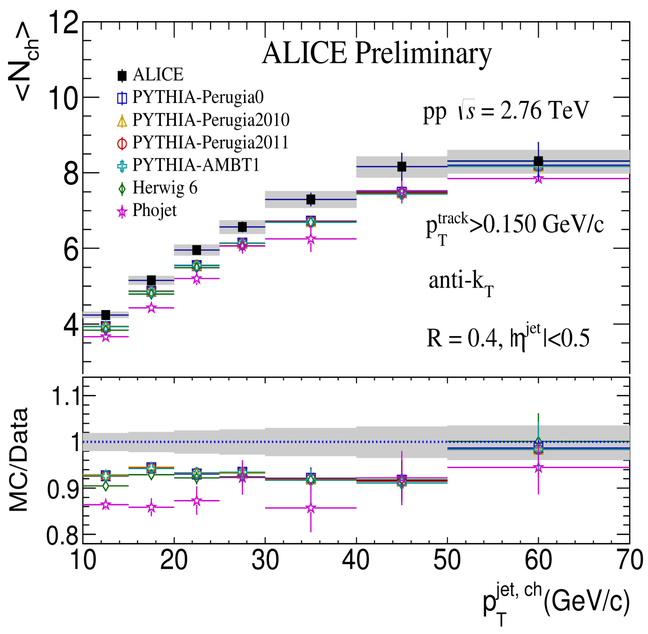
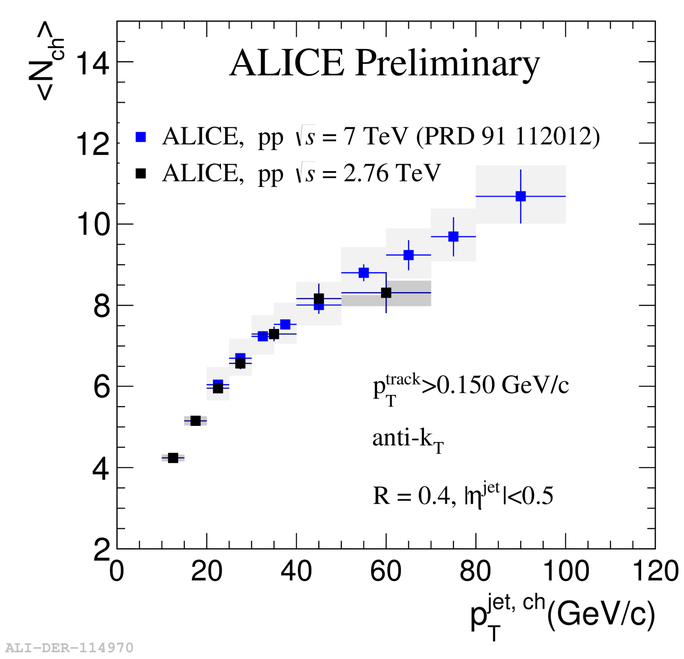
- Production cross sections measured with R = 0.2, 0.3, 0.4 and 0.6*

*M. Vajhar, EPSHEP 2013 Proceedings (arXiv:1311.0148v2)

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



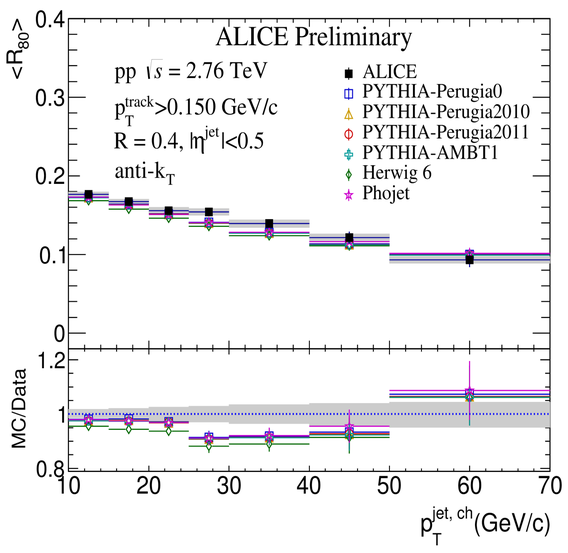


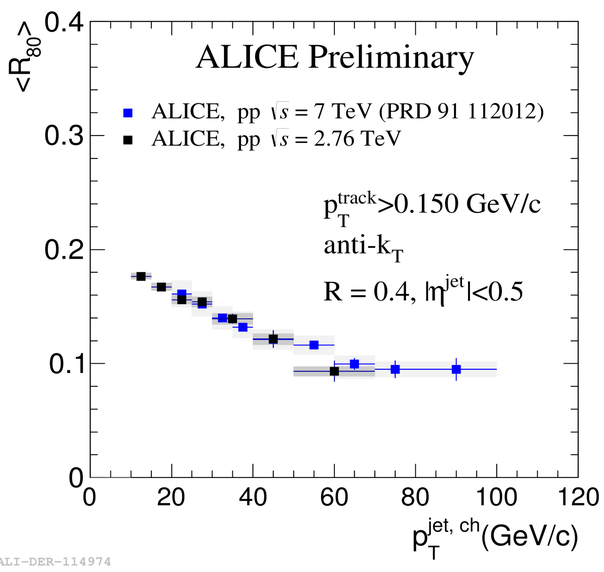
ALI-PREL-114954 ALI-DER-114970

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

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

➔ **Average radius containing 80% of the total jet p_T**





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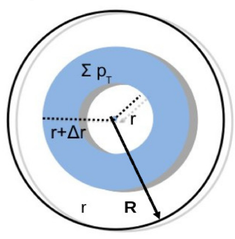
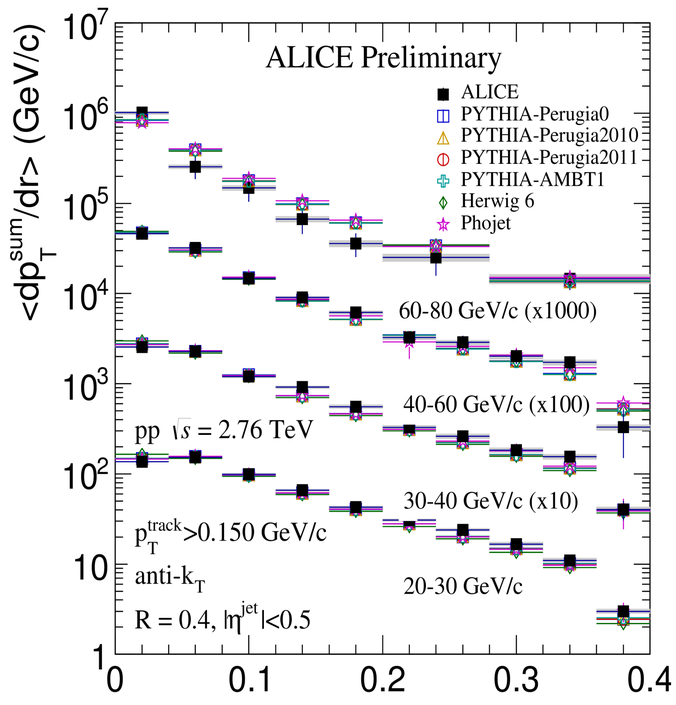
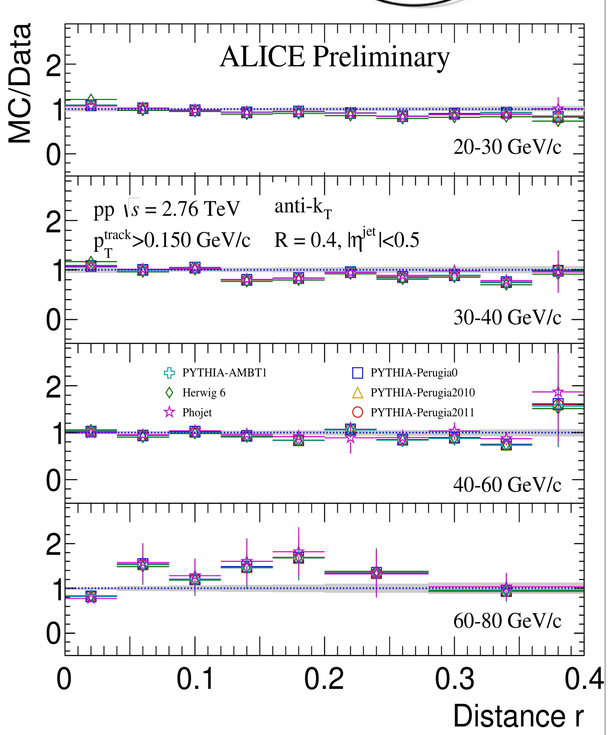
- <R_{80}> distributions for R = 0.4 compared to MC models and with that of pp collisions at √s = 7 TeV
- <R_{80}> is within half of the jet radius R
- <R_{80}> decreases with increasing jet p_T
- <R_{80}> shows no √s dependency within the measured jet p_T range

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

$$\left\langle \frac{dp_T^{sum}}{dr} \right\rangle (r) = \frac{1}{\delta r}\frac{1}{N_{jets}}\sum_{i=1}^{N_{jets}} p_T^i(r-\delta r/2, r+\delta r/2)$$







ALI-PREL-114966 ALI-PREL-114962

- <p_T^{sum}> for R = 0.4 in four jet p_T 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 p_T bin : high p_T jet are more collimated than low p_T jet

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 p_T
- <R_{80}> is measured for R = 0.4. <R_{80}> deccreases with increasing jet p_T
- <N_{ch}> and <R_{80}> shows no √s dependence within the jet p_T reach
- <p_T^{sum}> measured for R = 0.4 in four jet p_T bins
- <R_{80}> and <p_T^{sum}> measurements show collimation for higher p_T jet
- Pythia and Herwig agree within 10% and Phojet within 15% with data for jet shape observables

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

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ALICE jet measurements

[1] ALICE Collaboration, Charged jet properties (pp, 7 TeV), PRD 91 (2015) 112012
[2] ALICE Collaboration, Inclusive jet cross-sections (pp, 2.76 TeV), PLB 722 (2013) 262-272
[3] ALICE Collaboration, Jet mass in PbPb and pPb, PLB 776 (2018) 249
[4] ALICE Collaboration, Near-side jet peak shape (PbPb, 2.76 TeV), PRL 119 (2017) 102301
[5] ALICE Collaboration, Anisotropy in jet (PbPb, 2.76 TeV), PLB 753 (2016) 511-525
[6] ALICE Collaboration, Centrality dependence of jet production (pPb, 5.02 TeV)EPJC 76 (2016) 271
[7] ALICE Collaboration, Jet R_{pPb} at 2.76 TeV, PLB 749 (2015) 68-81