Update on B-jet Cross Section measurement

(O. Peters, NIKHEF)

- Working to get a reasonable b-jet cross-section with μ-tag for Moriond

- Updates since Oct. 25th:

  - Analyzed *all* p10.07.01 data (3.8M events)
  - Events selected on L1 trigger
  - Luminosity measurement
  - More insight in fakes
  - Very preliminary Jet + μ cross-section

Analyzed data – 'online'

- Currently 5.3M events, reco'd with p10.07.01 available in SAM - Analyzed 3.83M

- Required L1 trigger: mu1cmsc_j5_fz
  - AND term of:
    - Central muon A+C scintillator coincidence
    - 5 GeV Jet with $|\eta_{jet}| < 0.8$

- Events passing L1 trigger: 661504

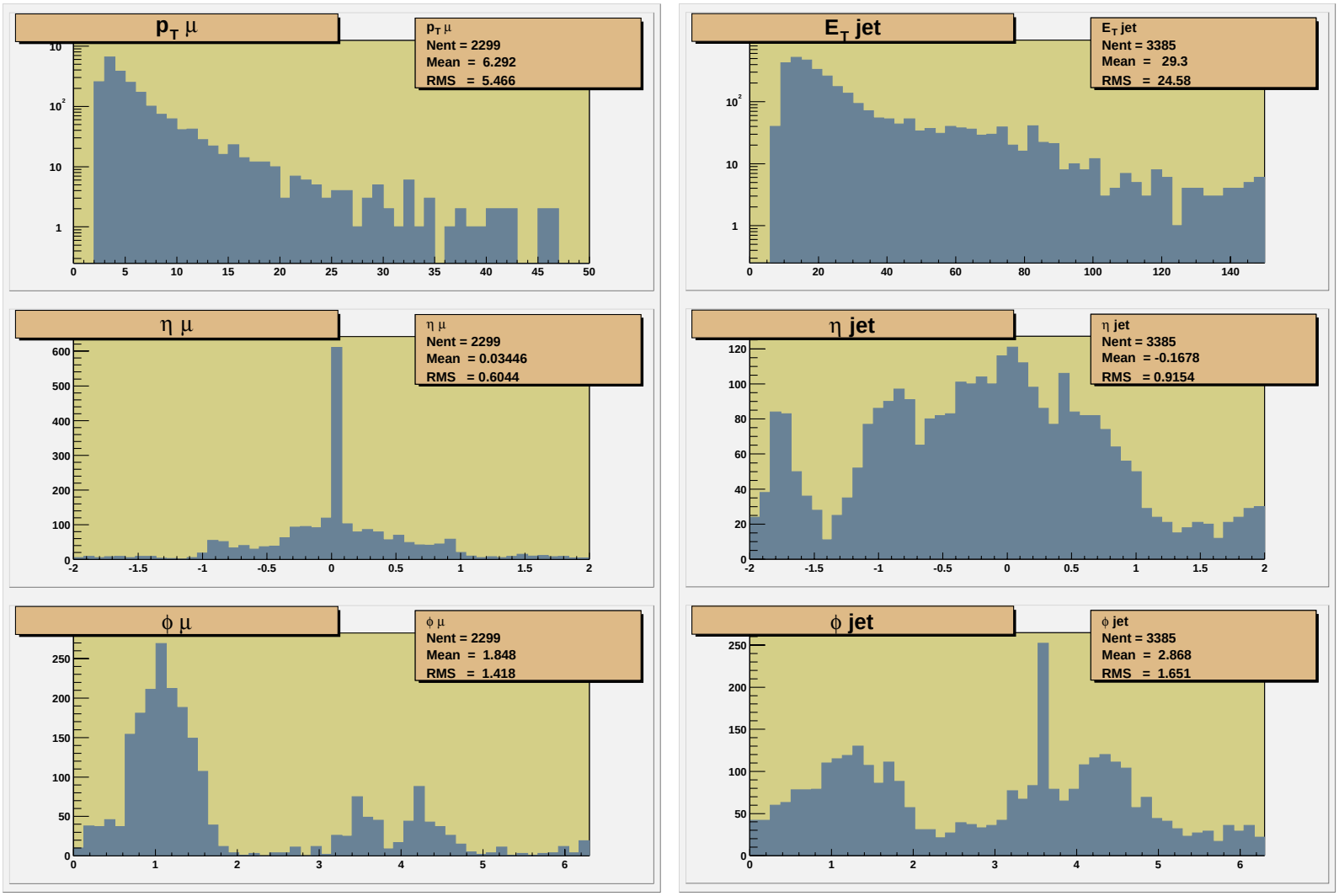
- Exposed luminosity: 0.85 pb^{-1}
  - L1 cross section: 0.78 μb

Analyzed data – 'offline'

- Offline requirements:
  - ≥ 1 reconstructed Jet (0.5 RunII cone)
  - ≥ 1 reconstructed Muon, #segments ≥ 2

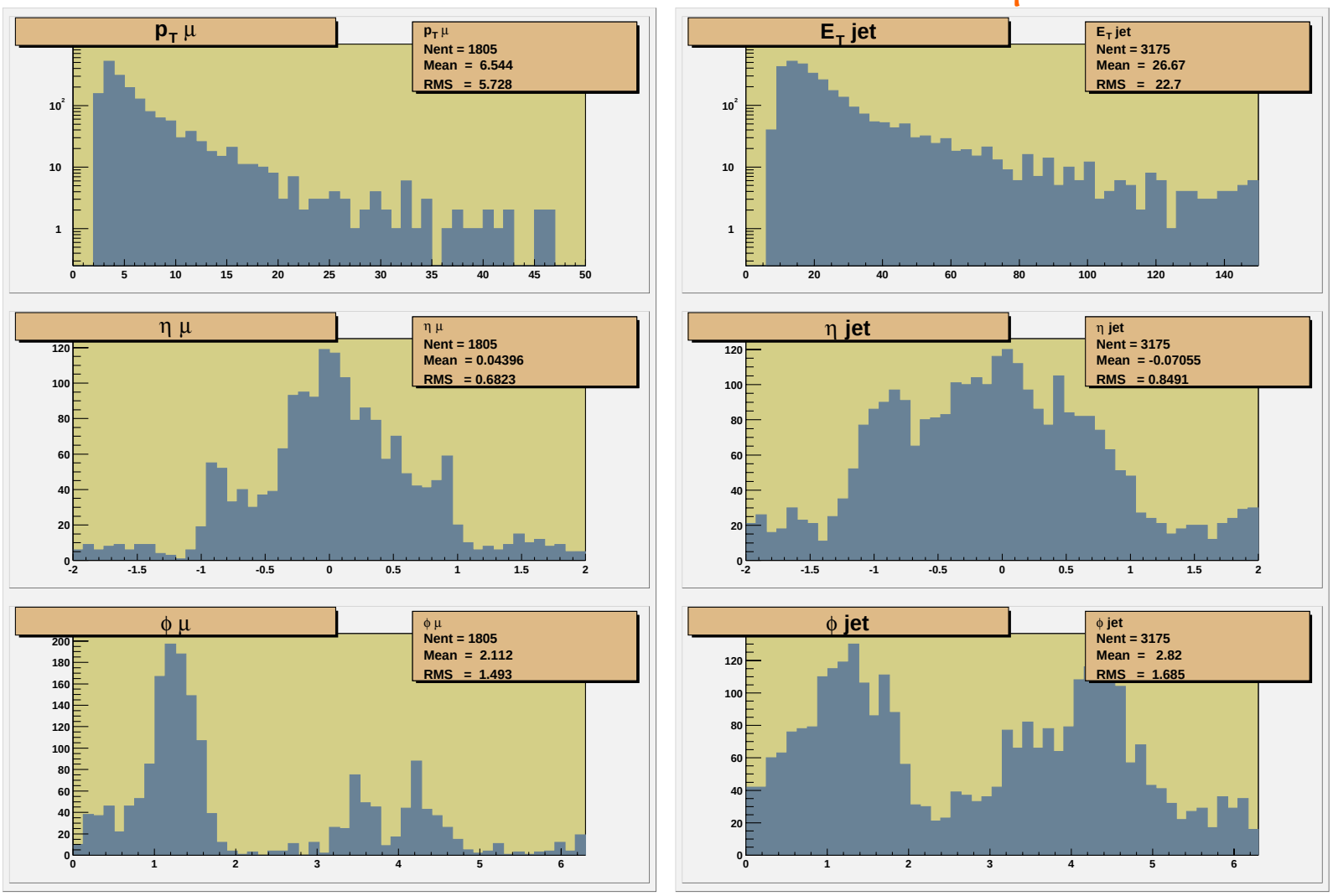
- Events passing cuts: 1489

Offline Reconstruction



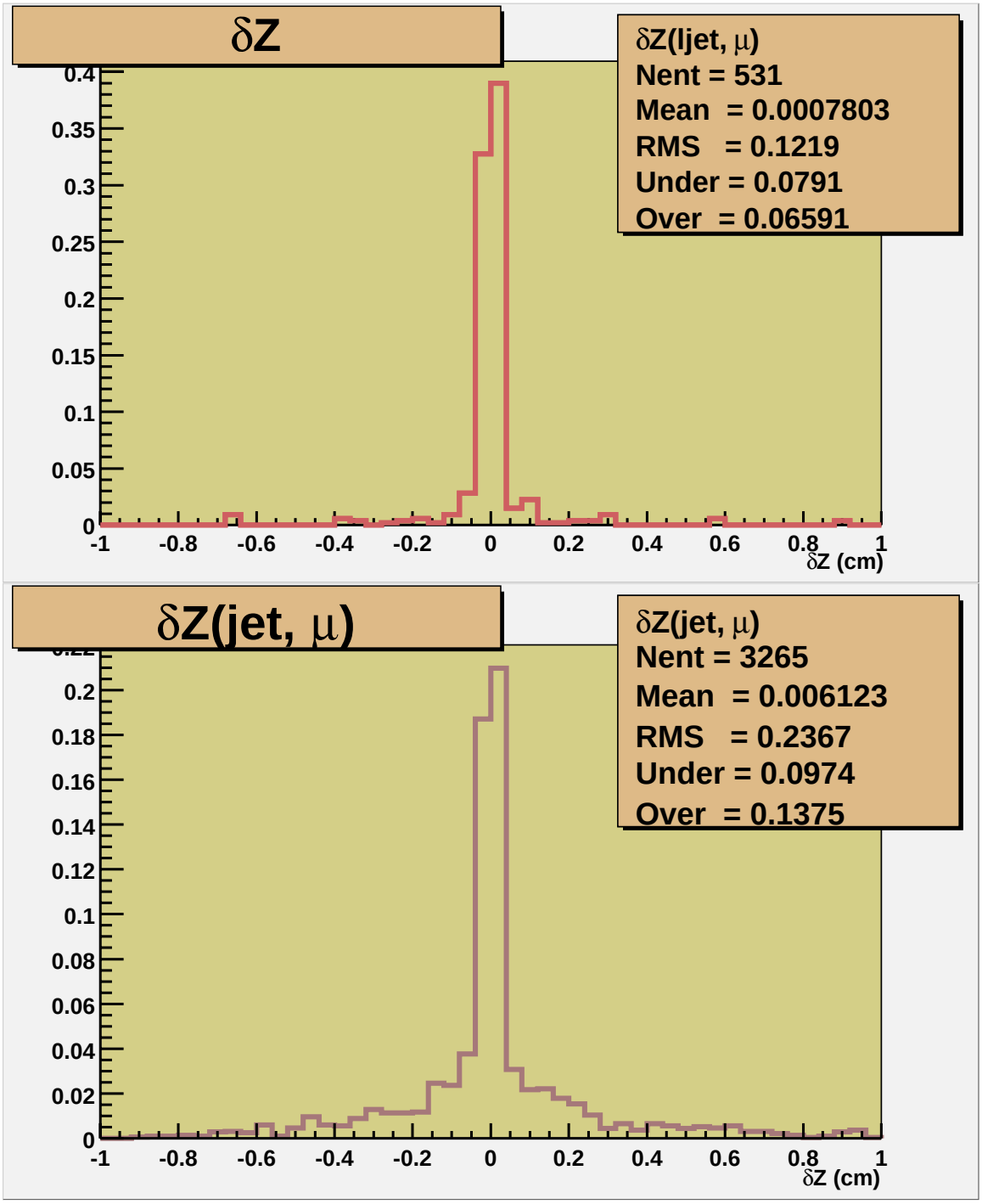
- η(μ) == 0: software problem
- Hot calorimeter cells at φ ≈ 3.55
  - HotF > 10
- Both φ distributions look weird

Offline Reconstruction – After cleanup



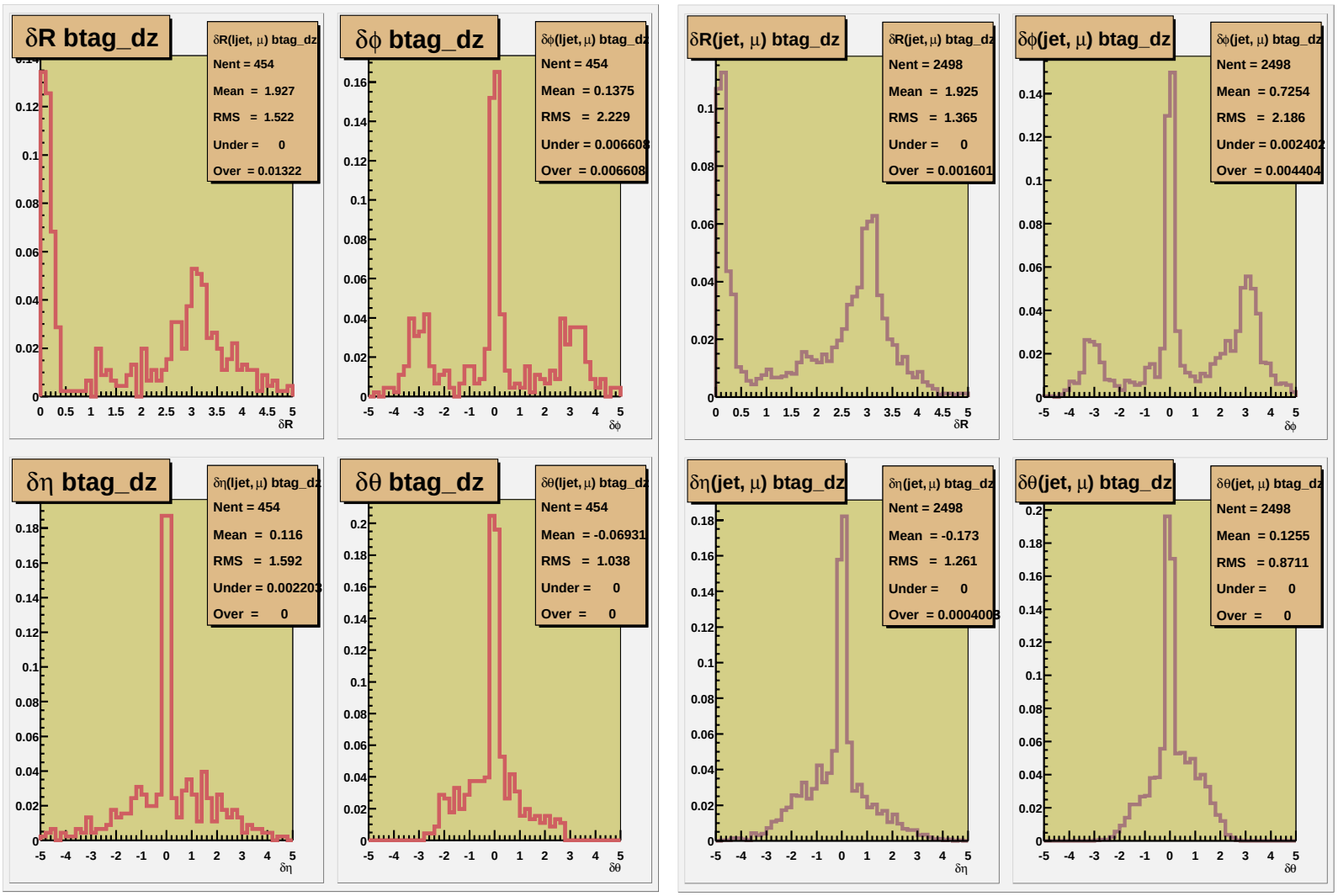
- η distributions look better
- φ distributions still look off
  - Hot chambers in muon system?

Jet+muon: δZ



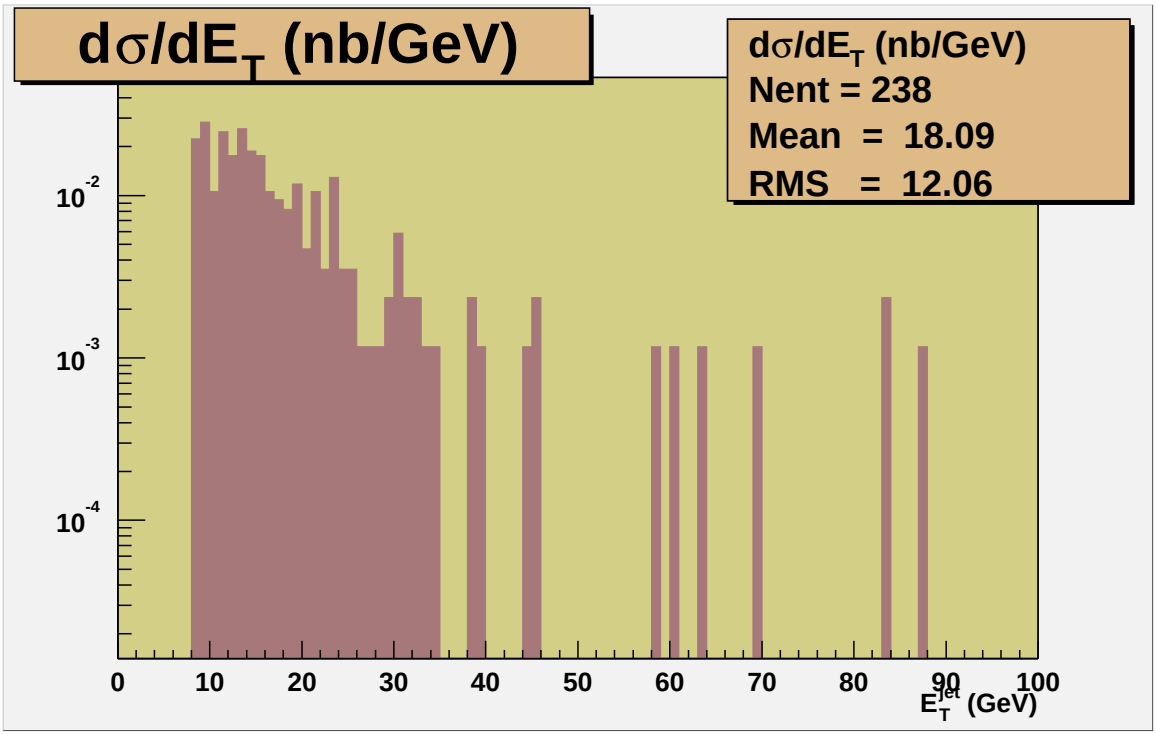
δZ = Distance of muon at DCA to Primary Vertex used for Jet Reconstruction

Jet+muon angular relations



- Left: MC, QCD $P_T > 10$ GeV
  - No trigger requirement, solely reco'd μ+jet
- Right: Real data sample, 1489 events
- $\delta Z < 1$ cm
- Peak at $\delta\varphi \approx 3$ caused by φ_{jet} peak at ~4 and φ_{μ} peak at ~1

Jet+muon cross-section



- Cuts applied:
  - $\delta R(\text{jet}, \mu) < 0.7$
  - $|\eta_{jet}| < 0.6$
  - $|\eta_{\mu}| < 0.8$
  - $P_T^{\mu} > 6$ GeV
- Factor ~100 too low (compared with Run I)
- No reconstruction efficiency folded in (~10%)?
- No trigger efficiency folded in (%?)

Jet+muon cross-section (Run I)
(d0note #3703: A. Sznajder, A. Maciel)

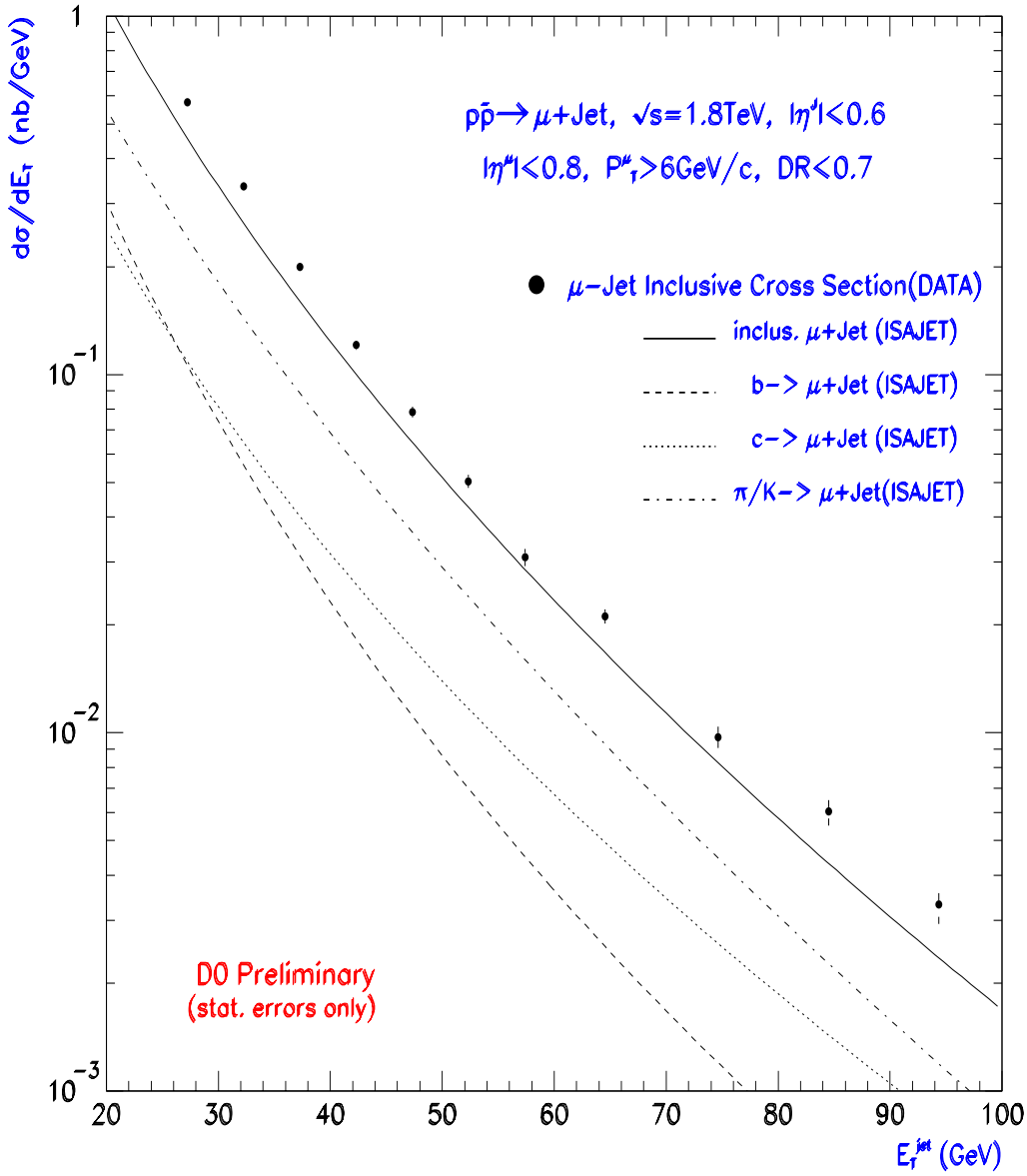
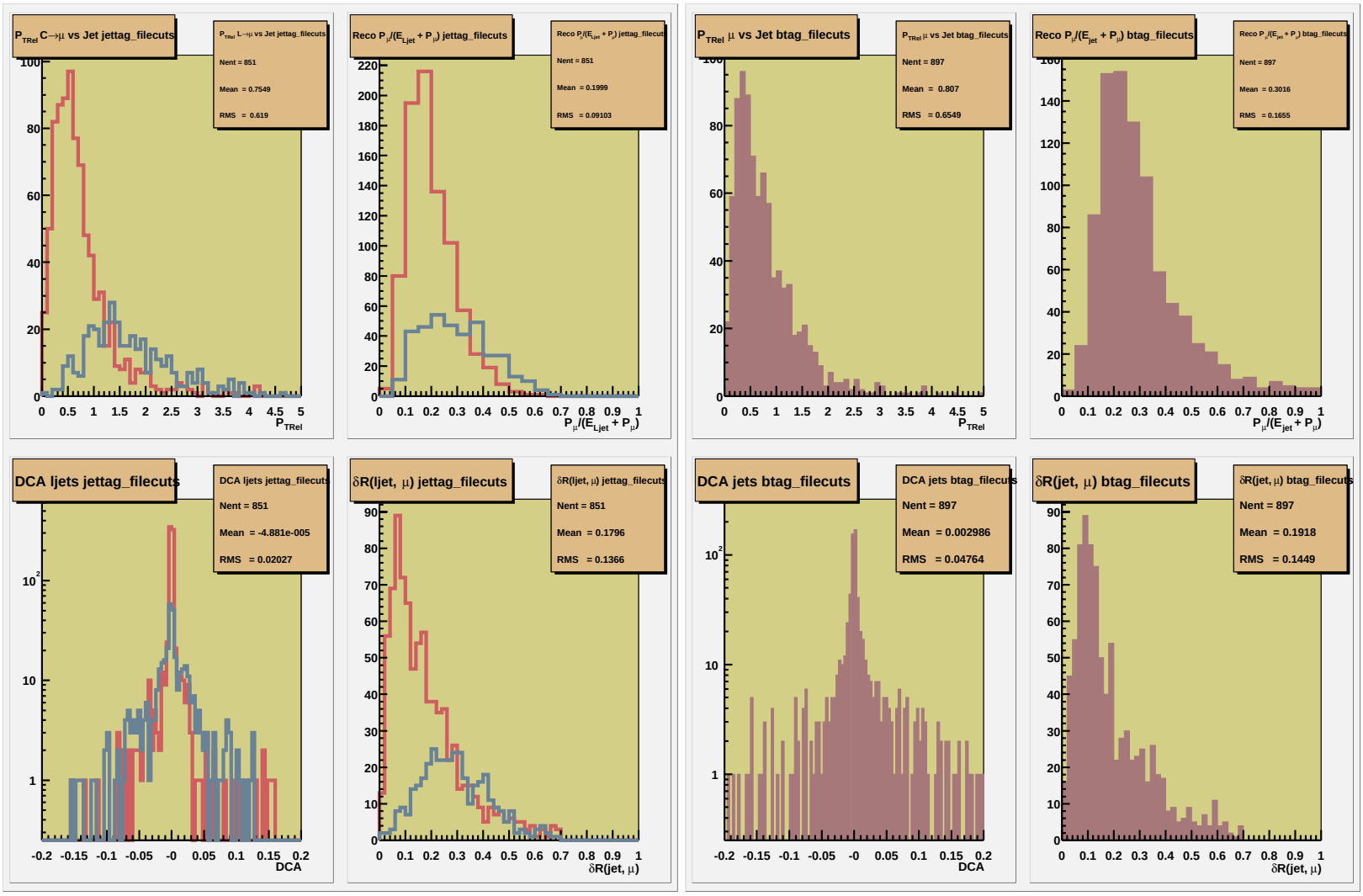


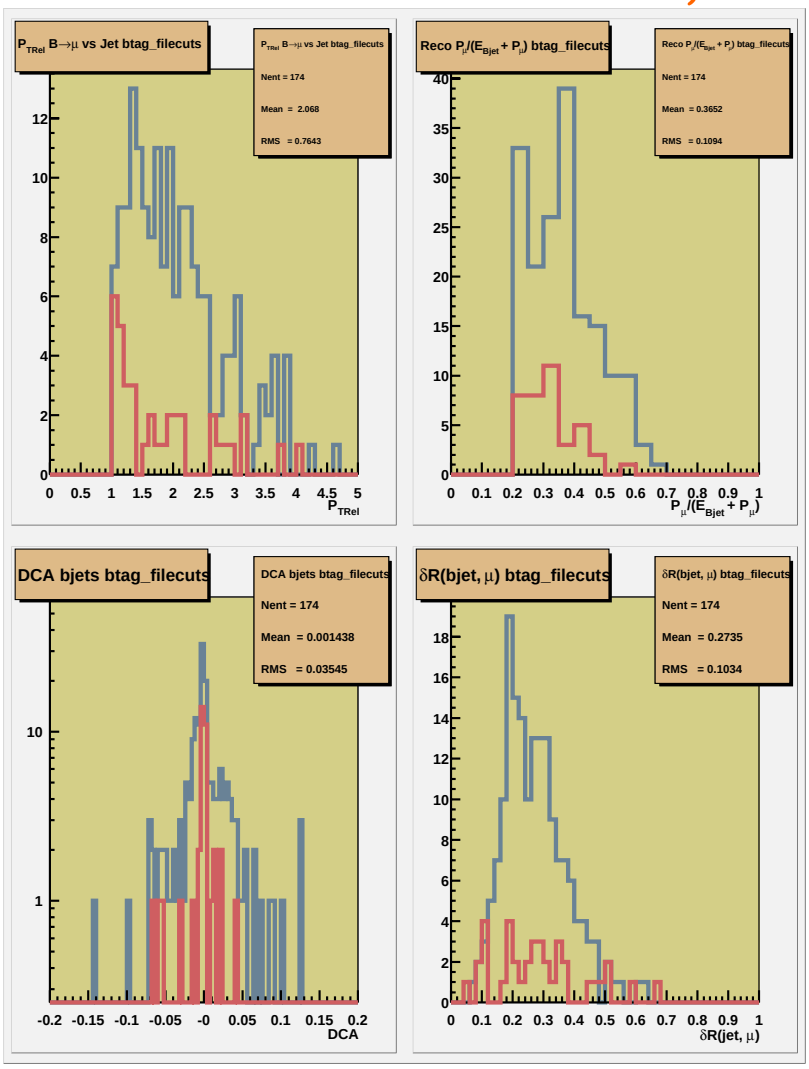
Figure 1: Muon tagged jet cross section as a function of hadron E_T (leptons not included). Uncertainties shown are statistical only.

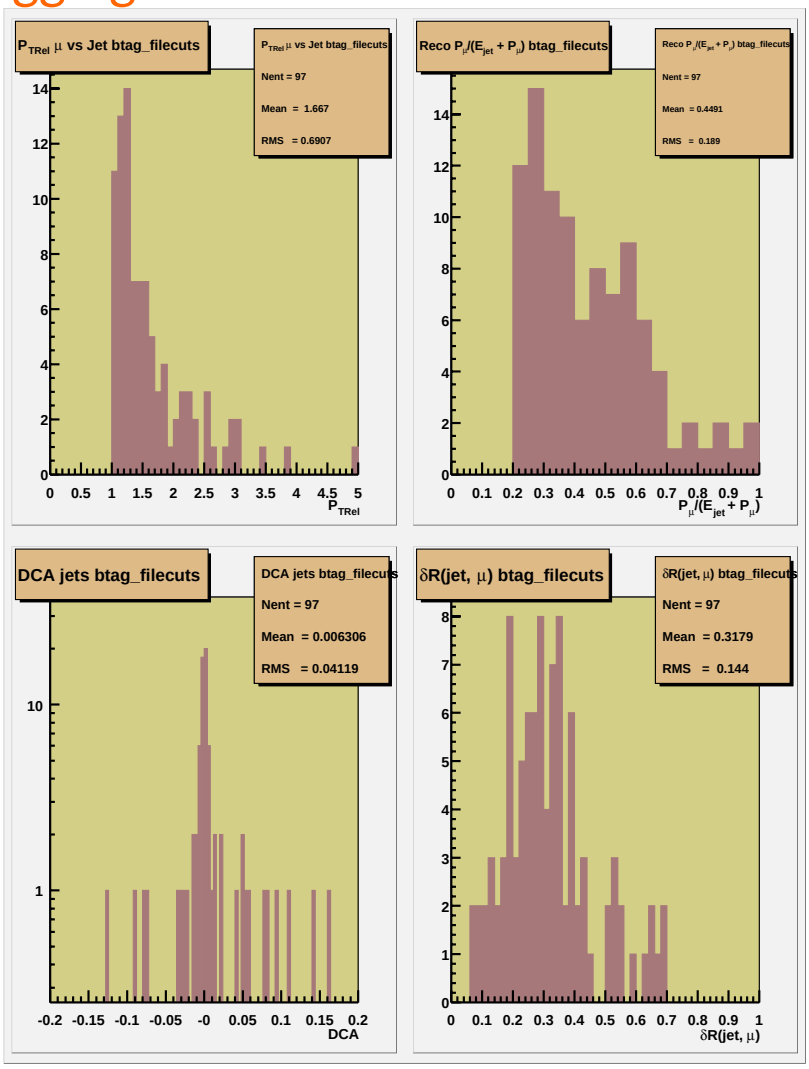
B-jet Tagging Variables



- Blue: MC Signal, 900 events, $P_T^b > 20$ GeV
- Red: MC QCD, 18K events, $P_T^q > 20$ GeV
- Purple: Data
- No other η cuts or P_T cuts

Cuts on B-jet Tagging Variables





- $\delta R(\text{jet}, \mu) < 0.7$ $\quad$ $P_{TRel} > 1.0$
- $P_\mu/(E_{jet} + P_\mu) > 0.2$ $\quad$ $\#seg_\mu = 3$
- $HotF_{jet} < 10$ $\quad$ $\delta Z(\mu, PV) < 1$ cm
- Definite number of b-jets in sample – hard to estimate S/B from MC

Conclusions

- Things are slowly shaping up

- First *very* crude 'estimate' of jet+μ cross section (more like proof of principle)
  - First step to take to b-jet cross section

- Badly needed:
  - Trigger efficiencies
  - Reconstruction efficiencies
  - Representative MC samples
  - Some help…