

# Tau Trigger Data Quality

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ATLAS Workshop on Tau Lepton Physics

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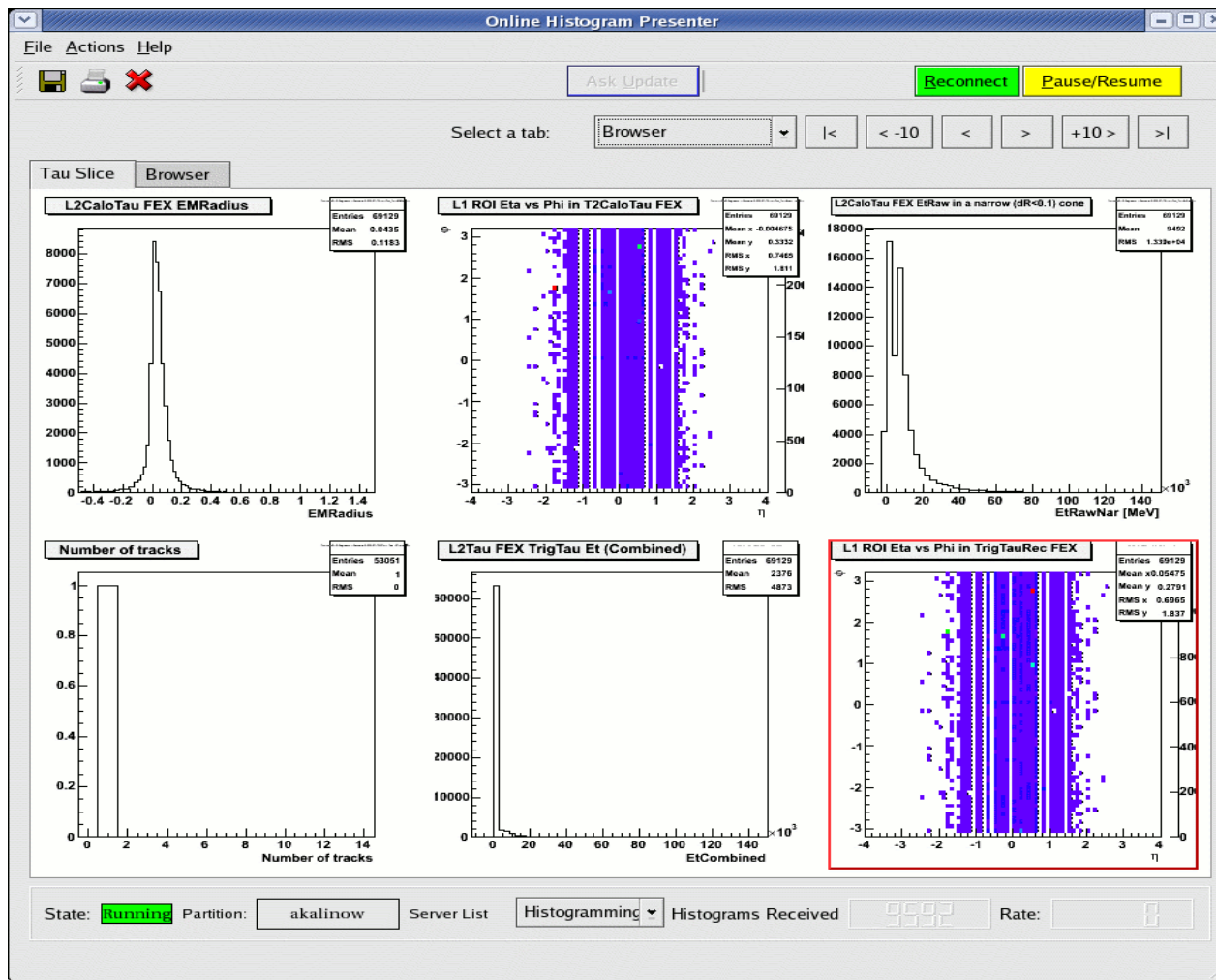


# Monitoring Tau Triggers

- Online
  - OHP (online histogram provider)
    - Monitored by the shifter at DQ desk in ACR
    - Few histograms to check “by eye”
  - DQMF (Data quality monitoring framework)
    - More detailed histograms to report problems with DQ
- Offline
  - Tier0 (TigHLTMonitoring)
  - CAF (TrigHLTOfflineMon)

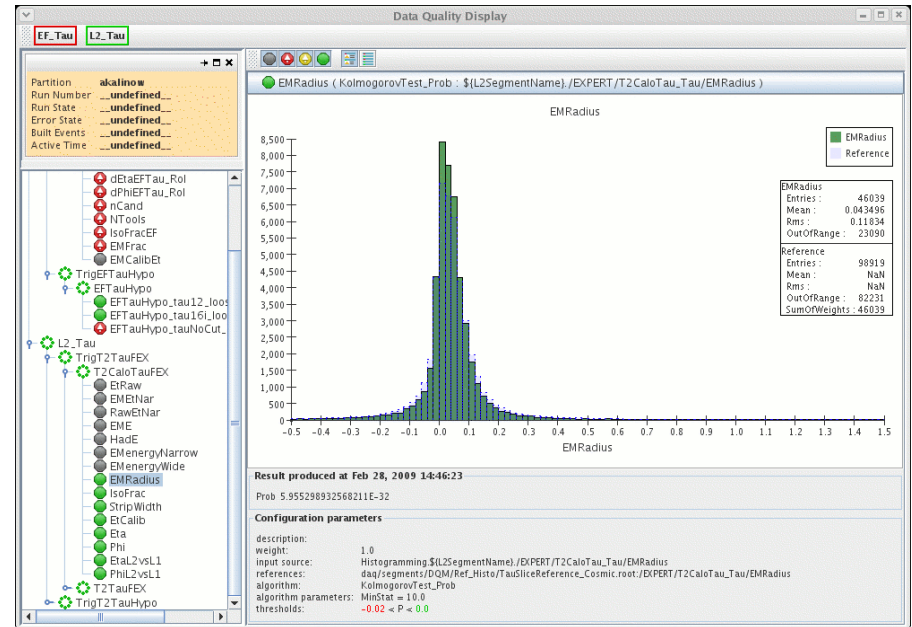
# OHP for Tau Slice

- Configuration done via xml files
- Histograms provided via IS(information server)



# DQMF(DQMD)

- More detailed checks of histograms produced by HLT algorithms
- DQ Regions (e.g L2Tau, TrigTauRec)
- DQ Parameters (histograms to be published for each algorithm)
- Both FEX and Hypo algorithms are monitored
- Comparison with reference histograms possible
- DQ flag is built using tests
  - Chi square test
  - KS probability test
  - Histogram not empty
- The final result is published as a summary
  - Red or green state is assigned by weighting the histograms according to the probabilities



DQMD Action View Help

Run Conditions

Partition: DQMD  
 Run Number: 1239464011  
 Active Time: 0:01:10  
 Run State: **RUNNING**

Trigger Table:  
 Error State: **NONE**  
 Build Events:  
 Event Number: Undefined

Inner Detector: PIX, SCT, TRT, IDGlobal  
 Calorimeters: LAr, Tile, CalGlobal  
 Muon Spectro: MDT, TGC, RPC, CSC  
 Trigger Systems: L1CAL, LIMU, L1CTP, L2, EF, Lumi  
 Physics Objects: Egamma, Muon, Tau, Jet/MEt  
 Trigger: Rate, Eff, Calib-Align (Calib, Align)  
 Physics: Cosmic, JPsi, Upsilon, B-physics, Z, W, Top

Beam: BCM, LUCID

Alarm log | DQM log

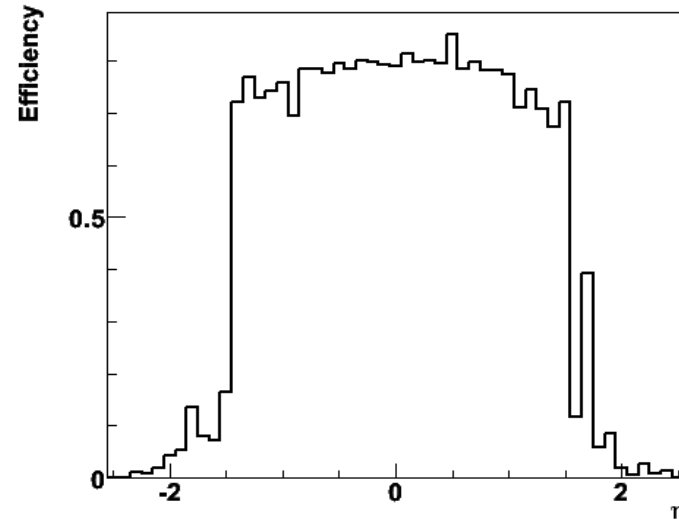
Time Stamp	Error Level	Subsystem/Function	Error Message

Number of result updates: 0

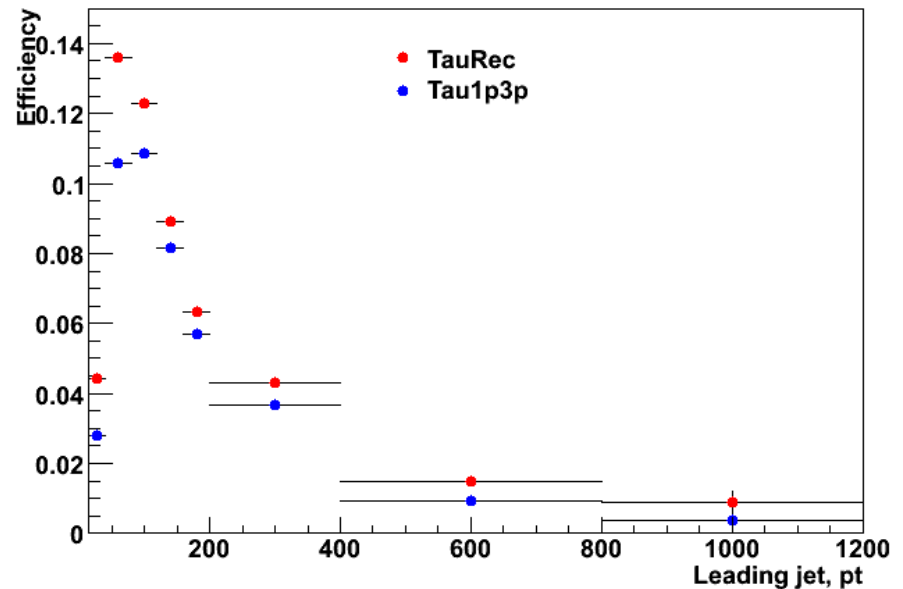
# TrigHLTMonitoring

- To be run on Tier0
  - 10% of the reconstructed data (express stream)
- Check of the offline reconstructed quantities
- Histograms of basic trigger level and offline variables
- Relative efficiency plots available
- Fake rate estimation has been implemented
  - dijet events
  - Tag and probe method
  - How many of probe jets matched to an EF Tau (TauRec or Tau1p3p) that fires tau trigger

Relative Efficiency of EF w.r.t.L1



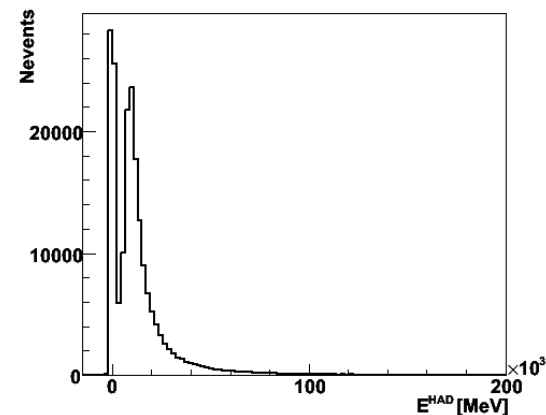
Run 91890, 1/physics\_L1Calo  
/HLT/tauSlice/tauNoCut/RelativeEfficiency/hEFvsL1EtaEfficiency



# Tau DQ Issues (I)

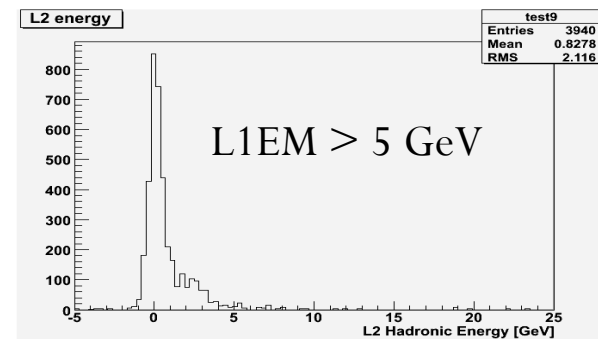
- Double peak structure in hadronic energy see at L2 and EF
  - observed in both online monitoring histograms and offline data
- Events in first and second peak can be separated on the basis of L1EM energy
  - First (second) peak corresponds to  $L1EM > (<) 5 \text{ GeV}$
- Tau Trigger requires the sum of HAD and EM energies  $> 5 \text{ GeV}$  at L1

L2 TrigCaloCluster, HAD energy

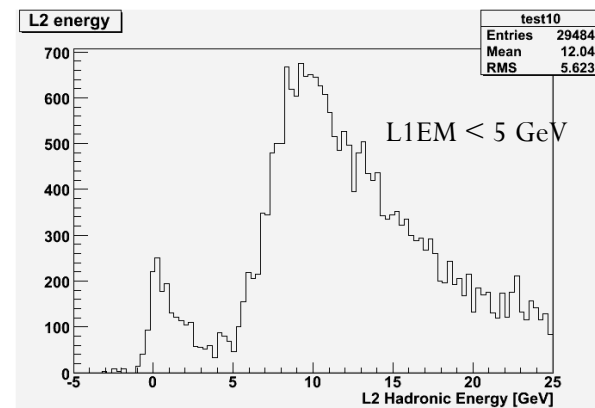


Run 90272, 2/physics\_L1Calo  
/HLT/Tau/tauNoCut/T2CaloTau/hHADenergy

L2 energy



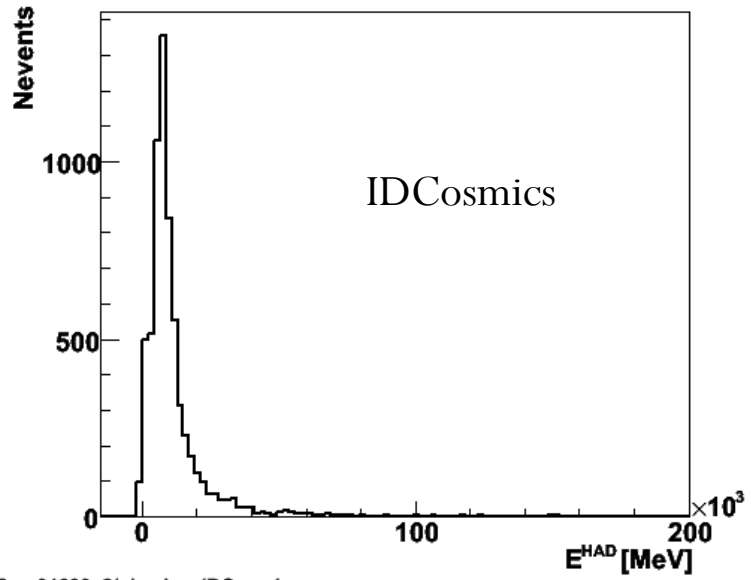
L2 energy



# Tau DQ Issues (II)

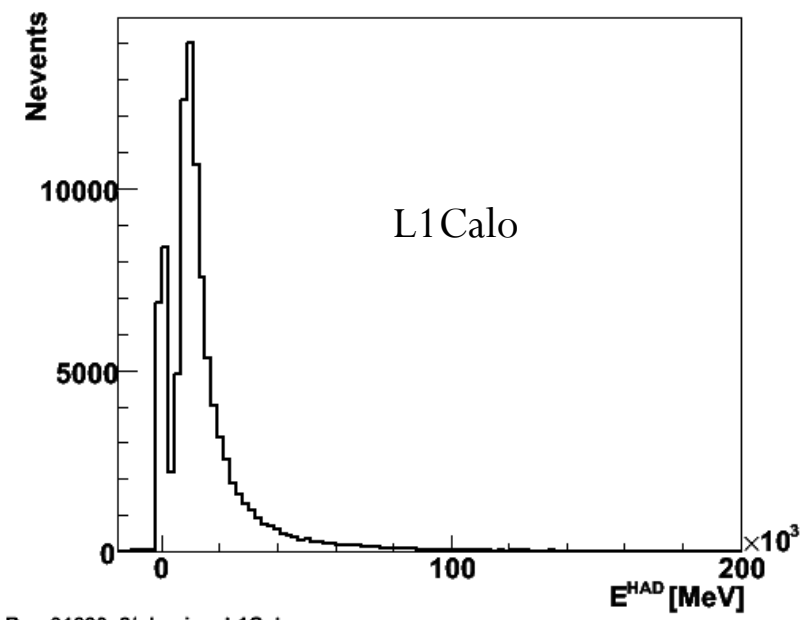
- One possible explanation of double peak structure
  - Real muons
    - Giving rise to electrons - correspond to first peak
    - Otherwise very little EM energy and only hadronic energy-hence the second peak
- The effect should be seen in other streams
  - CosmicMuons, IDCosmics (see next slide)
- Another idea if the second peak is due to the overlap of different triggers
  - The events are selected on the basis of tau triggers
  - There is no jet trigger fired at all levels in these events (J10 only at L1)

L2 TrigCaloCluster, HAD energy



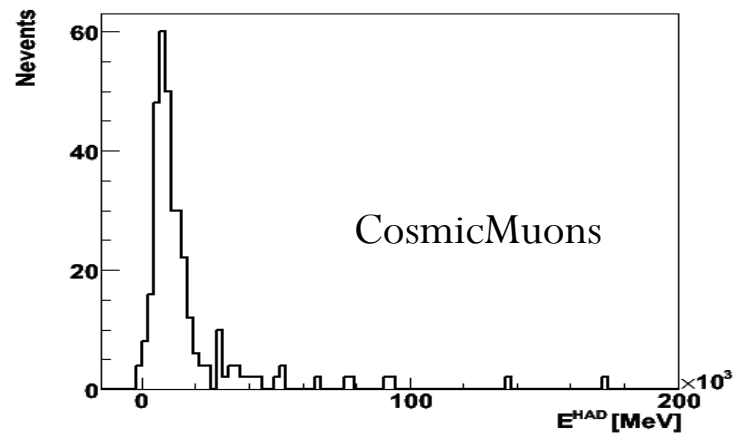
Run 91890, 2/physics\_IDCosmic  
/HLT/Tau/tauNoCut/T2CaloTau/hHADenergy

L2 TrigCaloCluster, HAD energy



Run 91890, 2/physics\_L1Calo  
/HLT/Tau/tauNoCut/T2CaloTau/hHADenergy

L2 TrigCaloCluster, HAD energy

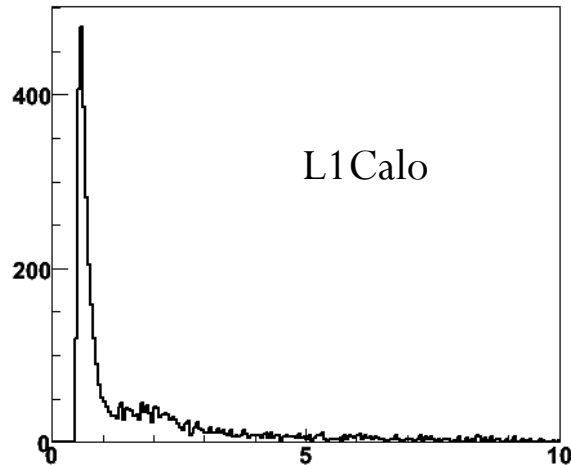


Run 91890, 2/physics\_CosmicMuons  
/HLT/Tau/tauNoCut/T2CaloTau/hHADenergy



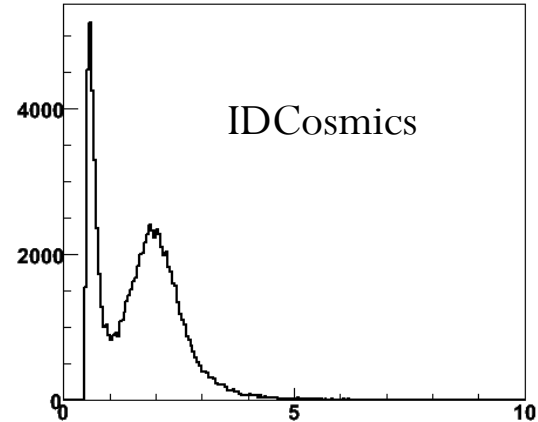
# Monitoring plots from Muon Slice

TileMu Energy(GeV)



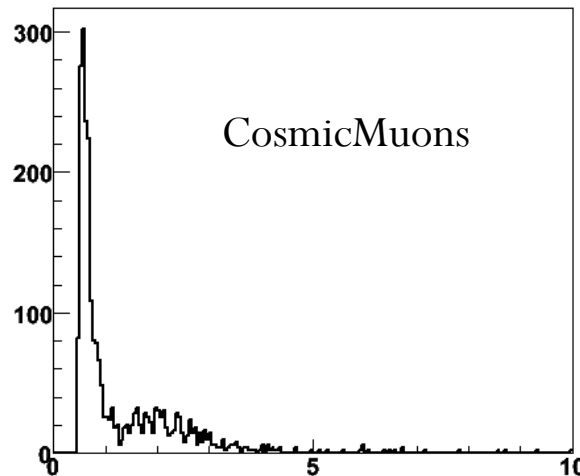
Run 91890, 2/physics\_L1Calo  
/HLT/Muon/TrigMuon\_TileMu\_Ene

TileMu Energy(GeV)



Run 91890, 2/physics\_IDCosmic  
/HLT/Muon/TrigMuon\_TileMu\_Ene

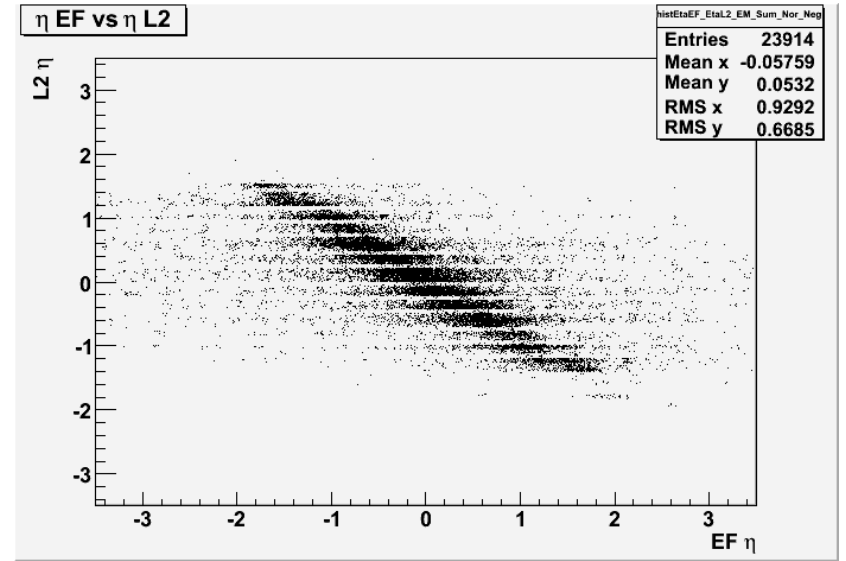
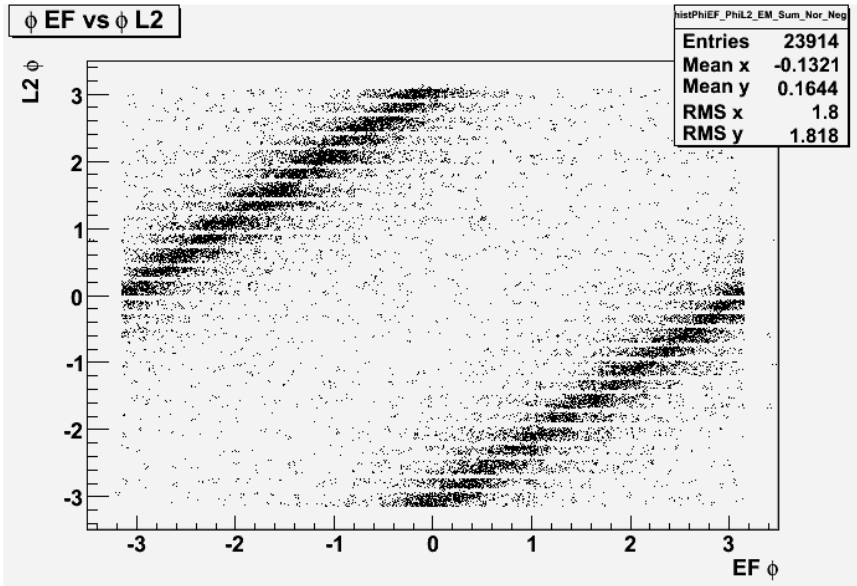
TileMu Energy(GeV)



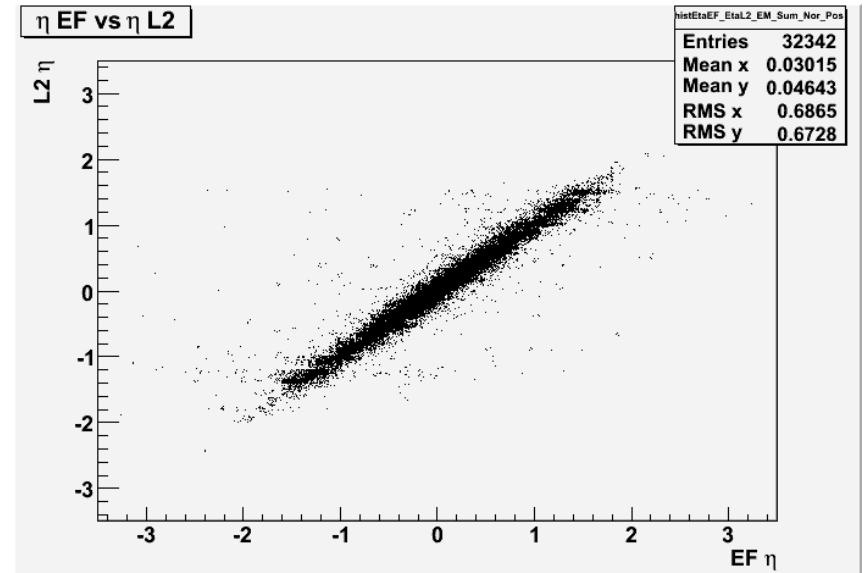
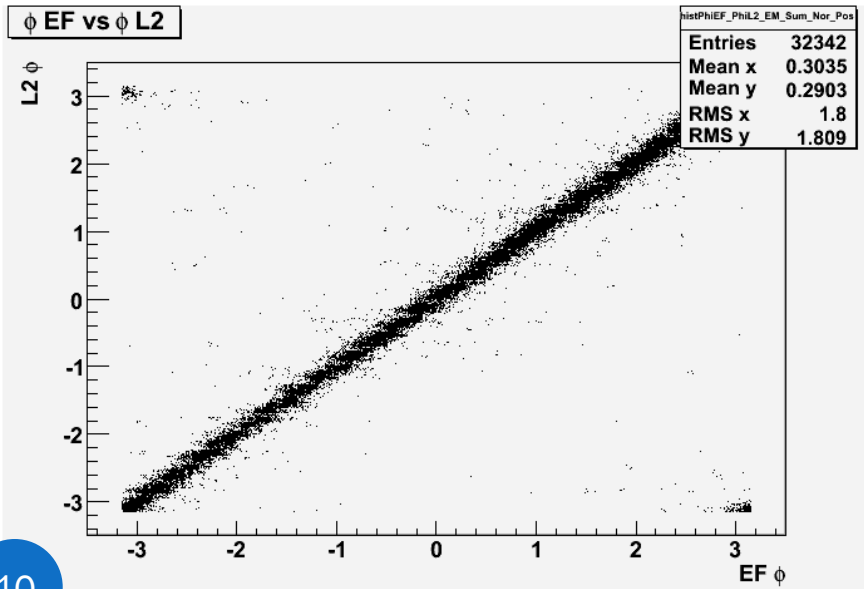
Run 91890, 2/physics\_CosmicMuons  
/HLT/Muon/TrigMuon\_TileMu\_Ene

Doesn't look like that the muon  
deposit  $> 5$  GeV in TileCal

EMNor < 0



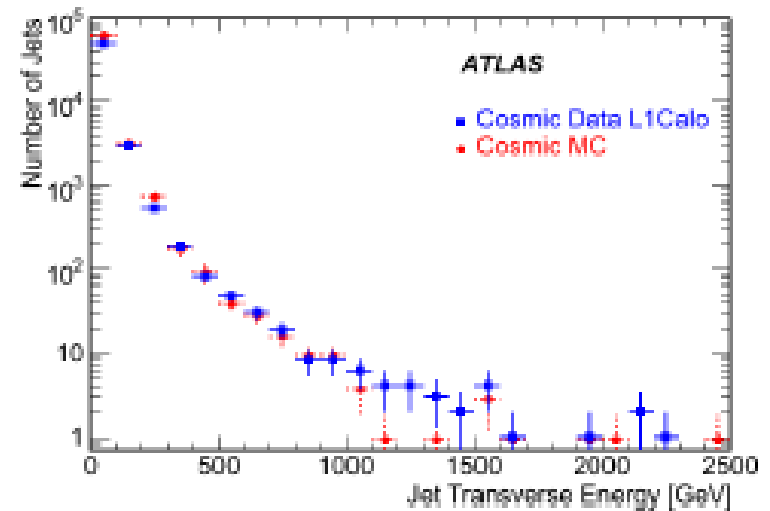
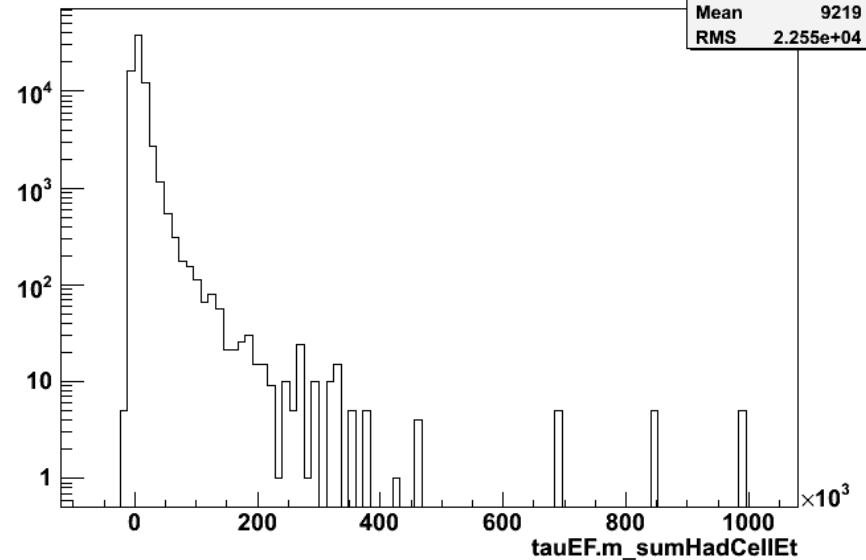
EMNor > 0



# Tau DQ Issues (III)

- Large values of energies seen in calorimeter ( $\sim 1\text{TeV}$ )
  - Seems to be acceptable by the LAr group
- Other problems (next slide)
  - Anticorrelation between eta at L2 and EF
  - Phi values shifted by  $\pm\pi$
  - Seems to be caused by negative values of energies at L2
    - Particularly the EM energy (summed over three layers) in normal cone ( $0.3 \times 0.3$ )

tauEF.m\_sumHadCellEt



# Summary

- Tau DQM is in good shape
  - We have most of the stuff in there
- New setup provided by Martin
  - Separate files and directories for Cosmic, single beam and physics modes
  - Should provide different histograms for each mode
  - Need to be tested-had problems with running in tadq-02-00-01
- Have observed a few DQ issues in online and offline reconstructed data
  - More important is the structure in hadronic energy
    - Could be a calibration issue in LAr for events where there is no EM energy at all
      - Need additional protection against such events
- Should the trigger (L1\_TAU5) require both EM and HAD energies to be non-zero than just applying the condition on the sum of the two
- A fix was introduced for events that had eta anti correlation and shifted phi
  - Assign small non-zero, non-negative value of energy when EM energy at L2 is negative