

# “ $\tau$ S” IN COSMIC DATA

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Saminder Dhaliwal (Utoronto)  
Rachid Mazini

- ⊙ Datasets / Run quality
- ⊙ *MC Comparison* TauRec seeds: cone4H1Topojets
- ⊙ *MC Comparison* Tau1P3P seeds: quality cut tracks
- ⊙ Identified taus

# COSMIC RUNS AND MC DATA

Considered runs **with** magnetic field

**Anna:**

Runs 91900, 91387, 91885, 91890

IDComm stream

ESDs from December reprocessing dumped to CBNTs using GRID

~430k events processed

**Saminder:**

Runs between 92226 - 91338

CaloComm stream (and IDComm stream – overlapping runs)

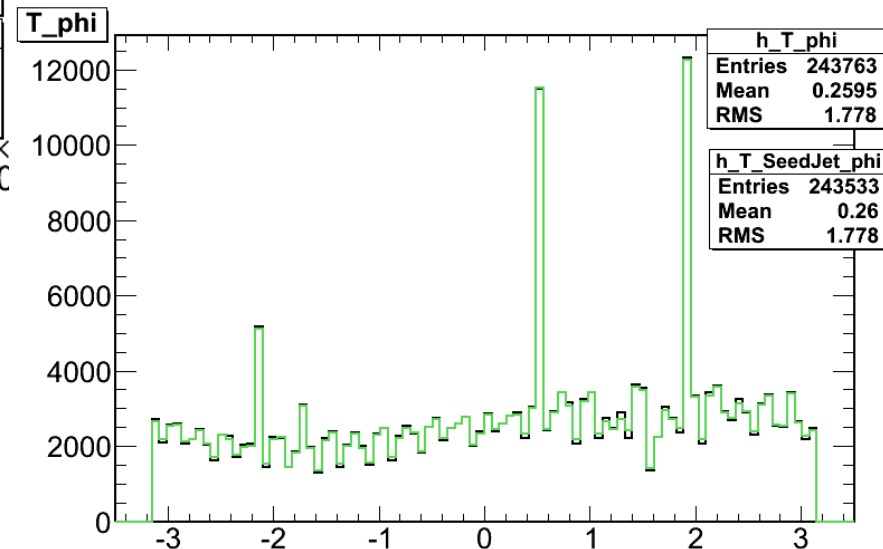
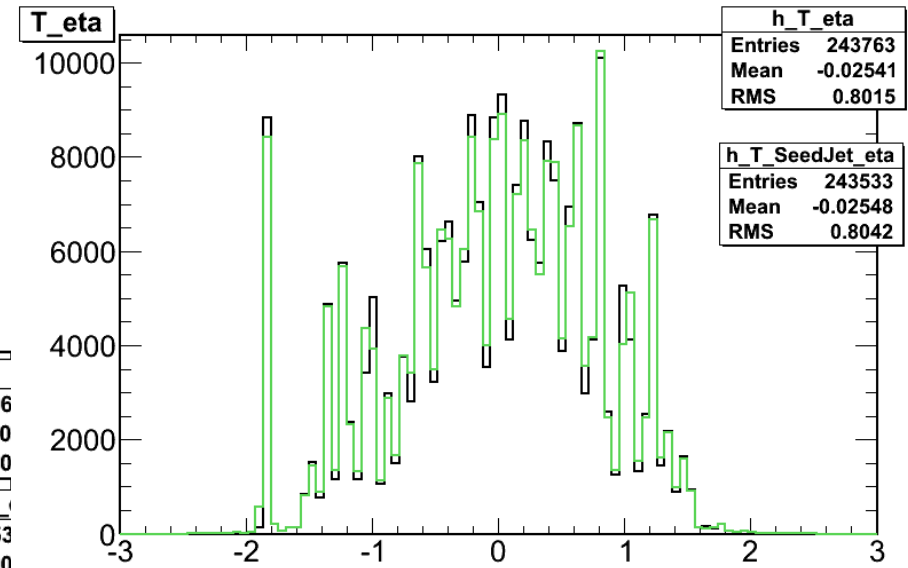
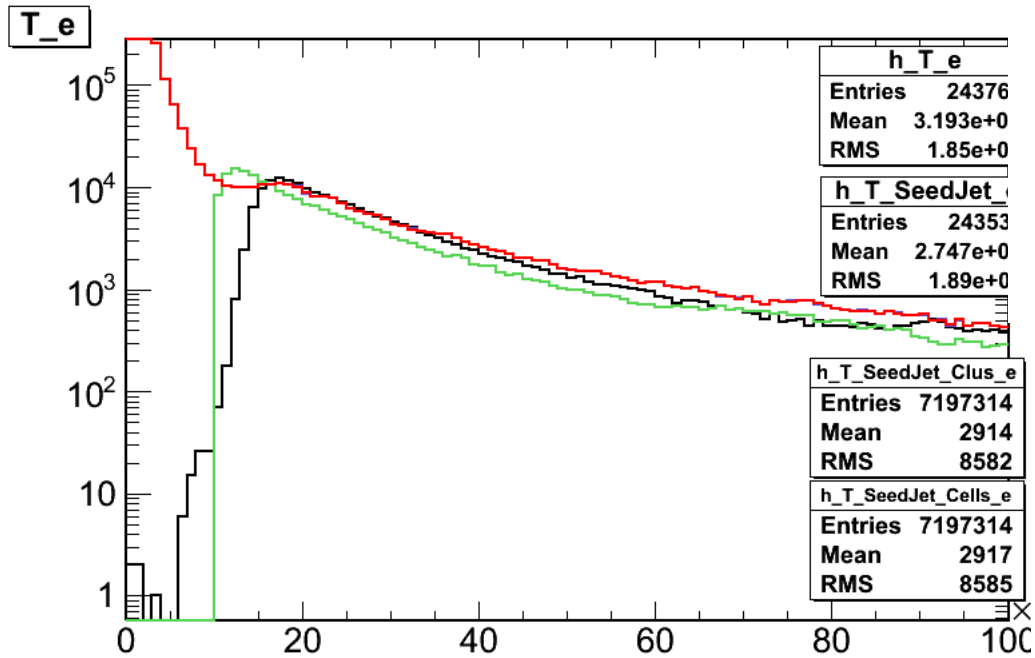
Commissioning DPDs from reprocessed cosmics

(So far have only been successful running at BNL)

- ⊙ No official cosmic MonteCarlo at the moment...
- ⊙ Anna: Non-official MC data with magnetic field (many thanks to S. Laplace and J.B. De Vivie)  
production cache 14.5.0.5  
filter on Pixel & TRT volumes  
~720k events processed  
in MC ESDs no tauRec info - have to rerun tauRec (and topojets)
- ⊙ Saminder: “Official” RDOs from ID group (50k simulated)  
TRT patch needs to be applied (bug 46028)  
<https://twiki.cern.ch/twiki/bin/view/Main/CosmicSimulationSamplesRel14>  
filter on TRT volume

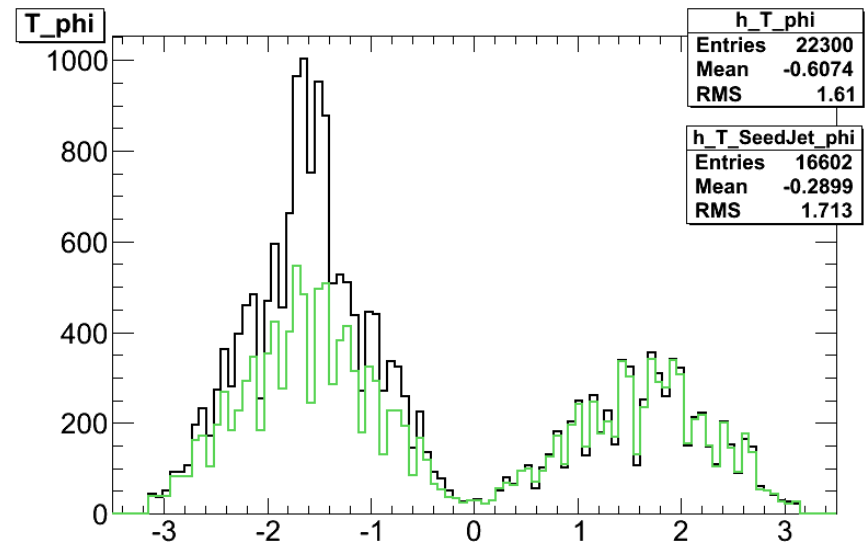
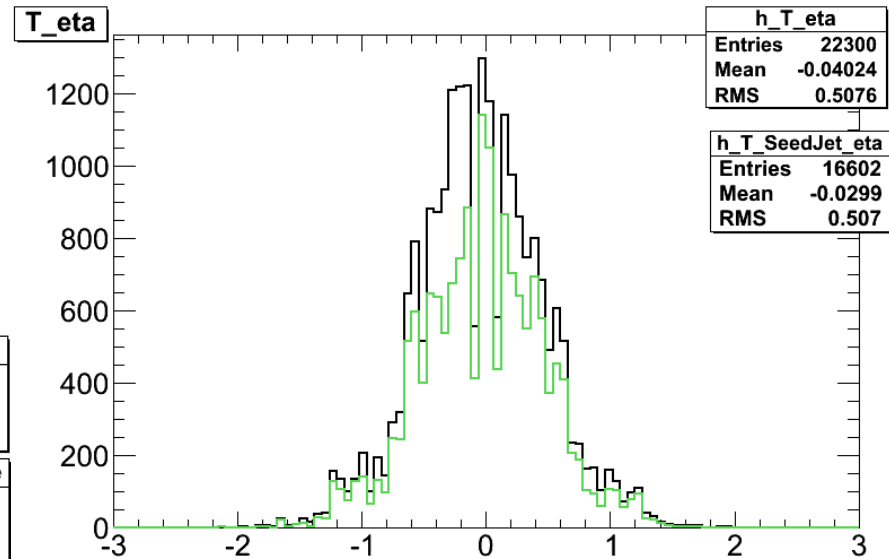
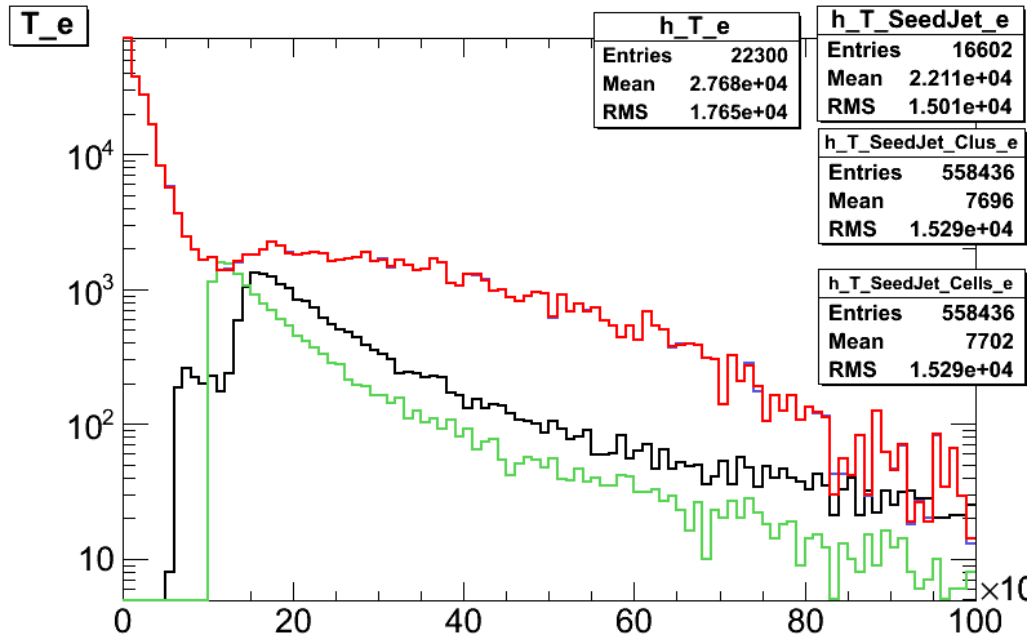
	CaloComm	IDComm	MC
Events	484043	548275	34549
TauCandidates	243763	22300	532
TauRec seeded	243533	16609 (75%)	353 (66%)
Tau1P3P seeded	193	5574 (25%)	178 (34%)
Both seeded	37 (0.015%)	117 (0.52%)	1 (0.19%)

# Calorimeter Seeds from CaloComm Stream



**█** Tau Candidates  
**█** JetSeeds  
**█** JetClusters

# Calorimeter Seeds from IDComm Stream



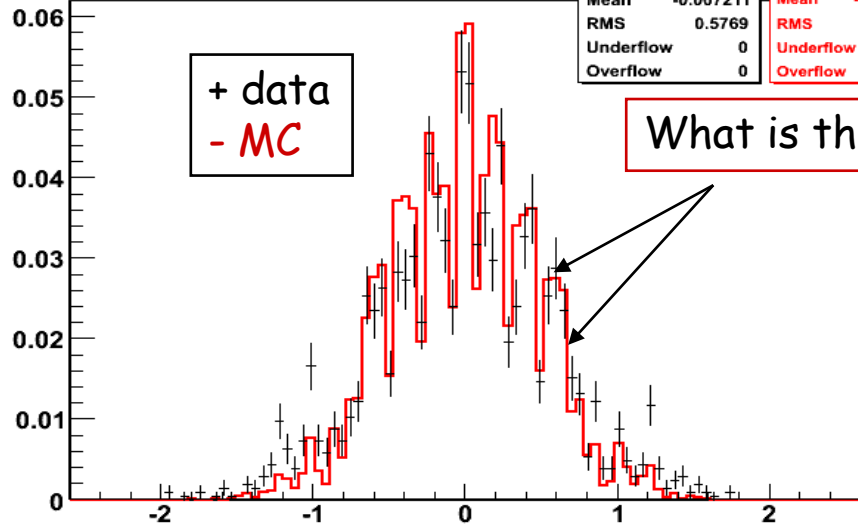
**█** Tau Candidates

**█** JetSeeds

**█** JetClusters

# Seeds: cone4 topojets

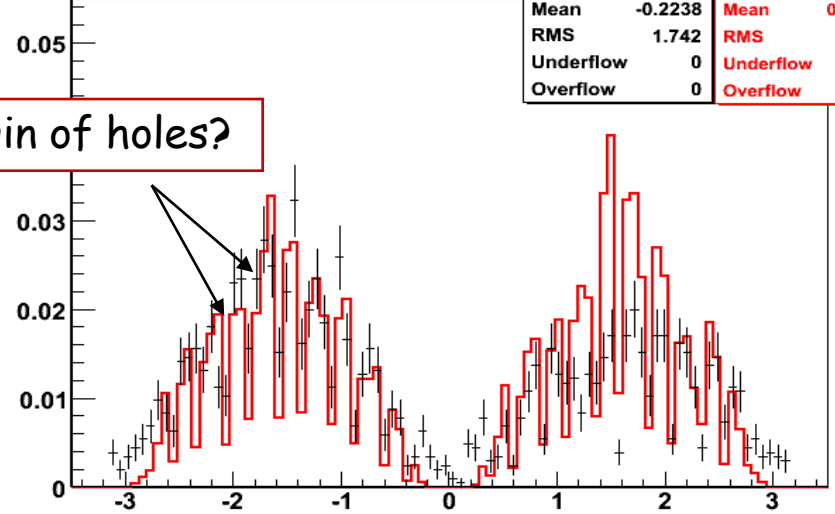
m\_jet\_eta



m_jet_eta	
Entries	2048
Mean	-0.007211
RMS	0.5769
Underflow	0
Overflow	0

m_jet_eta	
Entries	6155
Mean	-0.0005111
RMS	0.4738
Underflow	0
Overflow	0

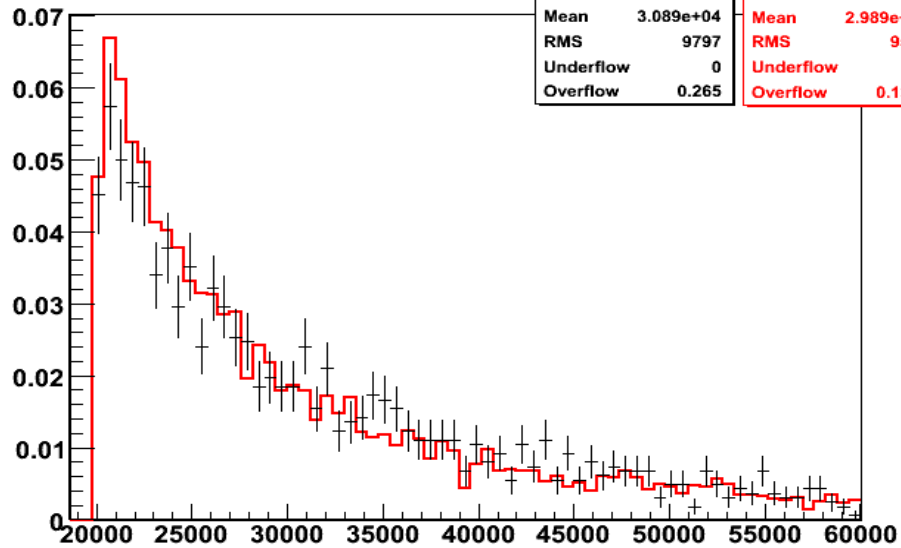
m\_jet\_phi



m_jet_phi	
Entries	2048
Mean	-0.2238
RMS	1.742
Underflow	0
Overflow	0

m_jet_phi	
Entries	6155
Mean	0.08079
RMS	1.676
Underflow	0
Overflow	0

m\_jet\_et

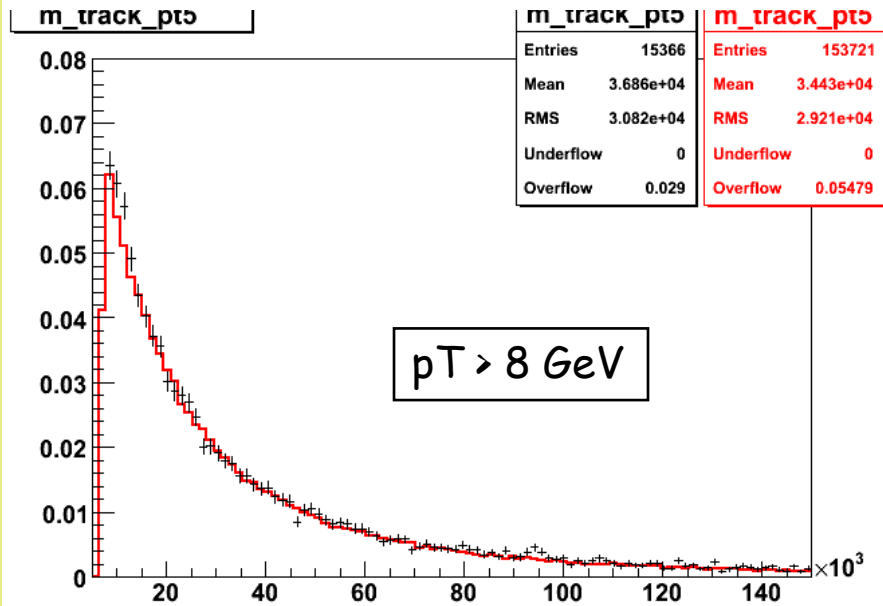
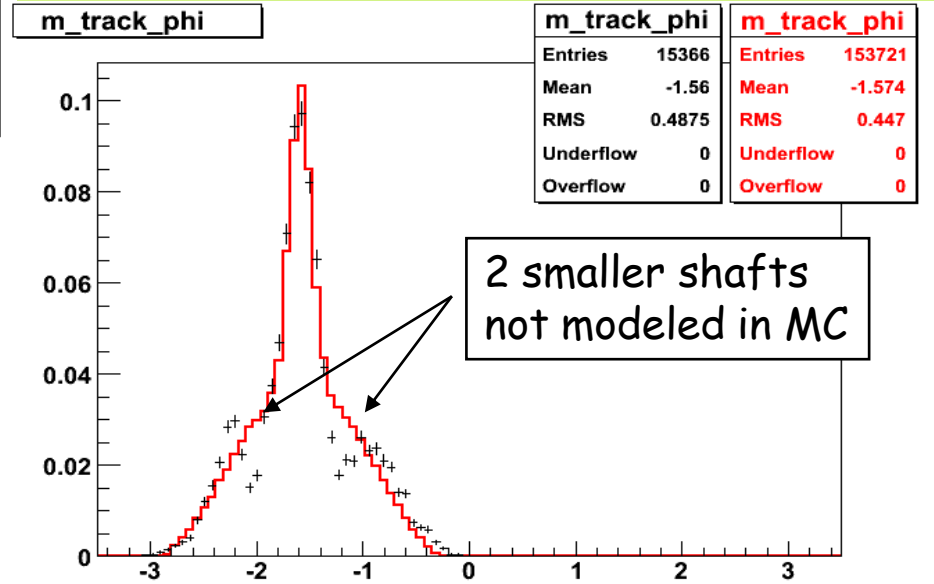
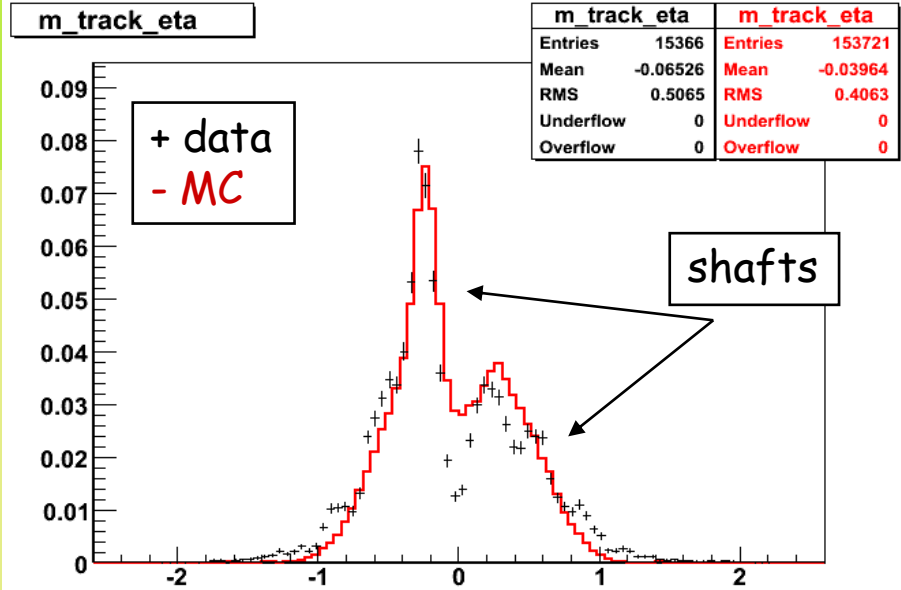


m_jet_et	
Entries	2048
Mean	3.089e+04
RMS	9797
Underflow	0
Overflow	0.265

m_jet_et	
Entries	6155
Mean	2.989e+04
RMS	9573
Underflow	0
Overflow	0.1356

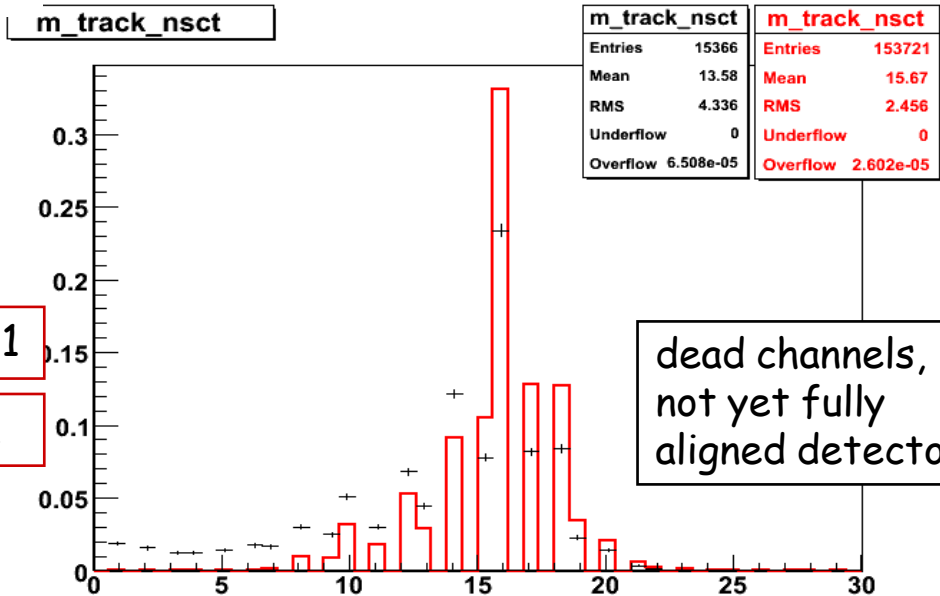
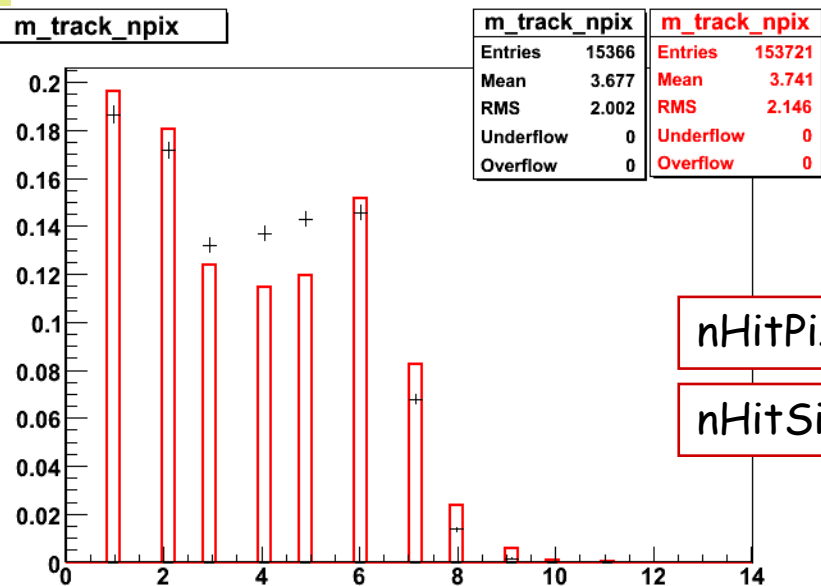
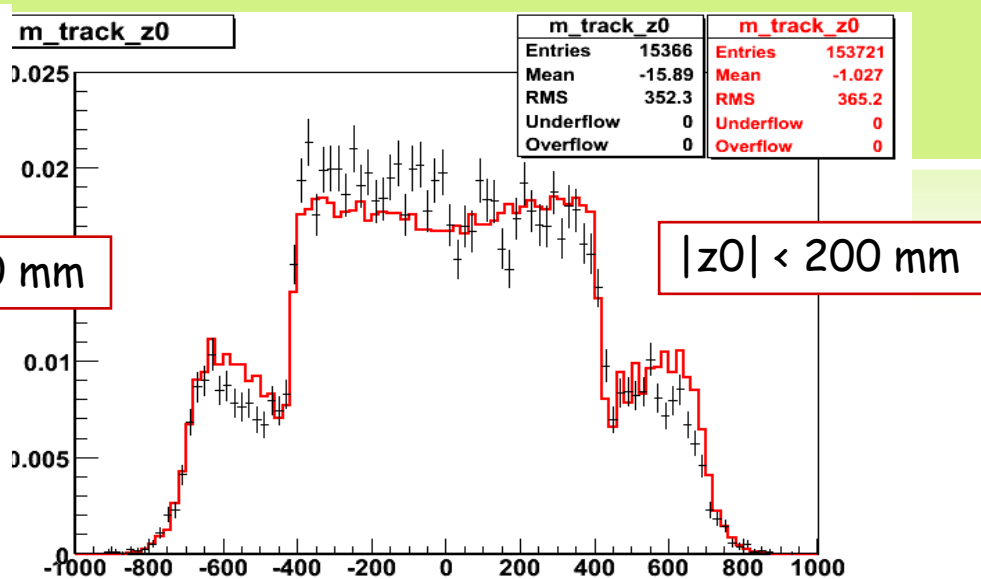
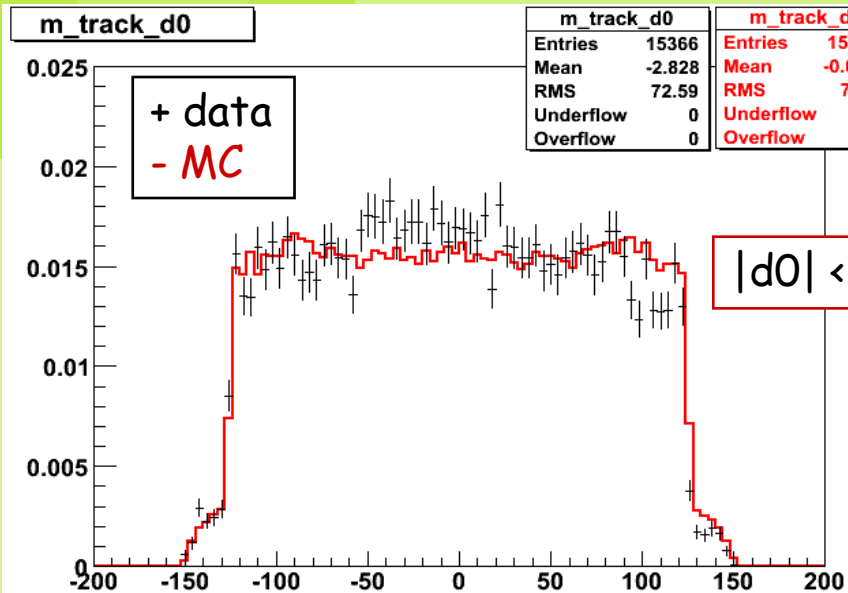
ET(cone4topojet) > 20 GeV  
Ntrack > 0

# Seeds: tracks

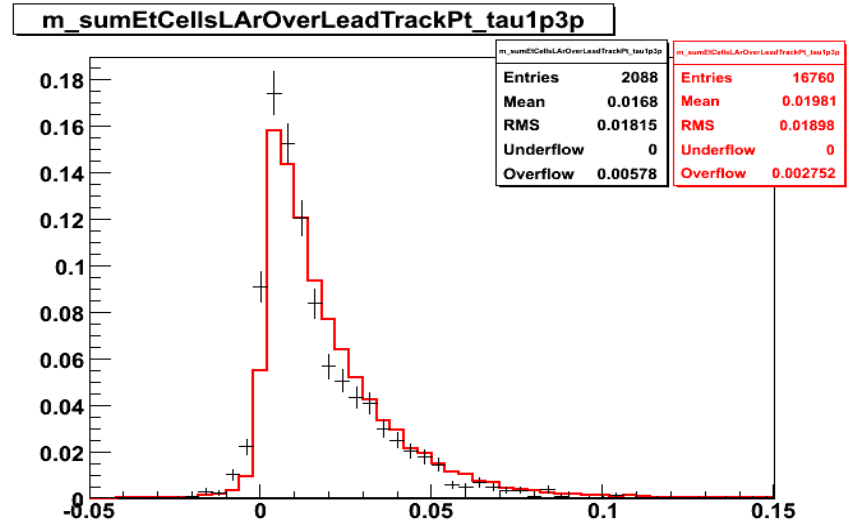
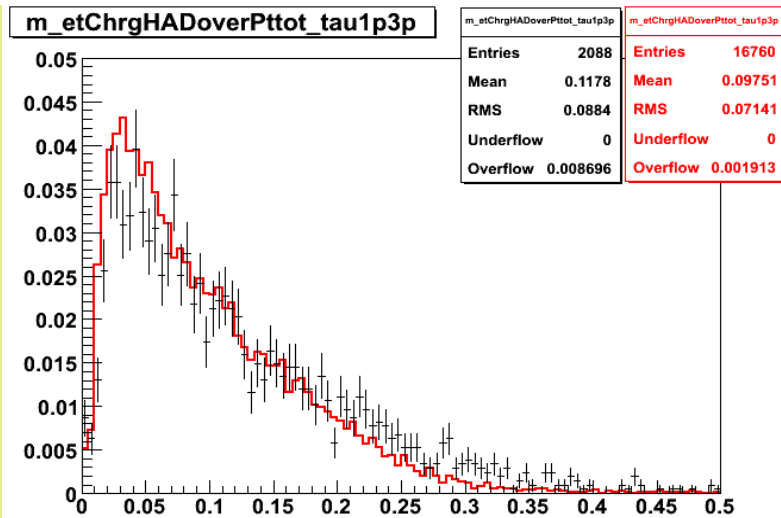
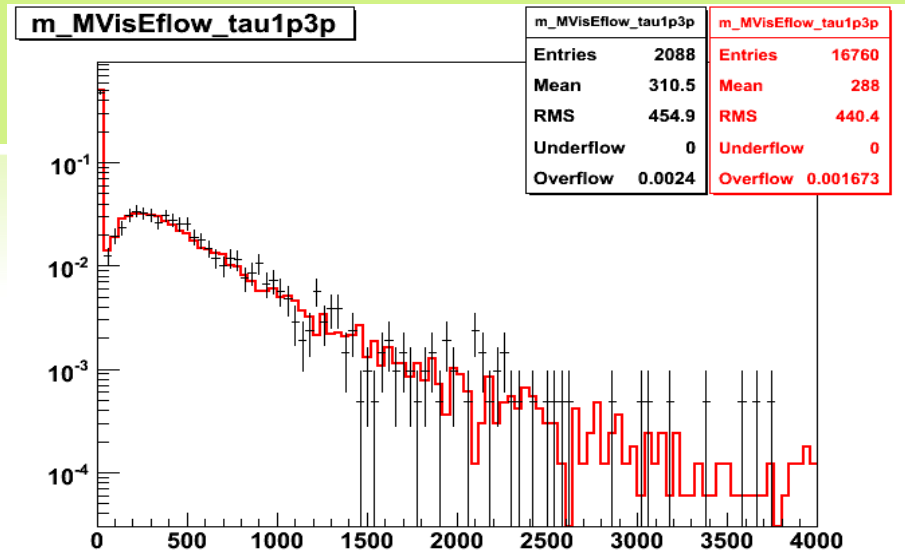
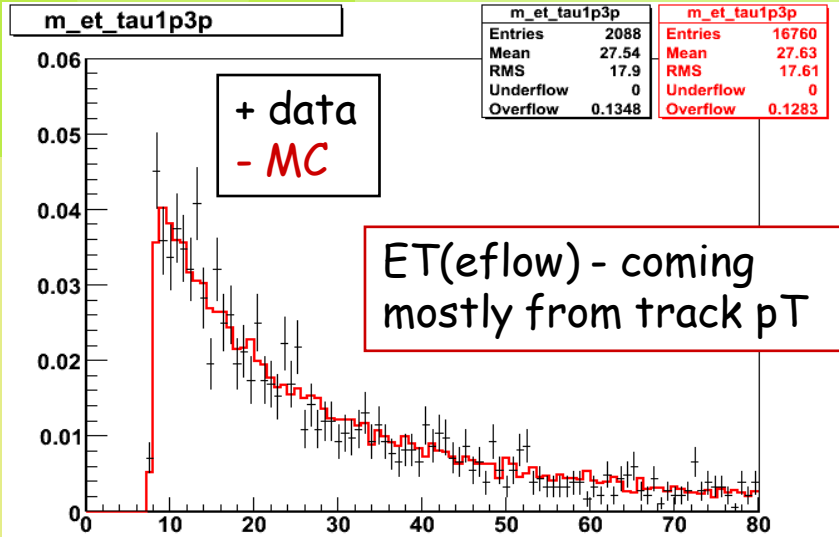




# Seeds: tracks - track quality variables

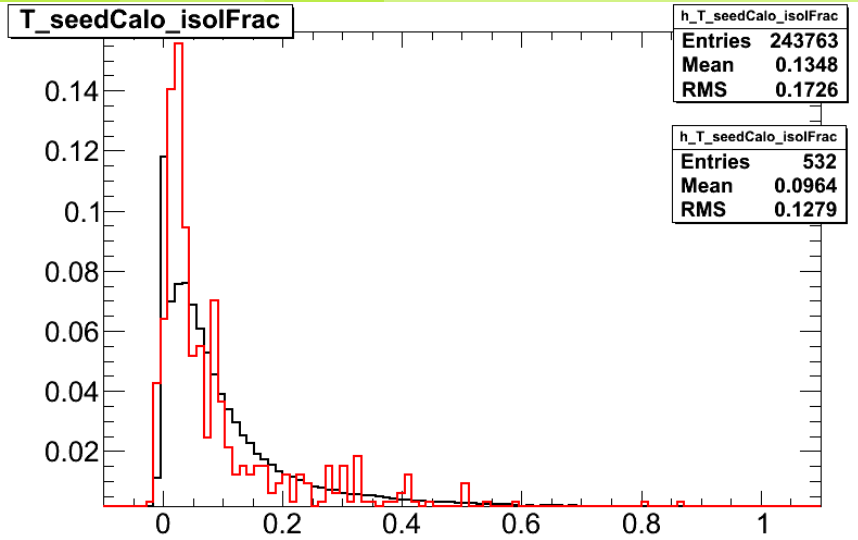


# Track-based candidates

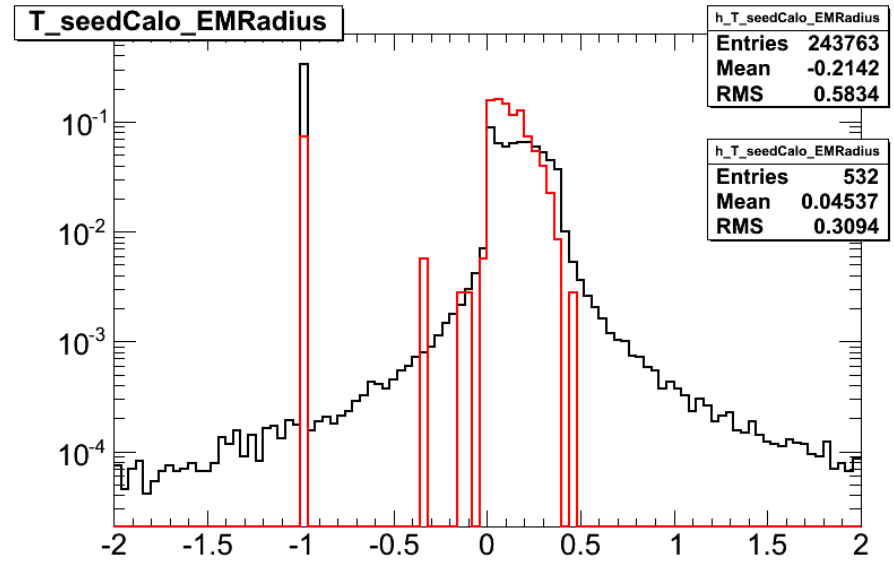
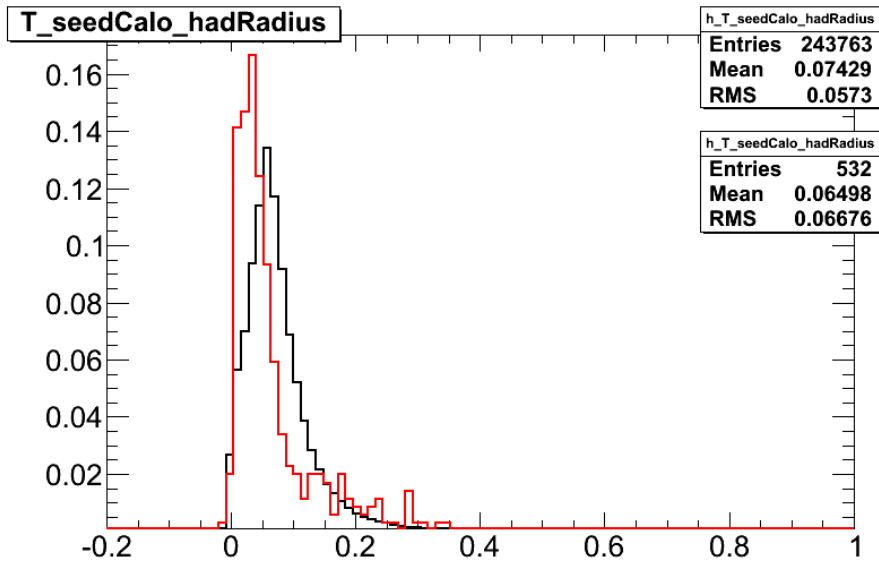


$pT(\text{tau1p3p track}) = 8\text{-}200 \text{ GeV}$

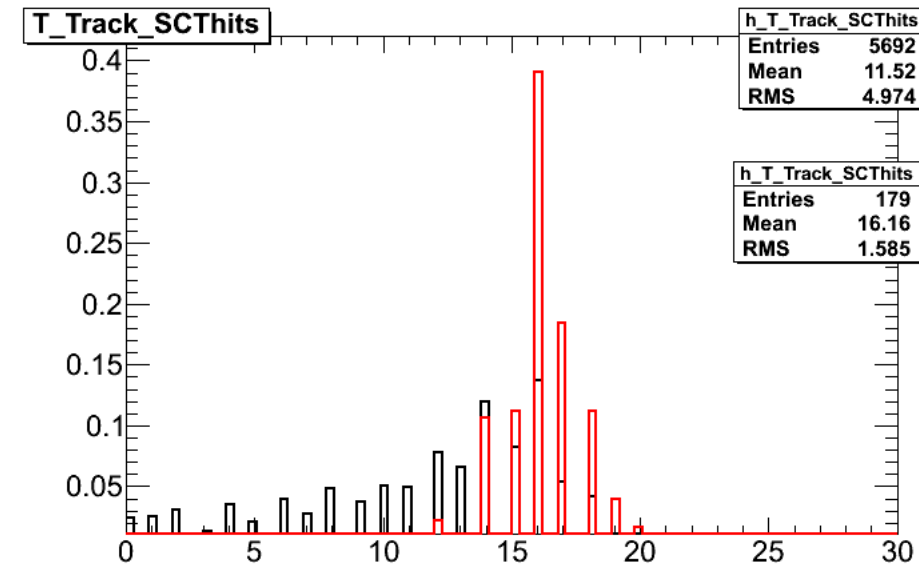
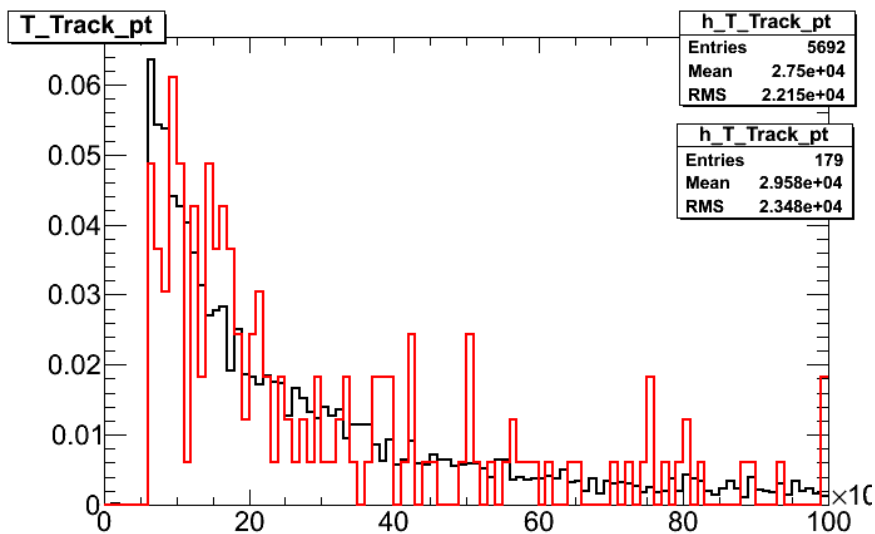
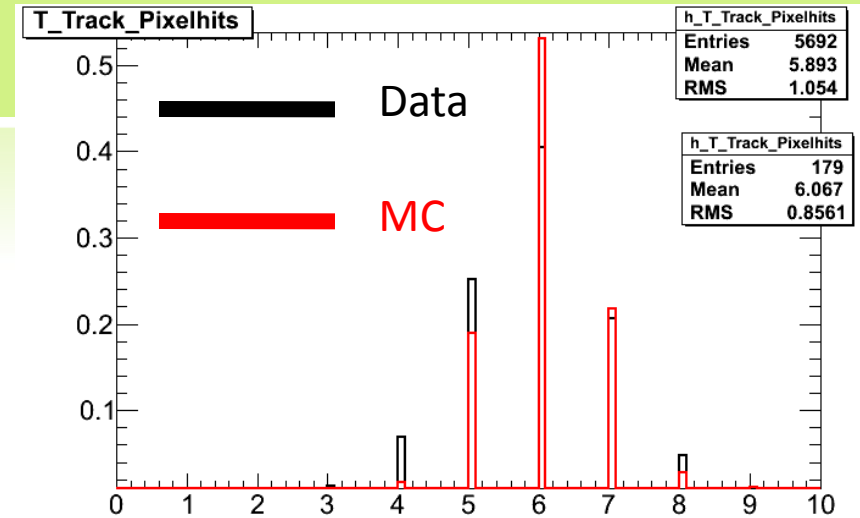
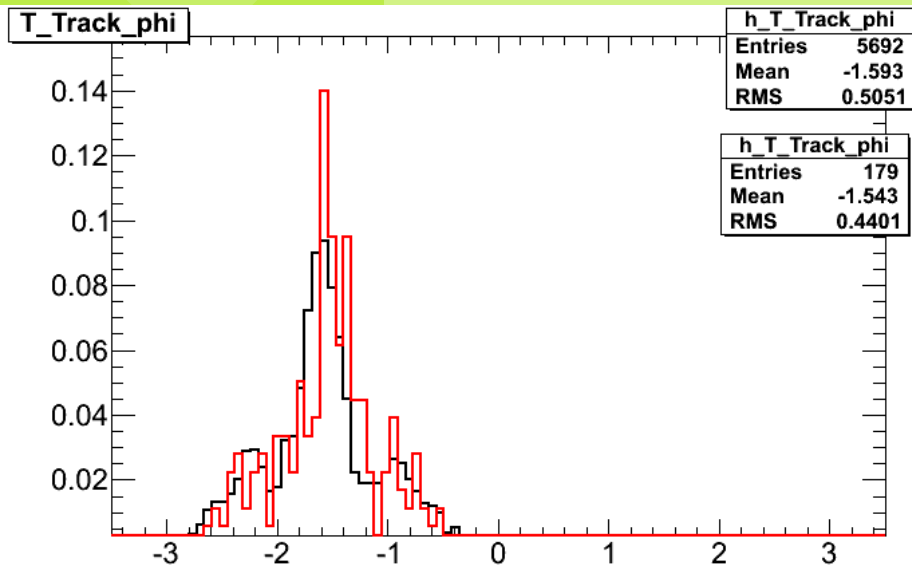
# TAU CANDIDATES IN CALOCOMM AND MC



— Data  
— MC



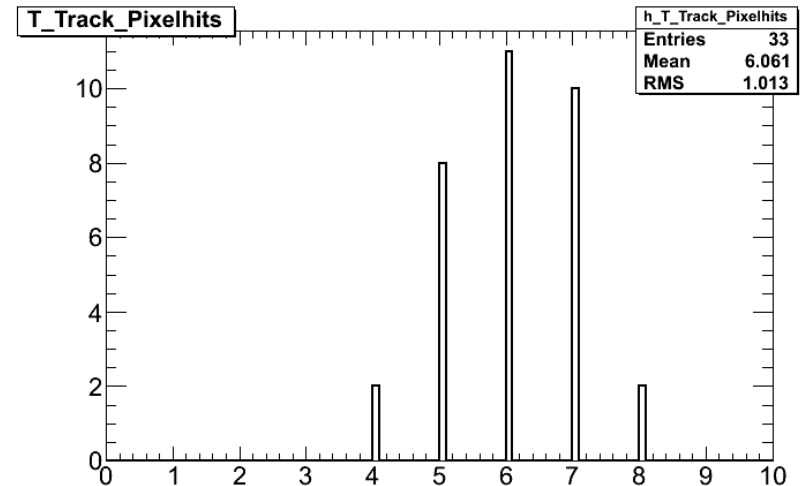
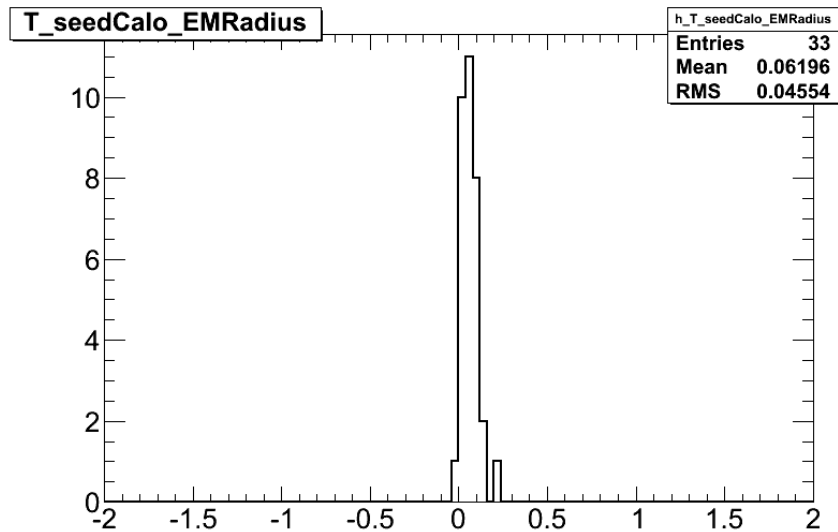
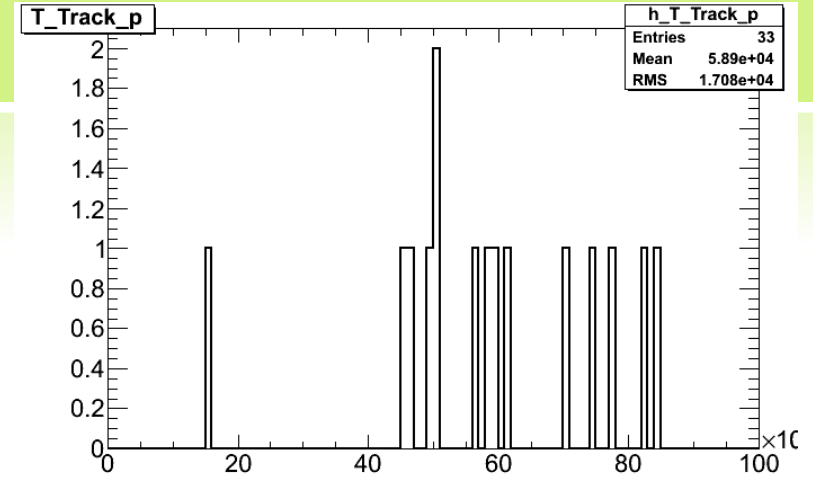
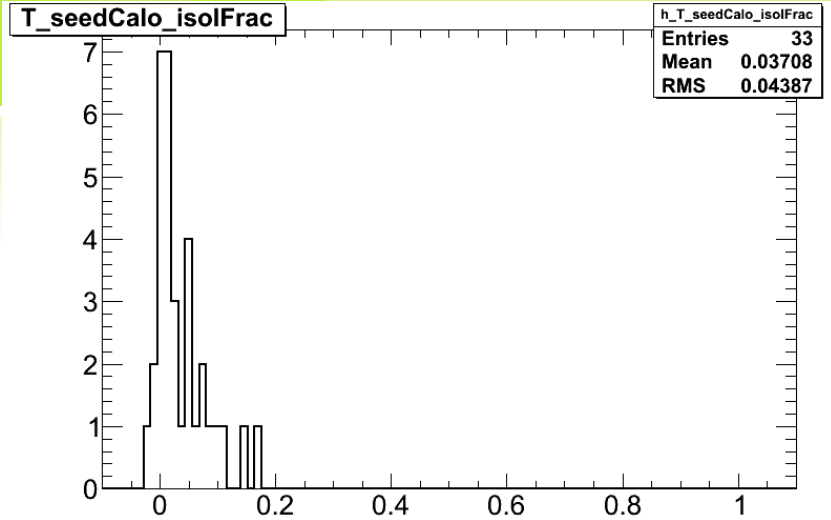
## TAUS IN IDCOMM AND MC



	CaloComm	IDComm	MC
Events	484043	548275	34549
TauCandidates	243763	22300	532
TauRec seeded	243533	16609	353
Tau1P3P seeded	193	5574	178
Both seeded	37	117	1
TauCutLoose	33 (0.01%)	109 (0.5%)	1 (0.2%)
TauCutMedium	20 (0.008%)	70 (0.3%)	0
TauCutTight	13 (0.005%)	40 (0.2%)	0

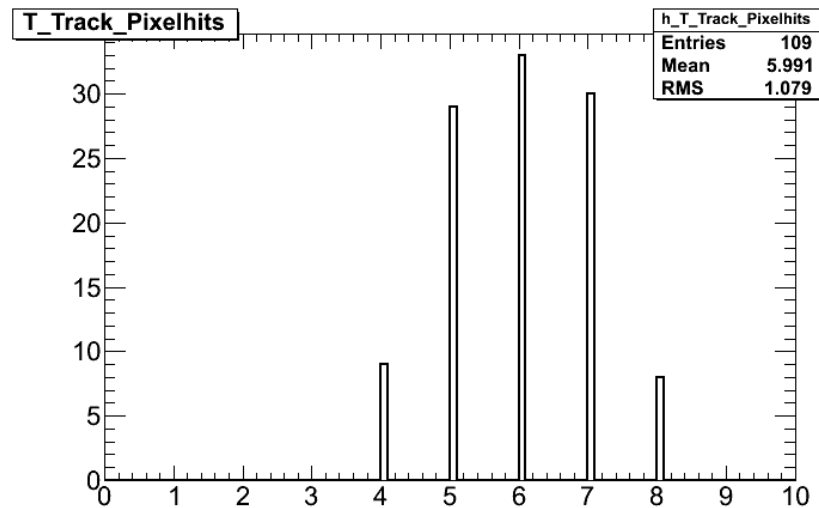
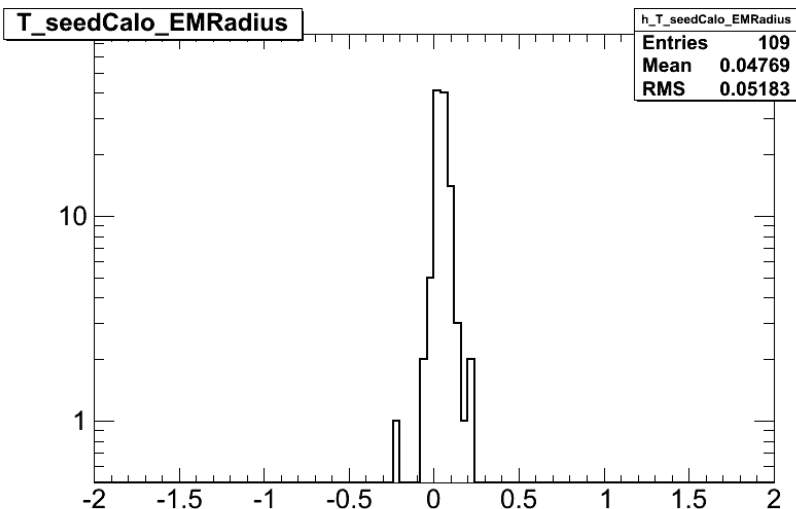
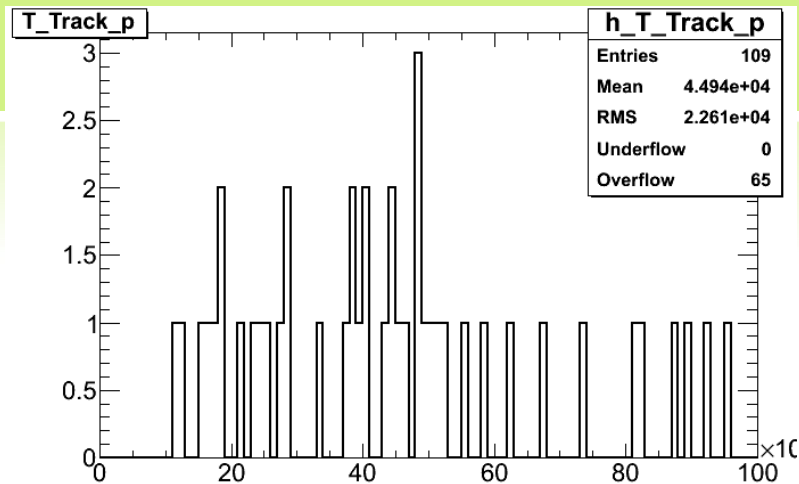
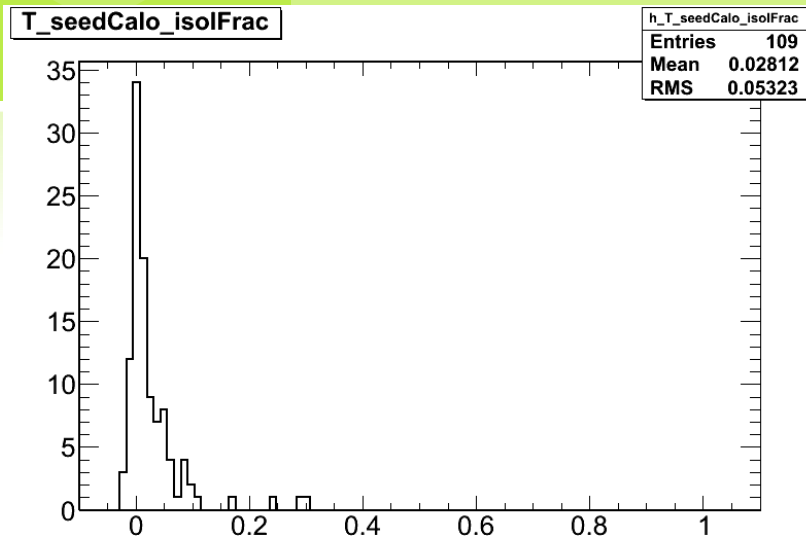
# ISTAUSAFELOOSE APPLIED TO CALOCOMM STREAM DATA

14



# ISTAU SAFE LOOSE APPLIED TO IDCOMM STREAM DATA

15



	CaloComm	IDComm	MC
Events	484043	548275	34549
TauCandidates	243763	22300	532
TauRec seeded	243533	16609	353
Tau1P3P seeded	193	5574	178
Both seeded	37	117	1
TauCutLoose	33(0.00965%)	109	1
TauCutMedium	20(0.00614%)	70	0
TauCutTight	13 (0.00438%)	40	0



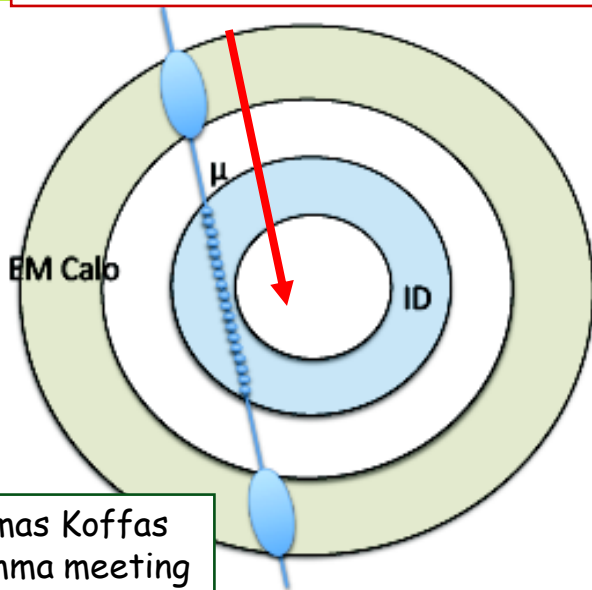
# SUMMARY

- ⊙ Need better (and more) MC data
  - ⊙ Should be coming soon...
  - ⊙ Continue comparison with seeds
- ⊙ Want to start dividing calorimeter variables between EM and Had sections
  - ⊙ Want to see a hard muon brem
- ⊙ Need statistics to form comparisons in different energy bins for tau variables

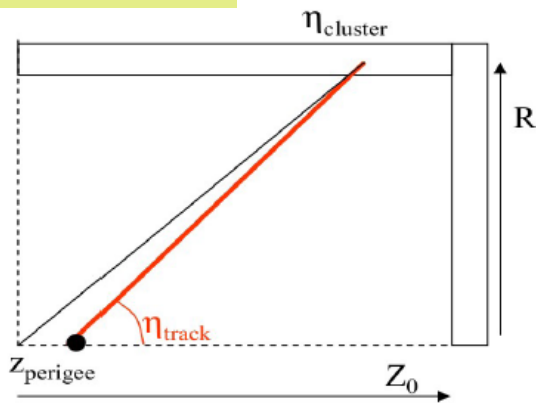
# BACKUP SLIDES

# Specifics of cosmic data

- Downward going muon can leave 2 calorimetric clusters
- Eta, phi of TrackParticle -> "along momentum"



Thomas Koffas  
egamma meeting  
20.20.08



## TauRec working on cosmic data:

### - Calo-based candidates

- low number, starting with  $E_T > 10 \text{ GeV}$  topojets
- candidates can be made from both upper and bottom clusters
- candidates with tracks matched only with bottom cluster

- in tauRec it is more difficult technically to apply egamma solution to extrapolate tracks also "opposite momentum" (to match also upper cluster)

### - Track-based candidates

- only with bottom cluster

### - For all candidates:

- problem in matching when muons non-projective (do not pass near the interaction point)

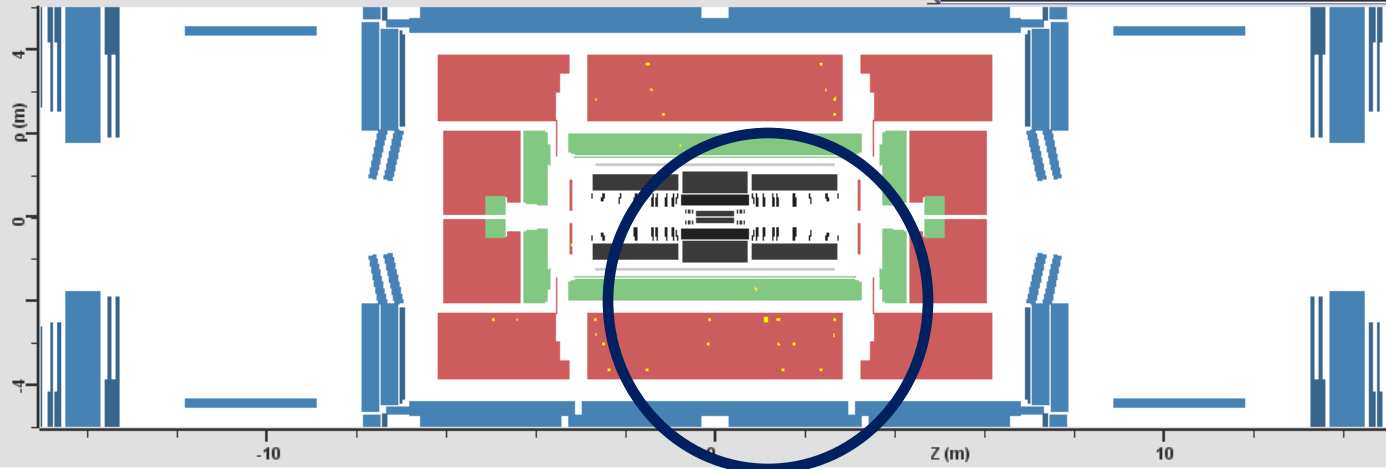
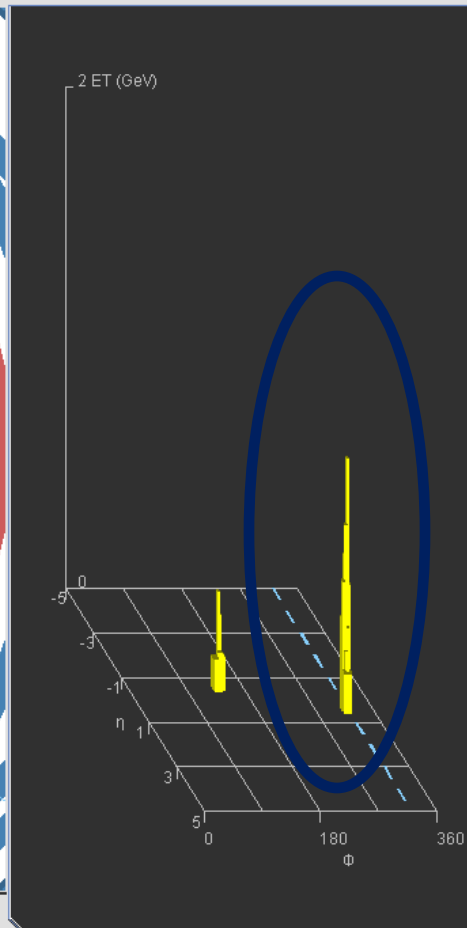
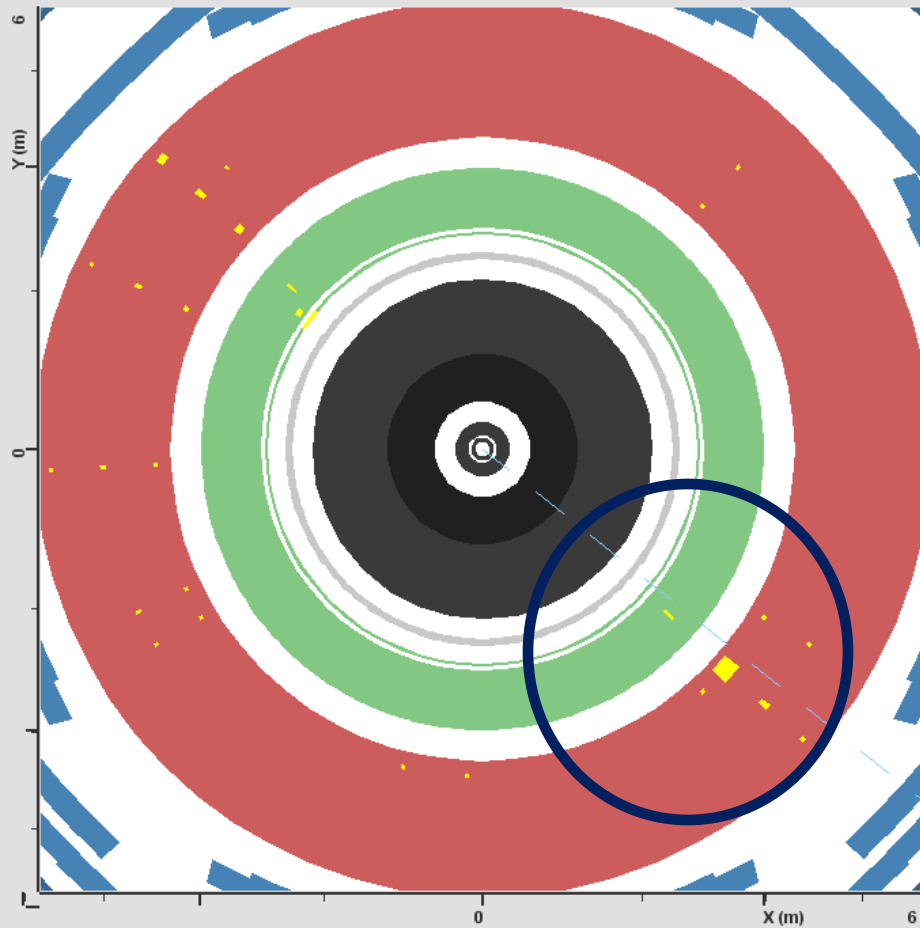
20

Run  
number:  
91862

Event  
number:  
2676158

Passes tight  
tau cut

$\phi = -0.708017$   
 $\text{Eta} = 0.477224$



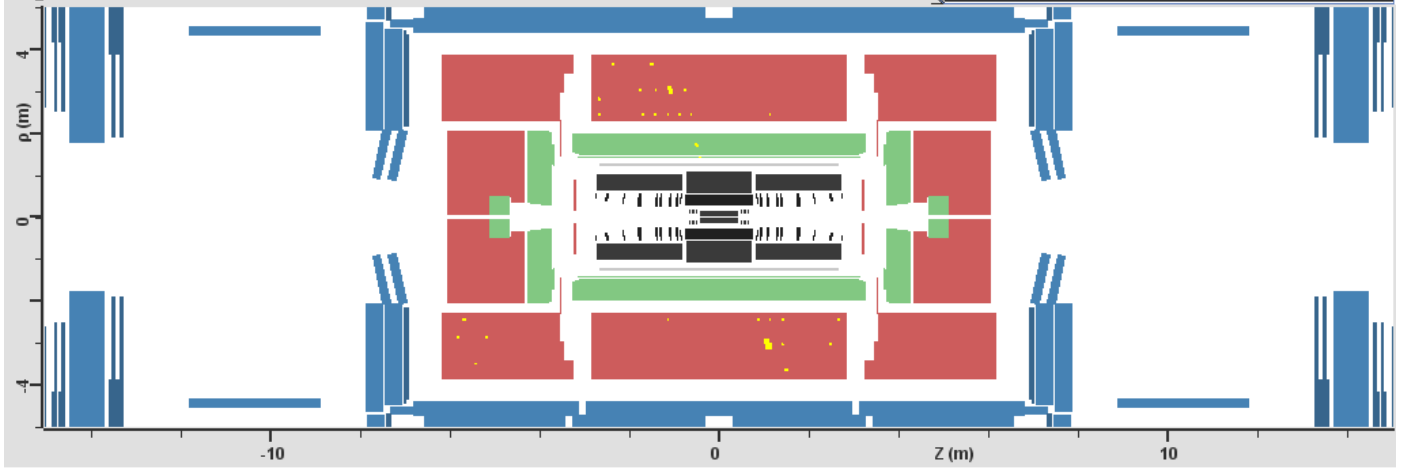
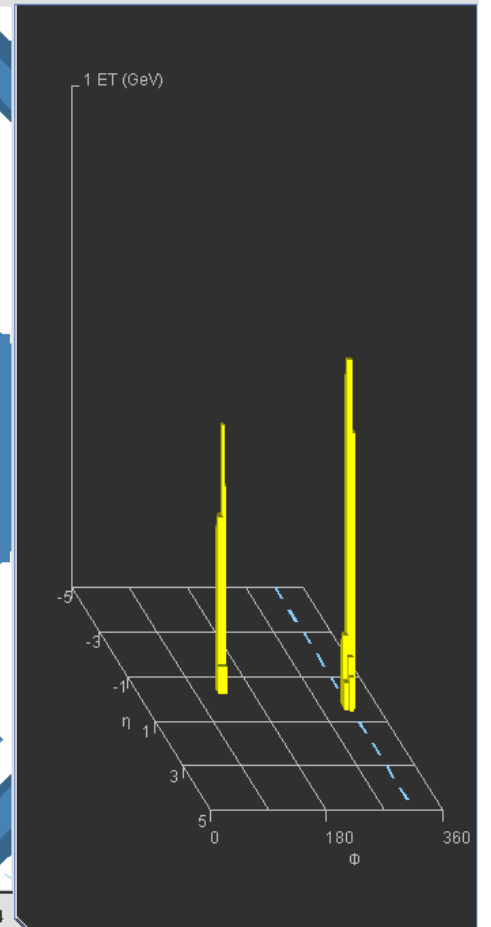
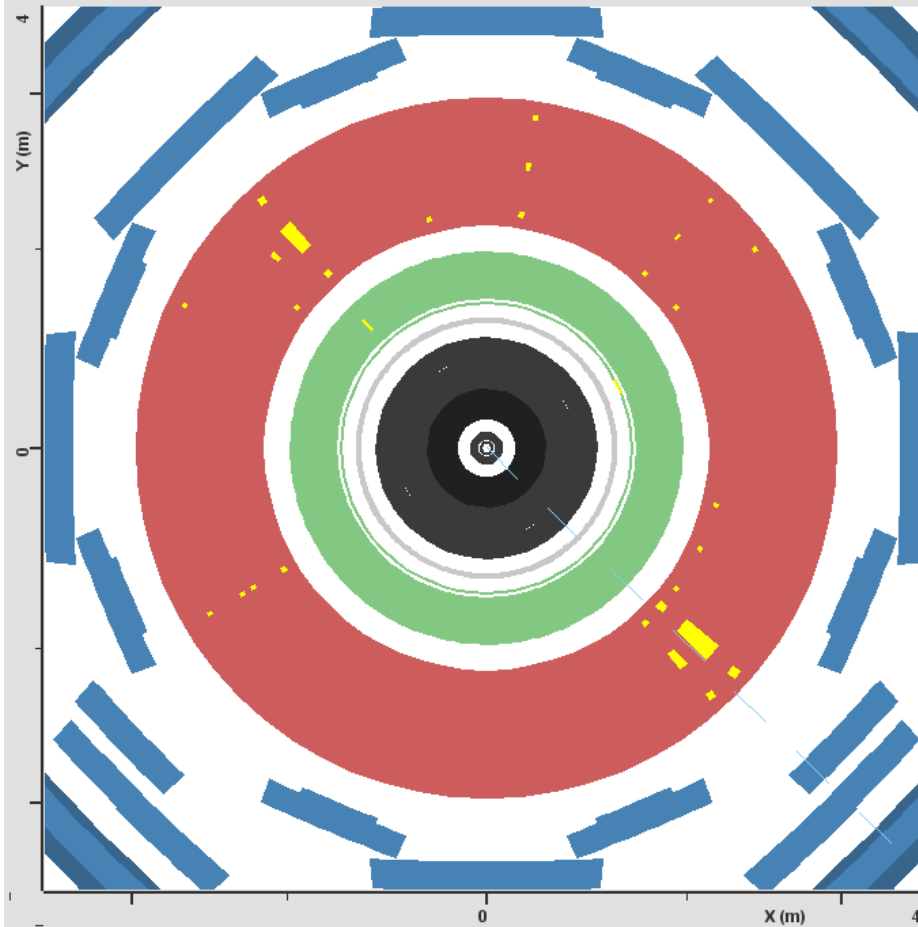
21

Run  
number:  
91862

Event  
number:  
832110

Passes tight  
tau cut

$\phi = -0.7842$   
 $\text{Eta} = 0.326771$



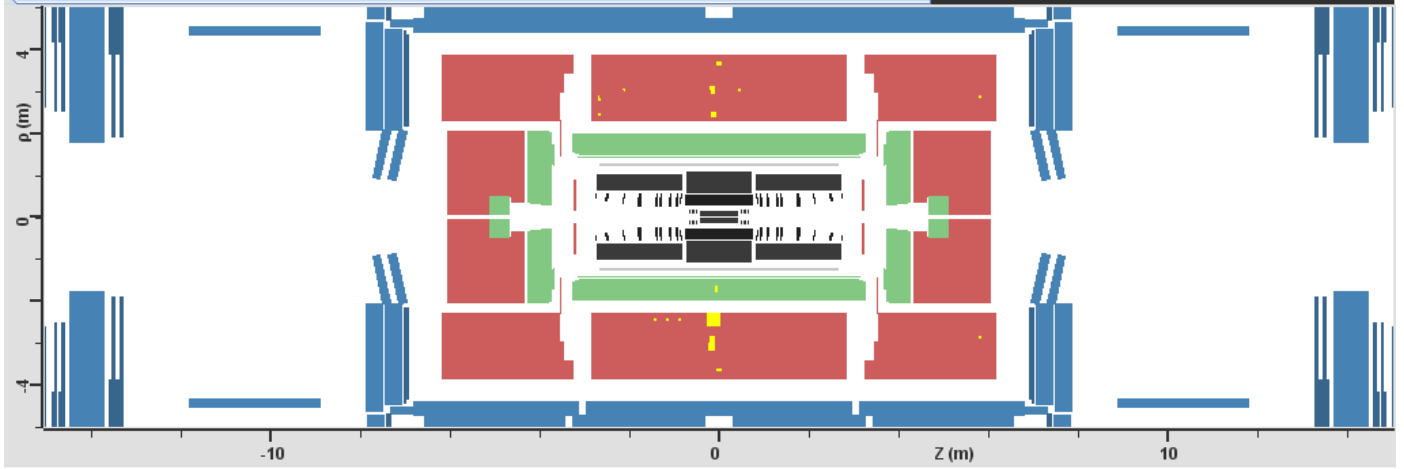
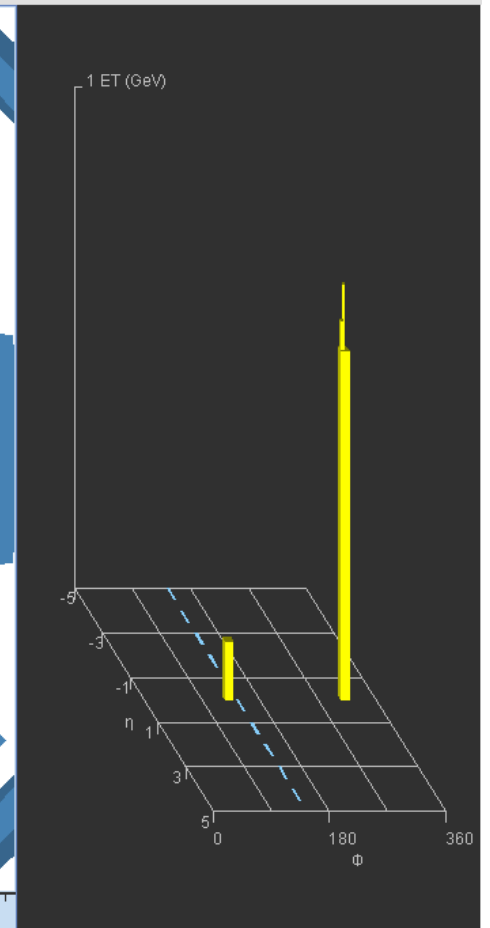
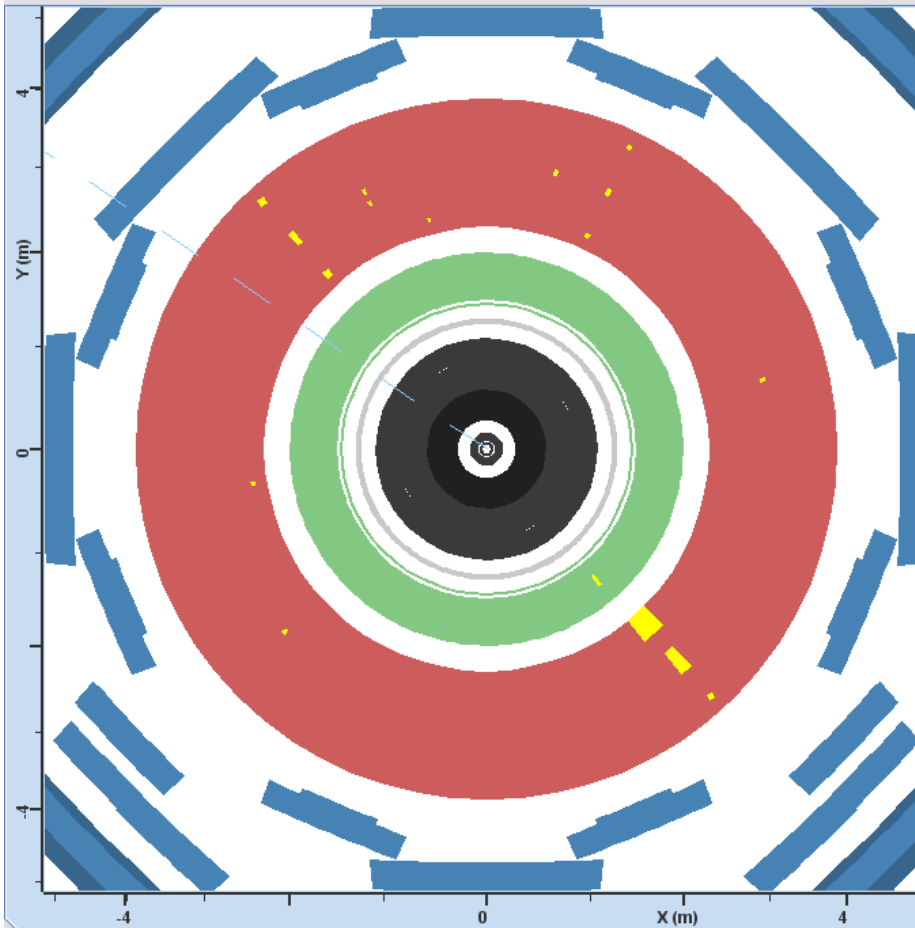
22

Run  
number:  
91862

Event  
number:  
3005641

Passes  
**medium** tau  
cut

$\phi = -0.858735$   
 $\eta = 0.0320584$

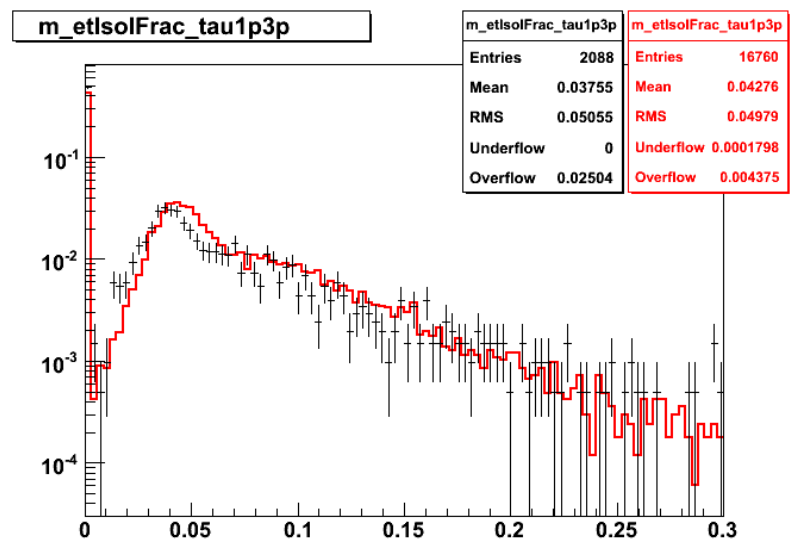
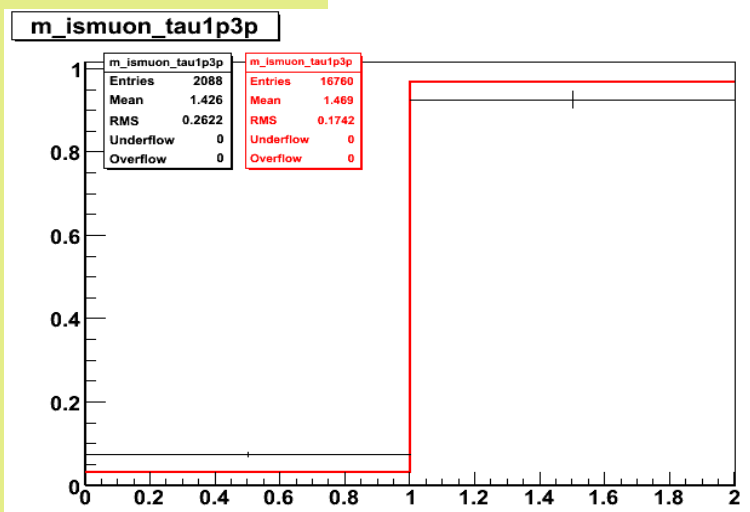
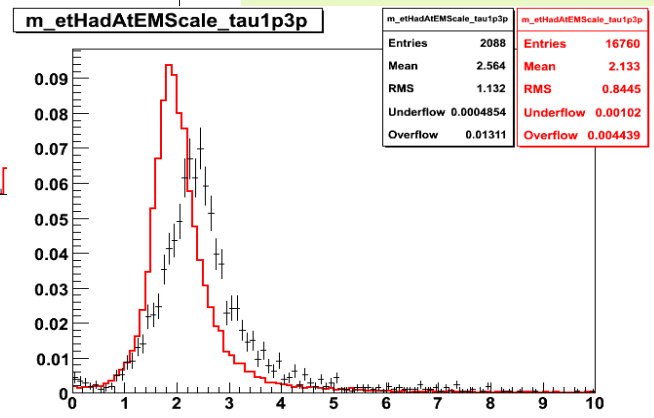
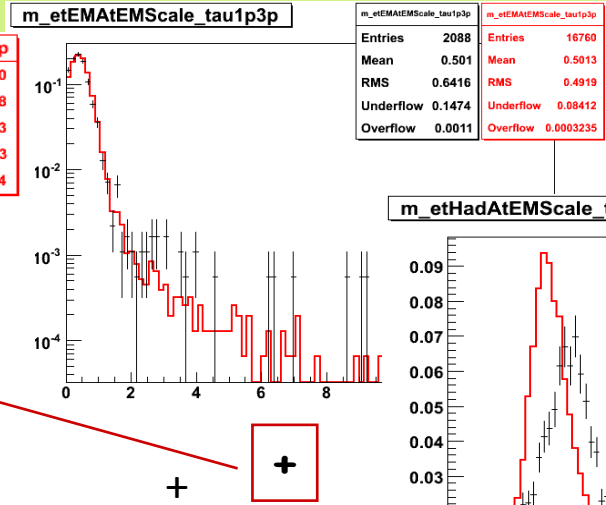
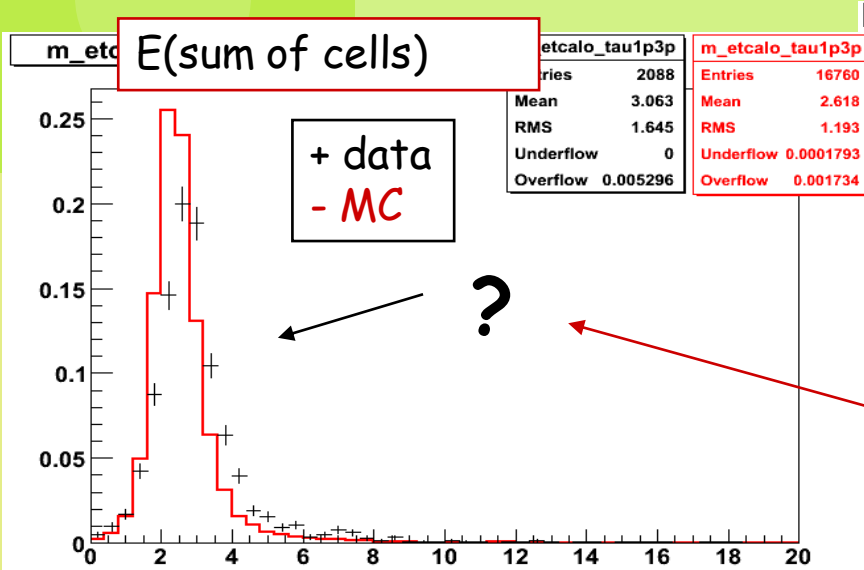


# DEFINITION OF SAFE TAU CUTS

<https://twiki.cern.ch/twiki/bin/view/AtlasProtected/TauIdentification>

- ⊙ Information contained in Björn Gosdzik's talk
- ⊙ Three levels of cuts: tight, medium and loose
  - ⊙ Defined using efficiencies of 0.3, 0.5 and 0.7
- ⊙ Cuts separated for 1 Prong and 3 Prong Candidates
- ⊙ Optimized in 5 different PT bins (10-25GeV, 25-45GeV, 70-100GeV, > 100GeV)
- ⊙ Calorimeter cuts: EMRadius, StripWidth2, IsoFrac and  $E_{\tau EM}/E_{\tau}$
- ⊙ Additional cuts beyond calorimeter involving tracks

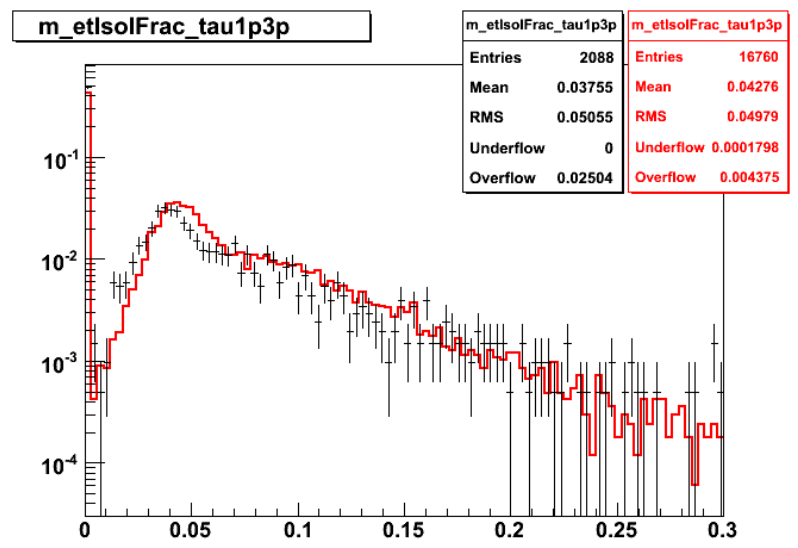
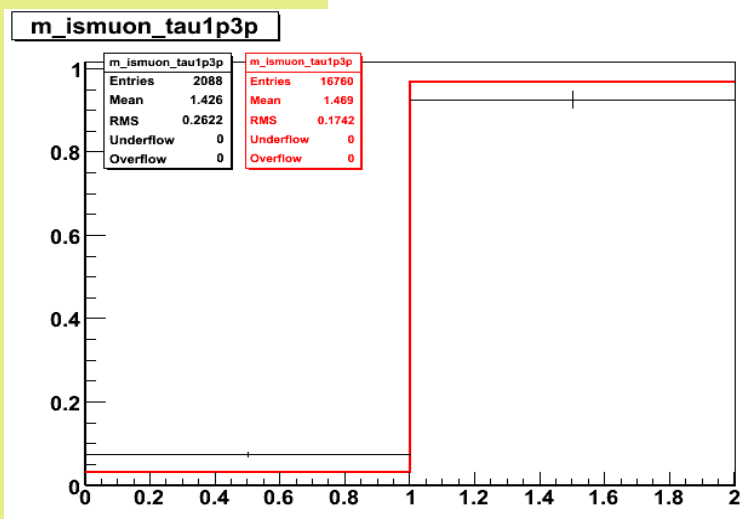
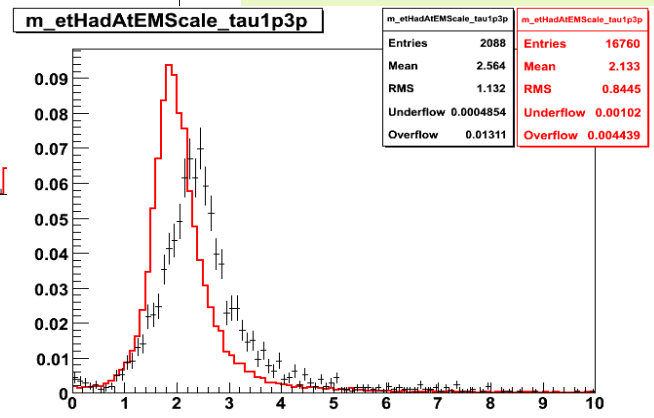
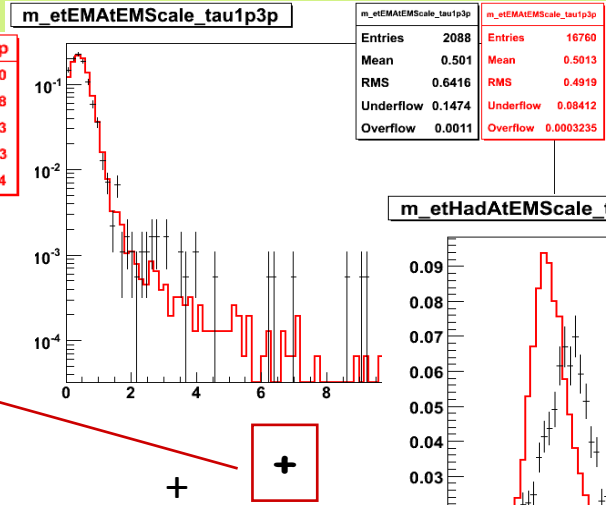
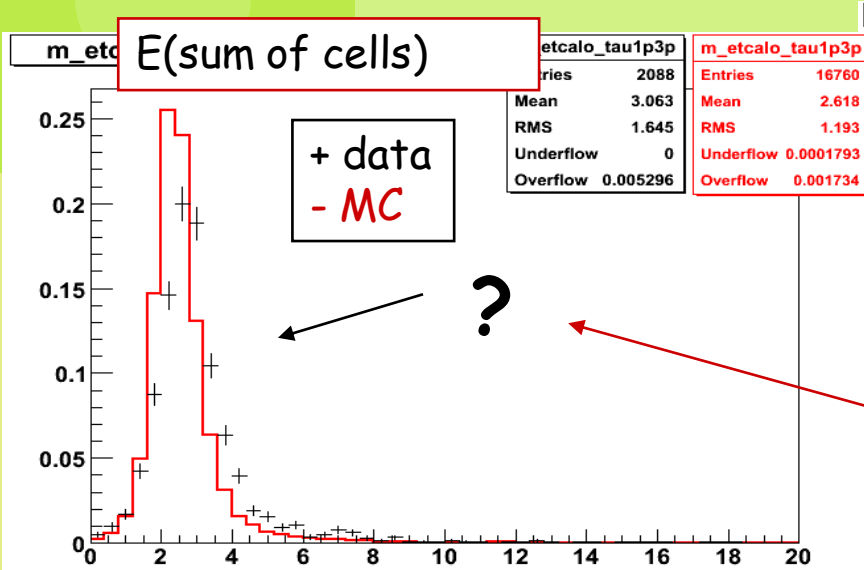
# Reconstructed energy: track-based candidates



pT(tau1p3p track) = 8-200 GeV

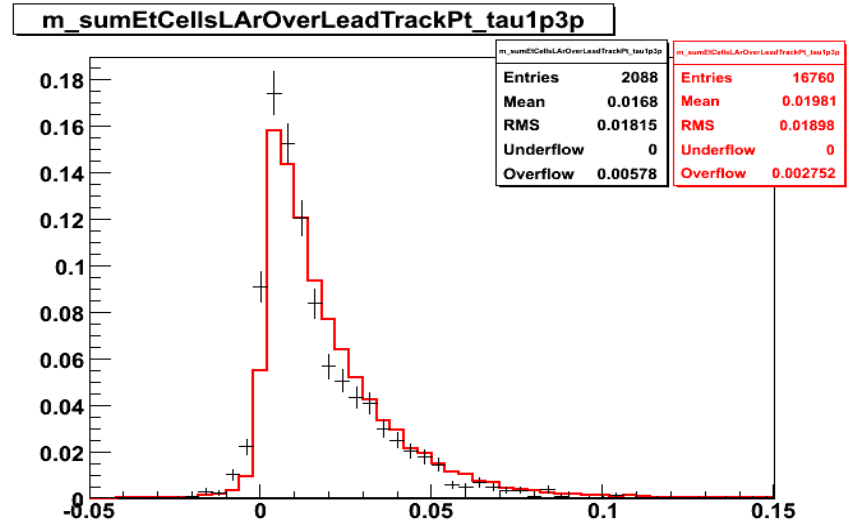
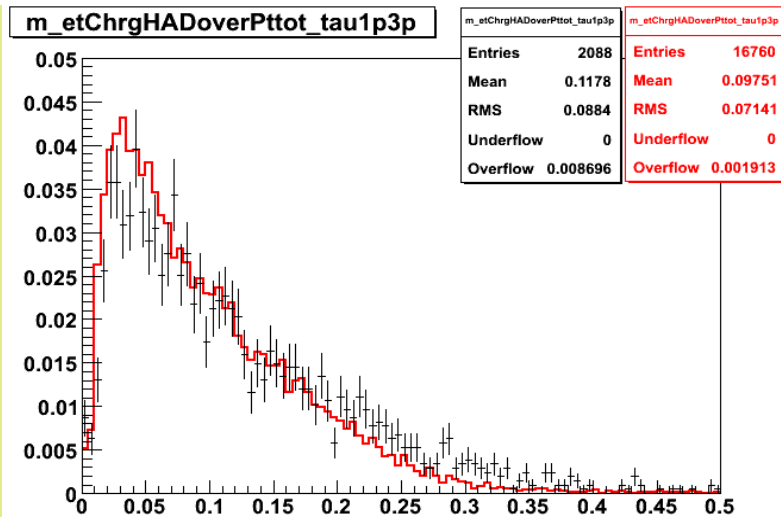
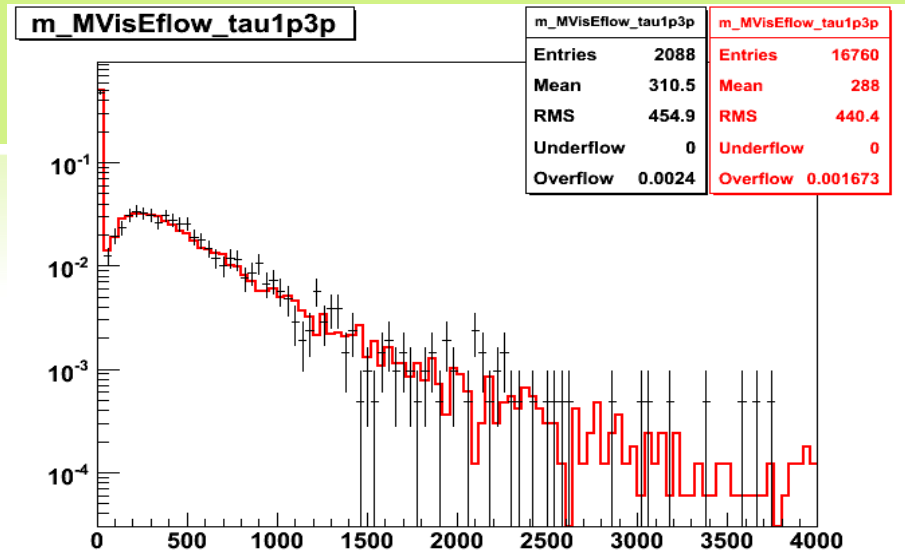
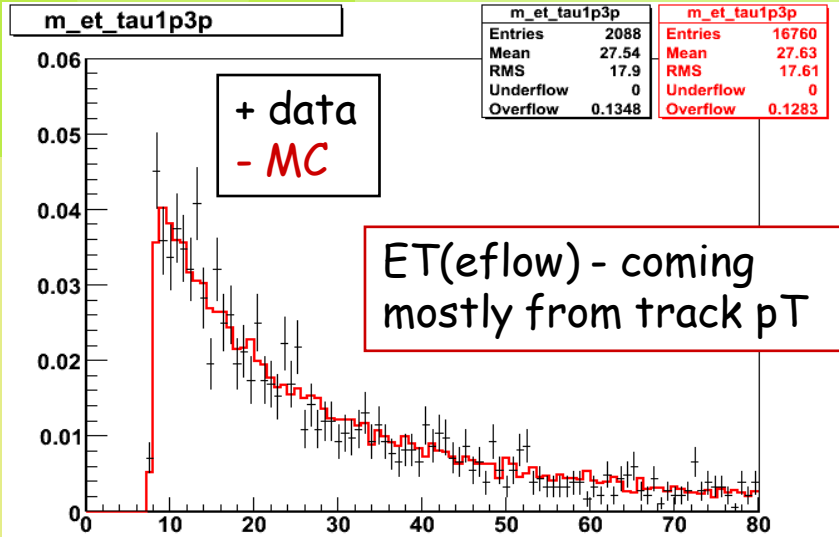


# Reconstructed energy: track-based candidates



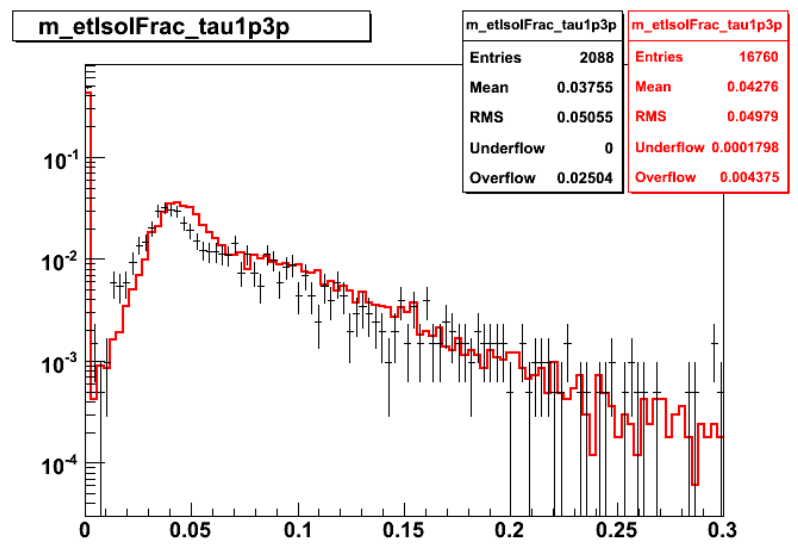
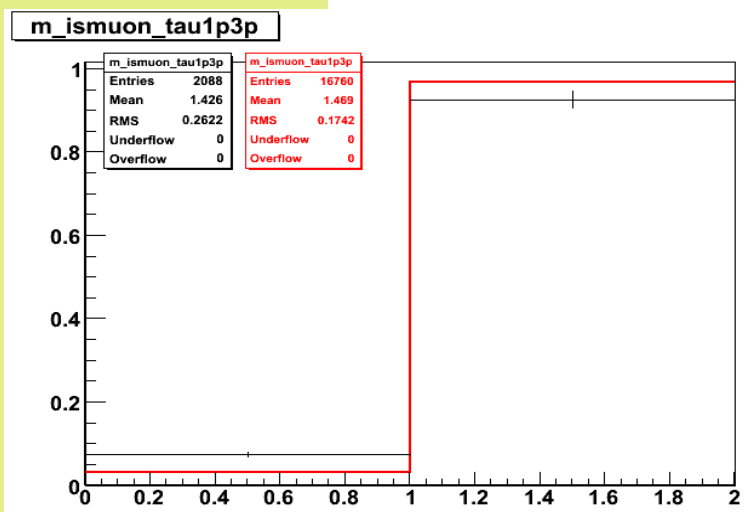
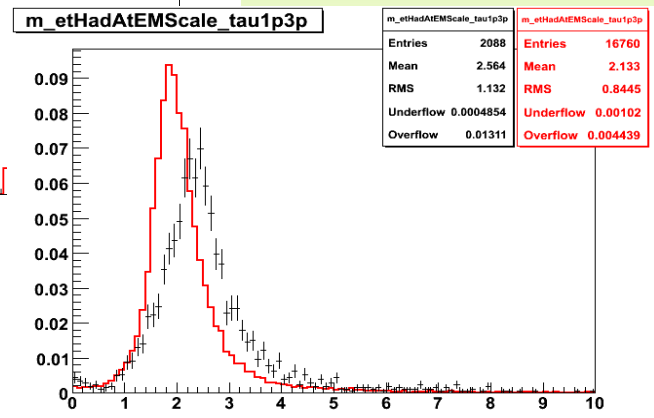
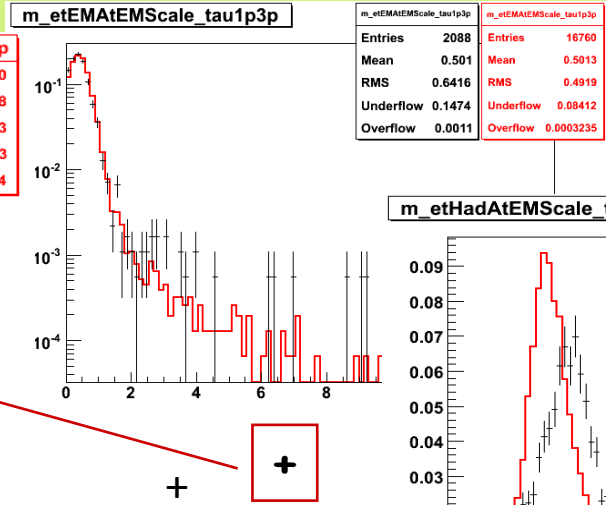
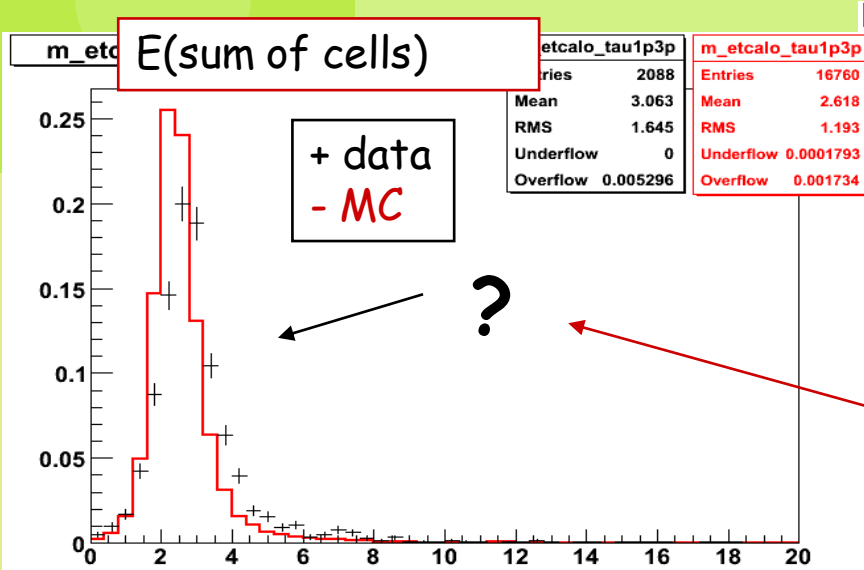
pT(tau1p3p track) = 8-200 GeV

# Track-based candidates



$pT(\text{tau1p3p track}) = 8\text{-}200 \text{ GeV}$

# Reconstructed energy: track-based candidates



pT(tau1p3p track) = 8-200 GeV