

Tau Fake Rate Study with Real Data Using tcTau (track corrected Calotau)

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On behalf of tauIdCommissioning

IMP weekly meeting

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Outline

- Goals of Study
- Tau Efficiency
- Control Plots
- Tau Fake Rate
- Summary and to Do

Goals

- Study Tau Fake Rate
 - With different Algorithms:
 - TcTau
 - FixedCone
 - ShrinkingCone
 - HPS
 - TaNC
 - For 3 Samples:
 - QCD
 - QCD Enriched with Muon
 - W+Jets
- Meanwhile, recalculate the Tau Efficiency in Ztautau Sample

Technicalities

With the Integrated Luminosity which will be collected until end of June ~ 0.1 (nb₋₁), we can only study the Fake of Jet in QCD sample for ICHEP.

- Requirement fro Data:
 - Select QCDDiJet Event
 - Pass hltJet15U
- Since we use the sample of Dijet, we benefit from tag and probe method in order to not bias fake rate calculation:
 - The Jet which passed the HLT is tag and the other one is probe.
 - Require the jet to match the probe

Samples

- /Ztautau/Spring10-START3X_V26_S09-v1/GEN-SIM-RECO
 - $1.69 * 10^6$ [nb⁻¹]
- /MinBias/Spring10-START3X_V26_S09-v1/GEN-SIM-RECO
 - 4.48 [nb⁻¹]
- /QCD_Pt15/Spring10-START3X_V26_S09-v1/GEN-SIM-RECO
 - 7.07 [nb⁻¹]
- /MinimumBias/Commissioning10-SD_JetMETTau-v9/RECO
 - 8.19 [nb⁻¹]

CMSSW_3_6_1

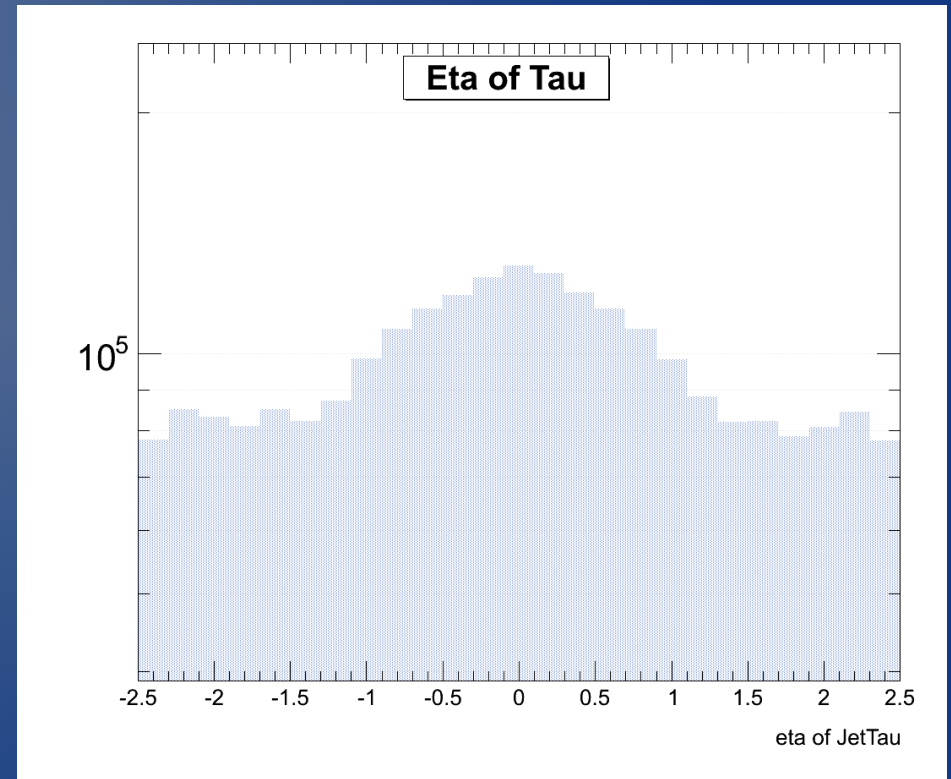
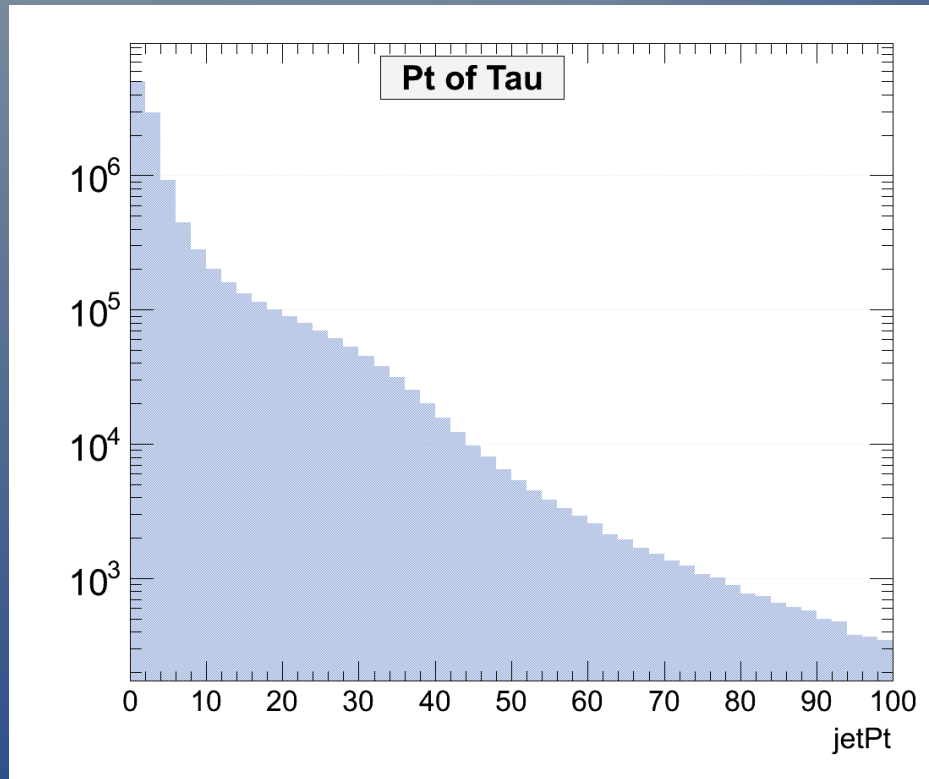
Tau Efficiency

Using Z_{tau} Sample

Tau pt and Eta

$|\eta| < 2.5$

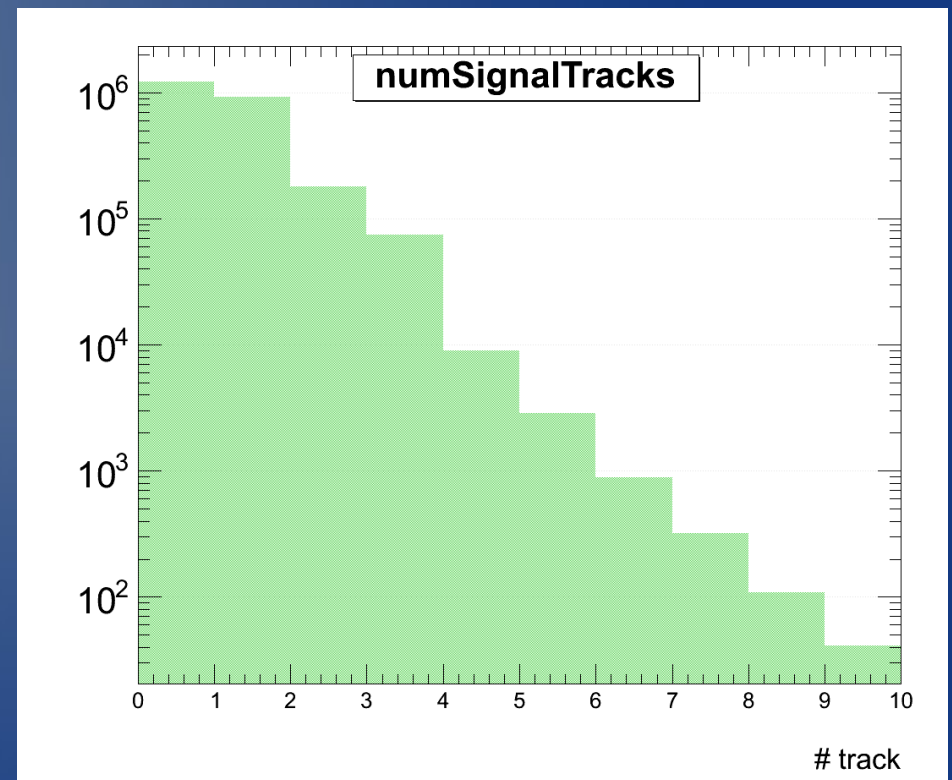
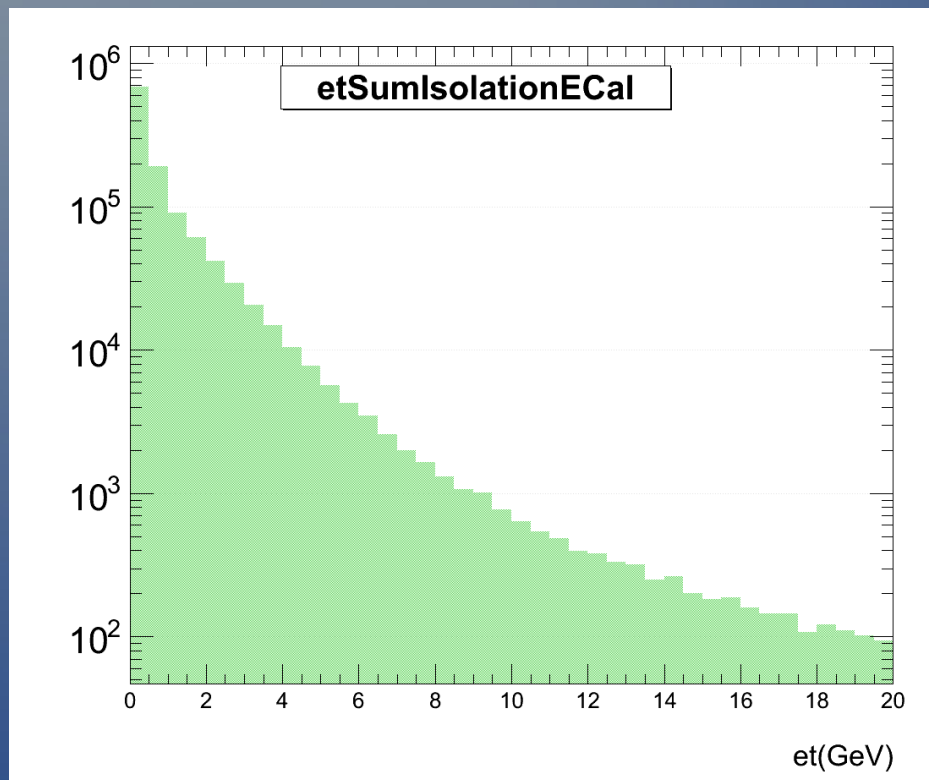
$Pt > 5 \text{ GeV}$



The jetpt and jetEta refers to sum of pt and eta of all particle in signal plus isolation cone

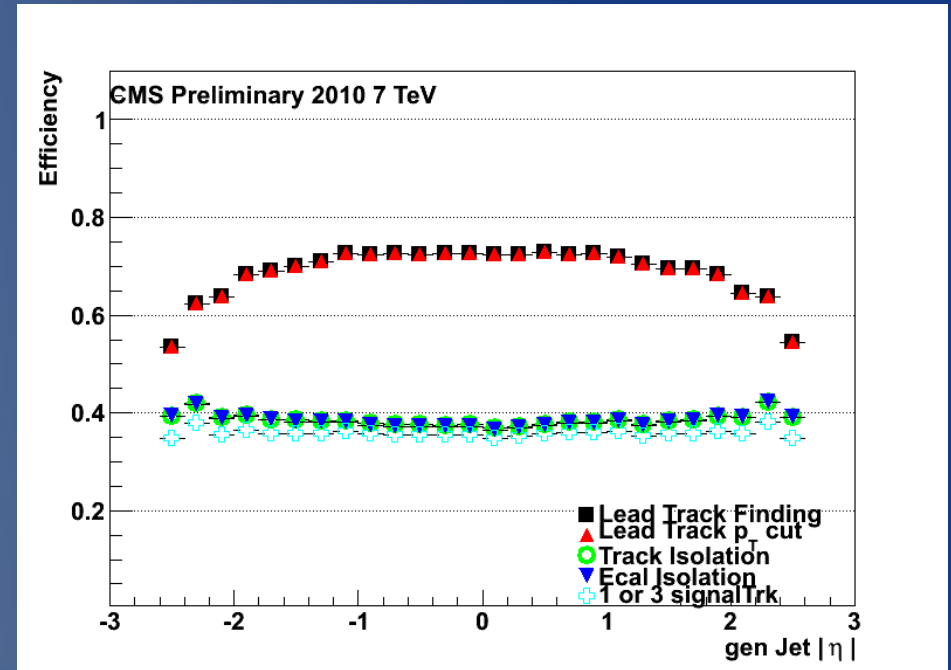
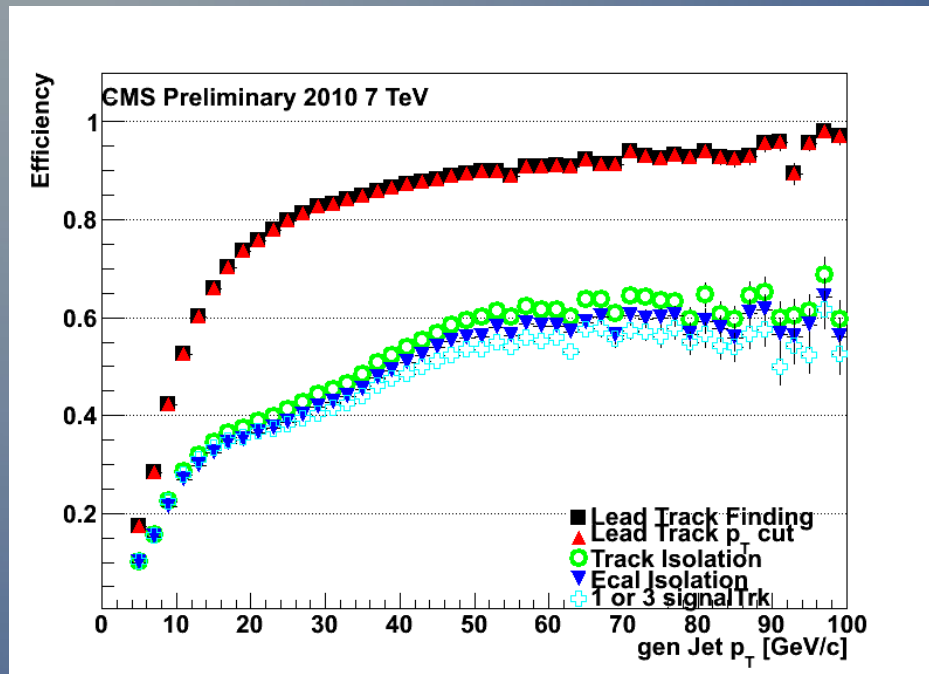
numSigTrk & etSumIsoEcal

Pt > 5GeV & |eta| < 2.5



Left hand: et of all superclusters in isolation annals
Right hand: number of tracks in the signal Cone

Efficiency plots for Tau in Ztautau

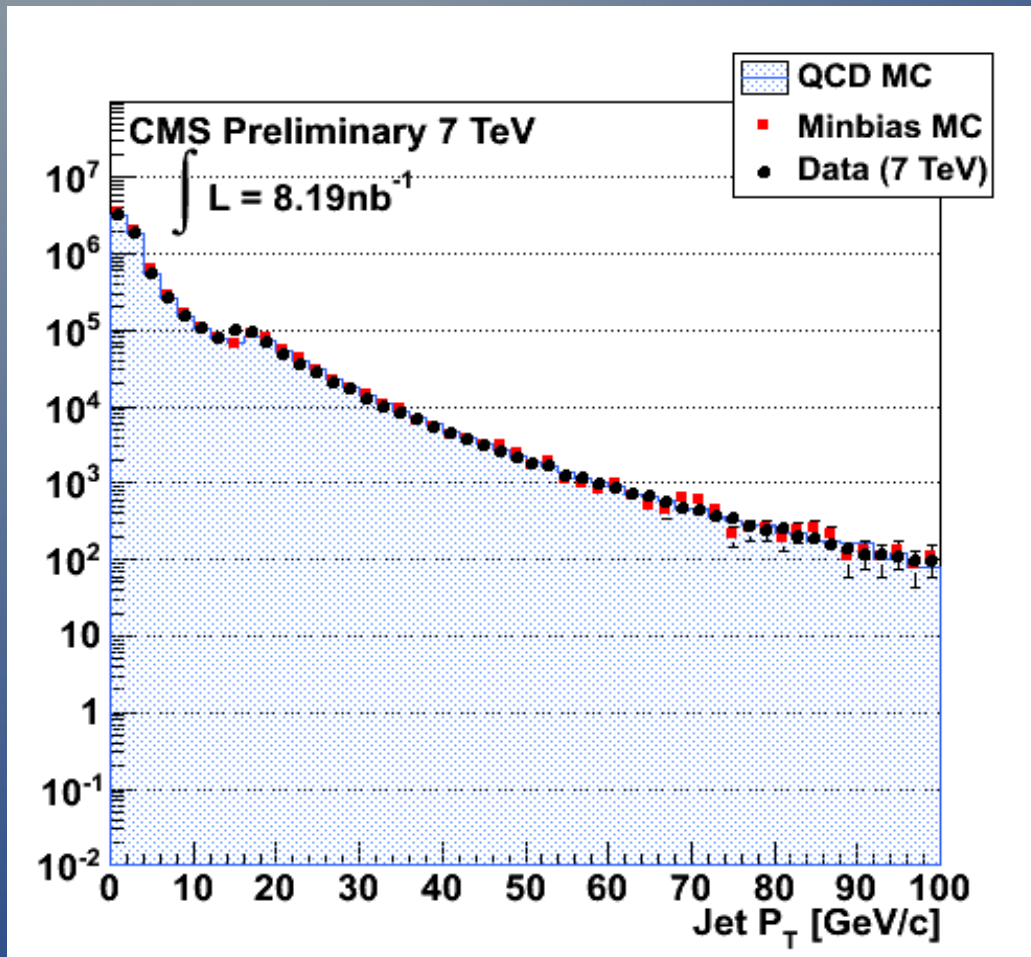


genPt/genEta is the transverse mass/pseudo rapidity of all visible particle produced in hadronic tau lepton decay on generator level

- Coincidence of LeadTrkFinding & LeadTrkPtCut
- Low efficiency of Track Isolation
- For Ecal Isolation: $etSumIsoEcal < 5\text{GeV}$

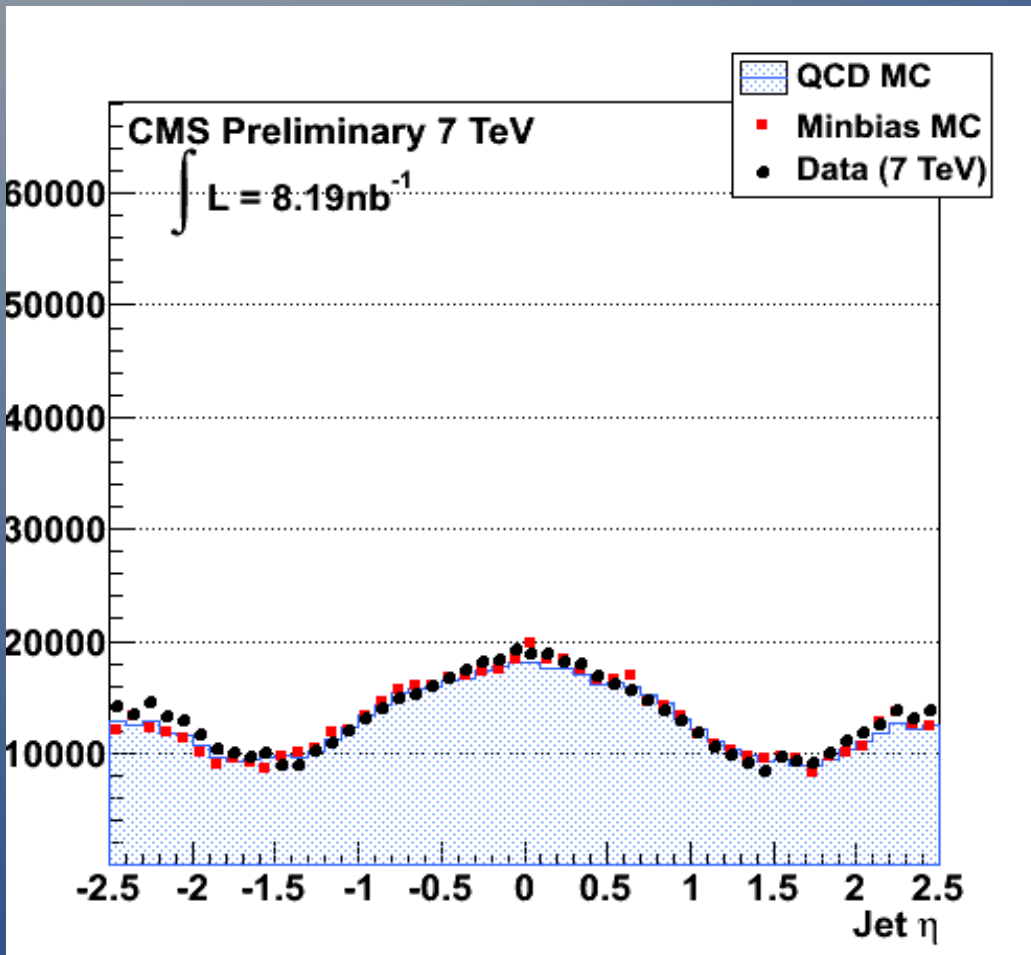
Control Plots

Pt



- probe > 0.5
- $\text{hltJet15U} > 0.5$
- $\text{JetEta} < 2.5$
- **Good agreement between Data & MC**

eta



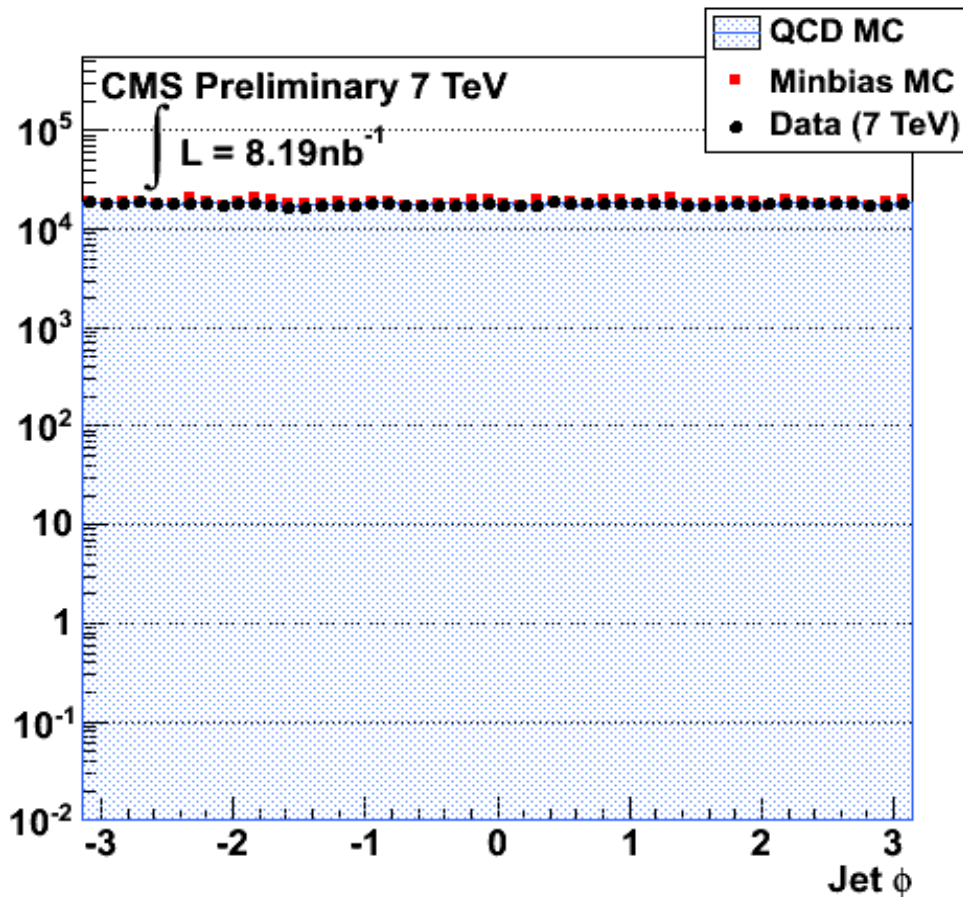
- probe > 0.5
- $\text{hltJet15U} > 0.5$
- $\text{JetPt} > 10$

In high eta, Data is a bit more than MC!?

a bit unusual around crack between EE and EB??!!!

(Under Discussion)

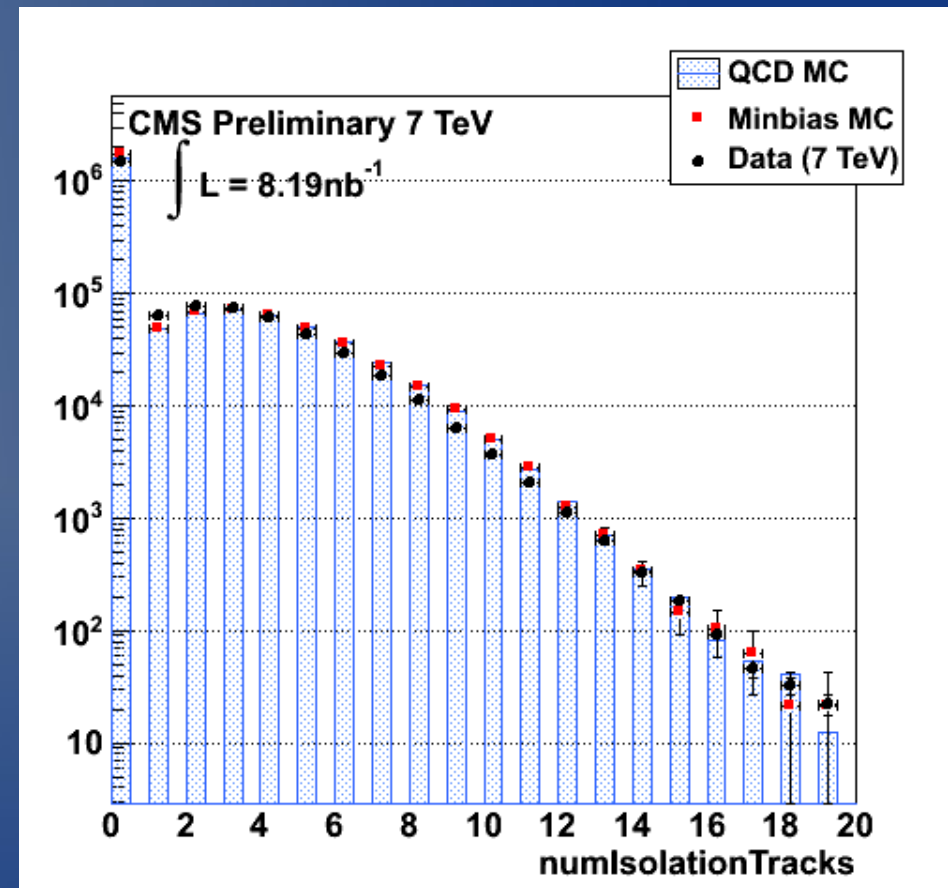
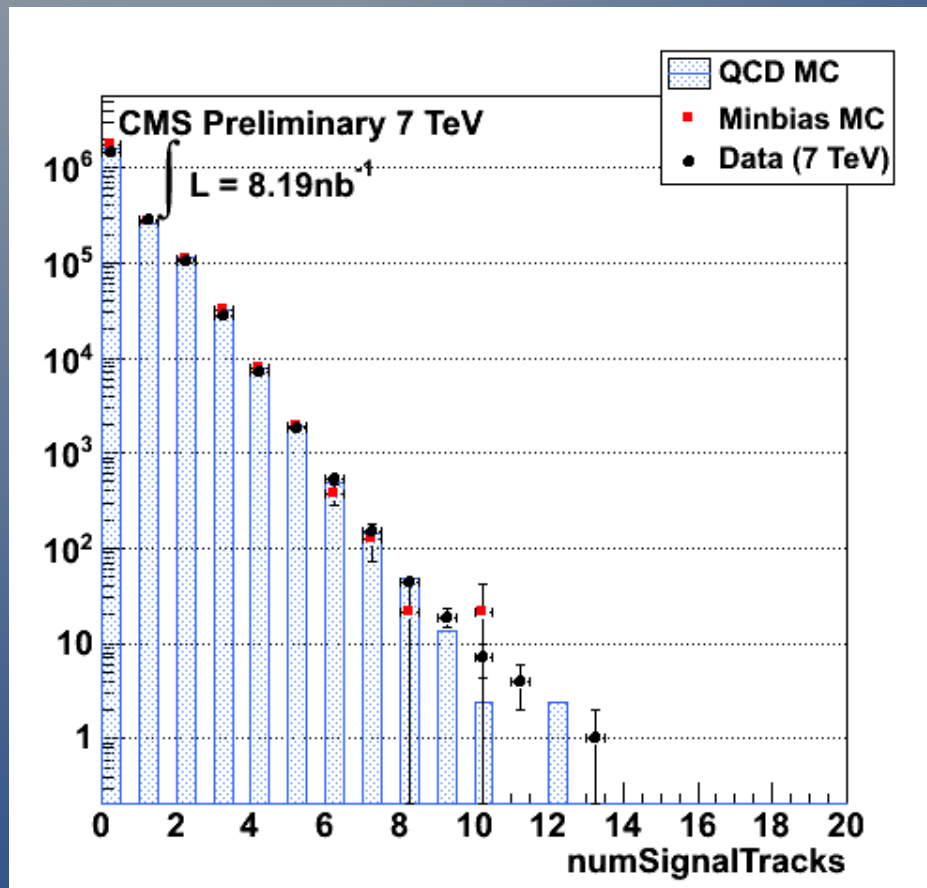
Phi



- probe > 0.5
- hltJet15U > 0.5
- JetPt > 10

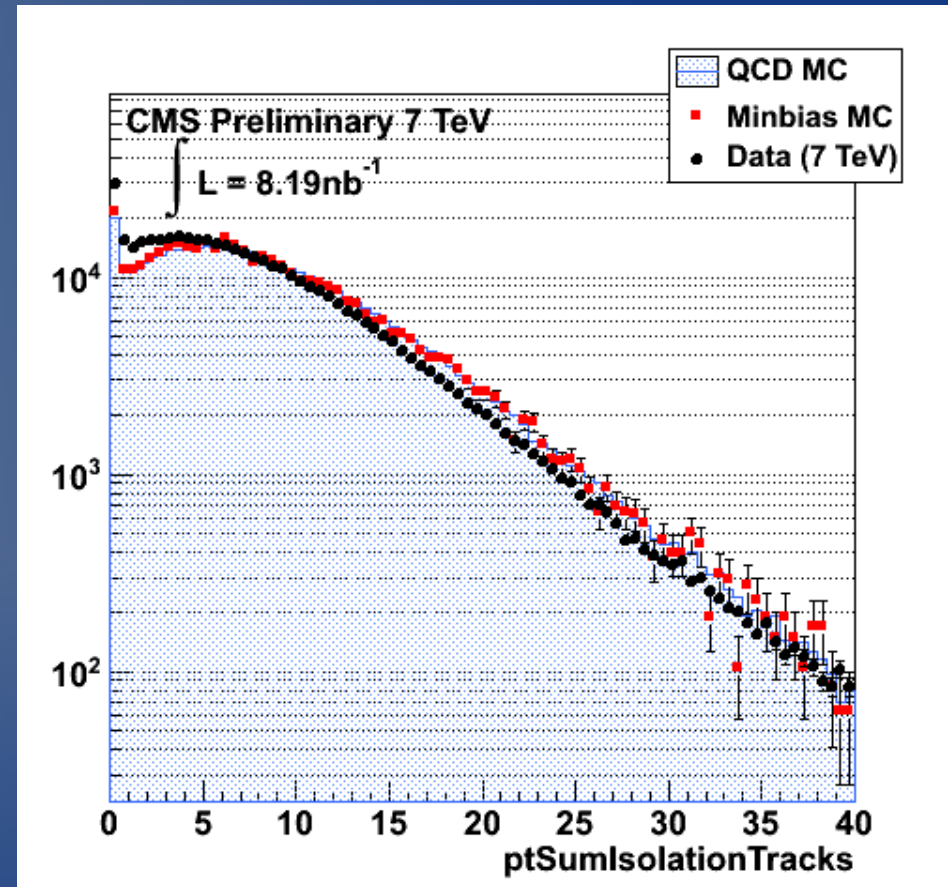
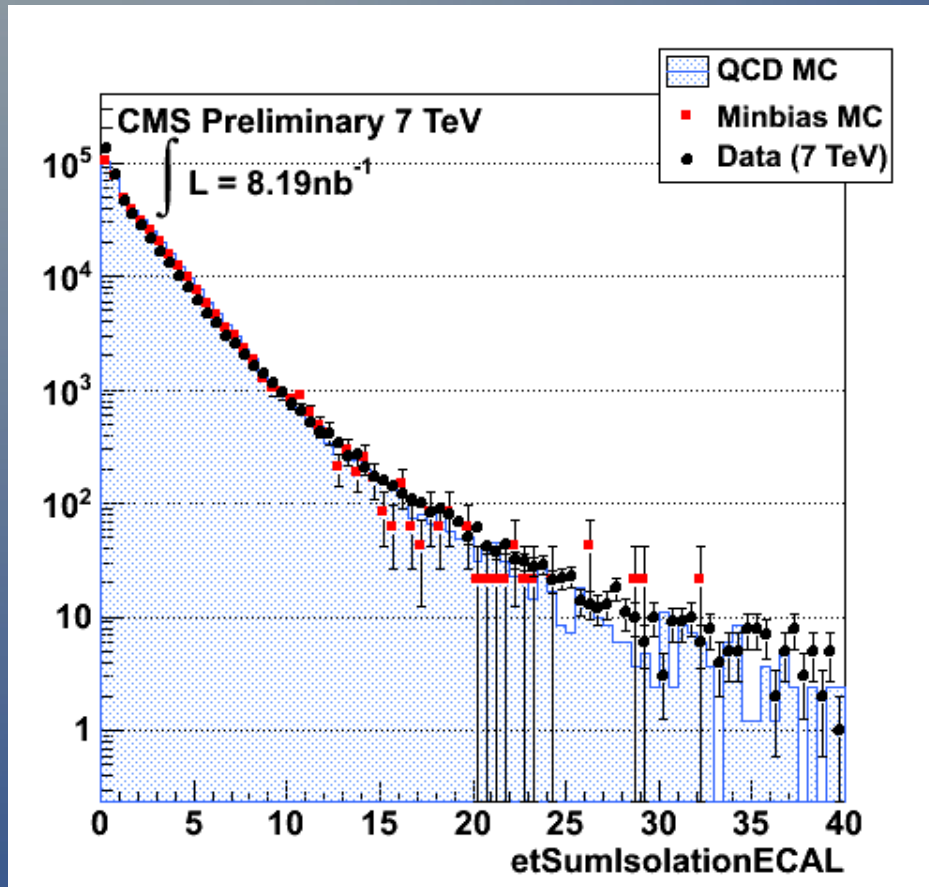
Good agreement between Data and MC and good azimuthal symmetry

Number of Tracks in Signal and Isolation Cone



- probe > 0.5
- hltJet15U > 0.5
- jetPt > 5

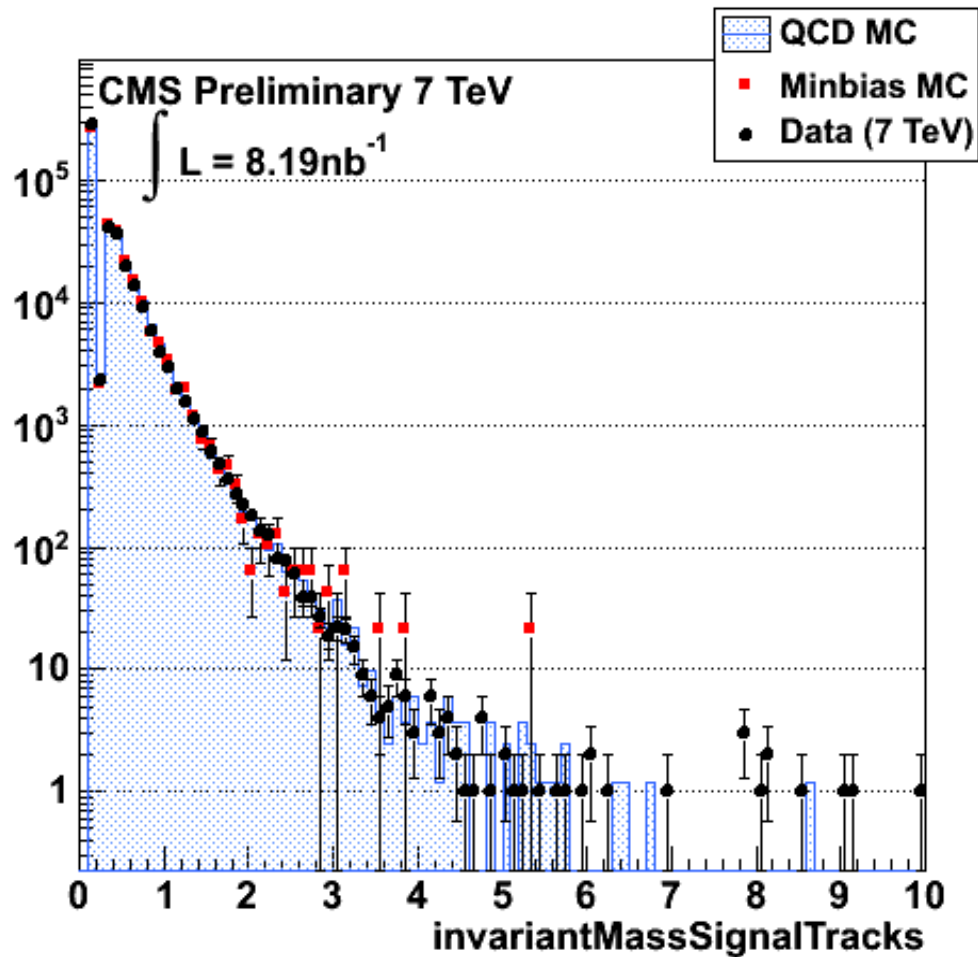
Energy deposit in Isolation annuals



For Ecal isolation->put a cut on etSumIsoEcal (i.e. 5 GeV)

For Track Isolation->put a cut on minPt of Tracks (i.e. 1 GeV)

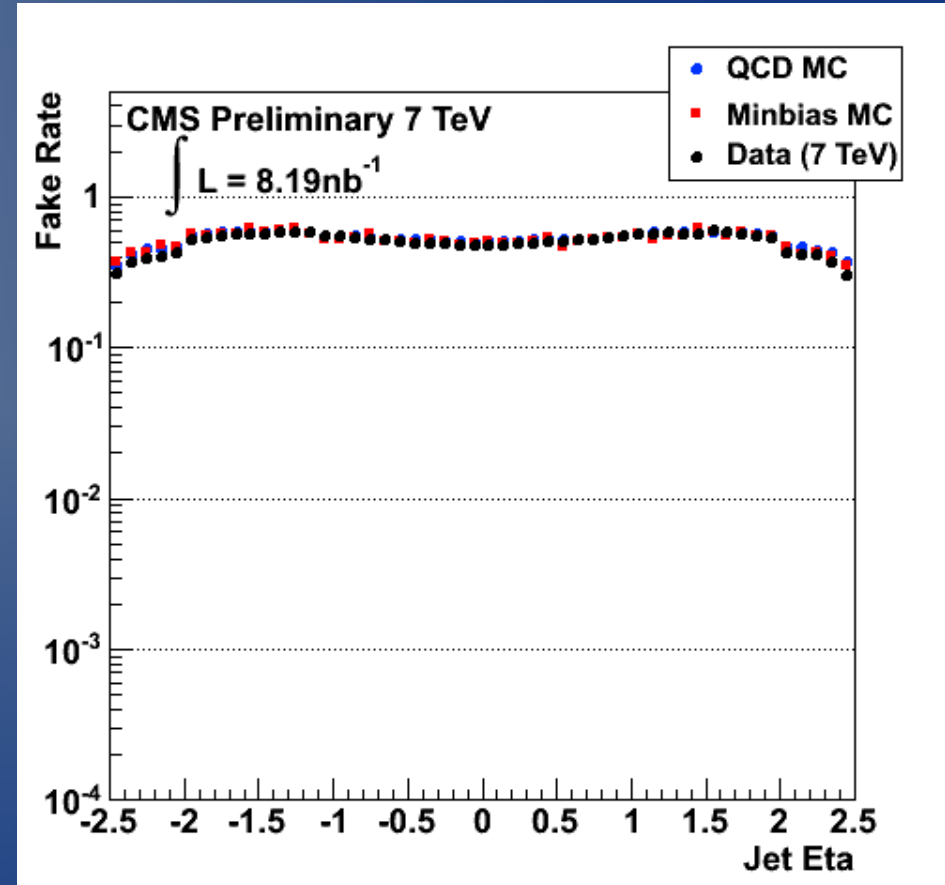
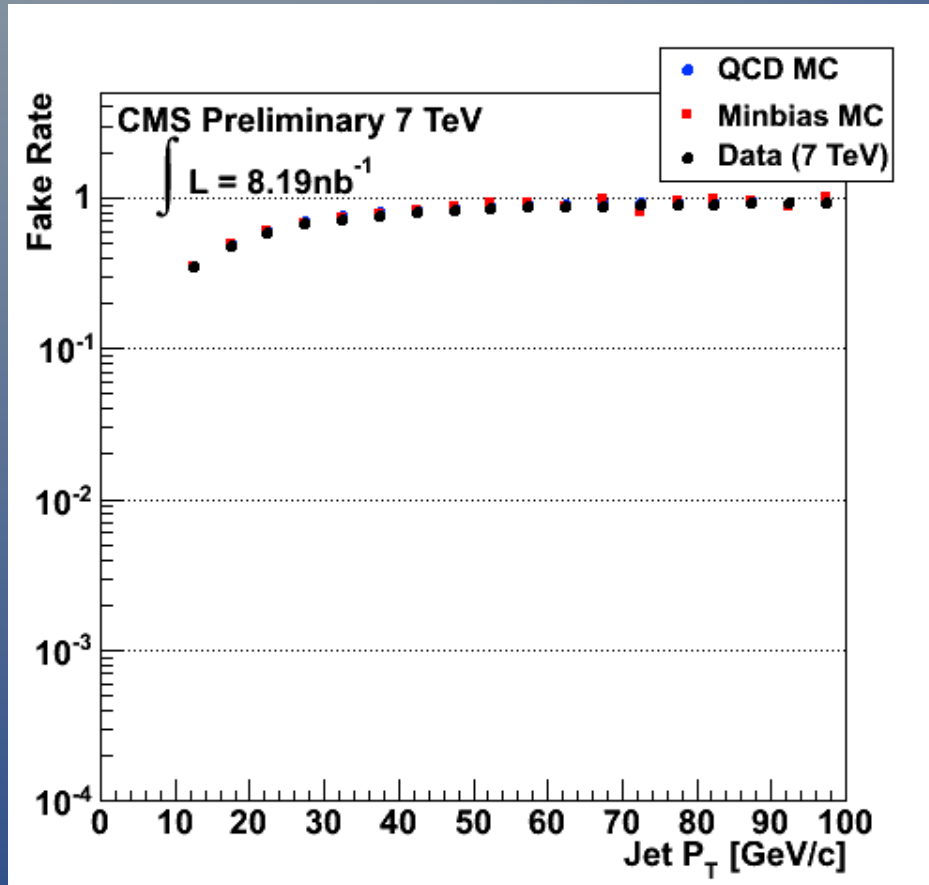
Invariant Mass of Tracks in Signal Cone



Calculated by sum of $p_4()$ of all tracks ($p_t > 1.0$ GeV) in the signal Cone

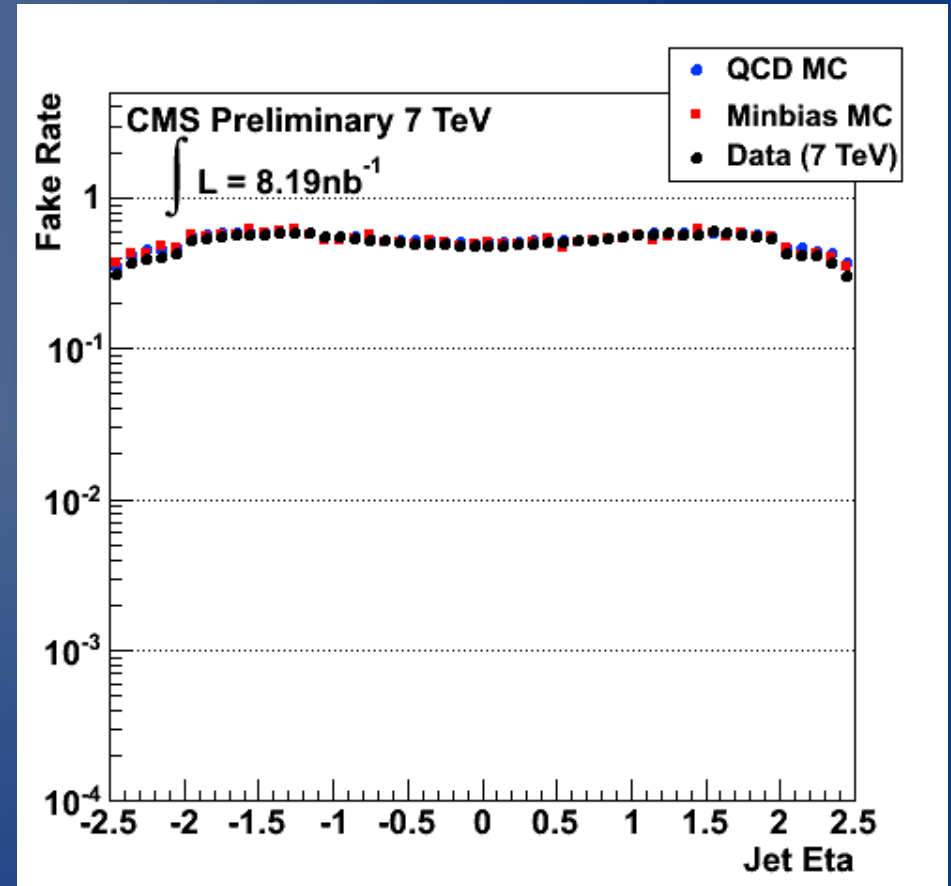
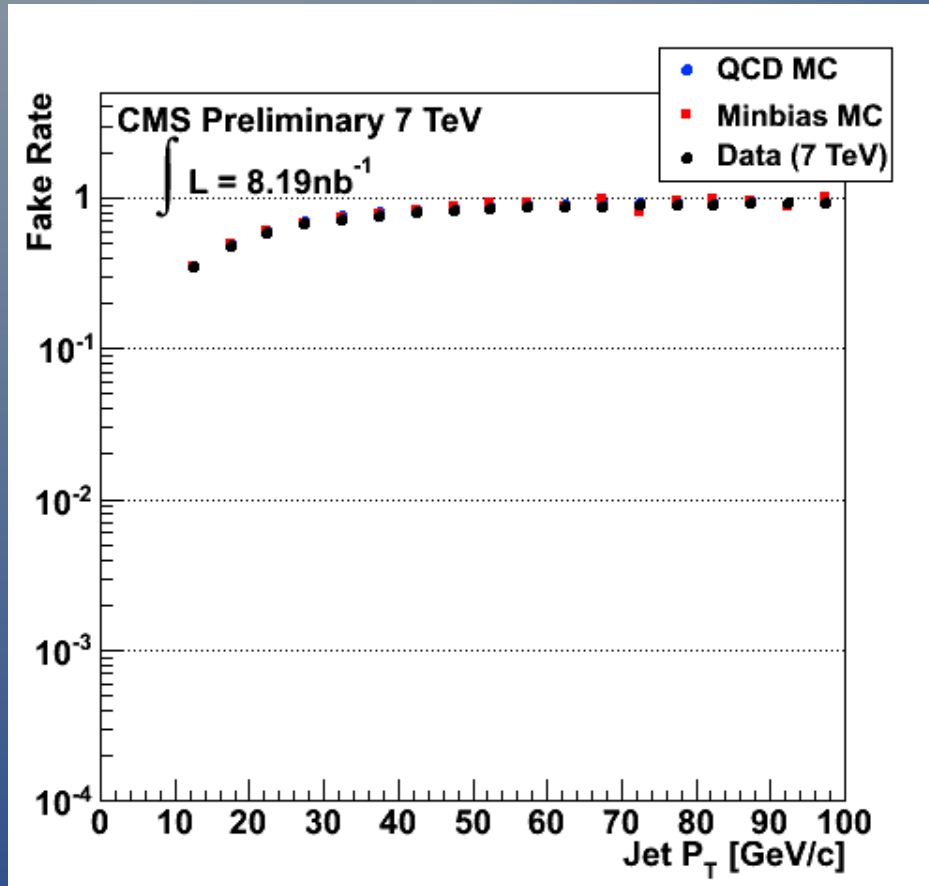
Tau Fake Rate

Discrimination by LeadTrackFinding

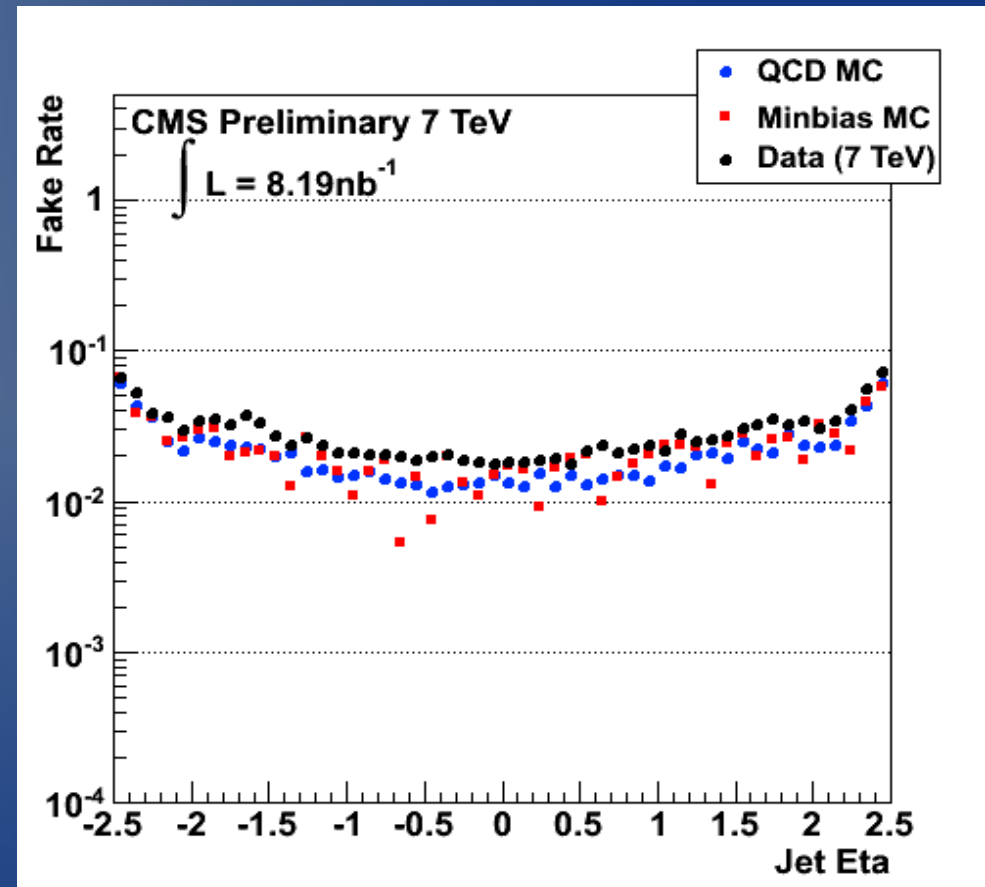
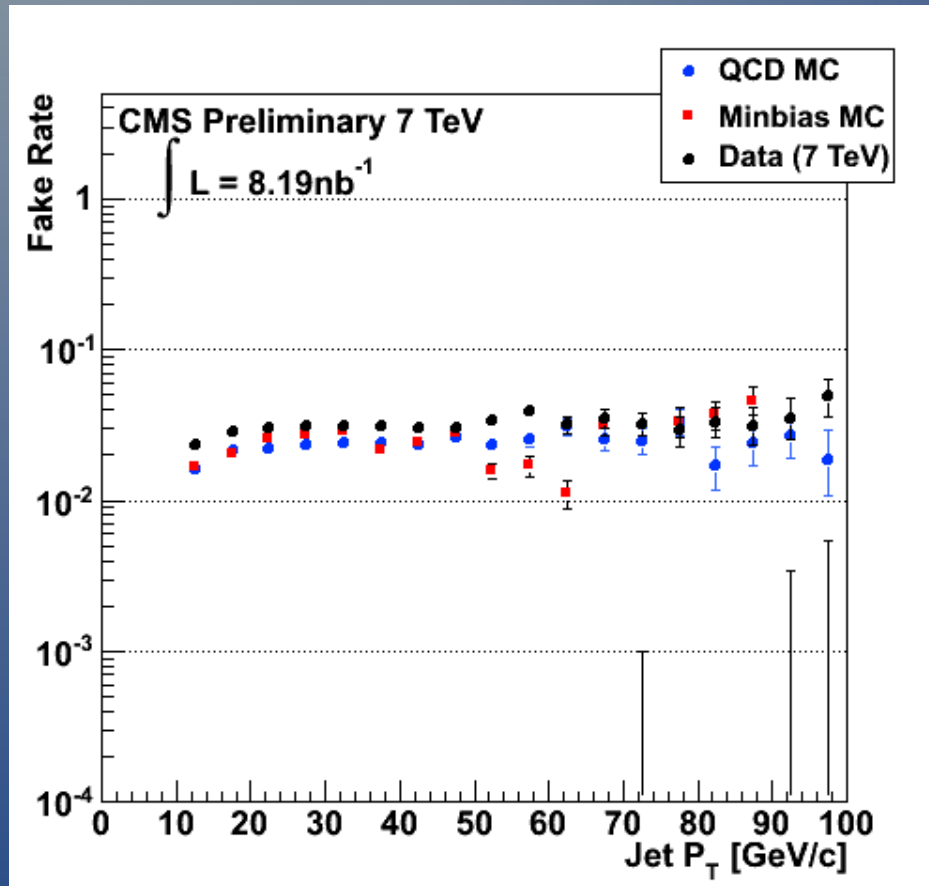


A 5 GeV cut on minPt of lead Track----> this plot is the same as next one

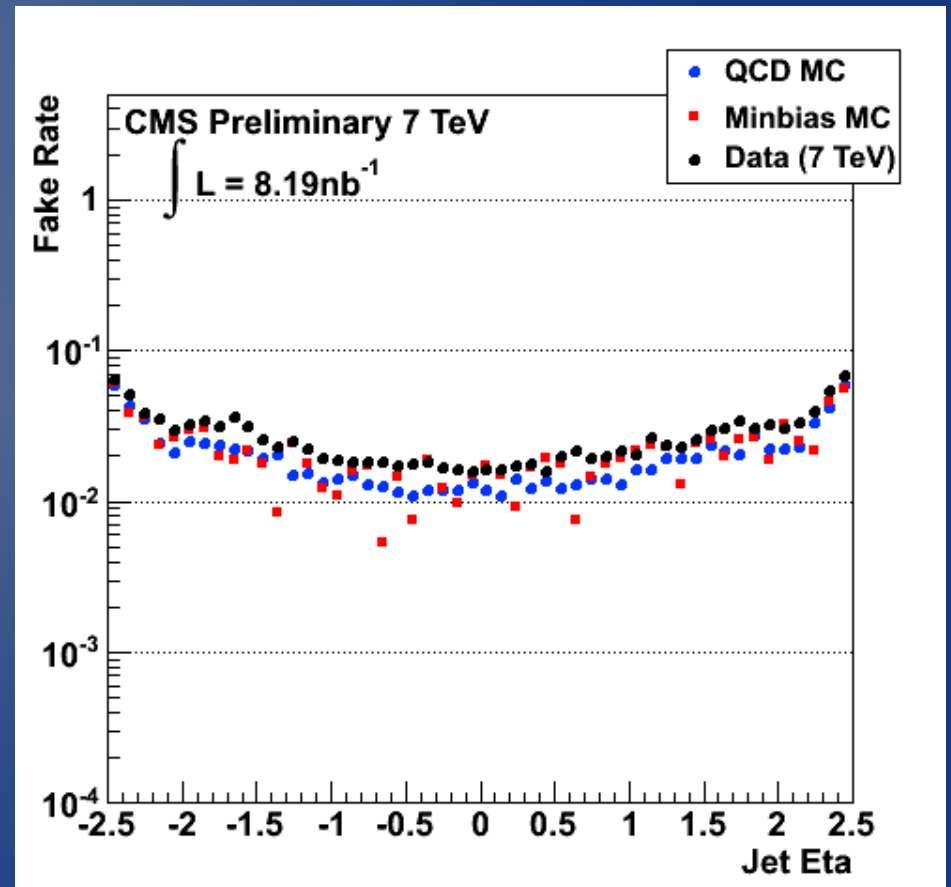
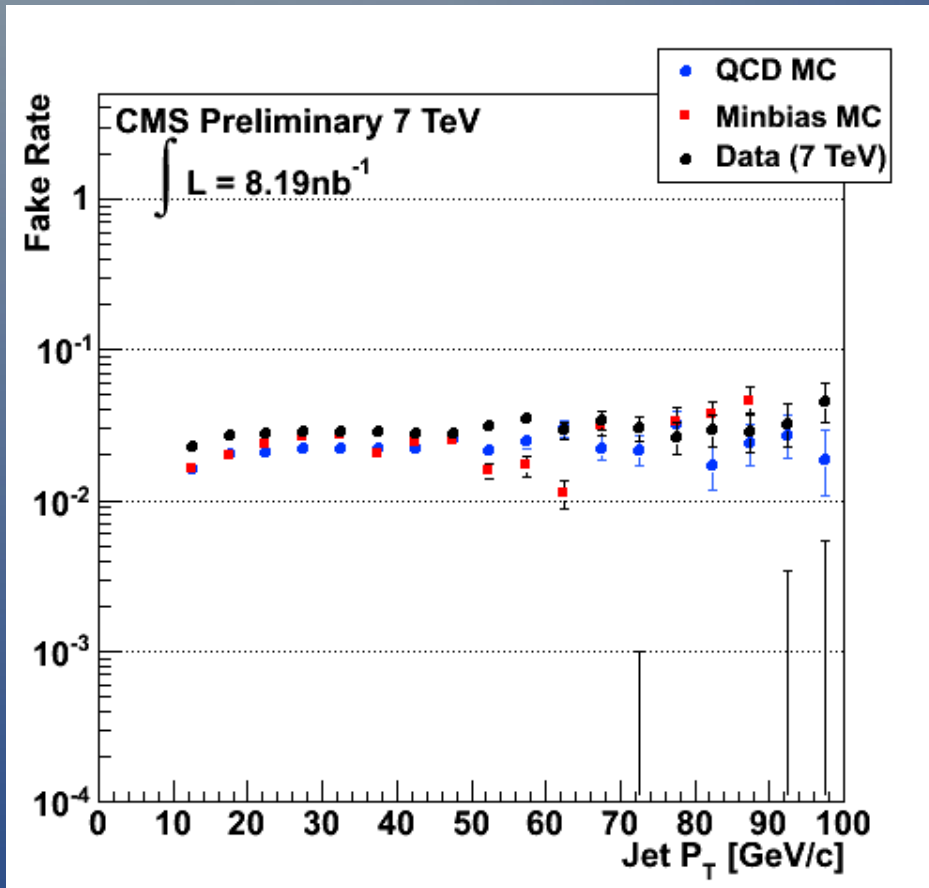
Discrimination by LeadTrackPtCut



byTrackIsolation

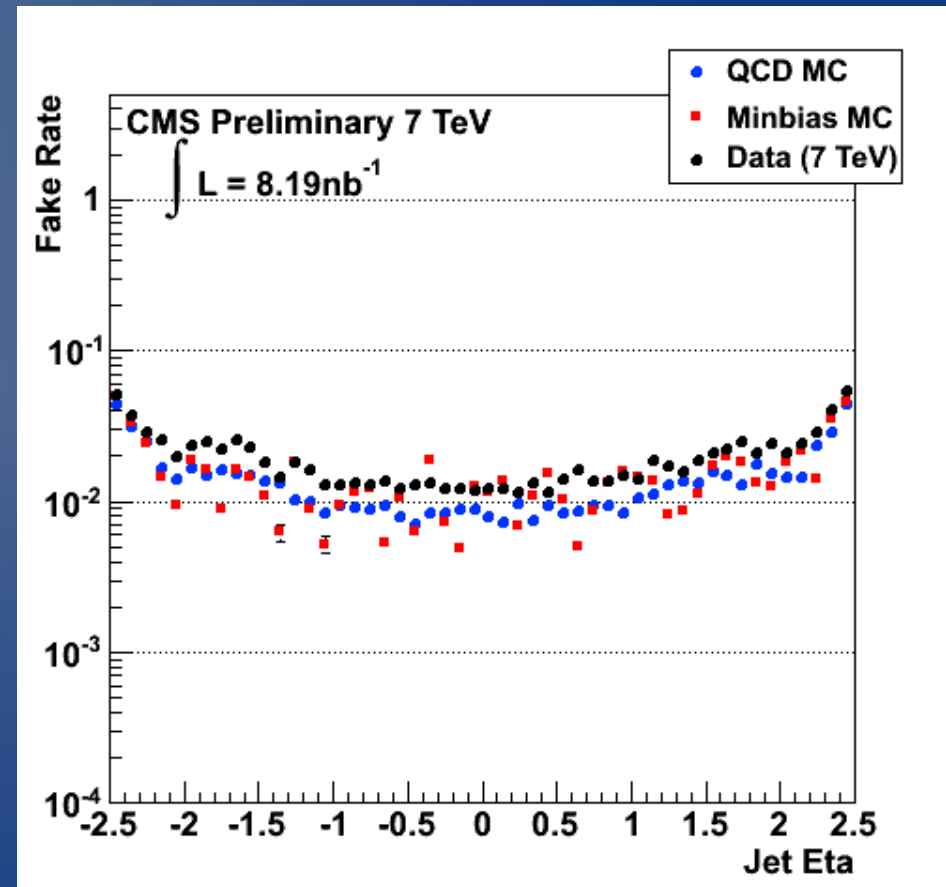
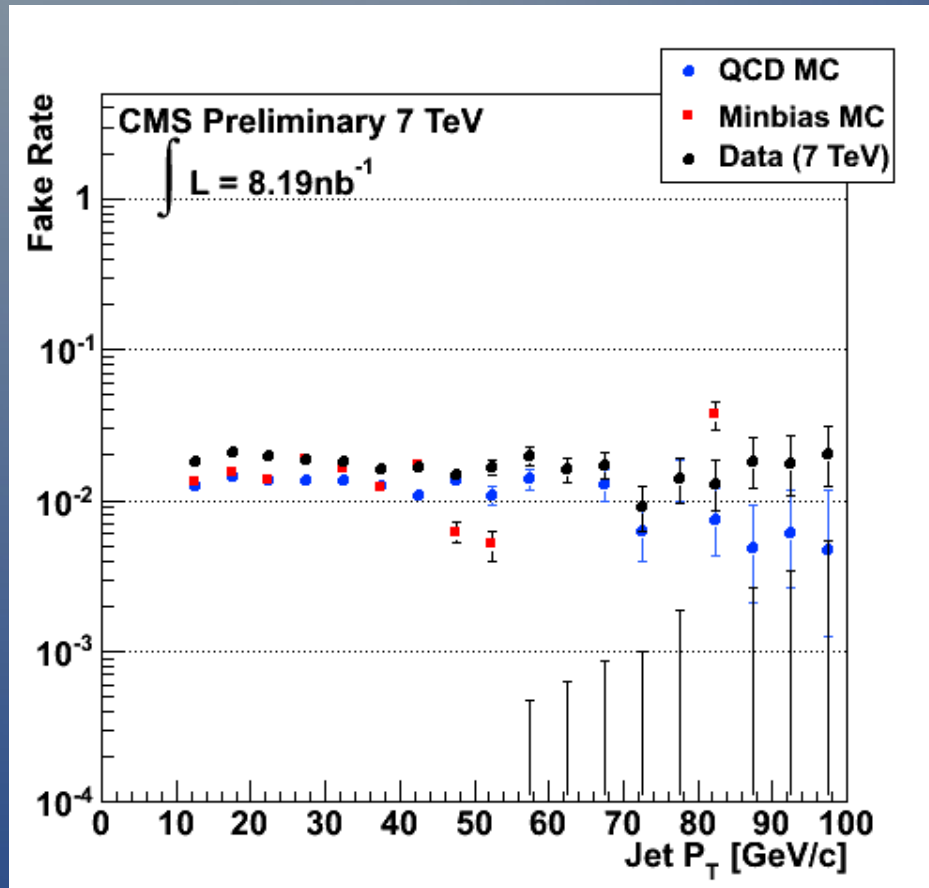


ByEcalIsolation



EtSumIsolationECAL < 5 GeV

1 or 3 prong



Summary and To Do

- A good agreement between Data and MC (both QCD & MiniBias)
- Fake rate is about 1% in QCDdiJet Events
- A new set of Ntuple is ready until Monday Afternoon with some changes included
- Run the efficiency and control plots and Fake rate codes over the new ntuple.
- Finalize the plots and prepare it for the Pre approval.
- Edit the tcTau part of the Paper for ICHEP by S.Lehti and A.Nikitenko

I will be back with more complete (and hopefully approved!) talk in a few weeks