Latest Jets Results from the DØ Collaboration

DIS 2005

27April-1May 2005

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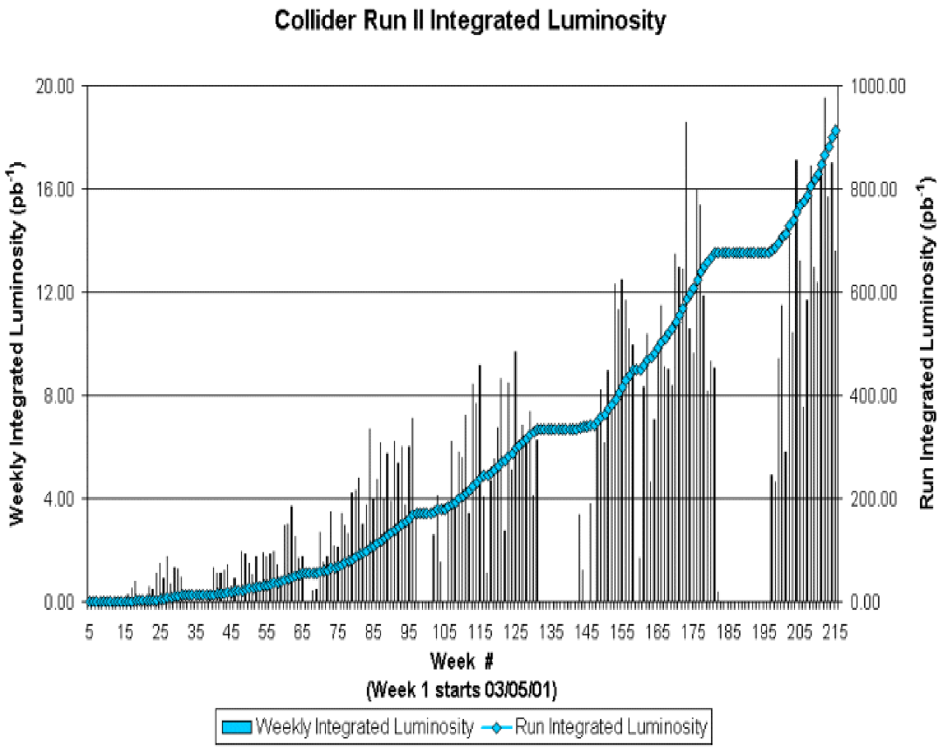
Current Measurements

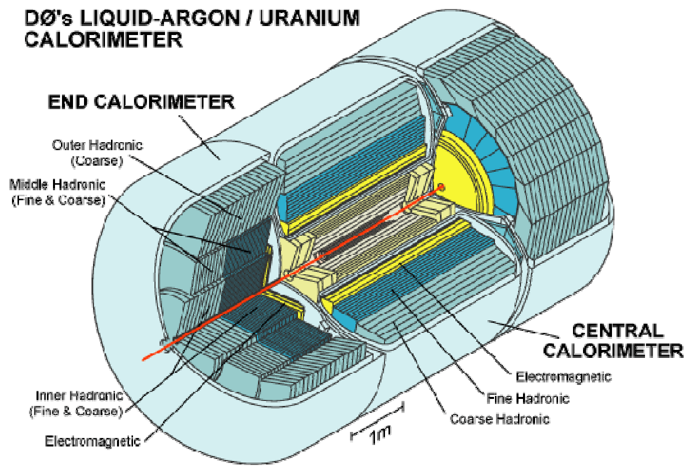
- High p_T cross sections
  - Inclusive Jet and Di-Jet cross sections
- Heavy Flavour Jets
  - μ-tagged Jet cross section
- High p_T multi-jet radiation
  - Dijet azimuthal decorrelations

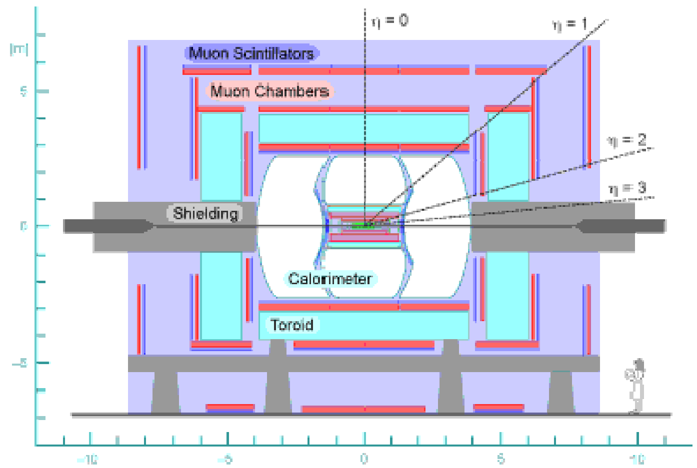
Tevatron Performance



- Run I →Run II
  - 1.8 TeV→1.96 TeV
  - Luminosity Upgrade
- Tevatron operates now at $\mathcal{L} = 10^{32}\ cm^{-2}.s^{-1}$
- DØ collected ~0.7 fb^{-1}
- Long Term Luminosity Plans (2009)
  - Base goal: 4.4 fb^{-1},design 8.5 fb^{-1}

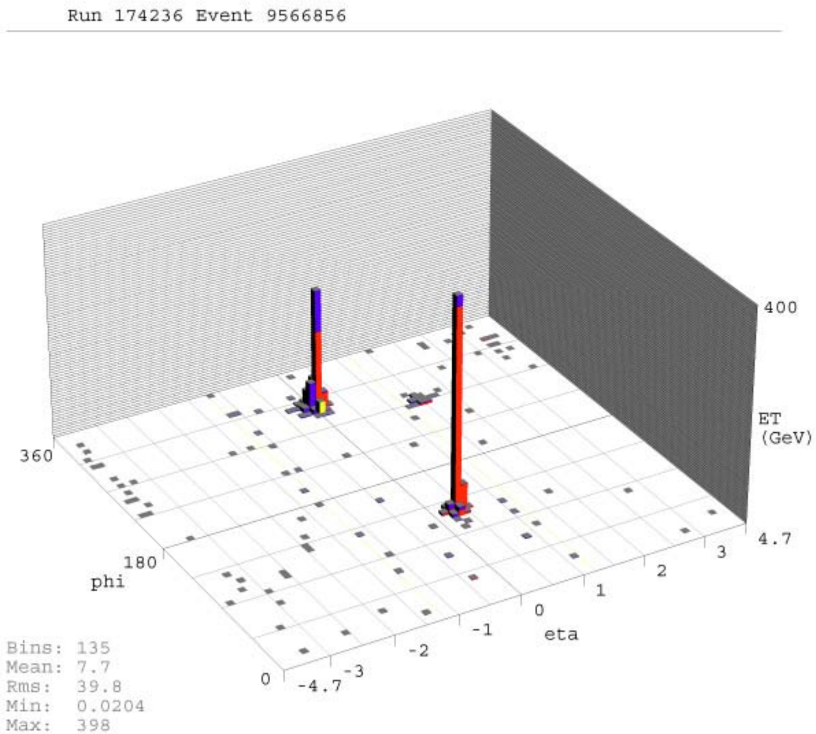
DØ Detector

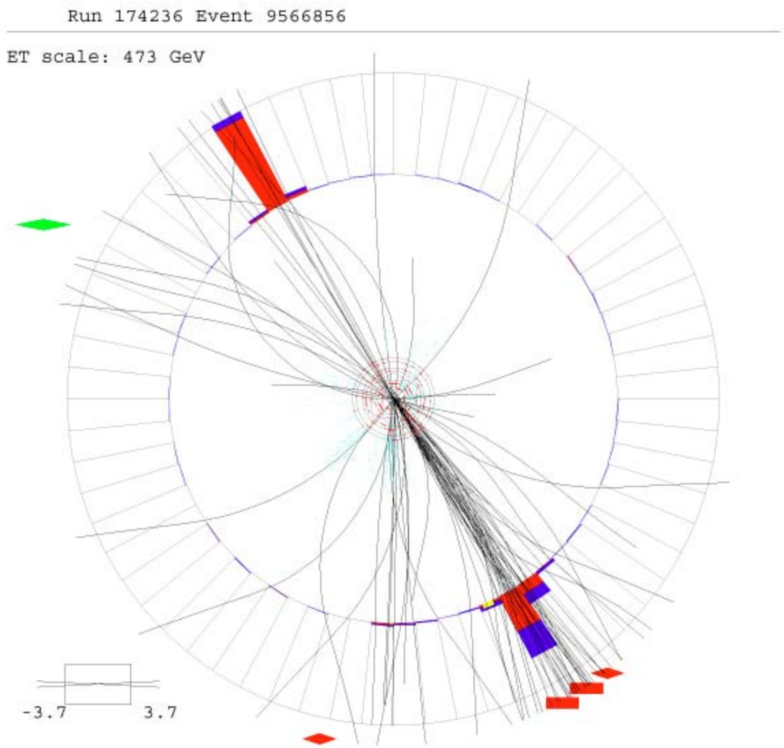




- Same calorimeter as Run I
  - uranium+liquid argon calorimeter
- New 2T B-field tracking volume
- Faster readout and trigger electronics
  - Run II 396 ns, Run I 2.4 μs

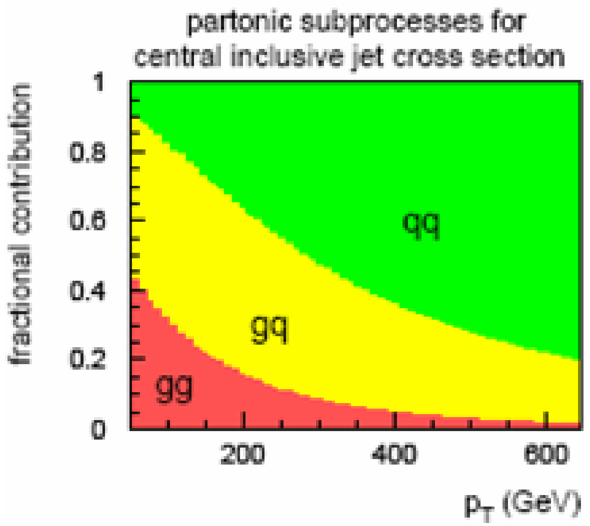
high p_T jets in Run II

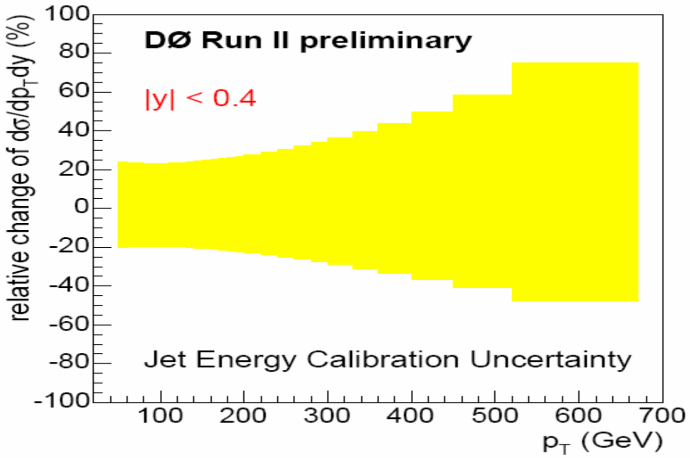


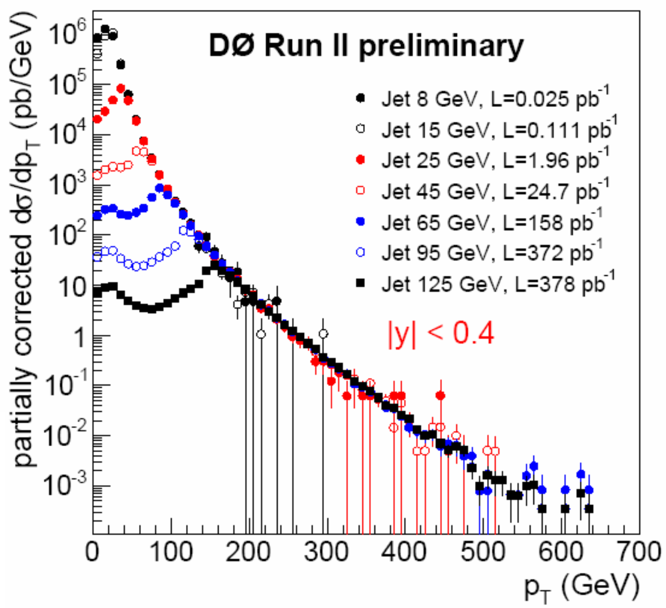


- Dijet event
- M_{jj}=1208 GeV/c^2
- p_T jet1= 631 GeV/c, p_T jet2= 560 GeV/c

high p_T jets in RunII



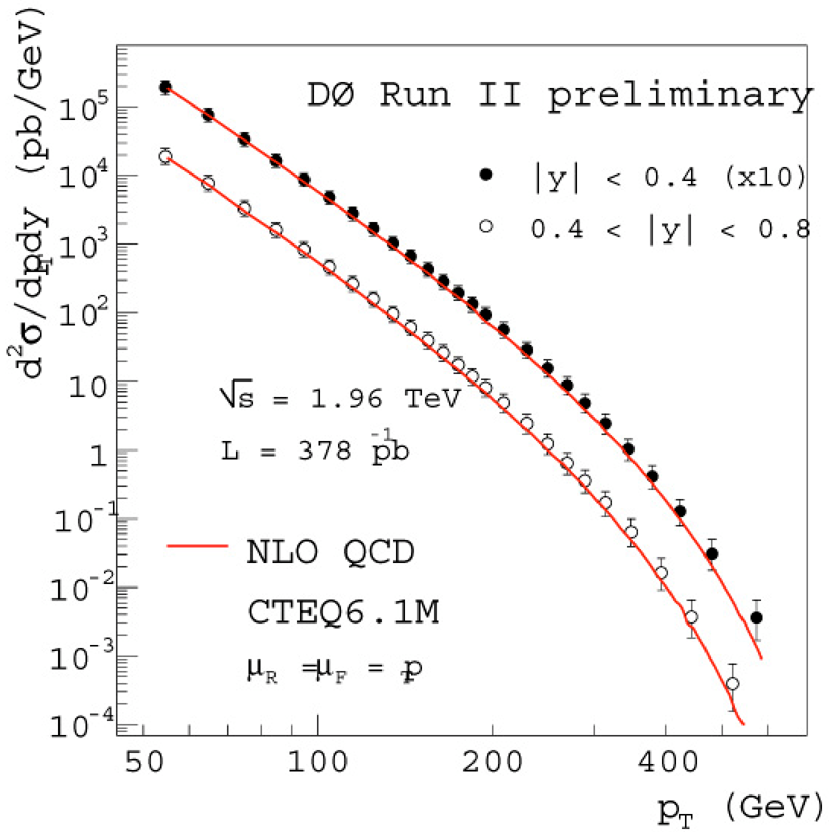


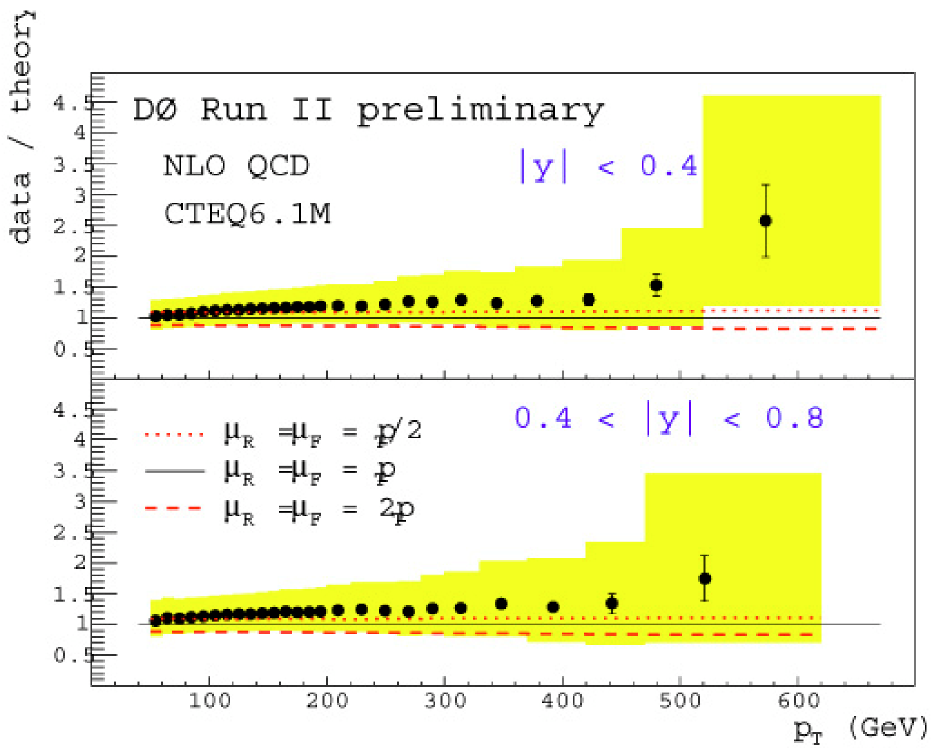


- Increase in beam energy → higher cross section at high p_T
  - → significant increase in jet p_T

  Sensitivity to gluon PDF at high x

high p_T jets in RunII

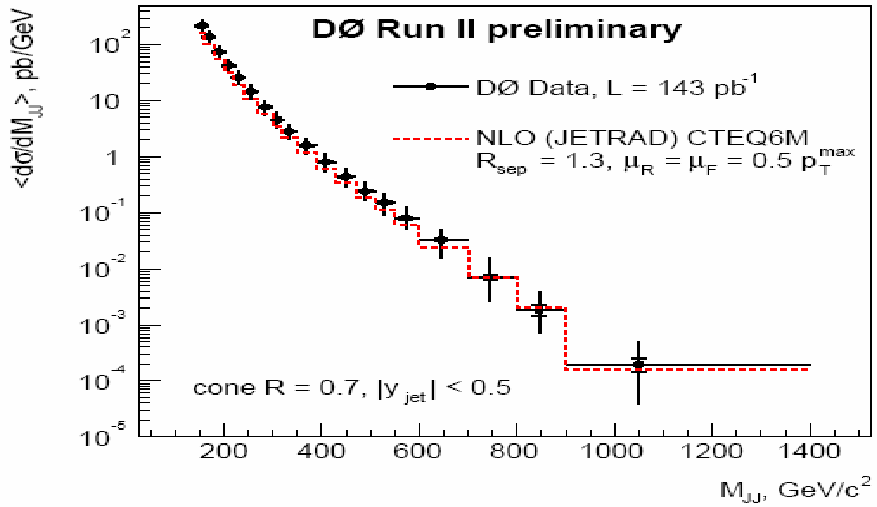




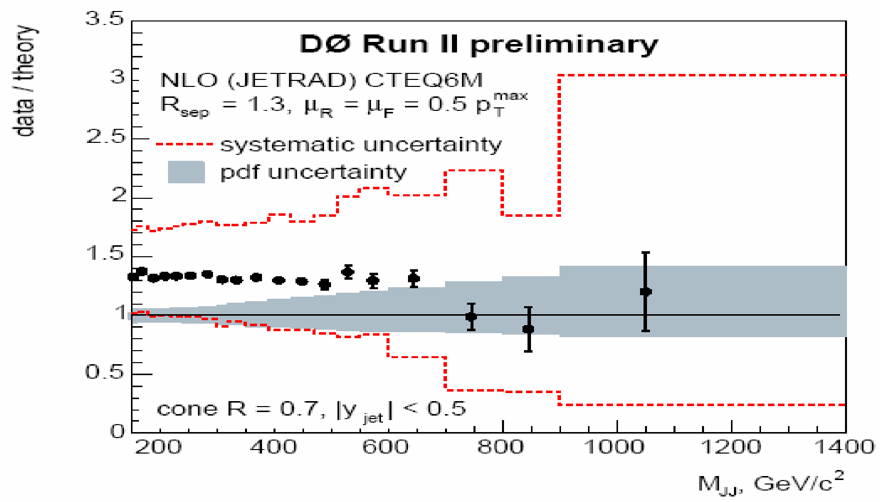
- New cone algorithm IR safe, shown for two separate rapidities
- Jet energy calibration dominates experimental uncertainty ~ 5%

Di-jets in RunII

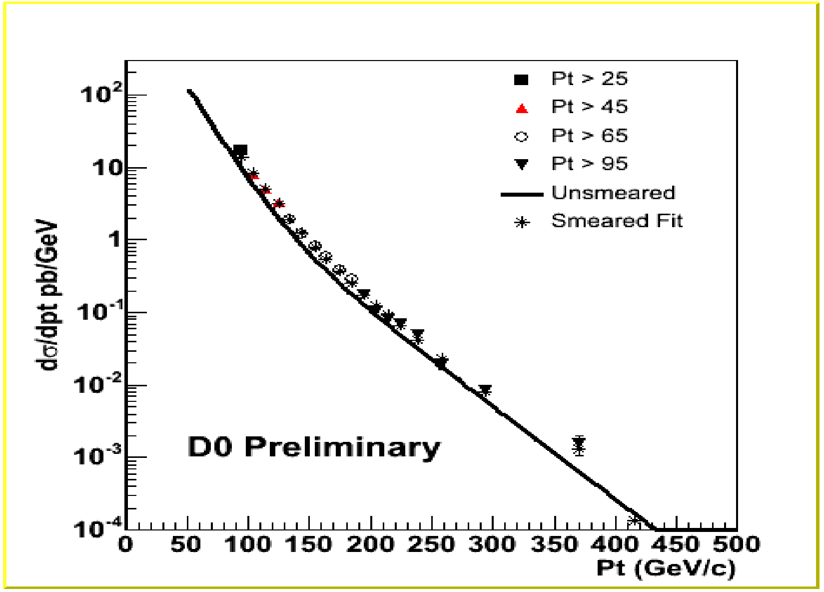
- Dijet Mass agrees with NLO pQCD

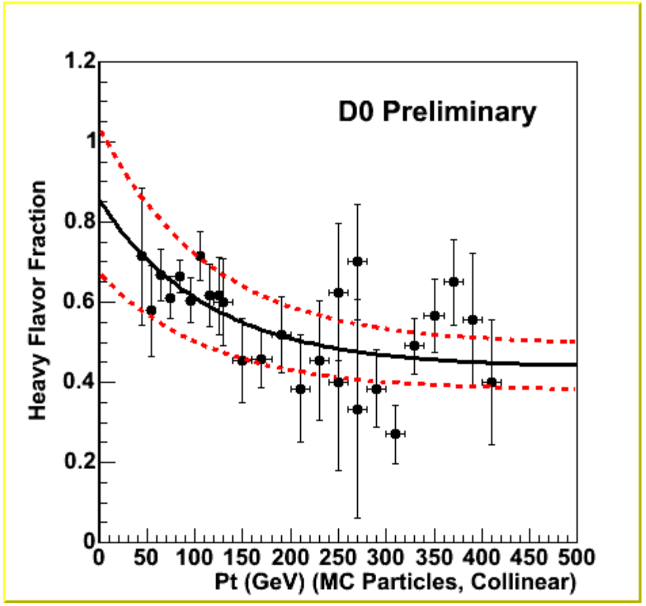


- Systematic uncertainty dominated



μ-tagged jet cross section

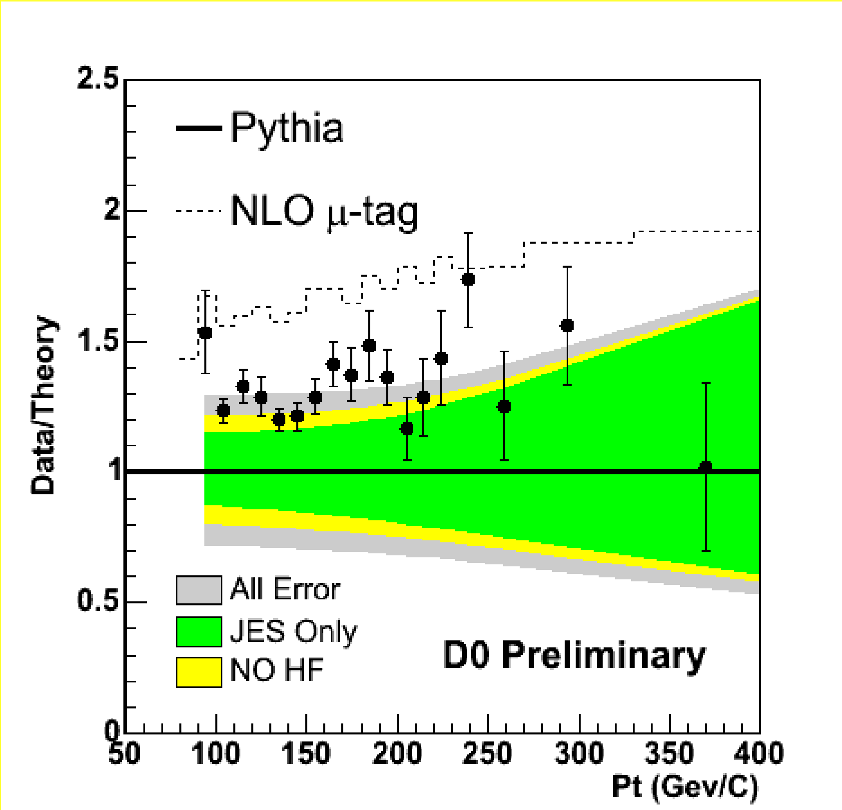




- Central jets($|y_{jet}|$) < 0.5) with cone size of R= 0.5
- $\Delta R(\text{jet},\mu) < 0.5$
- Based on $\mathcal{L} = 294\ pb^{-1}$
- Significantly enhanced heavy flavour sample

- Light quark contribution due to light meson decays (pions and kaons)
- Heavy flavour fraction studied in PYTHIA with full simulation of D0detector response

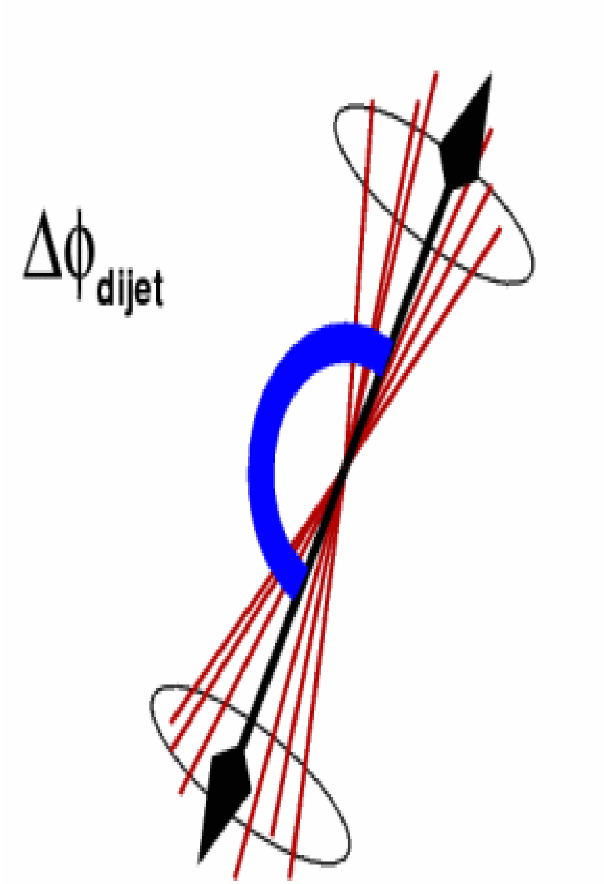
μ-tagged jet cross section



- Data compared with PYTHIA (represents LO QCD)
- NLO k-factor estimated using NLOJET++
- Experimental error dominated by jet energy calibration uncertainty
- At low p_T also contribution from error on heavy flavour content

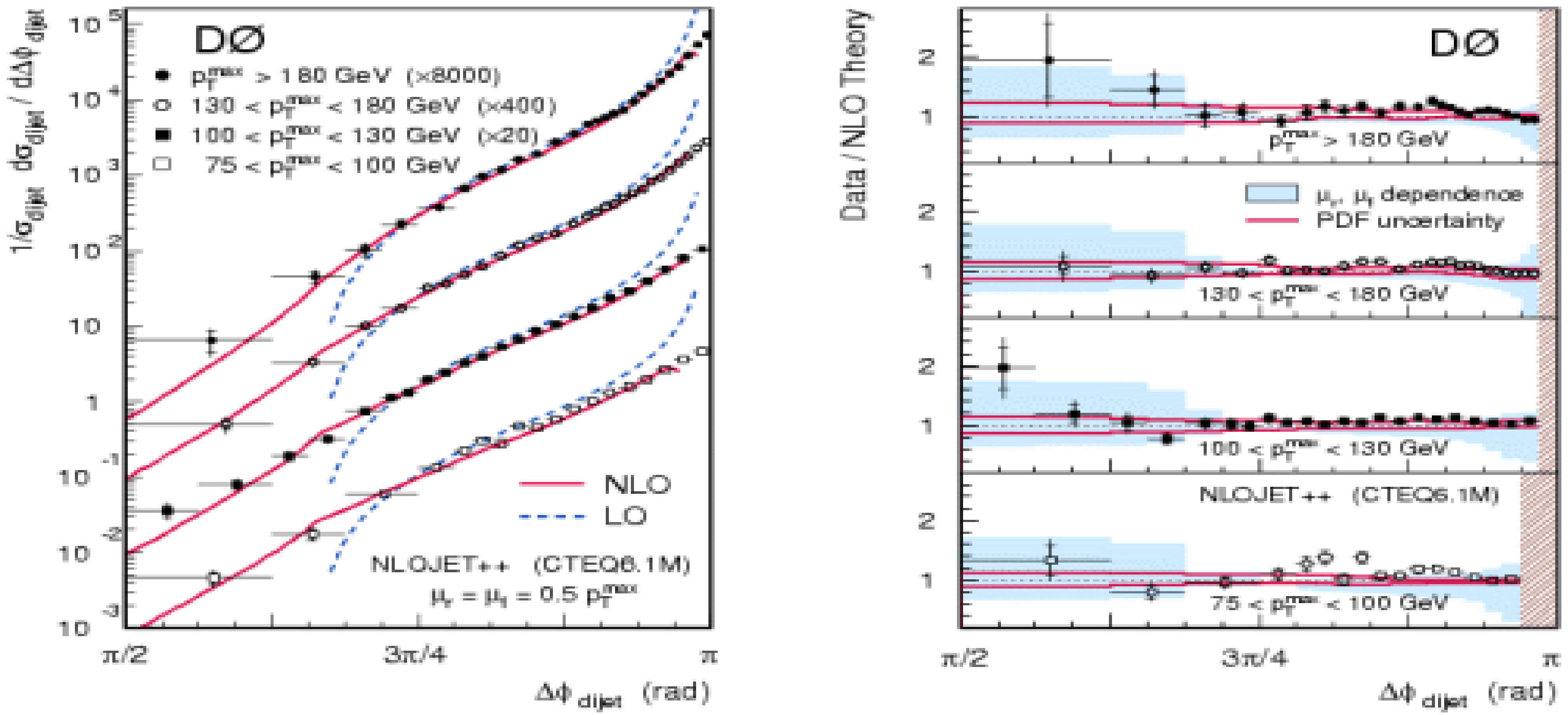
- Next step to use secondary vertex information to distinguish between c-jet and b-jet contributions

Azimuthal de-correlations



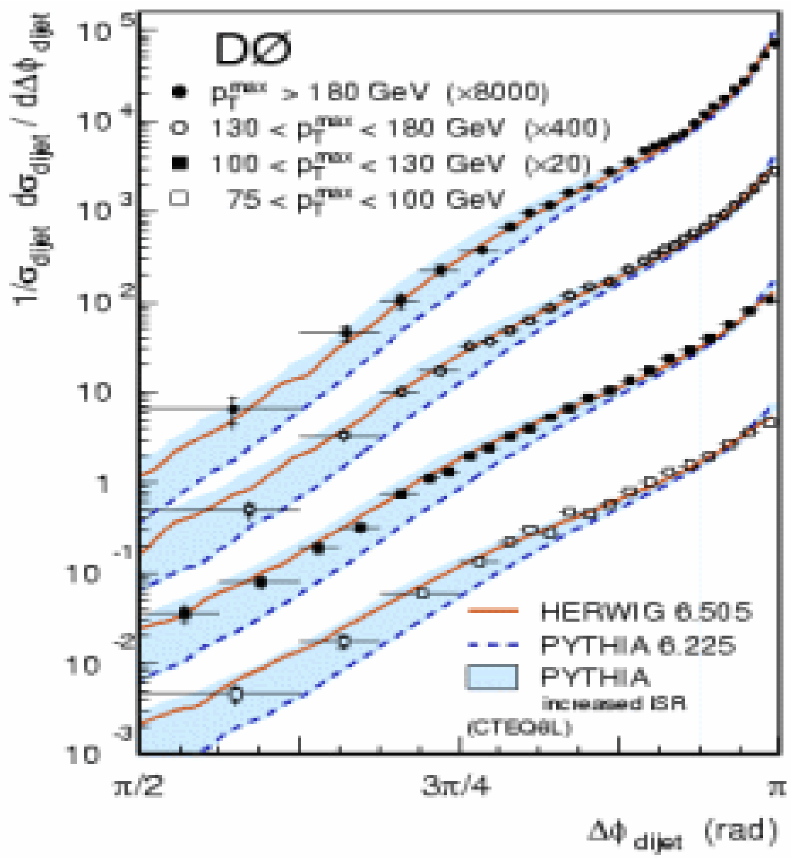
- Different regions of $\Delta\Phi_{di\text{-}jet}$ are sensitive to different aspects of multi-parton emissions
- a clean and simple way to study QCD radiative process
  - Reduced sensitivity to jet energy calibration
- Hep-ex/0409040

ΔΦ – comparison with pQCD



- Comparison with 2→3 NLO calculations (were not available for Run I)
- agreement with NLO QCD except ΔΦ→ π

ΔΦ – comparison with MC



- Herwig shows good agreement with data
- Not true for PYTHIA
  - Distribution sensitive to PARP(67) which controls the maximal allowed virtuality in the initial state parton shower
  - PARP(67)=2.5 fits the data well

Plot demonstrates the impact on tuning the MC generators

Summary

- Higher Beam Energy and increase Luminosity lead to further reach in p_T
- Started to look at heavy flavours
- Multi-jet studies allow study of various aspects of pQCD