

Tau fake rates for $t\bar{t}$ tau dilepton analysis

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Tau Meeting during CP Week



The Analysis



- This analysis has been done with Root Plain Ntuples:

(TopQuarkAODtoROOTuple , RELEASE 12.0.6, “Alternative ntuples” from the Top group.)

Nota Atlas ATL-COM-PHYS-2008-068

“Reconstruction and Identification of Hadronic t Decays with ATLAS”

- We are in the process of cross-checking this results with private ntuples produced:
 - Using TopView (TopView-00-12-13-03)
 - For Tau1p3p & TauRec tau reconstruction algorithms
 - Removing the tau preselection.

- In the $t\bar{t}$ (lepton, τ_{HAD}) analysis reported in *ATL-COM-PHYS-2008-068* the W +jets background is the dominant “instrumental” background with jets falsely identified as τ leptons.
- The W +jets background estimate was obtained directly from the W + N -jets samples counting the number of events passing the event selection defined for $t\bar{t}$ (lepton, τ_{HAD}) .
- Towards a more realistic estimate of the W +jets background we have computed fake rates using MC Dijet samples.



MC SAMPLES



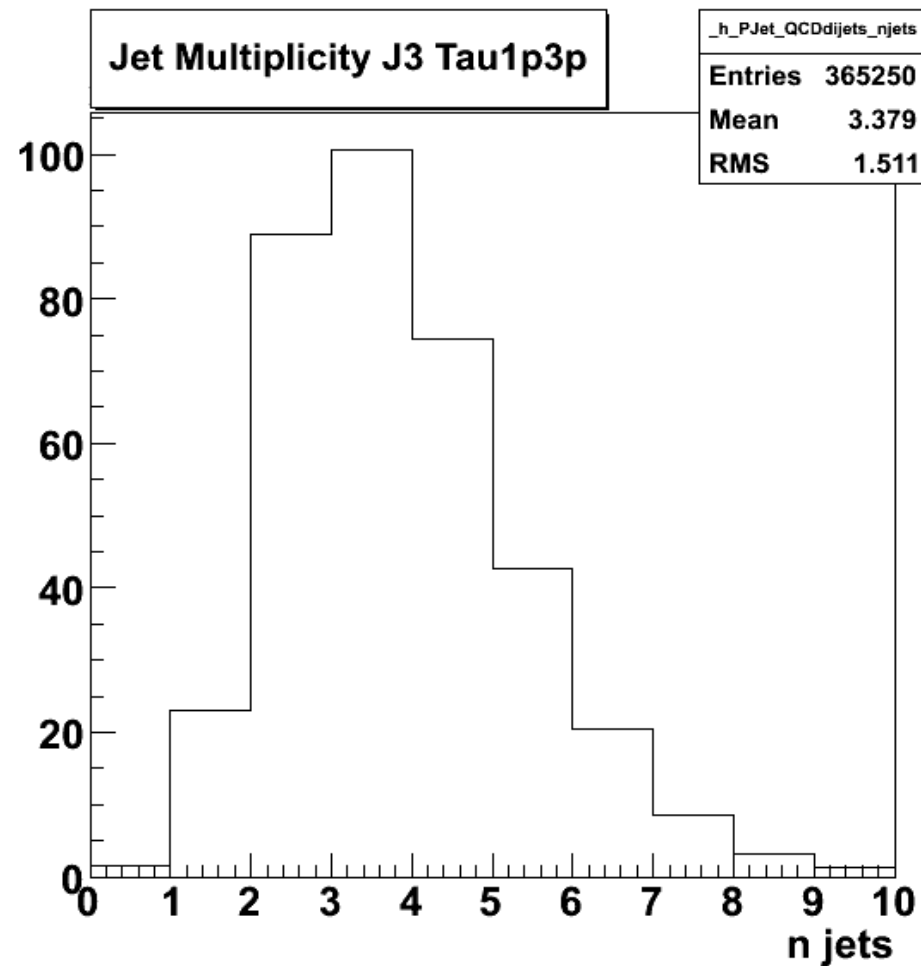
- Use very clean sample of QCD jets, with no significant contamination from true t leptons:
 - trig1_misal1_csc11.005009.J0_pythia_jetjet.recon.AOD.v12000604_tid010586
 - trig1_misal1_csc11.005010.J1_pythia_jetjet.recon.AOD.v12000601_tid006001
 - trig1_misal1_csc11.005011.J2_pythia_jetjet.recon.AOD.v12000503_tid005591
 - trig1_misal1_csc11.005012.J3_pythia_jetjet.recon.AOD.v12000604_tid009525
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 - trig1_misal1_csc11.005015.J6_pythia_jetjet.recon.AOD.v12000601_tid005996
 - trig1_misal1_csc11.005016.J7_pythia_jetjet.recon.AOD.v12000601_tid006005

- Select dijet events with two or more jets

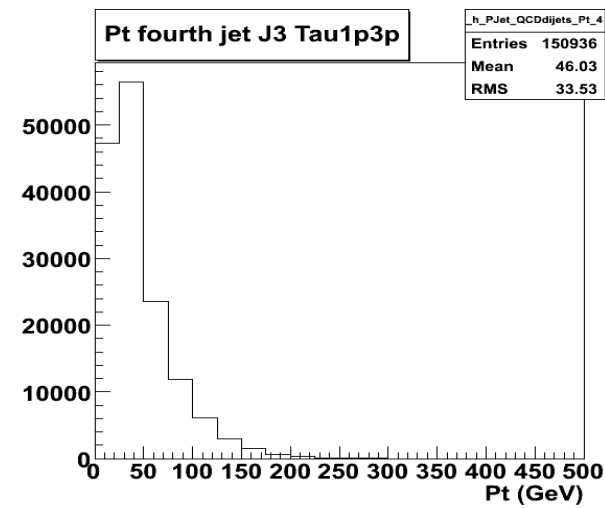
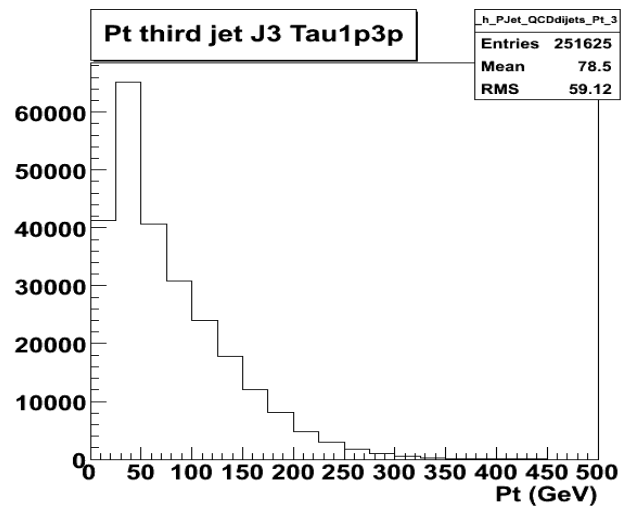
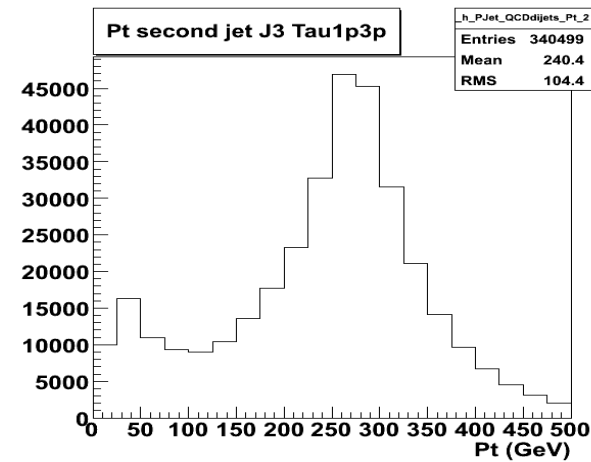
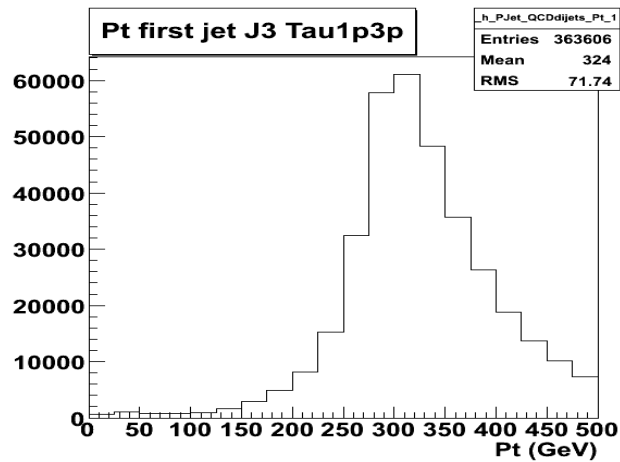
$$N_{\text{JETS}} \geq 2$$

$$P_T > 15 \text{ GeV}$$

$$|\eta| < 2.5$$

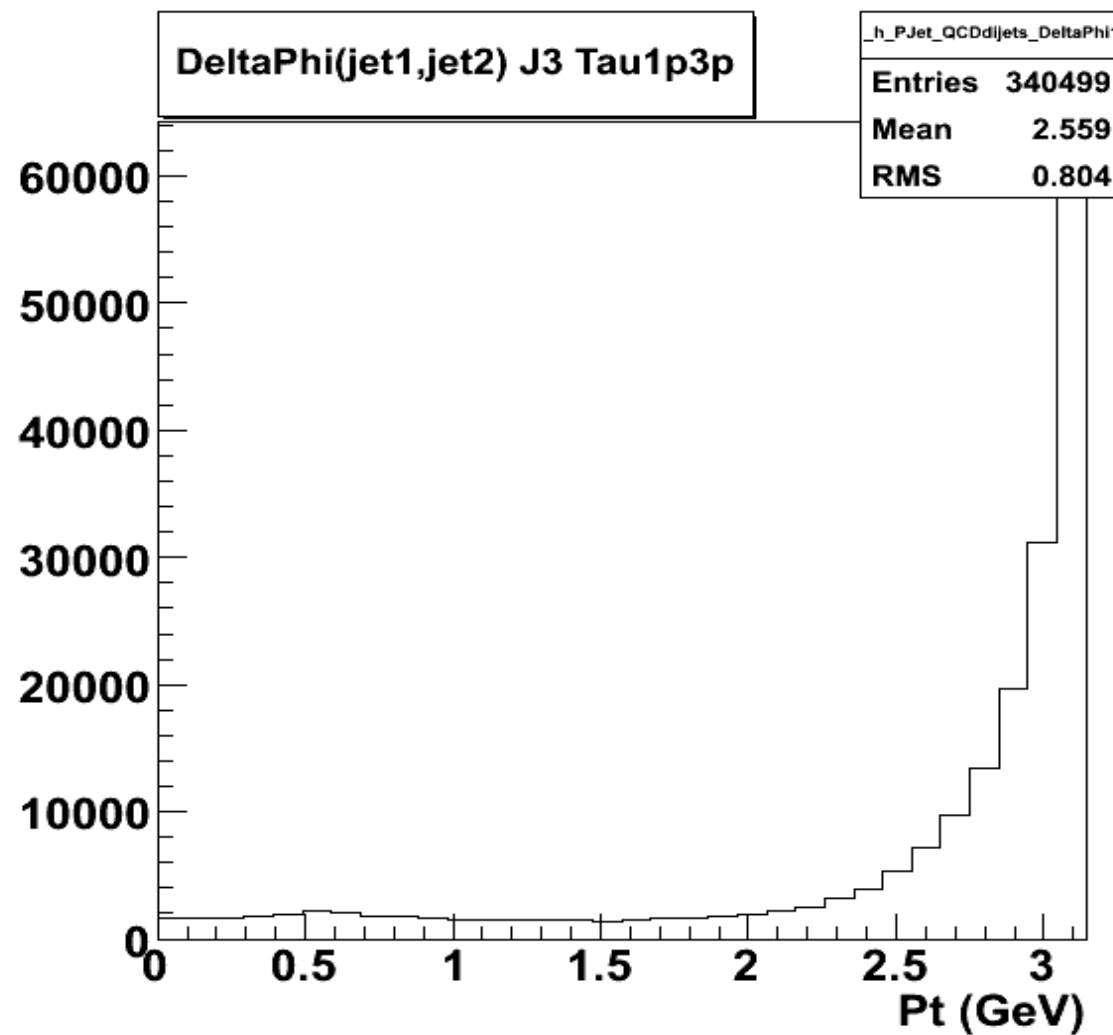


Similar Pt $\rightarrow$ 2 more energetic jets



Event Selection (III)

Back to back jets $\rightarrow \Delta\phi \geq (\pi - 0.3)$



- Randomly select one as the ‘tag jet’ and the other as the ‘probe jet’
- Cut applied on ‘tag jet’
 - $n_{\text{trak min}} = 4 (p_T \leq 50 \text{ GeV}) + 1 \text{ track for each additional } 50 \text{ GeV interval in } p_T$



Probe jet = FR-Tau_Candidates

- Cut applied on ‘probe jet’
 - $\text{Tau1p3p} \rightarrow \text{Tau_Discriminant} = 1$
 - $\text{TauRec} \rightarrow \text{Tau_logLikelihoodRatio} > 4$
- } FR-Tau_ID

Event Selection (V)

	<i>QCDDijetsEvents(Tau1p3p)</i>					
	J0		J1		J2	
MC	398000.00	0.00 ± 0.00	307850.00	0.00 ± 0.00	10000.00	0.00 ± 0.00
njets	5179.00	1.30 ± 0.02	46509.00	15.11 ± 0.06	5065.00	50.65 ± 0.50
DeltaPhi	2406.00	46.46 ± 0.69	26856.00	57.74 ± 0.23	3052.00	60.26 ± 0.69
ntracks	1680.00	69.83 ± 0.94	18304.00	68.16 ± 0.28	2621.00	85.88 ± 0.63
Tau ID	291.00	17.32 ± 0.92	3302.00	18.04 ± 0.28	332.00	12.67 ± 0.65

	<i>QCDDijetsEvents(Tau1p3p)</i>					
	J3		J5		J6	
MC	346050.00	0.00 ± 0.00	365250.00	0.00 ± 0.00	183400.00	0.00 ± 0.00
njets	246521.00	71.24 ± 0.08	340499.00	93.22 ± 0.04	176539.00	96.26 ± 0.04
DeltaPhi	149856.00	60.79 ± 0.10	258775.00	76.00 ± 0.07	147792.00	83.72 ± 0.09
ntracks	140281.00	93.61 ± 0.06	229693.00	88.76 ± 0.06	103118.00	69.77 ± 0.12
Tau ID	13676.00	9.75 ± 0.08	15740.00	6.85 ± 0.05	6196.00	6.01 ± 0.07

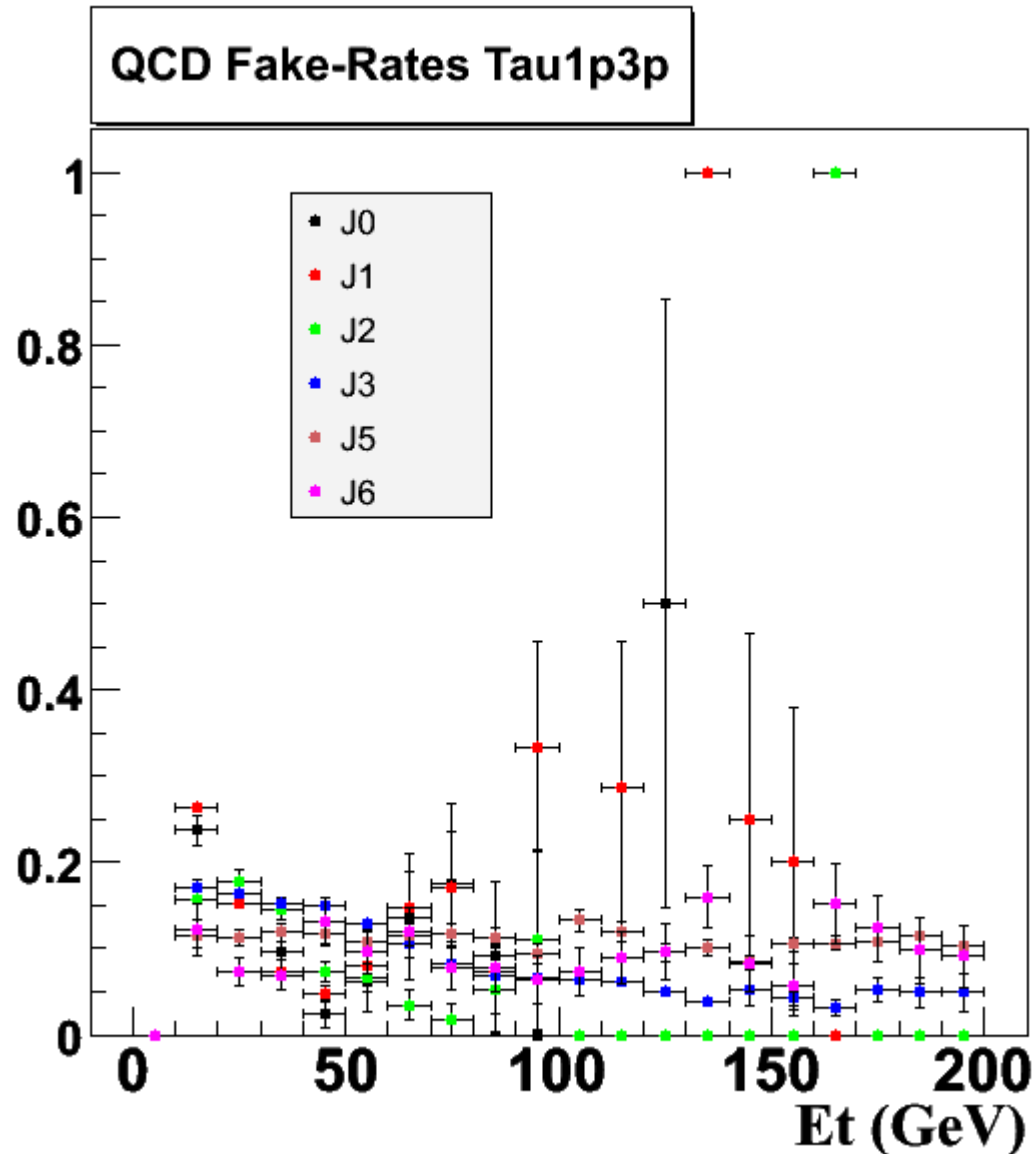
Event Selection (VI)

	<i>QCDDijetsEvents(TauRec)</i>					
	J1		J2		J3	
MC	249100.00	0.00 ± 0.00	377600.00	0.00 ± 0.00	10000.00	0.00 ± 0.00
njets	2869.00	1.15 ± 0.02	46733.00	12.38 ± 0.05	3638.00	36.38 ± 0.48
DeltaPhi	1288.00	44.89 ± 0.93	26088.00	55.82 ± 0.23	1989.00	54.67 ± 0.83
ntracks	845.00	65.61 ± 1.32	17383.00	66.63 ± 0.29	1728.00	86.88 ± 0.76
Tau ID	34.00	4.02 ± 0.68	398.00	2.29 ± 0.11	35.00	2.03 ± 0.34

	<i>QCDDijetsEvents(TauRec)</i>					
	J3		J5		J6	
MC	335800.00	0.00 ± 0.00	288100.00	0.00 ± 0.00	261600.00	0.00 ± 0.00
njets	227721.00	67.81 ± 0.08	277284.00	96.25 ± 0.04	259400.00	99.16 ± 0.02
DeltaPhi	143959.00	63.22 ± 0.10	226500.00	81.69 ± 0.07	232755.00	89.73 ± 0.06
ntracks	136902.00	95.10 ± 0.06	198141.00	87.48 ± 0.07	157354.00	67.60 ± 0.10
Tau ID	2047.00	1.50 ± 0.03	2520.00	1.27 ± 0.03	1957.00	1.24 ± 0.03

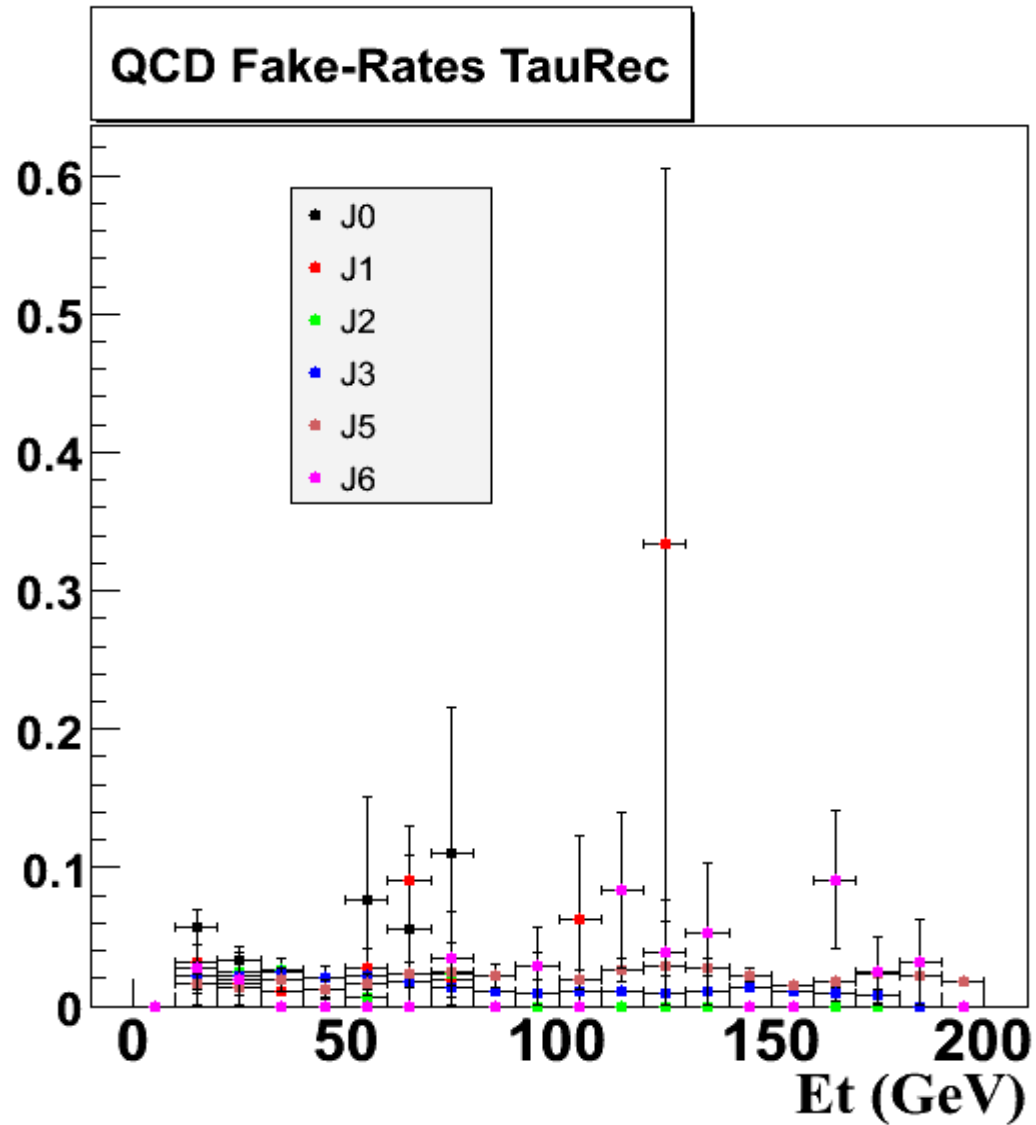
- Tau1p3p
- FR $\sim 10\%$

10% Discrepancy from
One sample to another



- TauRec
- FR $\sim 5\%$

5% Discrepancy from
One sample to another





Summary & Plans

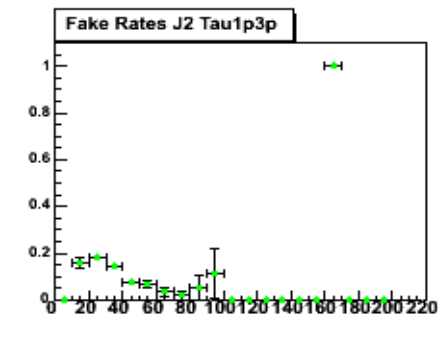
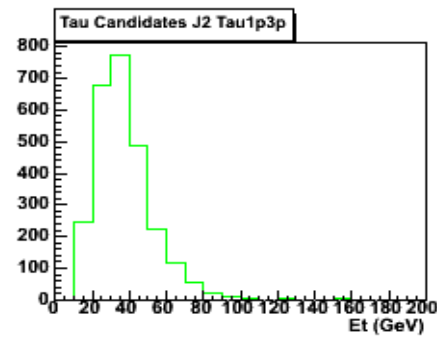
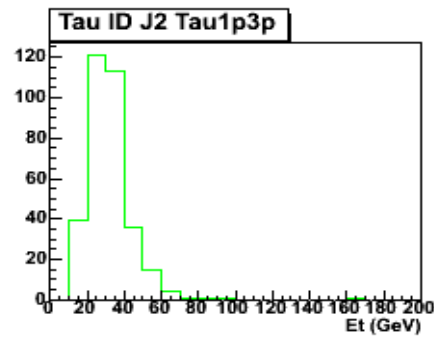
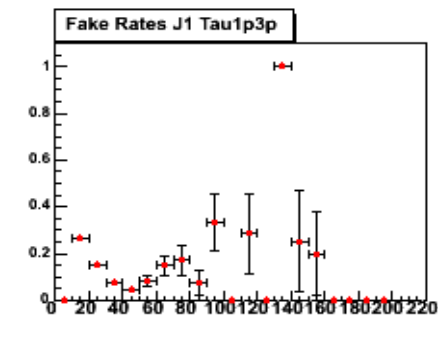
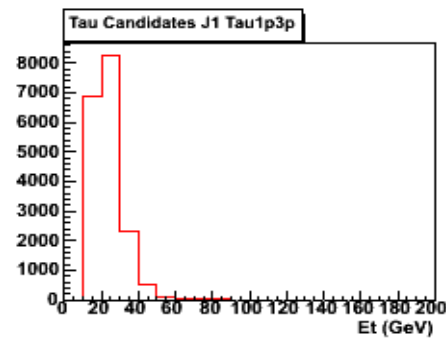
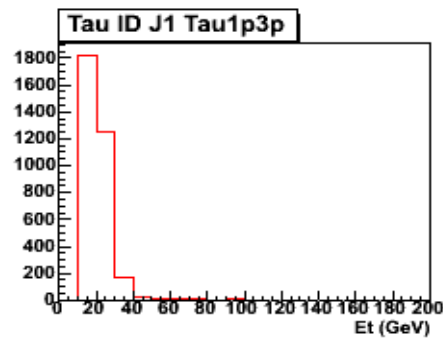
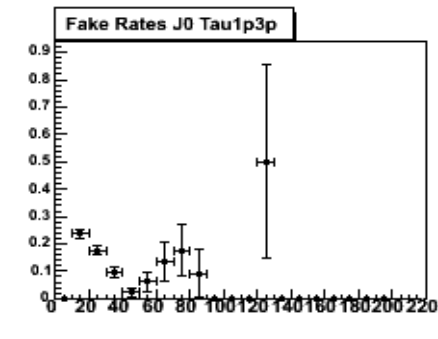
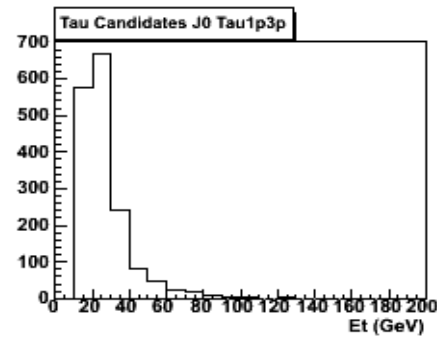
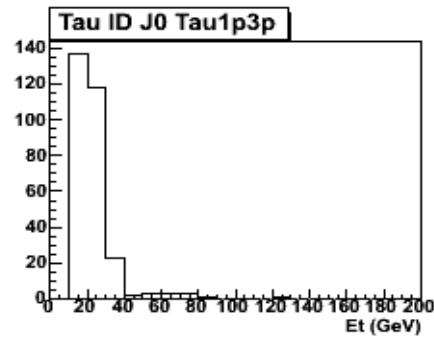


- We have computed FR from Dijet MC versus E_t of the τ candidate.
- To be applied to the “signal” sample: $t\bar{t}$ + W+jets.
- To investigate FR parametrization versus ΣE_T or τ isolation.



Back up slides

Tau1p3p FR



Tau1p3p FR

