Z(ee)+Jets Analysis

- Electron Eta horns ...

Samples

- **Data**:
  - EM1TRK skim
  - Single EM triggers
  - Run range: 20 April 2002 - 28 June 2004 (Runs 151,817 - 194,566)
  - Rejecting bad runs (CAL, SMT, CFT, Jet/Met, Lumi)
  - $323 pb^{-1}$
  - No T42 applied
  - Jetcorr v5.1
  - Processed with ATHENA (v01-05-02)

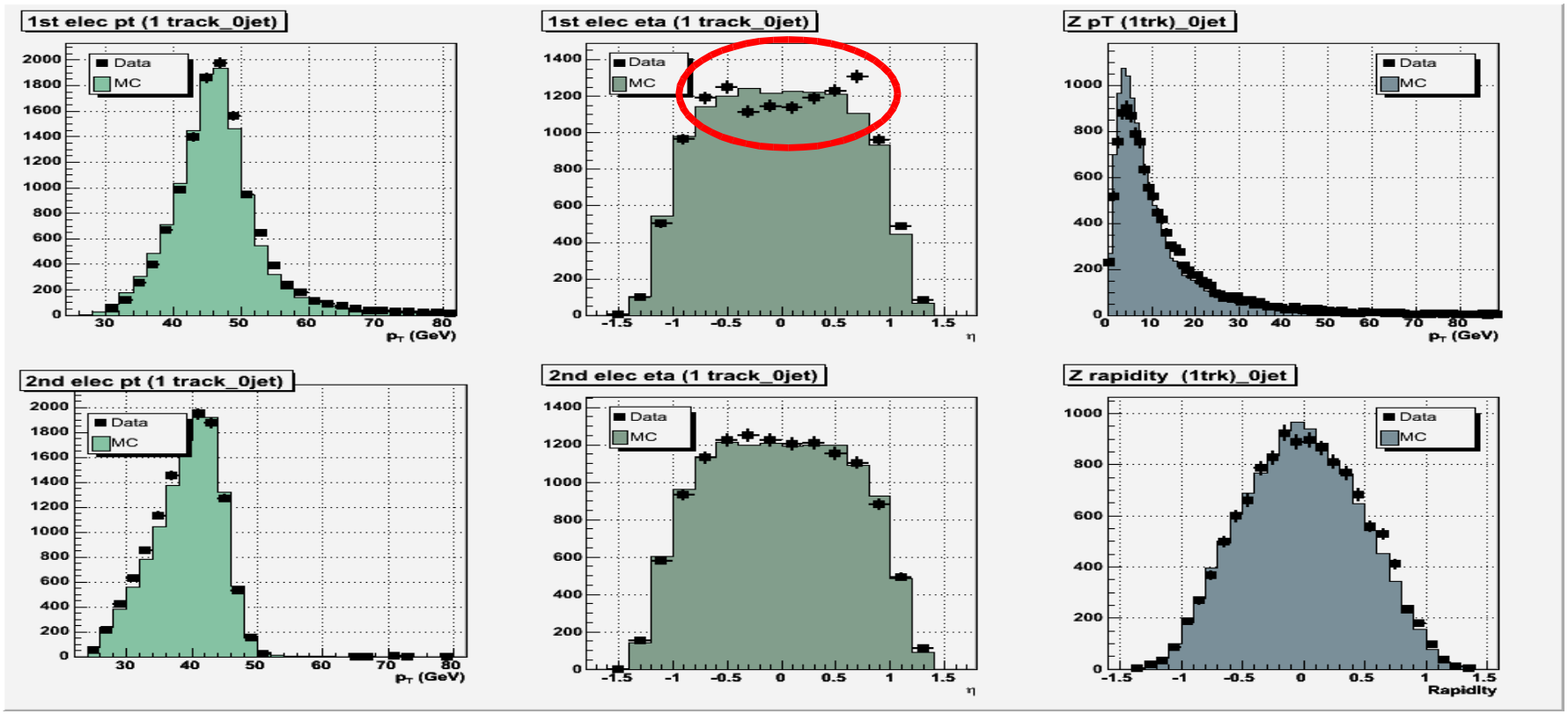
- **MC:**
  - Z/Gamma* > e^+e^- +X: 400k Pythia
  - Processed with ATHENA (v01-05-02)

Selection Criteria

- Removing bad runs/LBNs & dupli events
- PVX cut: |z|<60cm
- Using unprescaled single EM triggers
- Electron selection:
  - |ID|=10,11
  - EMF>0.9
  - Iso<0.15
  - HMx(7)<12
  - p_T>25GeV
  - |eta|<1.1
  - Including phi cracks
- Z selection:
  - 75GeV < M_{ee} < 105GeV
  - At least one trackmatched electron
  - At least one electron needs to fire the trigger
- Jet selection:
  - 0.05 < EMF < 0.95
  - HotF < 10
  - N90>1
  - CHF<0.4
  - L1conf
  - JES corrected p_T>20GeV
  - |eta|<2.5
  - Removal of jets overlapping with electrons from Z within dR of 0.4

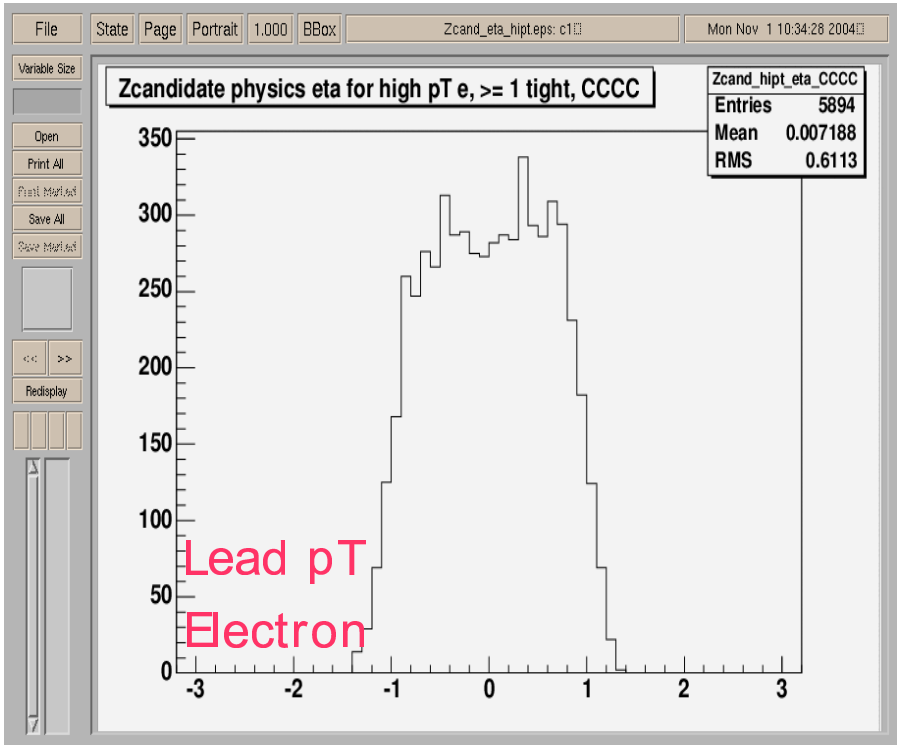
Data vs MC

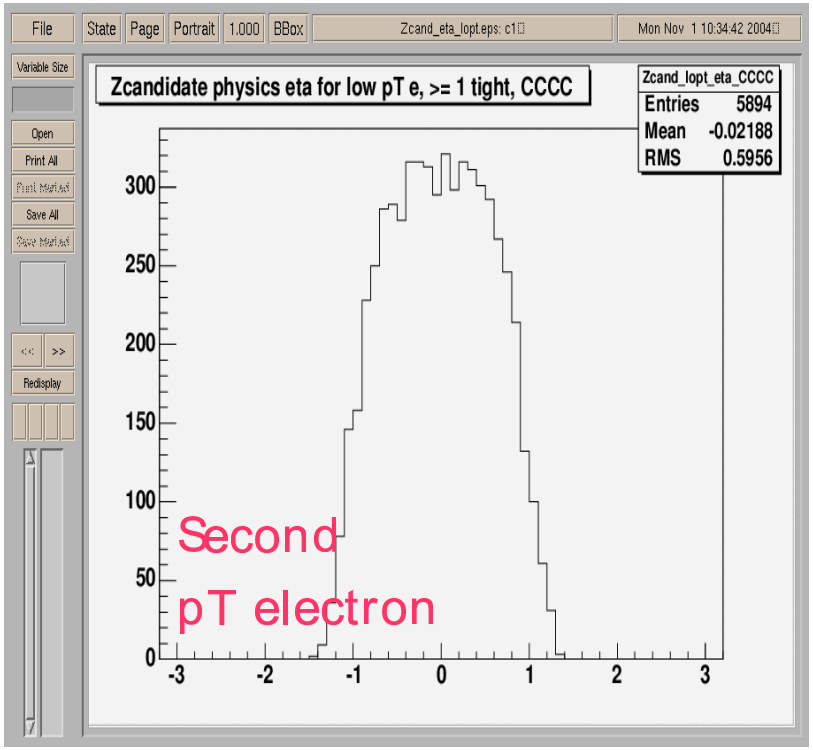
- MC = Pythia sample
- MC: smearing: pT' = pT c [1+Gauss(0,f)] c = 1.003, f = 0.045
- Data: background subtracted based on sidebands (40-75GeV & 105-140GeV)
- Normalization between data and MC wrt area (shape comparison)



Comparison with Electroweak Group (John Gardner)

- same electron quality cuts
- pT>25GeV
- CCCC electrons
- not applying bad-CAL-map (with bad-CAL-map horns are still there!)
- smaller dataset (177pb-1)



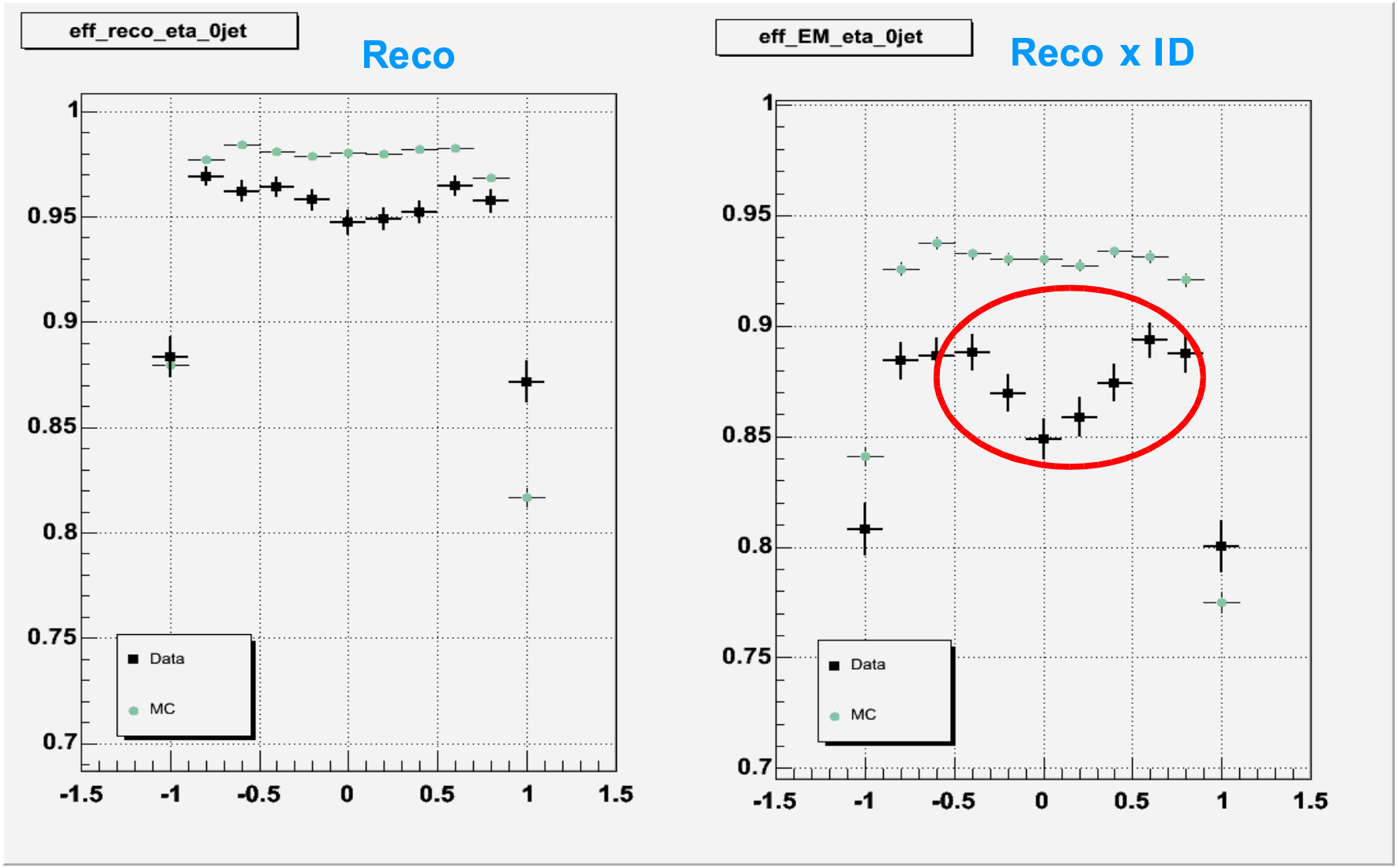


Some basic checks

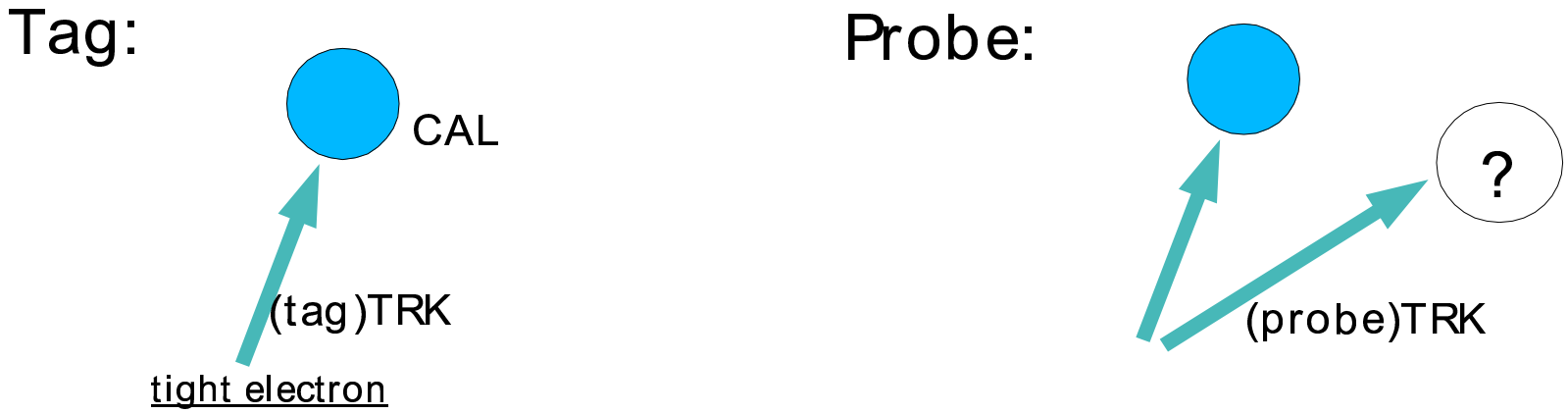
- ✗ Electron pt vs electron eta
- ✗ Module 17
- ✗ Phi cracks
- ✗ Electron pT cut
- ✗ Mass window cut
- ✗ Jet Multiplicities
- ✗ Track matching
- ✗ Runrange dependence

See plots at the end of this talk ...

EM- and Reco efficiencies vs Eta



Tag & Probe Method Overview



Z(ee) + n Jets Analysis Cuts:

PVX < 60cm

Tag-Electron: EMF > 0.9, Iso < 0.15, HMx7 < 12., p_T > 25 GeV, $|\eta|$ < 1.1, **with** phi cracks, matched with a good track in ΔR(<0.14)

Trigger: tag electron is required to have fired single electron trigger

Tag & ProbeTracks: 25 GeV < p_T < 80 GeV, Chi2 < 8.0, |DCA0| < 0.3, |DCA1| < 4.0, $|\eta|$ < 1.1, **with** phi cracks

Probe: Good track separated from Tag by $\Delta\Phi$ > 2.0

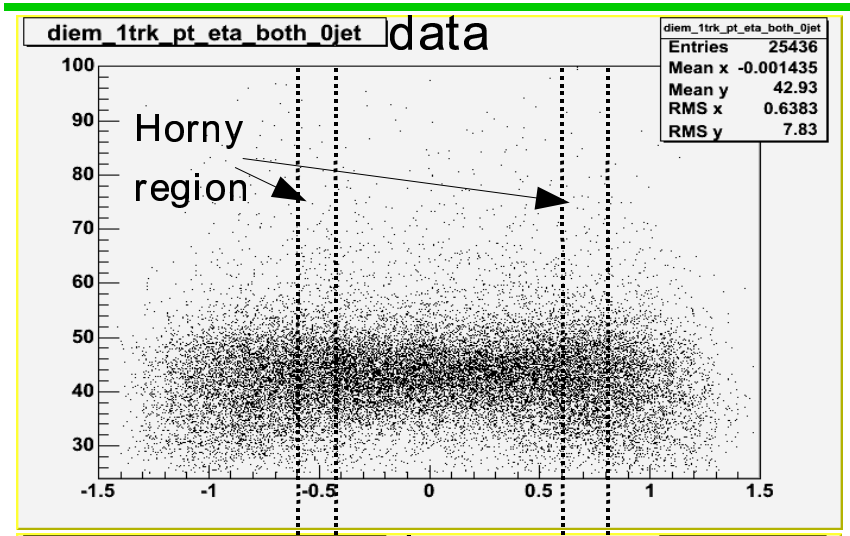
Background reduction: Opposite signed tracks, MET<15GeV

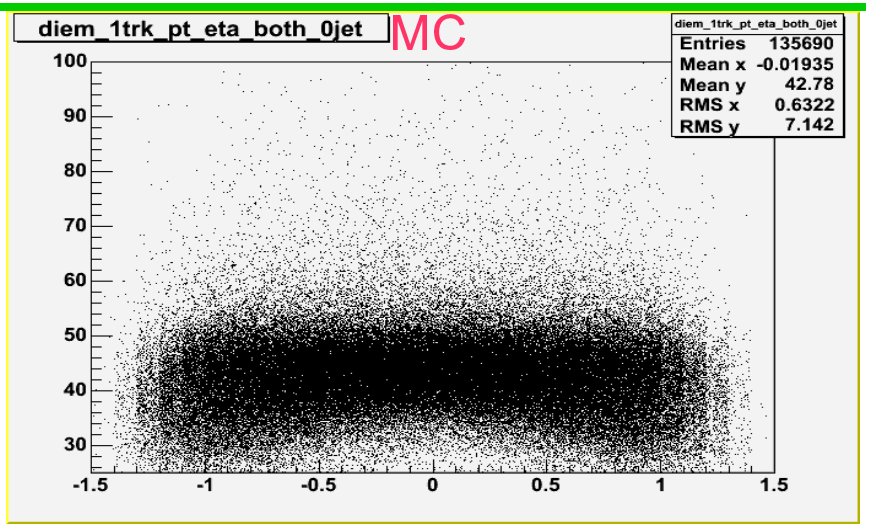
TagElec-ProbeTrack-invmass cut: 70 GeV < M_{ee} < 110 GeV

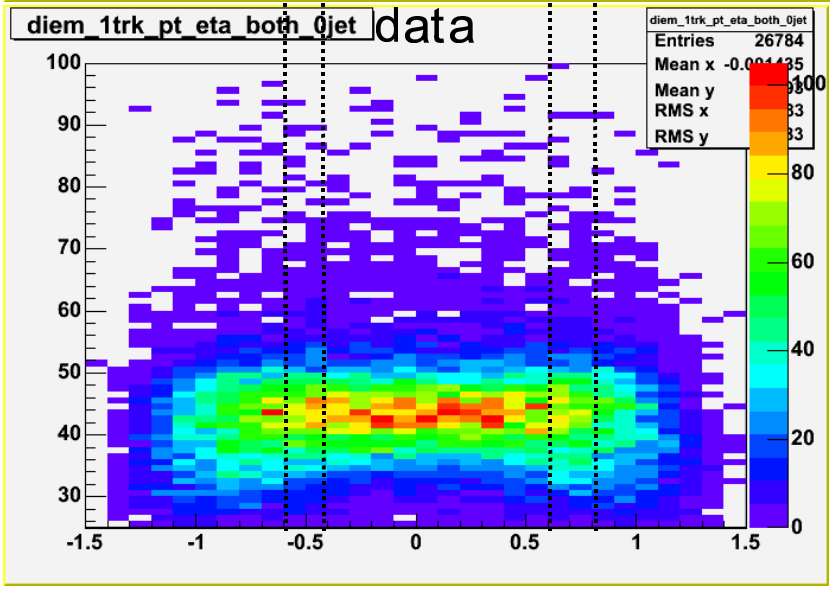
Reco matching cone: dR = SQRT($\Delta\eta^2 + \Delta\Phi^2$) = SQRT($.1^2$+$.1^2$) = 0.14

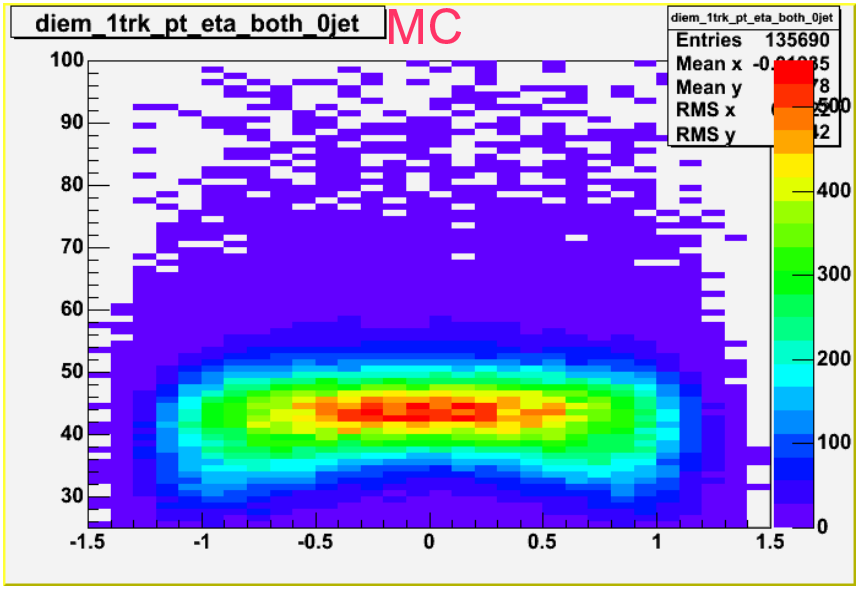
Jets: 0.05 < EMF < 0.95, HotF < 10.0, N90 > 1, CHF < 0.4, L1conf, p_T > 20., |eta| < 2.5, not counting jets overlapping with probe tracks within ΔR < 0.4

Electron pT vs Electron Eta (combining both electrons)

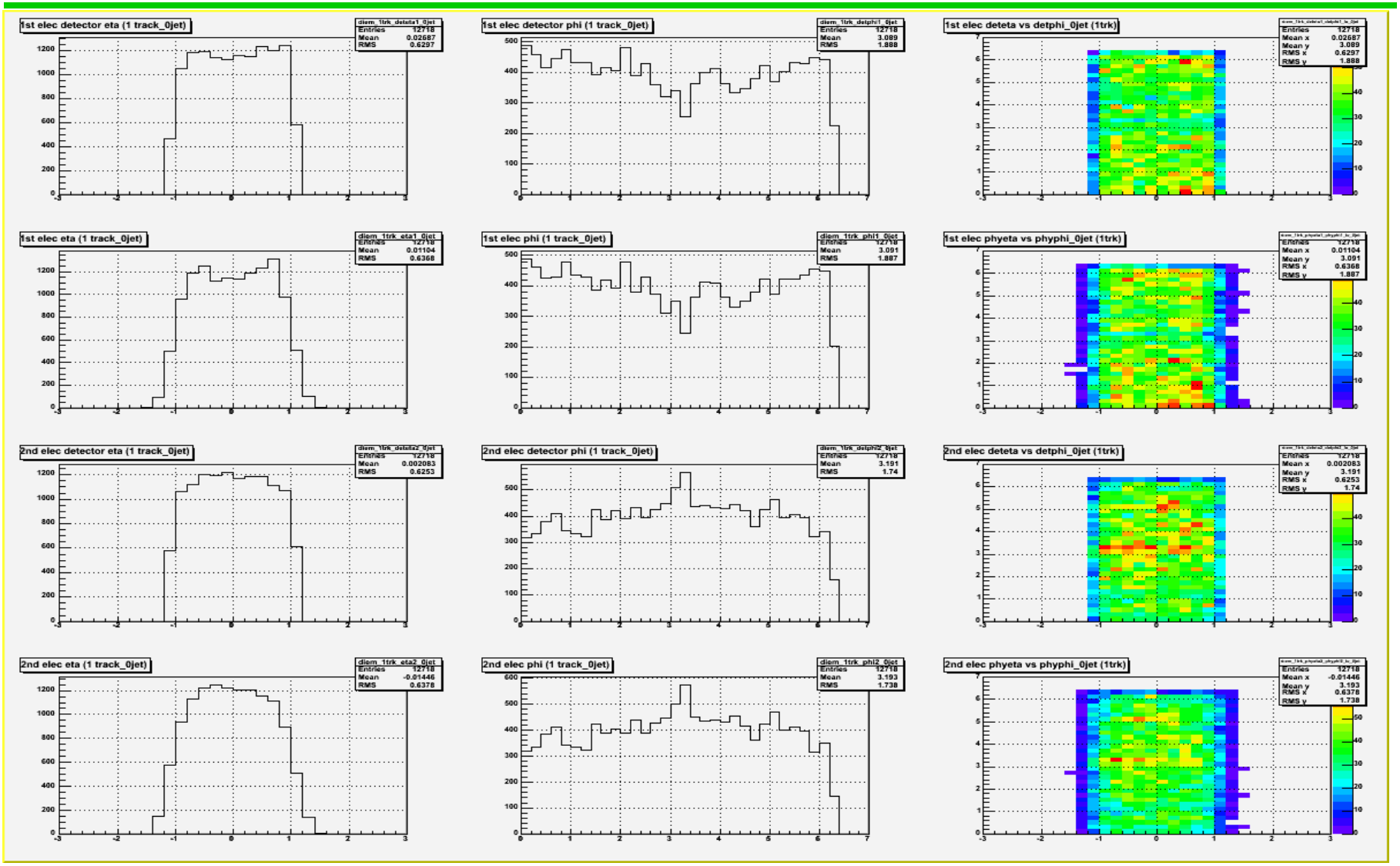




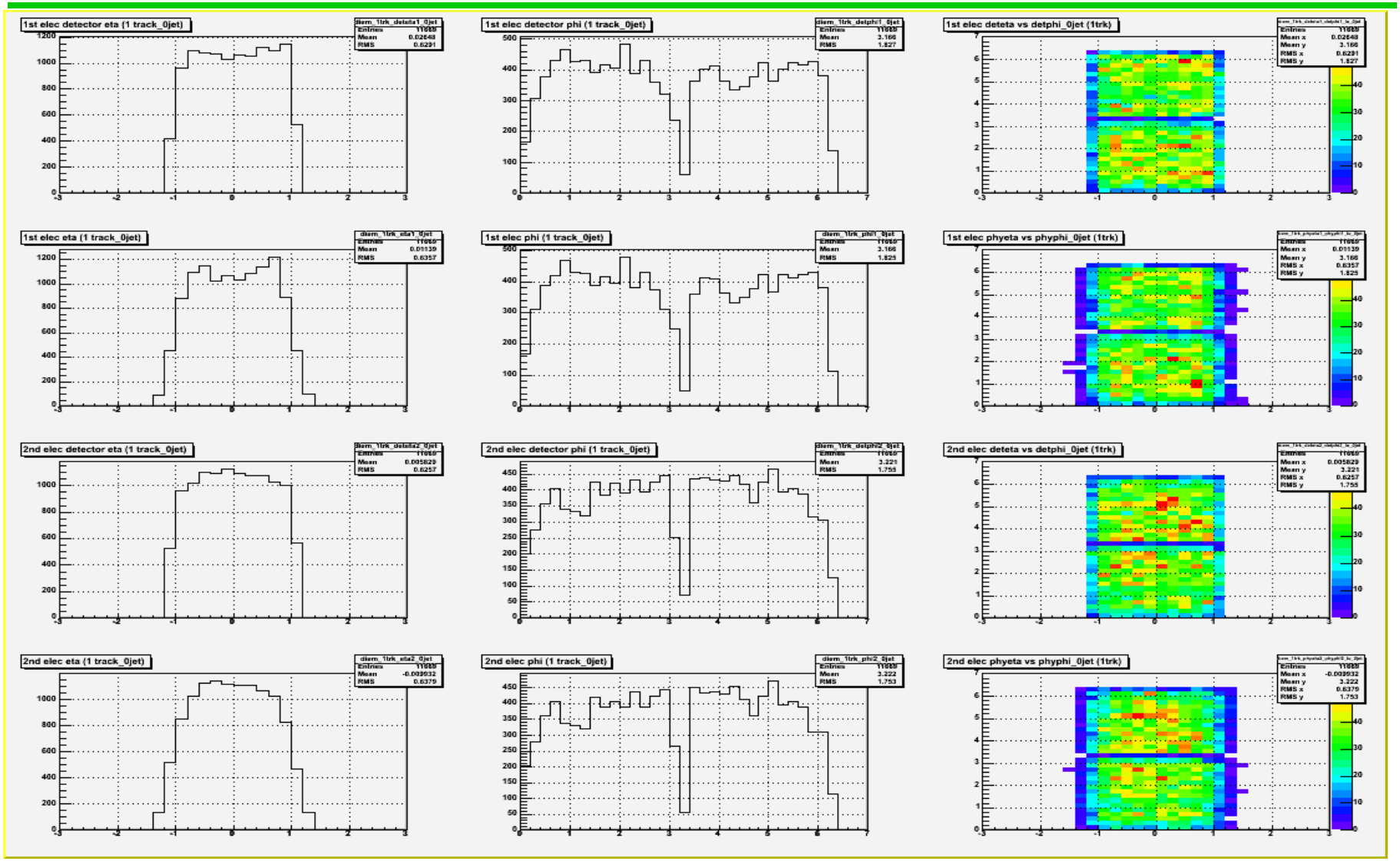




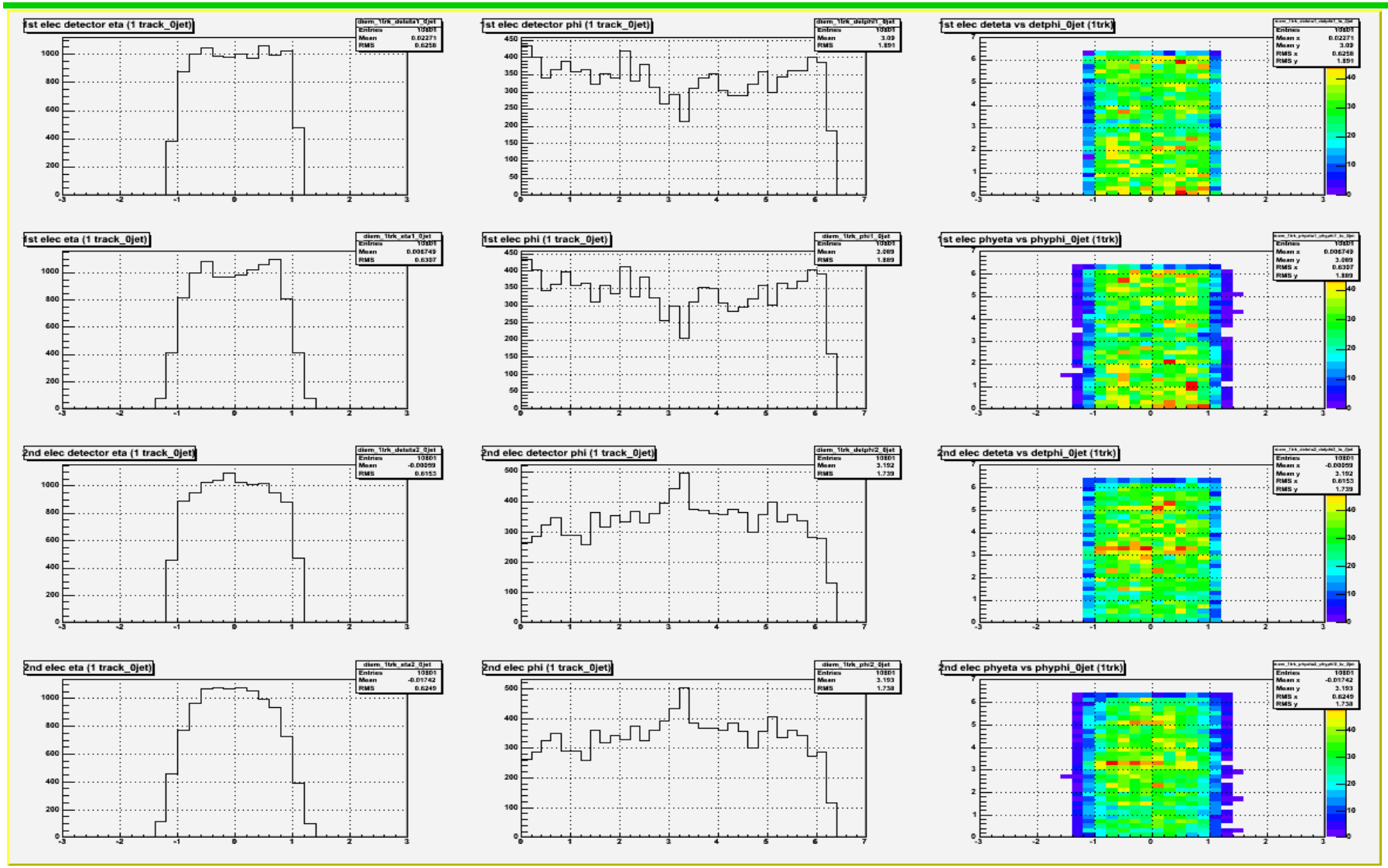
Applying Analysis Cuts



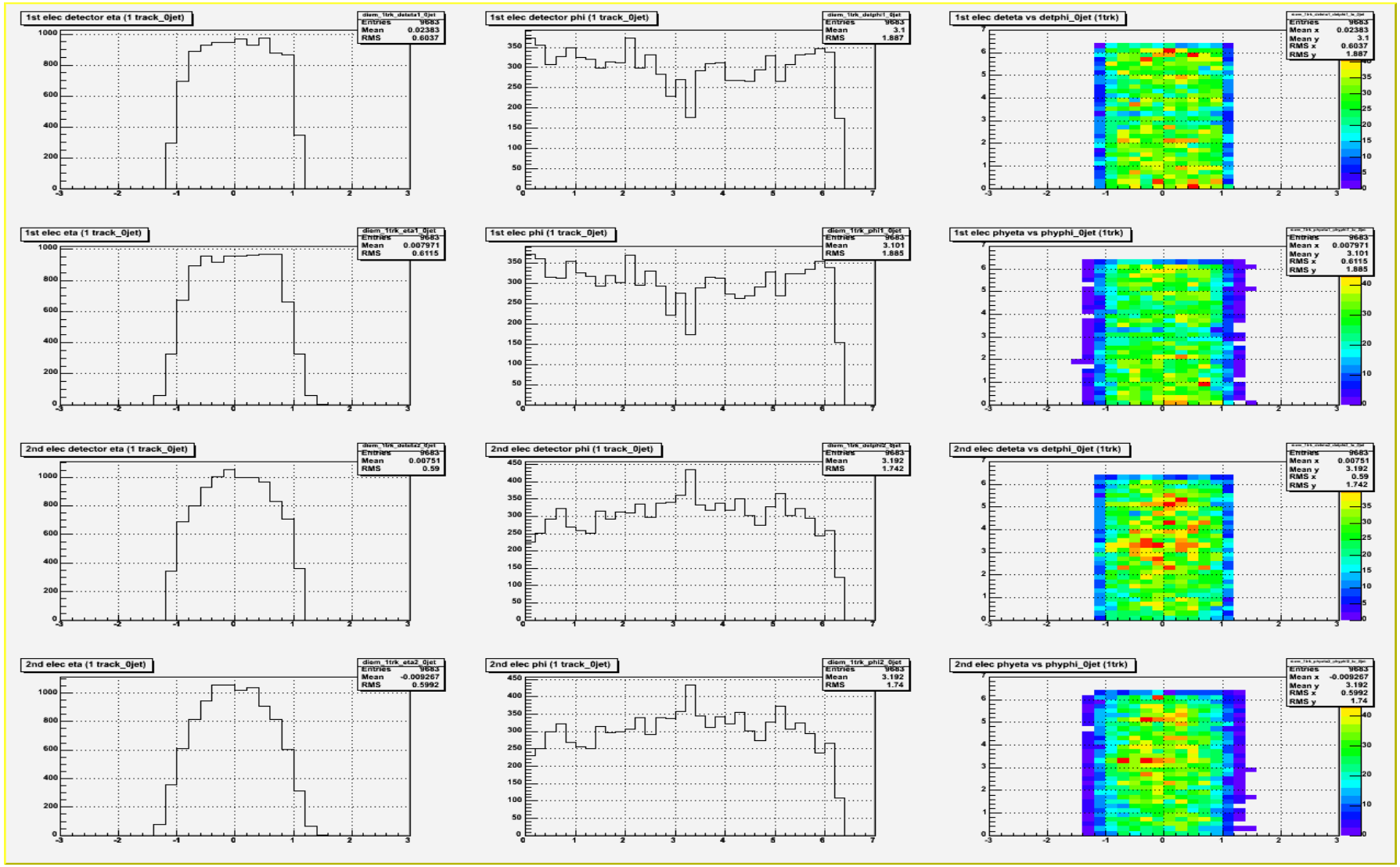
Excluding CAL Module 17



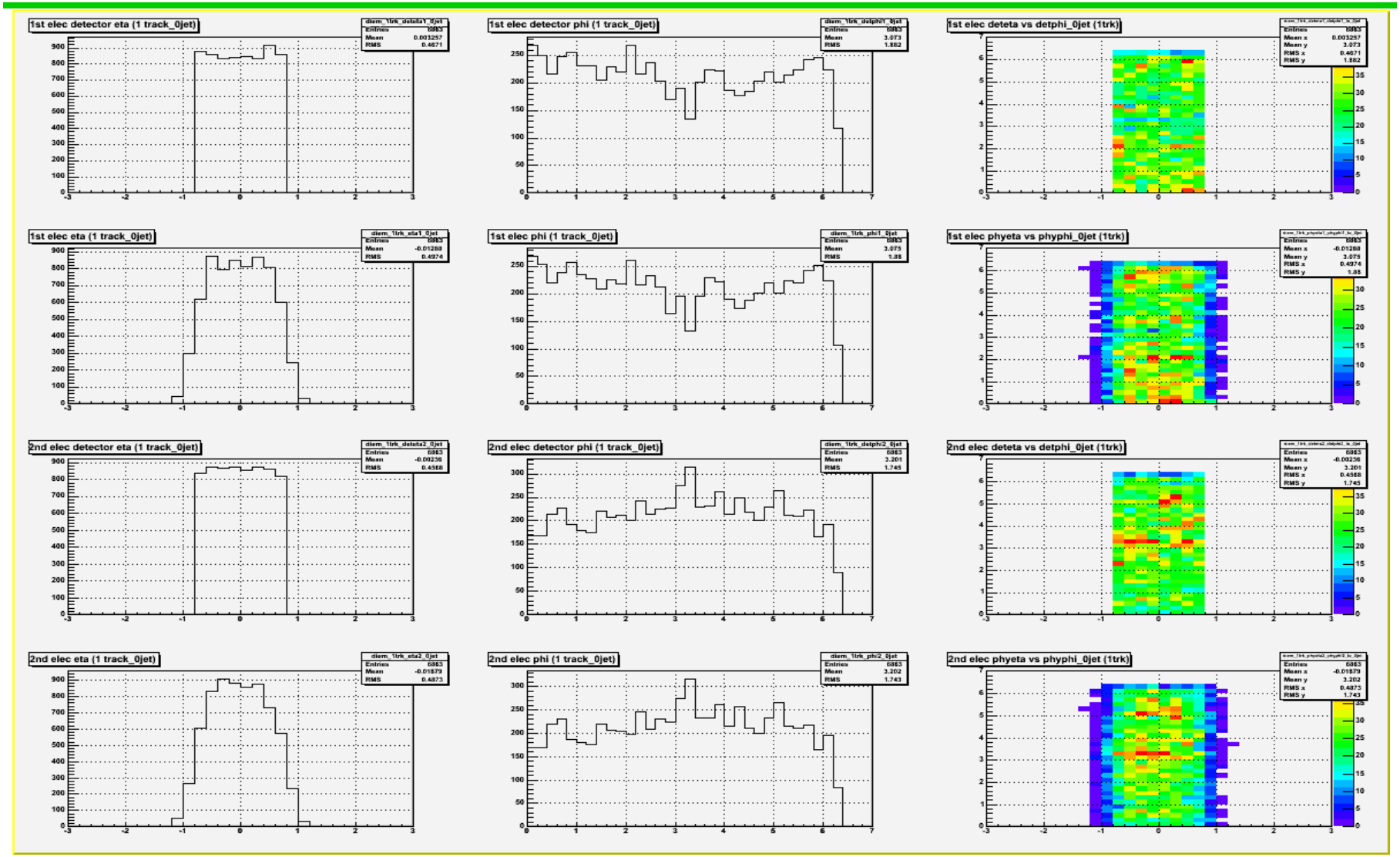
Excluding Phi Cracks



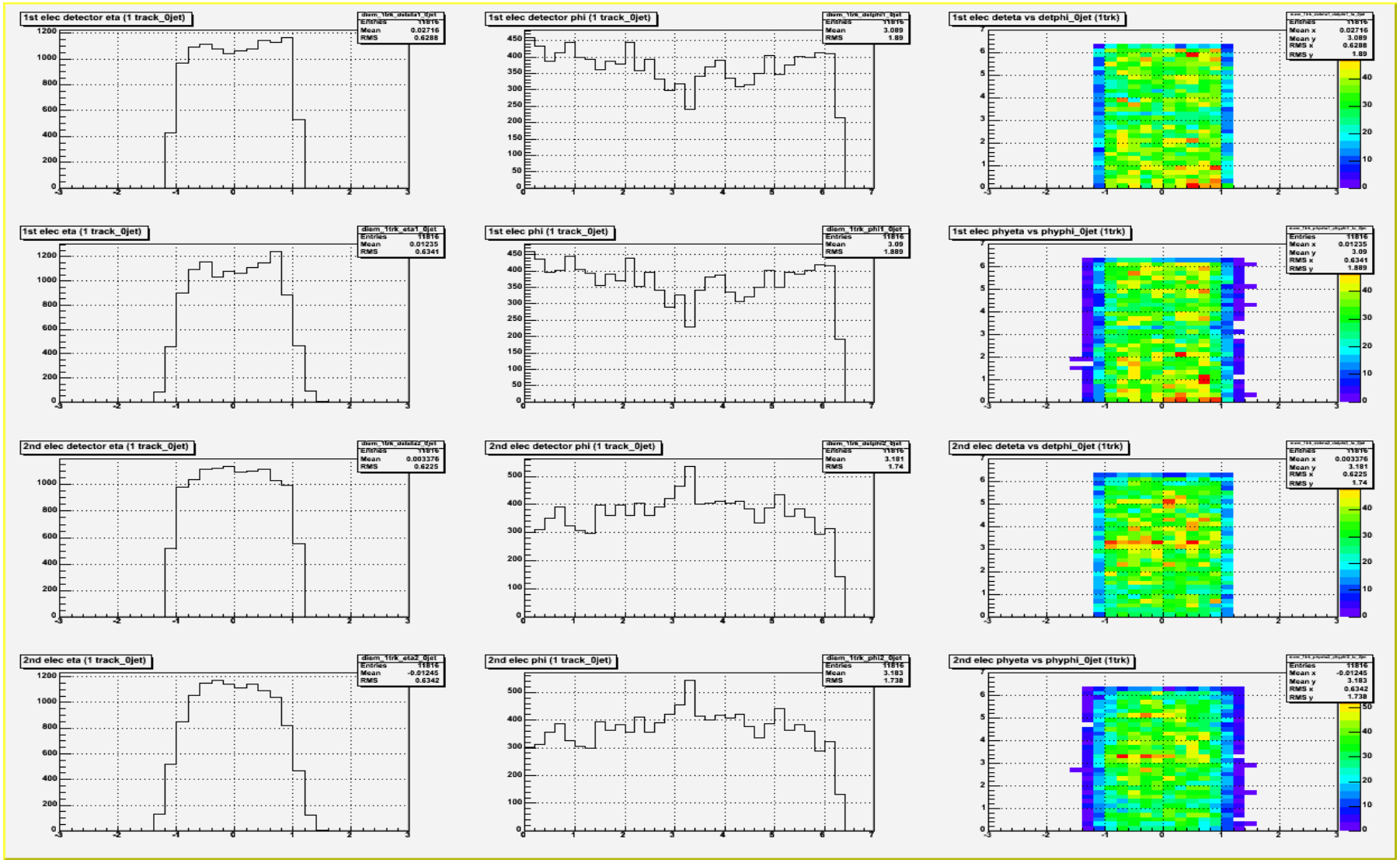
Raising Electron pT Threshold: pT>35GeV



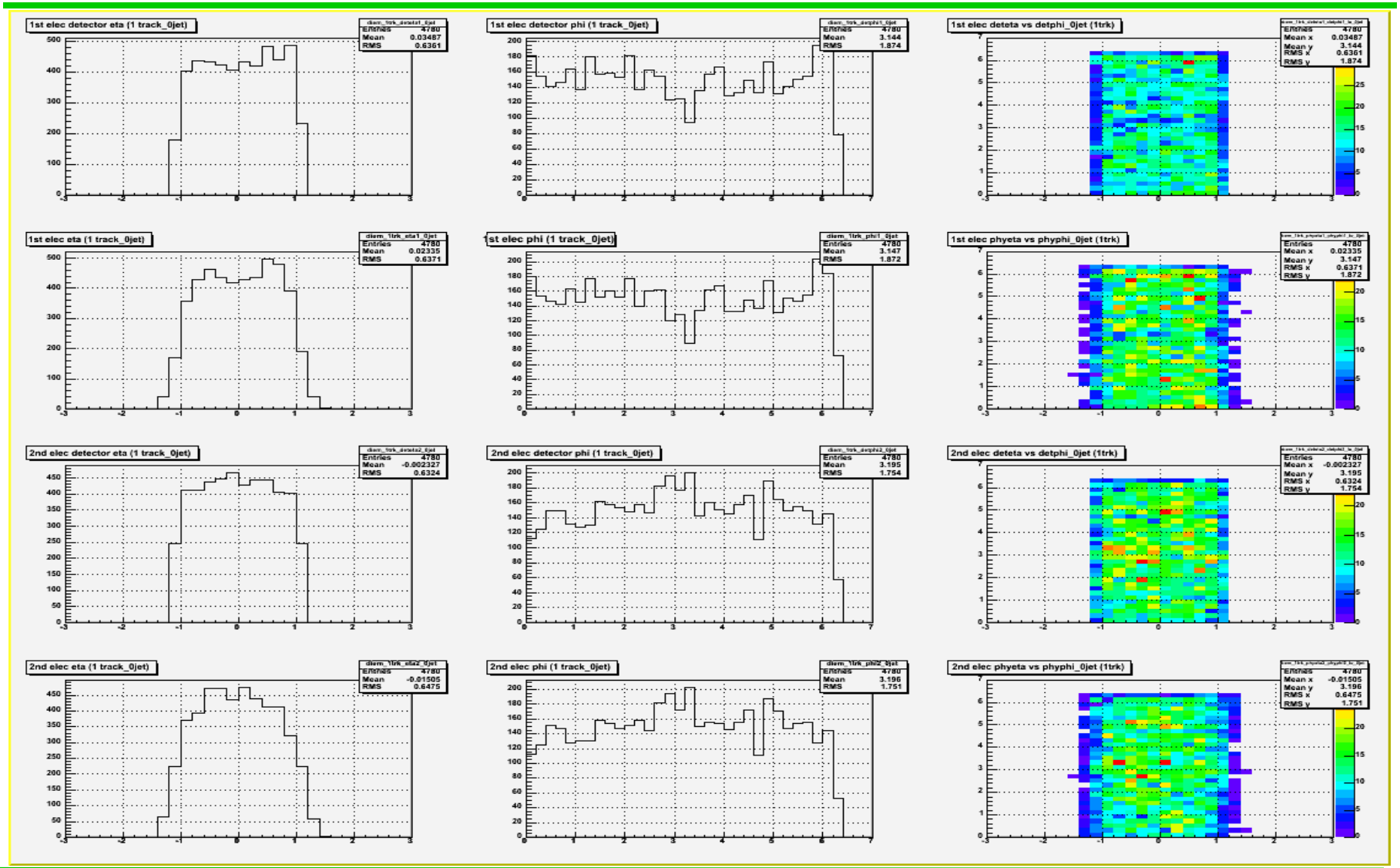
Requiring |eta|<0.8



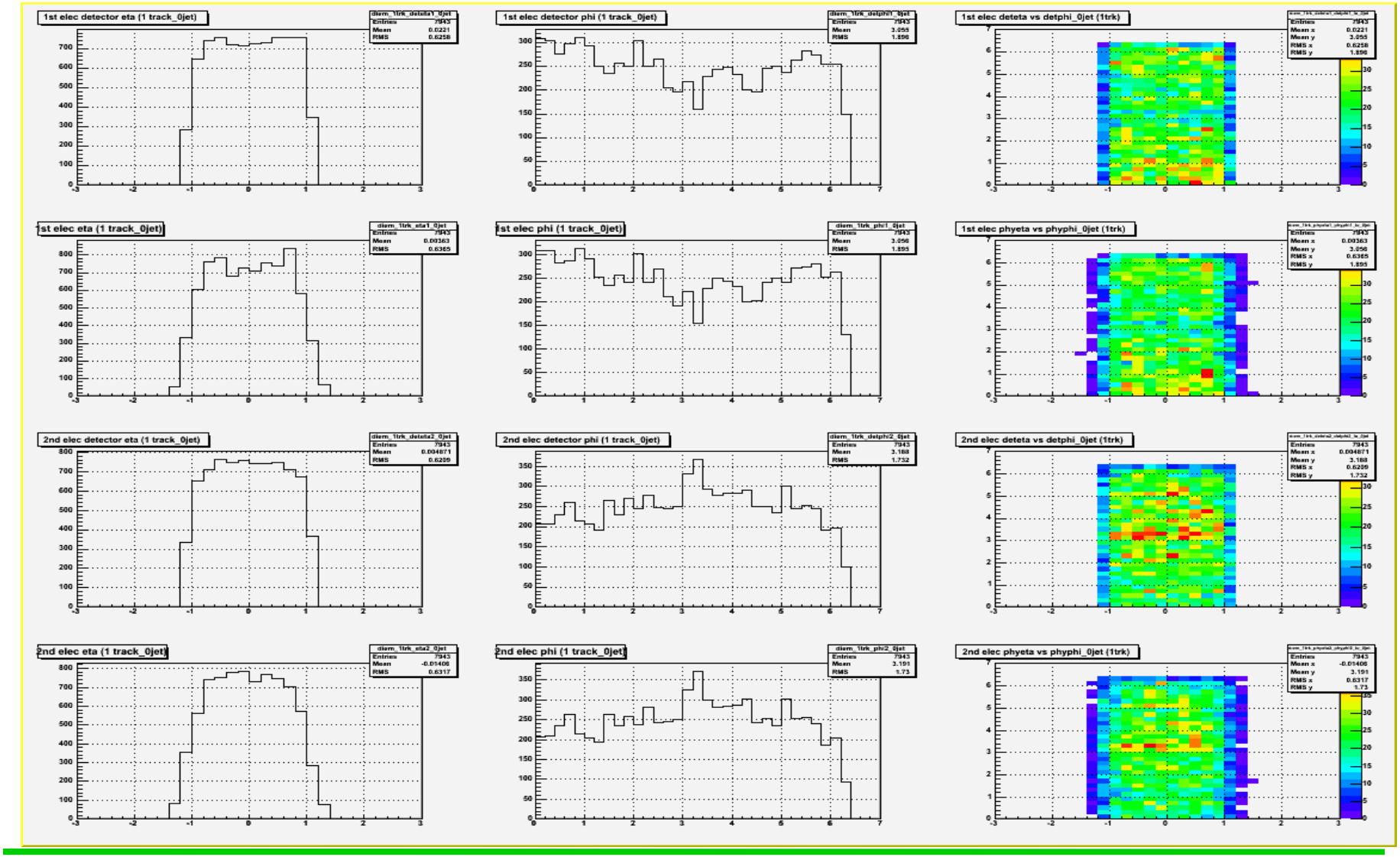
Tightening Mass Window: 80GeV < M_ee < 100GeV



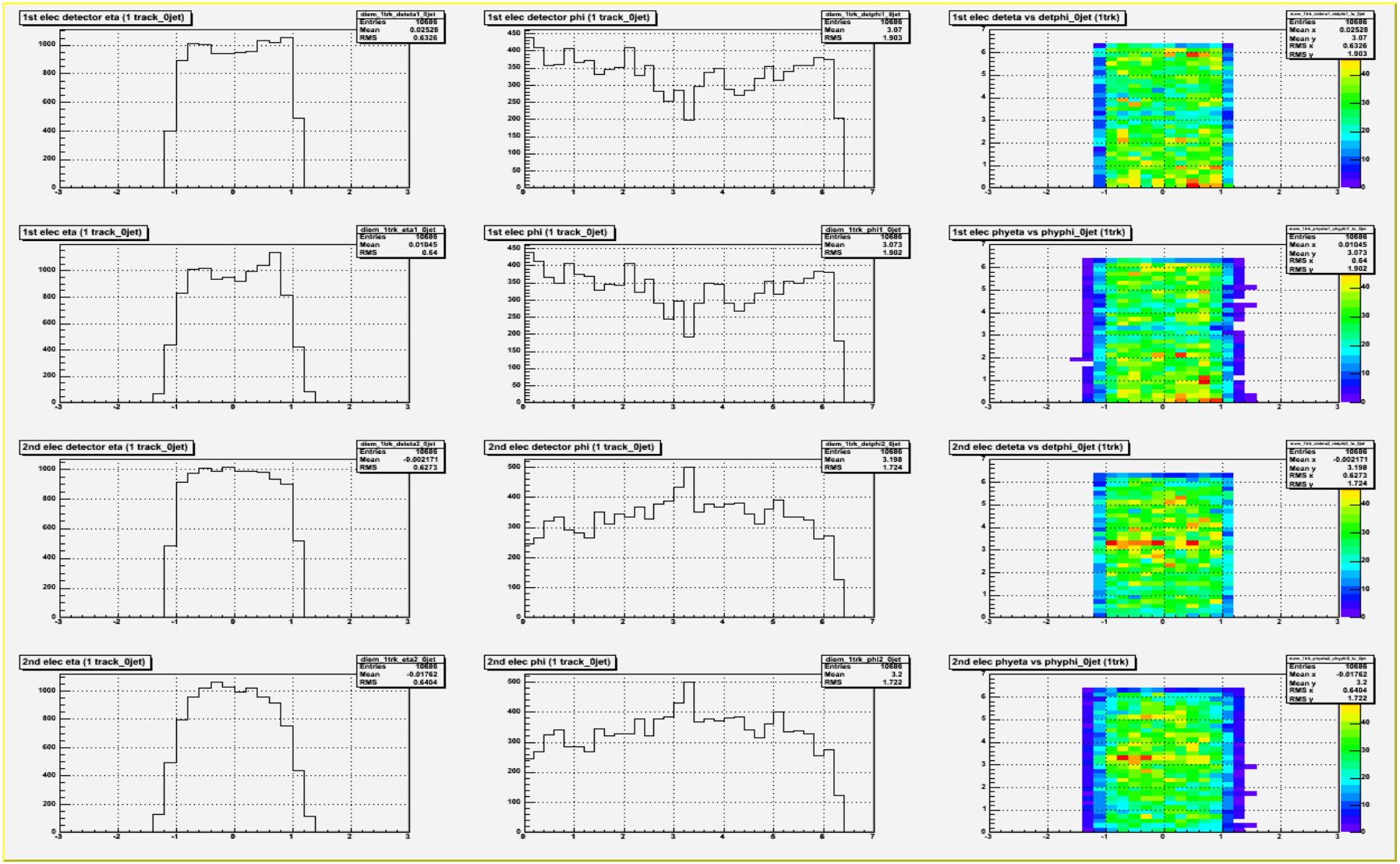
Requiring 1 Track Match (exclusively)



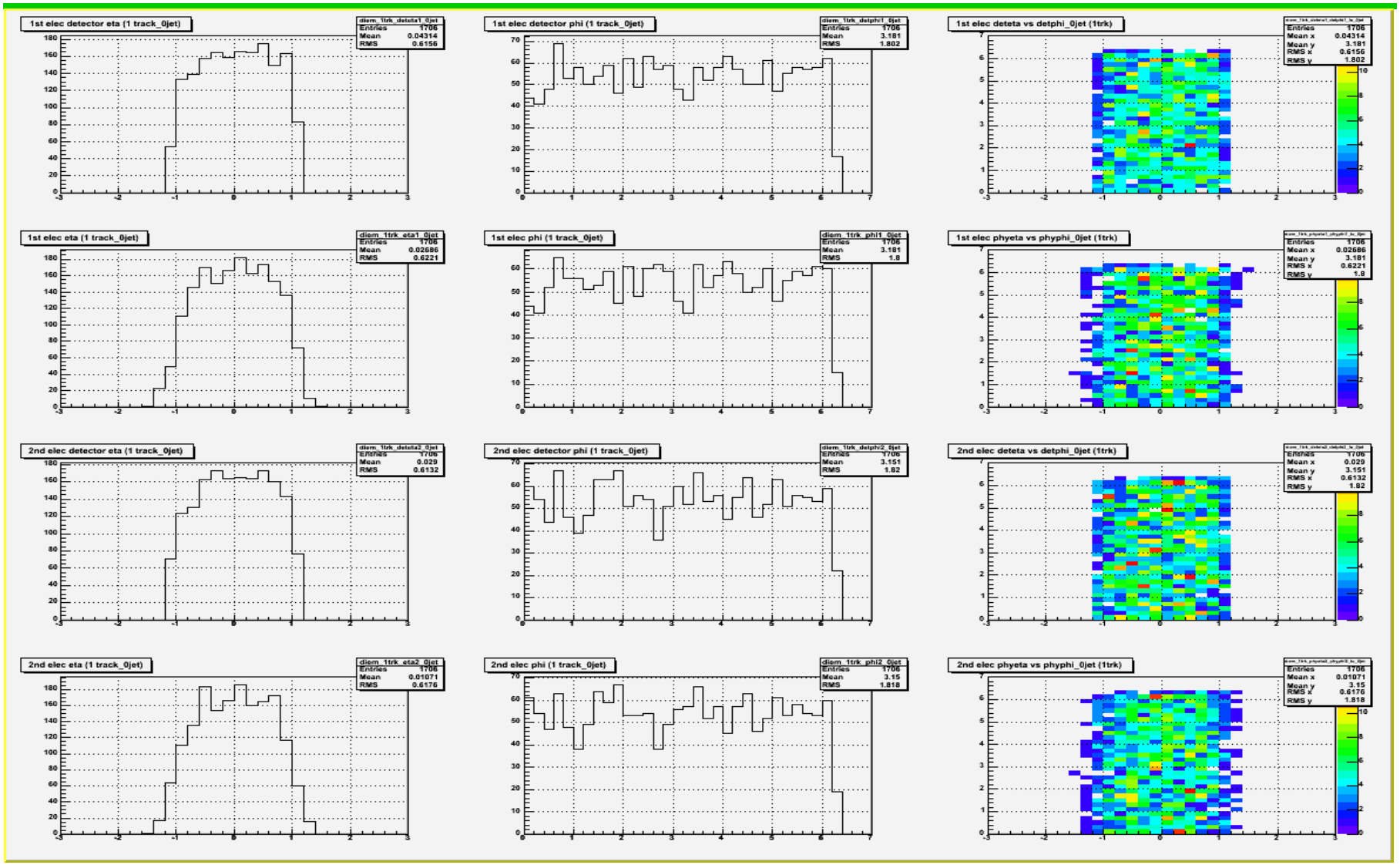
Requiring 2 Track Matches (exclusively)



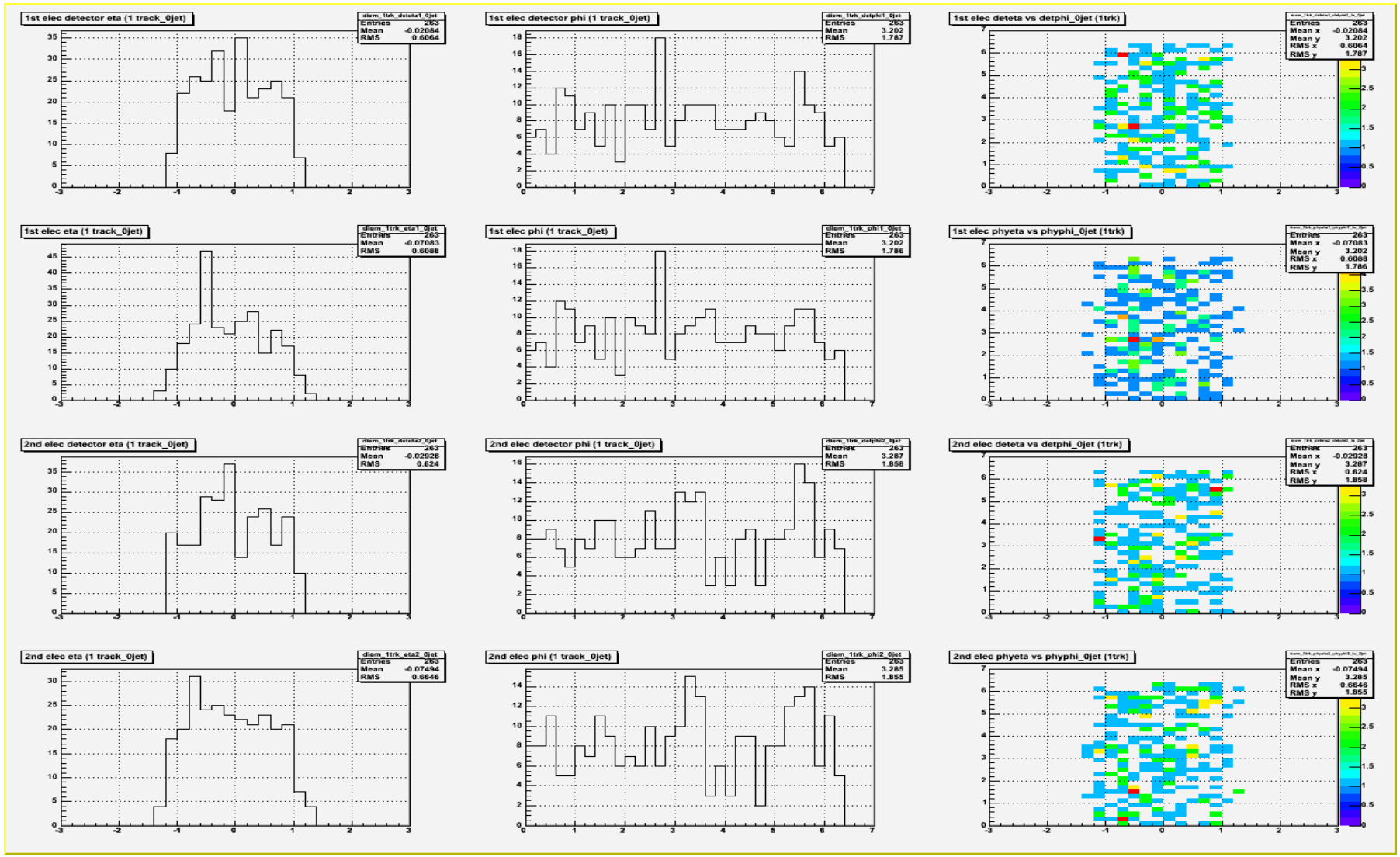
Number of Jets = 0 (Exclusively)



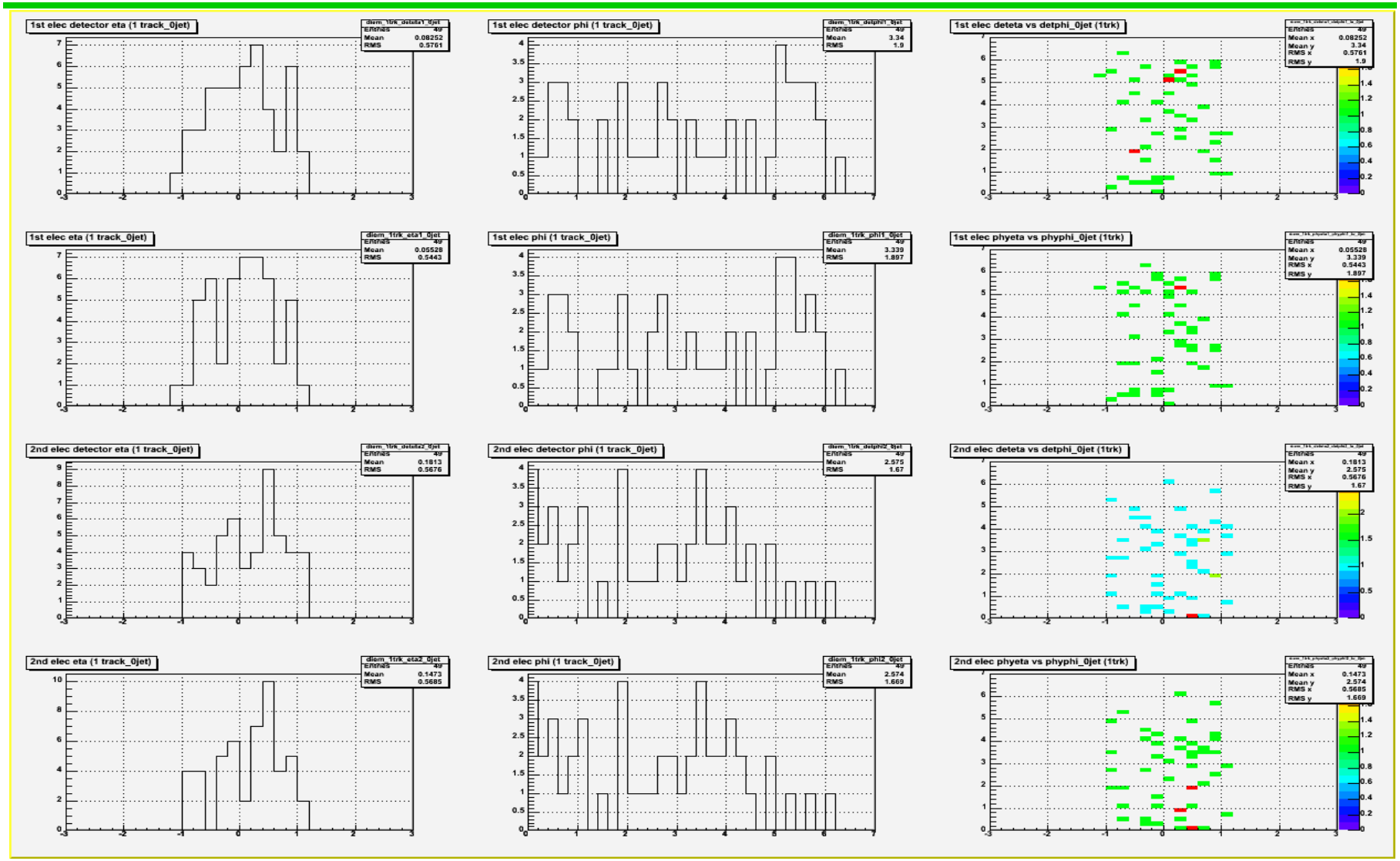
Number of Jets = 1 (Exclusively)



Number of Jets = 2 (Exclusively)

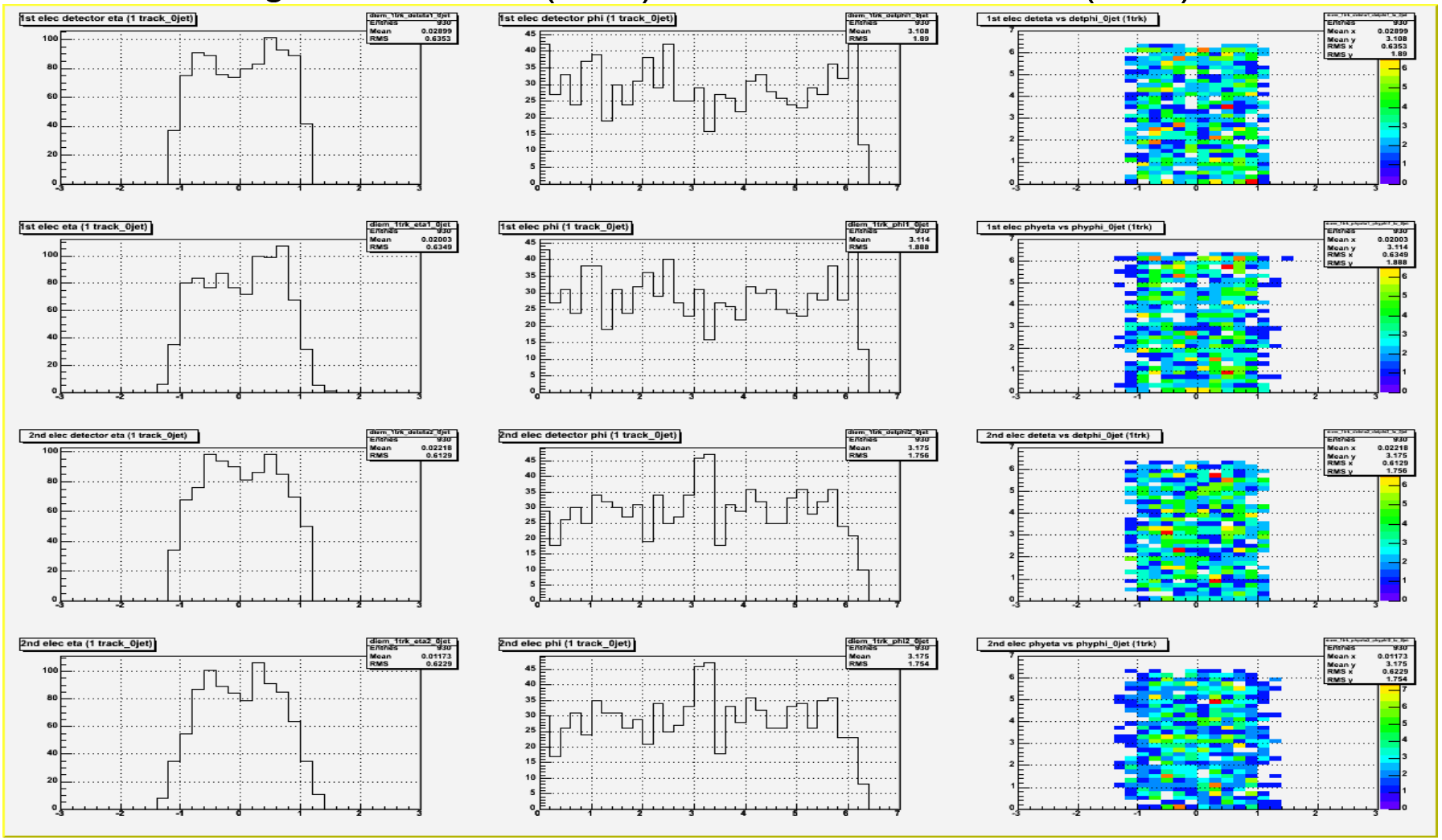


Number of Jets = 3 (Exclusively)



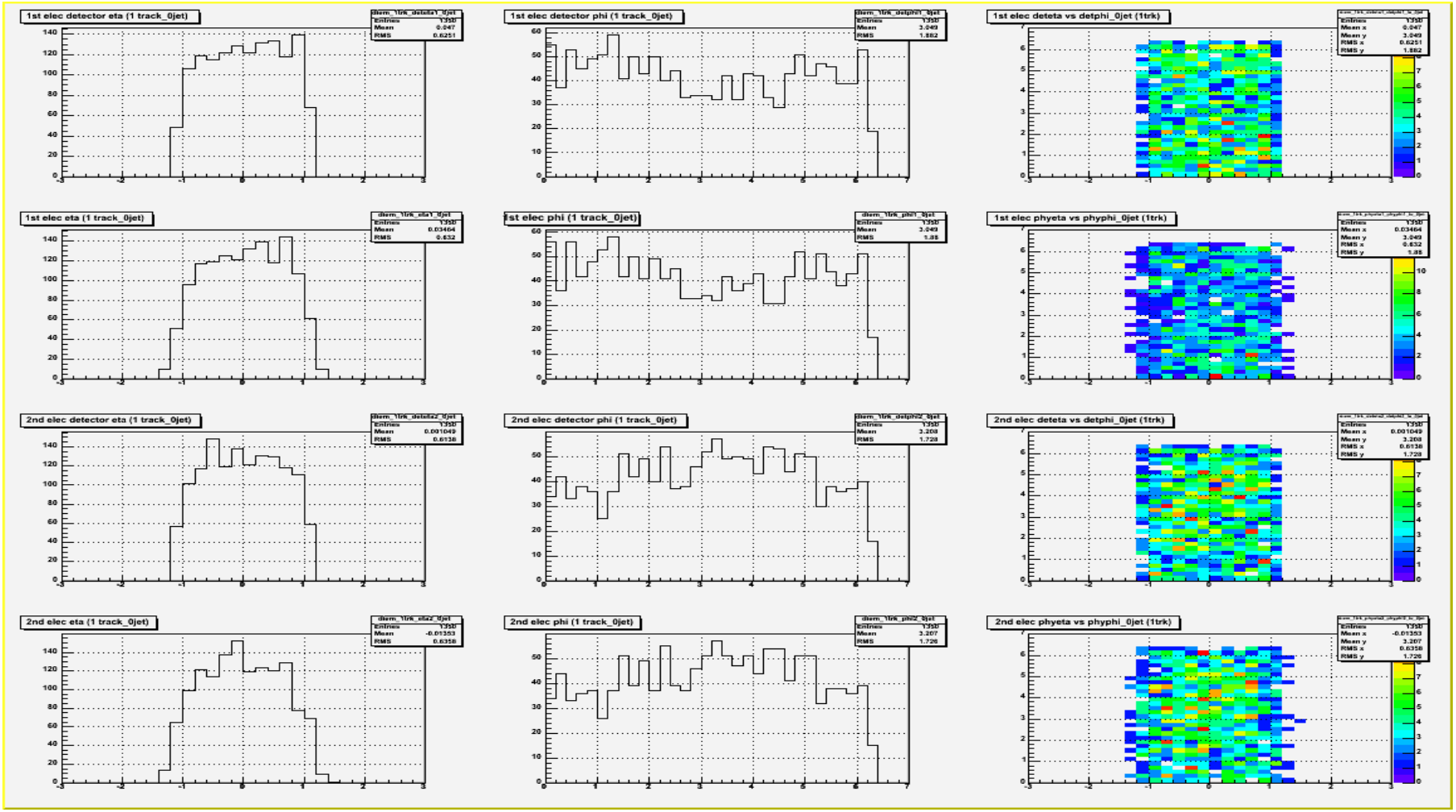
Run Range: 161,973 - 168,134

August 15, 2002 (8.10) – November 15, 2002 (9.30)



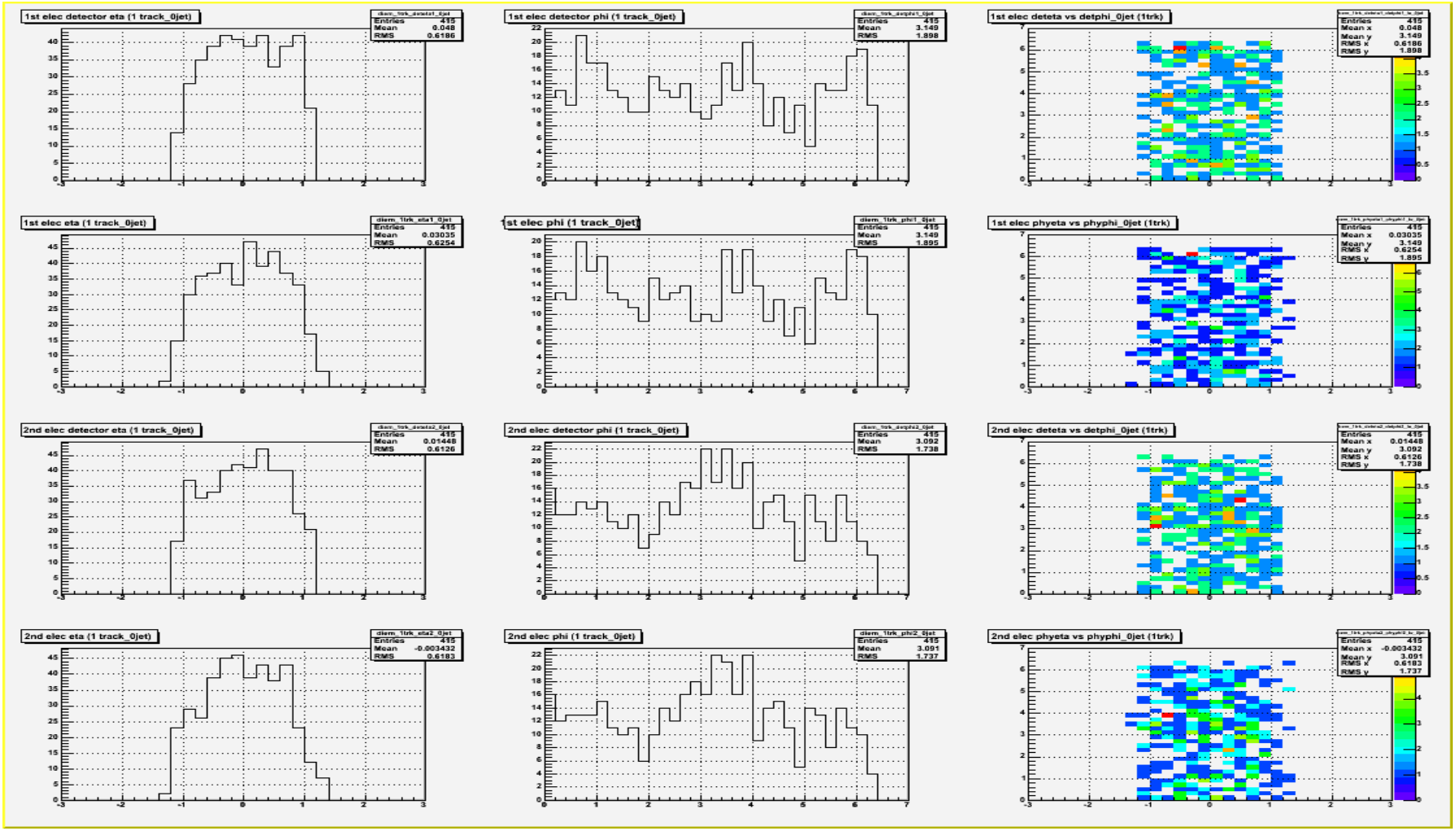
Run Range: 168,135-174,495

November 15, 2002 (9.30) – March 20, 2003 (10.35)



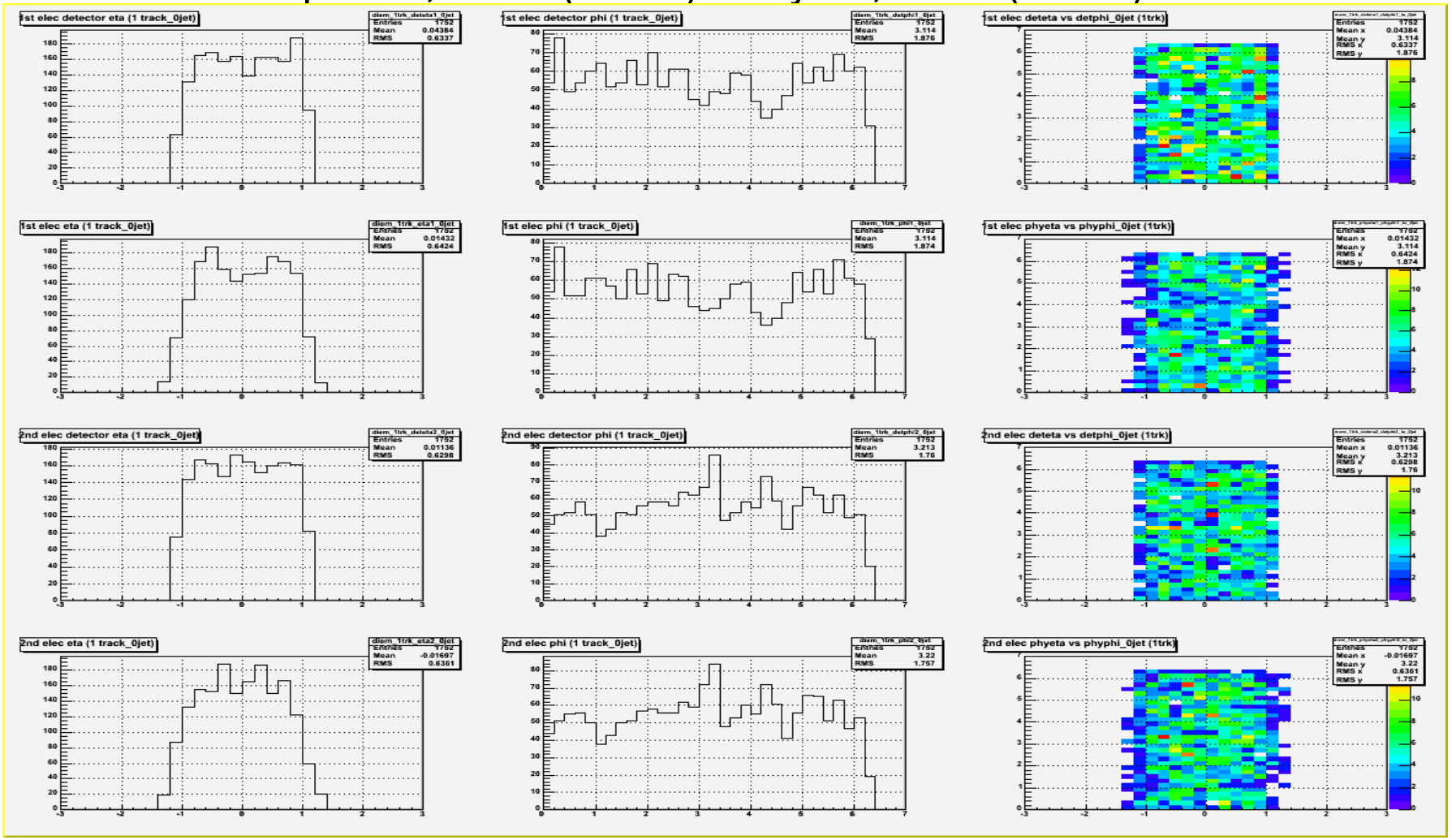
Run Range: 174,496-175,819

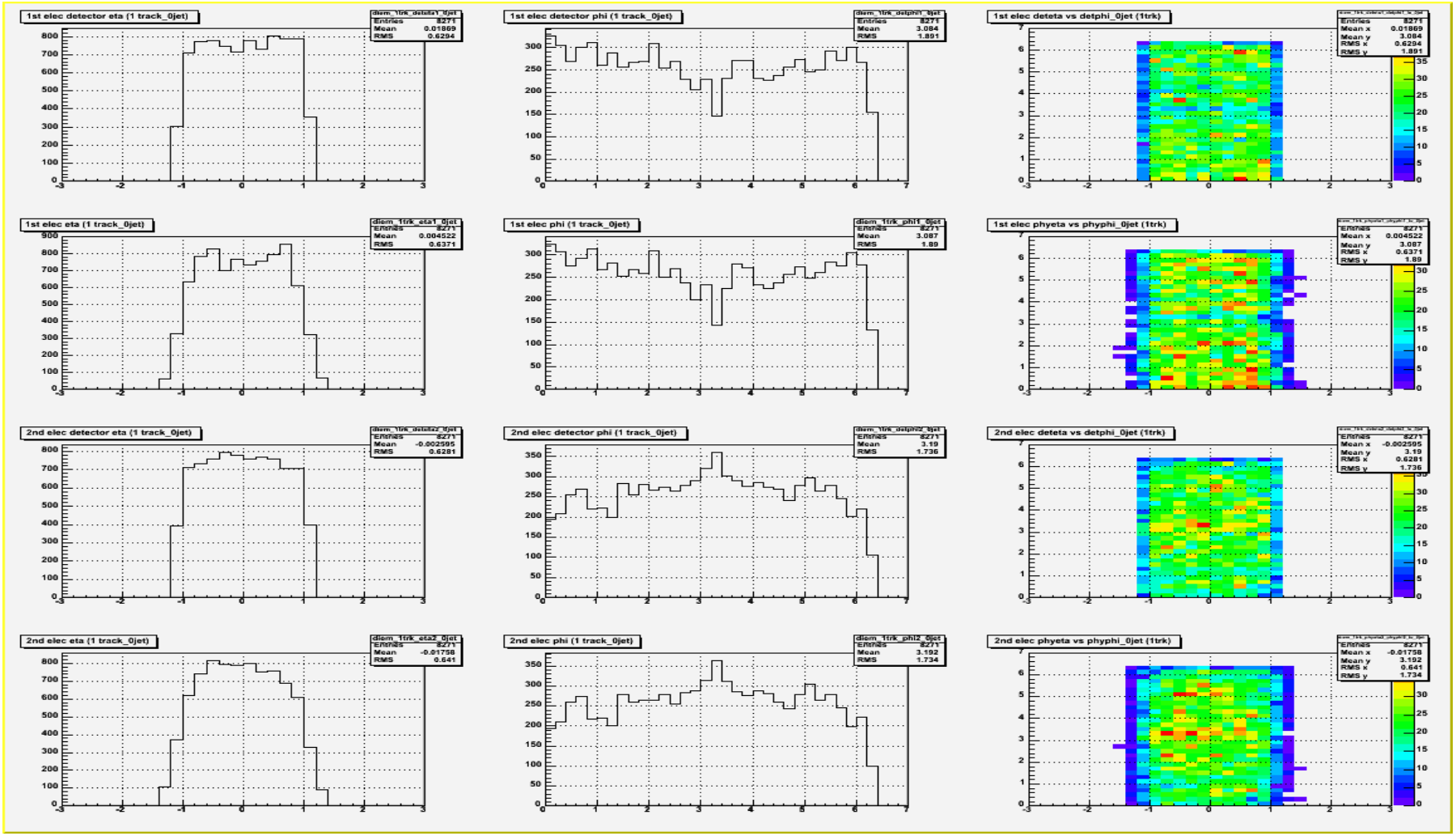
March 20, 2003 (10.35) - April 17, 2003 (11.03)



Run Range: 175,820-178,788

April 17, 2003 (11.03) – July 10, 2003 (12.10)



Run Range: 178,789-194,566

July 10, 2003 (12.10) – June 29, 2004 (12.37)