



ORCA4: Trigger/L1CaloTrigger

Status

- All algorithms implemented
 - Includes new 12x12 jets and tau
 - Central and forward jets
 - Jet counts
- Use ORCA_4_2_0 or later

Testing

- Sridhara Dasu and Johannes Zeppenfeld started studying level-1 rates
- Pamela Chumney working on efficiencies and helping with understanding rate problems

Plans

- Repeat all plots in Trigger TDR with new ORCA4 data sets



Two Electron Events

No change to electron trigger

Continues to work

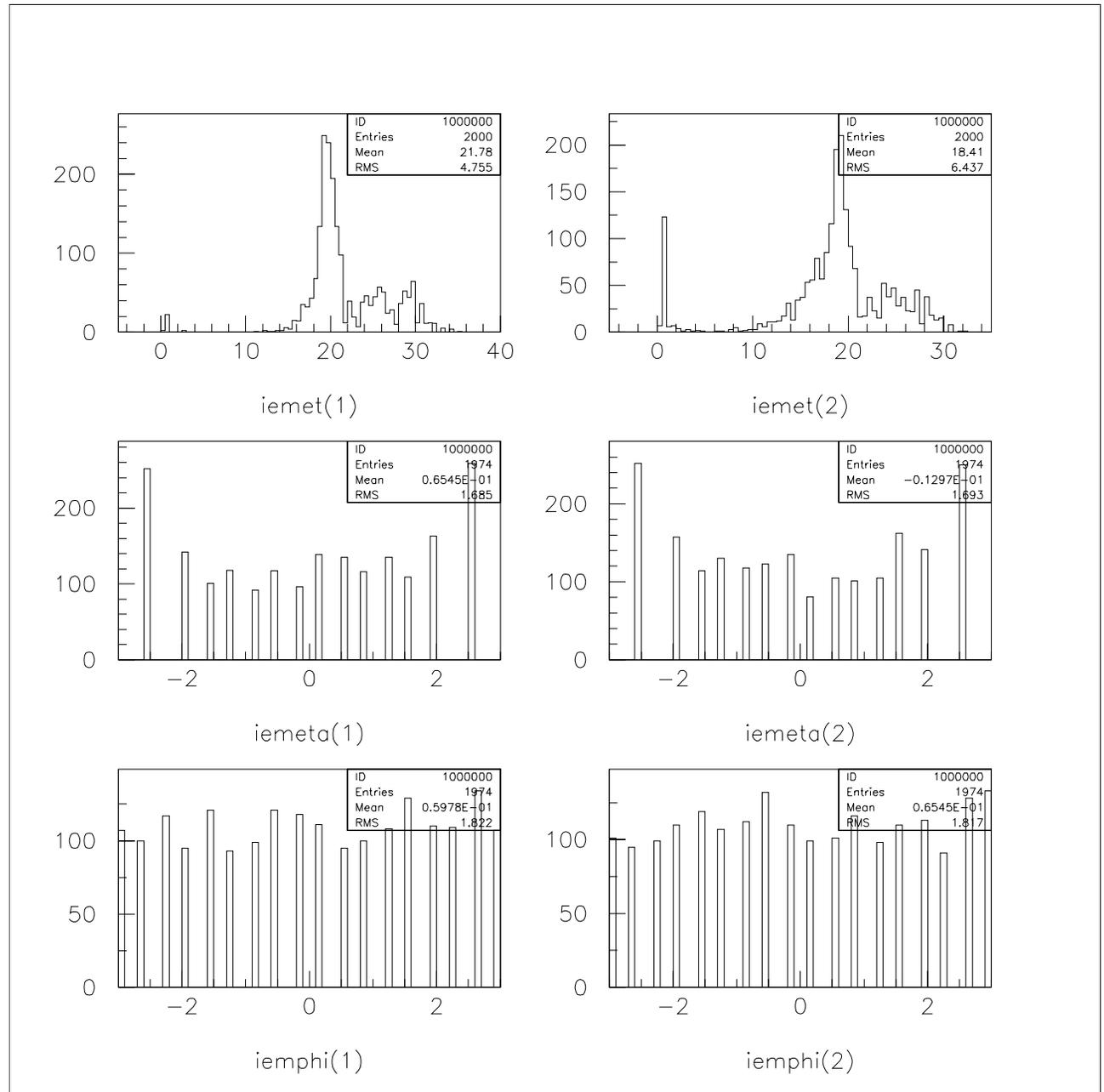
Two electron events

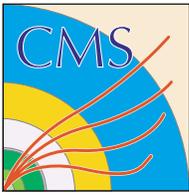
Both found.

Evenly distributed.

Last eta bin is bigger.

Tracker material correction seems to overdo it.





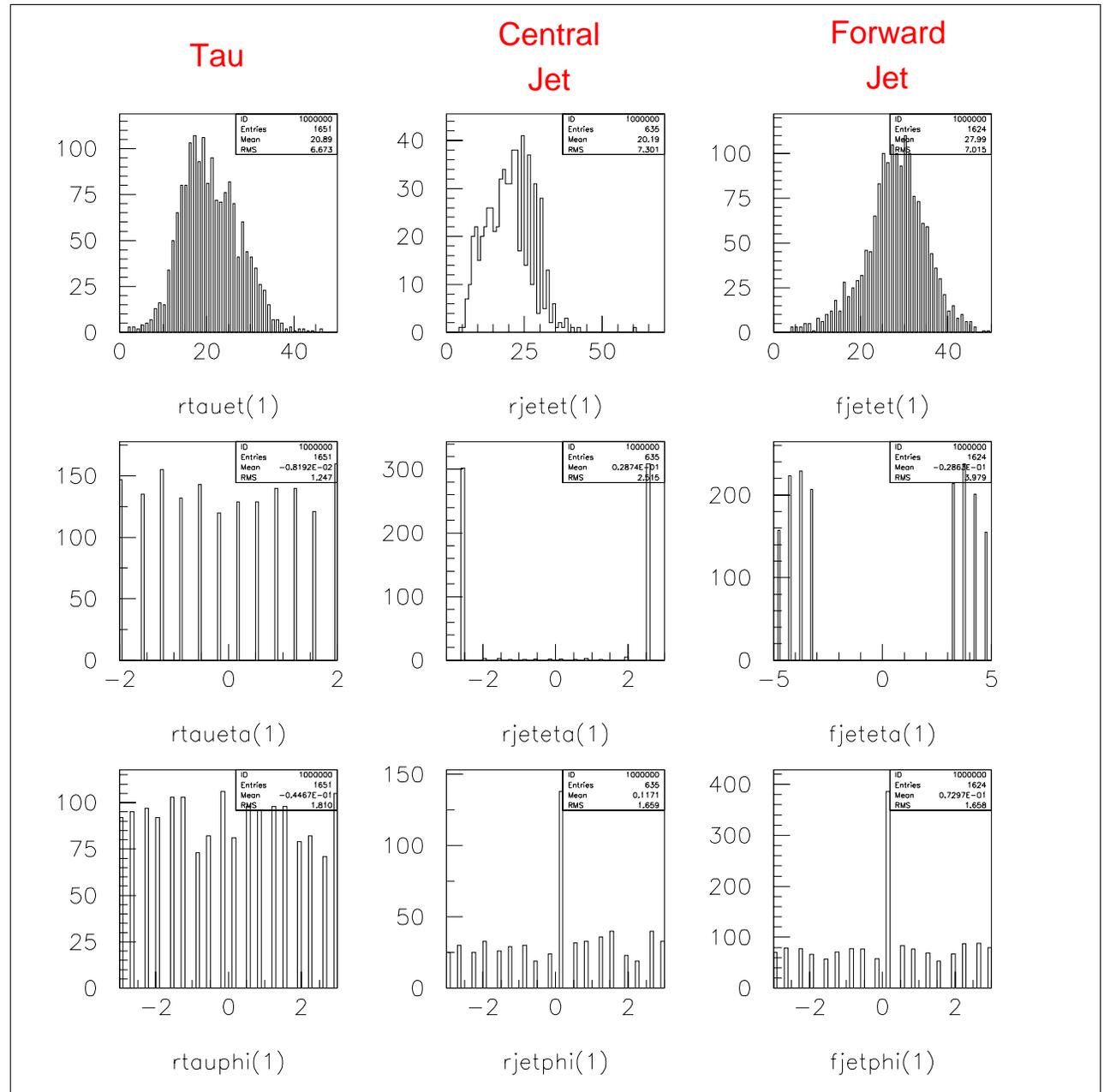
Single Pion Events

Single charged pions pass tau trigger as expected

Default cuts are reasonable

In central region most pions are identified as "tau" correctly. The outer most eta bin of the central region fails "tau" cuts. In the forward region there is no "tau" classification.

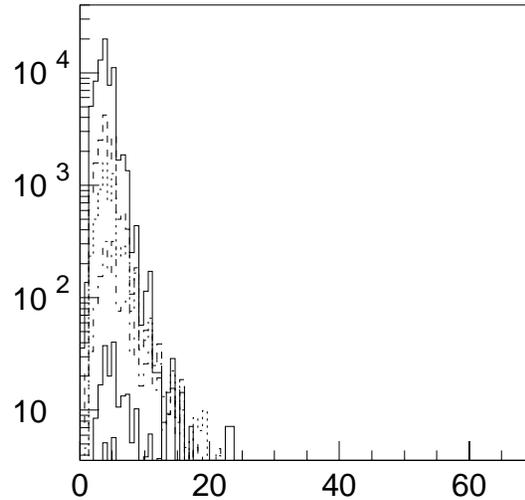
*Updated after the talk :
HF related bug in
L1CaloTrigger fixed*



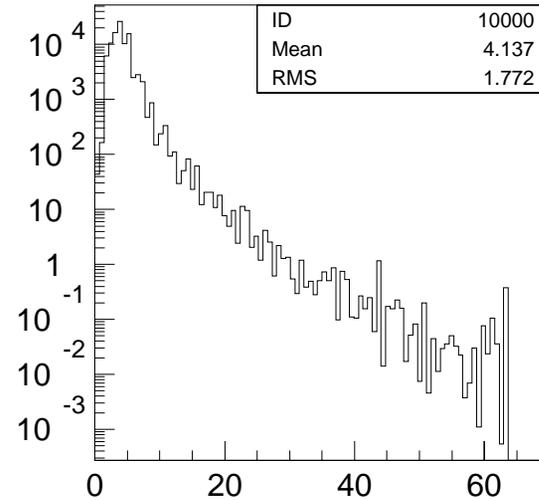


Electron Trigger Rate

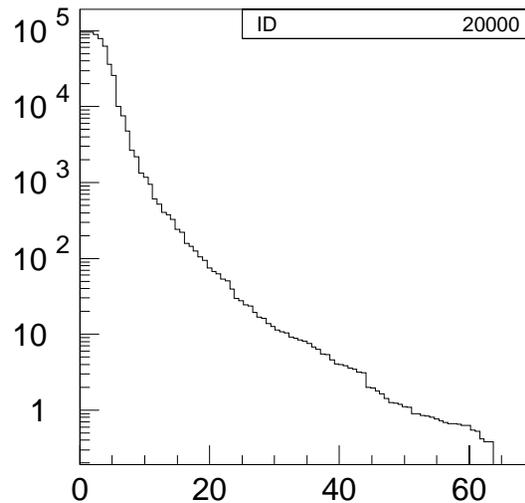
Isolated electron rate at $L = 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$



Rate (kHz) from each file Vs Et (GeV)



Sum rate (kHz) Vs Et (GeV)



Integrated rate (kHz) Vs Et (GeV)

Rate is marginally higher than was seen in earlier studies.

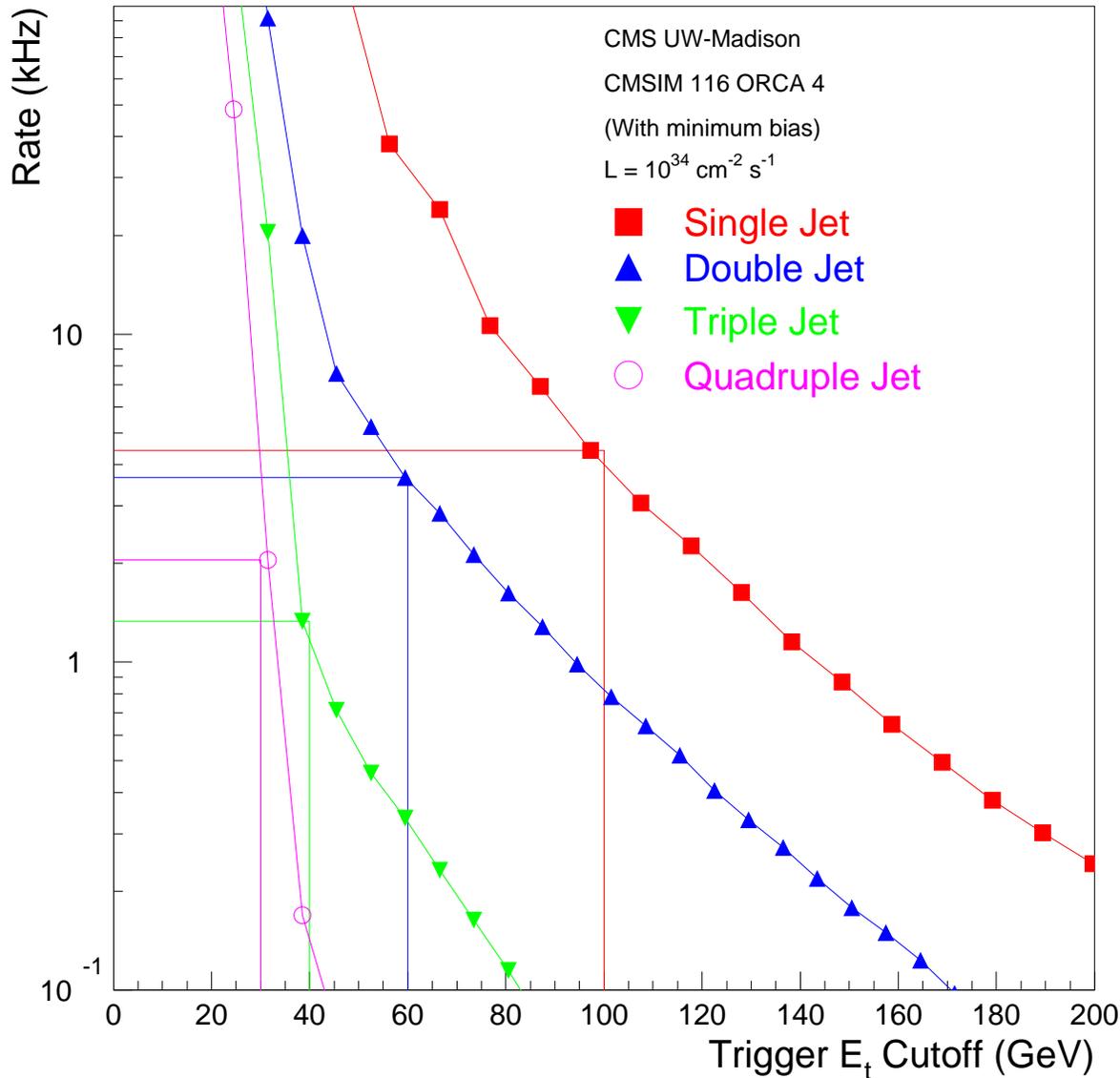
This result includes jet P_T bins 10-15, 15-20, 20-30, ... GeV.

My earlier studies used P_T bins 20-30 GeV and above.



Jet Trigger Rate

Jet trigger rates



Jet rates are also somewhat higher than was seen in earlier studies.

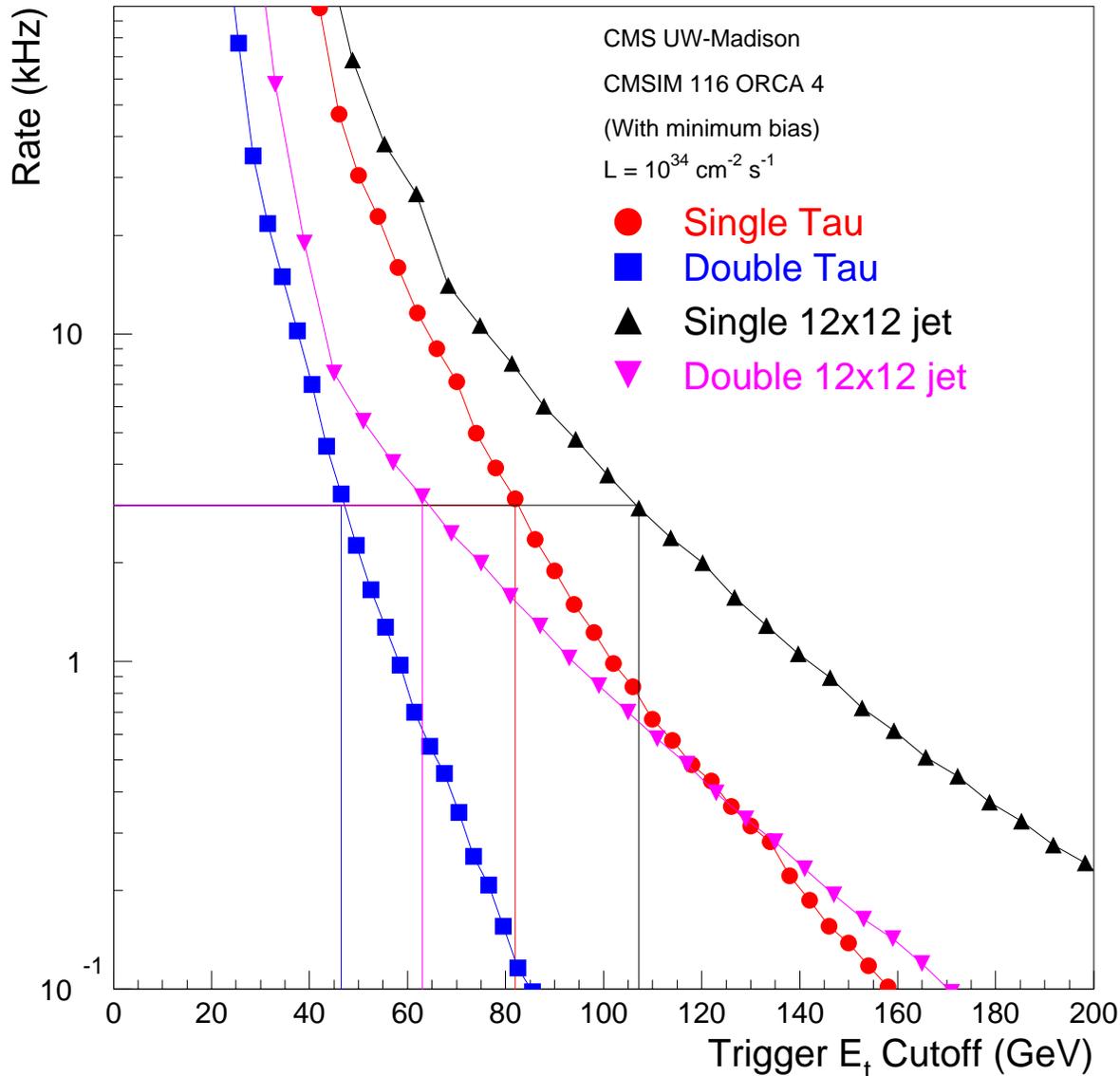
This result also includes jet P_T bins 10-15, 15-20, 20-30, ... GeV.

My earlier studies used P_T bins 20-30 GeV and above.



Tau Trigger Rate

Tau and jet trigger rates



This plot confirms my earlier finding that the dedicated tau trigger thresholds can be set at about 20% lower values than for jet triggers.

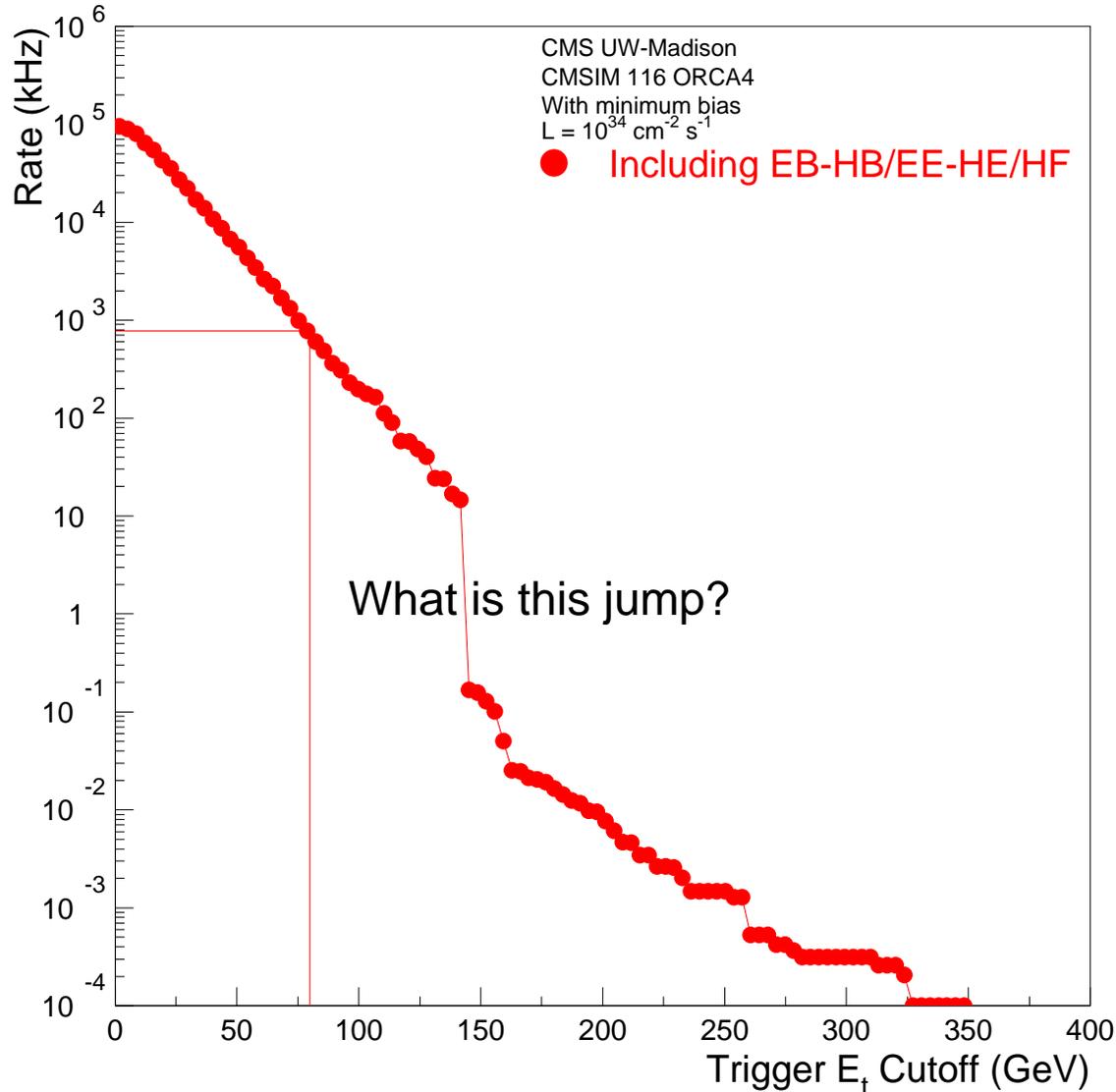
Sasha is checking efficiency for $H \rightarrow \tau\tau$

There is some room for tuning the algorithm



Missing E_T Rate

Missing E_T trigger rate

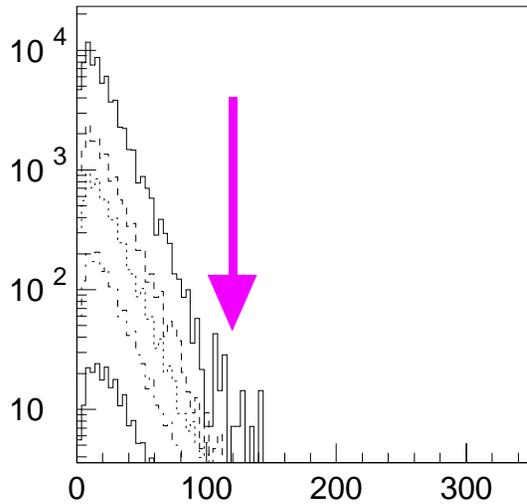


Clearly this is artificial bump - In the past, I found this type of problem because of including higher P_T pileup events in low P_T jet bins and scaling the rate up due to the high cross section of the low P_T jet bin.

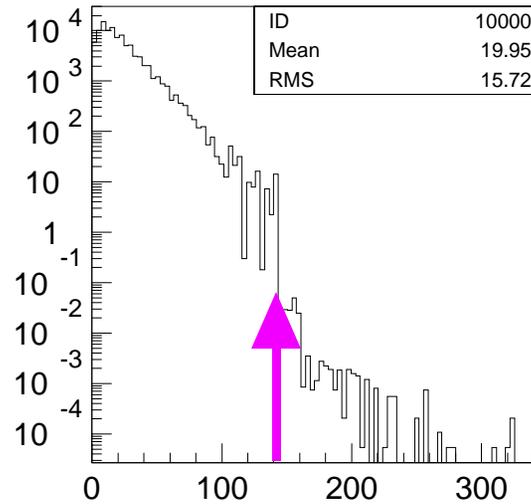


Missing E_T Rate Details

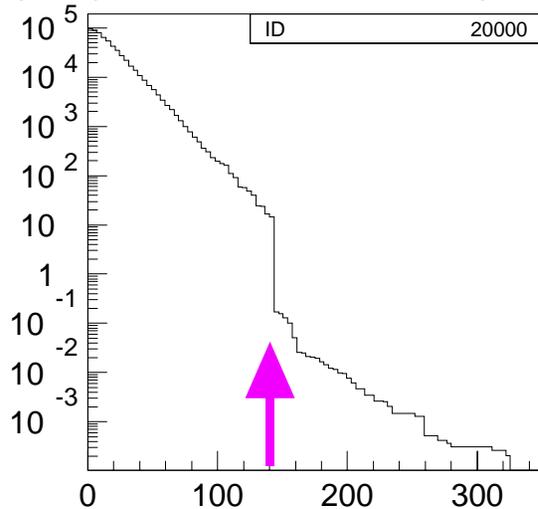
Missing ET rate at $L = 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$



rate (kHz) from each file vs Et (GeV)

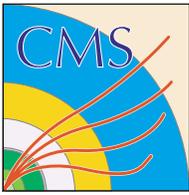


summed rate (kHz) Vs Et (GeV)



Integrated rate (kHz) Vs Et (GeV)

I think this (pileup related?) problem needs to be solved before trusting any rate numbers from ORCA4 (ORCA3 as well?).



Pileup Problem?

My method for adding pileup

- For each hard event pileup events are added requiring that the the P_T of hard event is higher than P_T of each pileup event added
- Requires storing generator level P_T

ORCA 4 pileup

- No restriction is placed on the P_T of added minimum bias events
- Is this the cause of artificial bumps in rate plots
- Is the rate over estimated because of this problem

What next?

- ORCA 4 event nTuples do not have P_T information stored
- Can we reconstruct generator level P_T from HEPEVT parton information?



Parton P_T vs event P_T hard

Pam compared generator level parton P_T with PYTHIA reported P_T

Both the partons are back-to-back

There is correlation - However, it is not good enough to base pileup cut on.

Cannot figure out what the outliers are - are these events causing problem?

