Missing Et

Pal Hidas

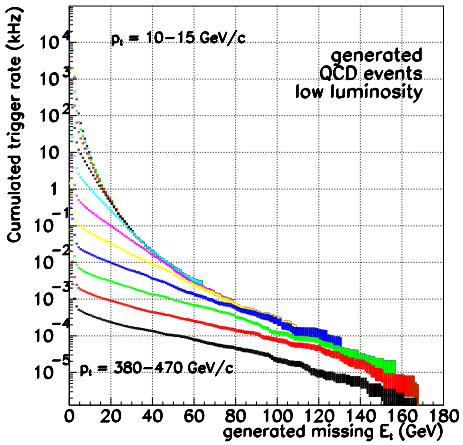
FNAL Batavia / RMKI Budapest

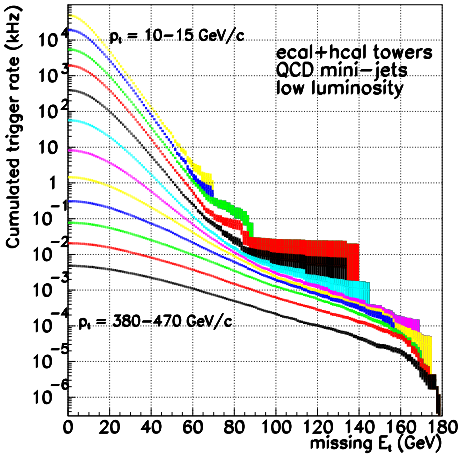
Content

- low luminosity rates
  - 2*10^33 cm^−2 s^−1, ~3.47 pile−up
- source of missing Et
  - JetMetFast
    - fast detector simulation
    - fast event generator

Missing Et trigger rate

HCAL
JET
MET

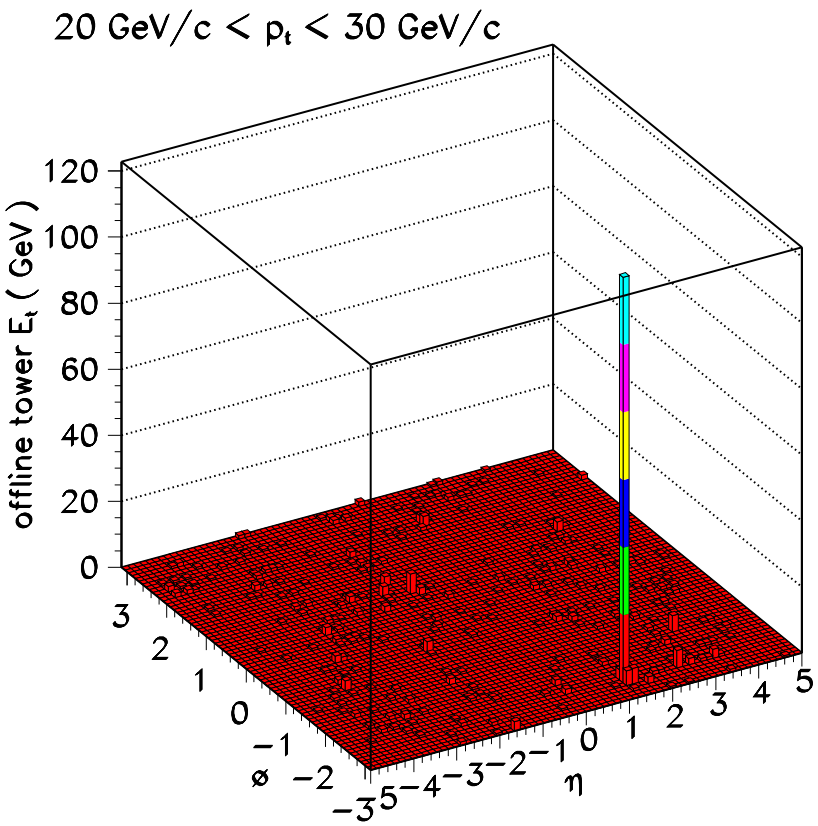




- pt^ binned minimum bias data (hlt)
  - no correct (Branson−Trepagnier) weights yet
- say 1 Hz quota for pure met
  - for generated it is now at 80 GeV
  - for reconstructed it is now at 140 GeV
- generated met
  - no W,Z, top in pythia − there is b,c
- reconstructed met
  - big separate value for esp. 20−30 GeV bin
    - if Poisson−fluctuation −> weighting would cure it
    - but it is ILOSS bug
    - 1 Hz is at ~130 GeV (by eye)

ILOSS bug

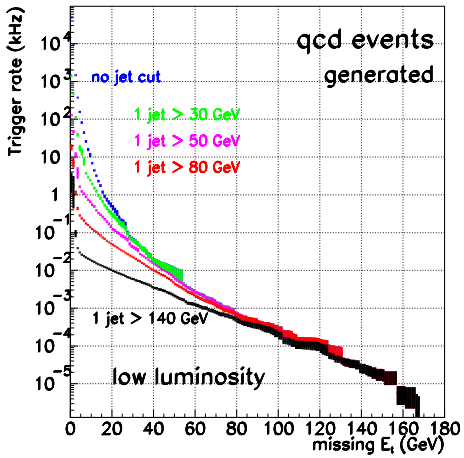
HCAL
JET
MET

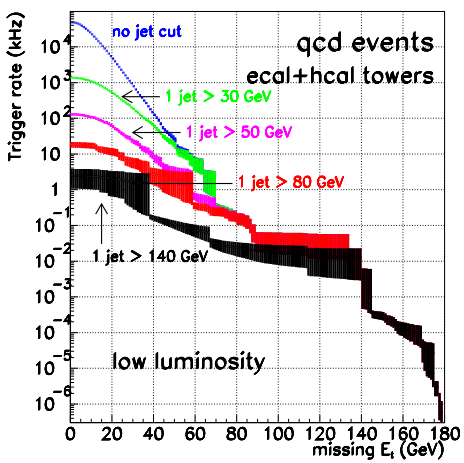


- **big individual tower**
  - **in big statistics bins**
- **to cure it**
  - **I prefer reproduction**
  - **visual correction in the meantime**
  - **Et_tower/Et_jet cut**
    - no separation
    - jet picks up too much energy
  - **1x1 / 3x3 tower Et cut**
    - very time consuming in PAW
  - **Et_em/Et cut for towers**
    - no separation
    - a lot of towers has no EM energy

Missing Et trigger rate

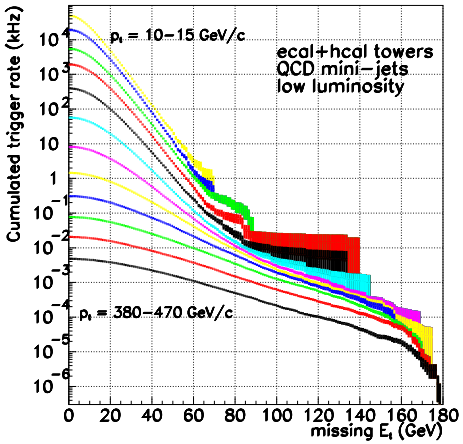
HCAL
JET
MET

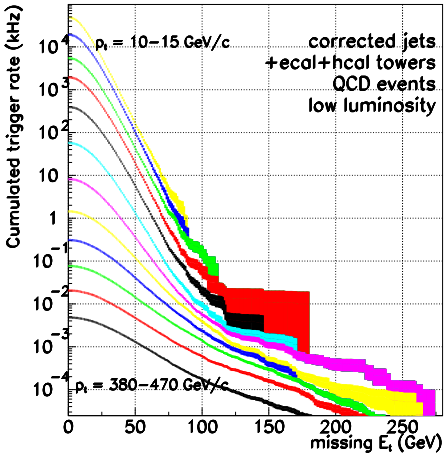




- 1 jet reduces the rate at low met
- 80 −100 GeV is a turning point ?
  - below is it response ?
  - above is it physics ?
  - jet+ met rate becomes pure met rate
- same stat. fluctuation problem as prev.page
  - we may get rid of it by cuts
  - I prefer reproduction
  - we can correct the information by eye

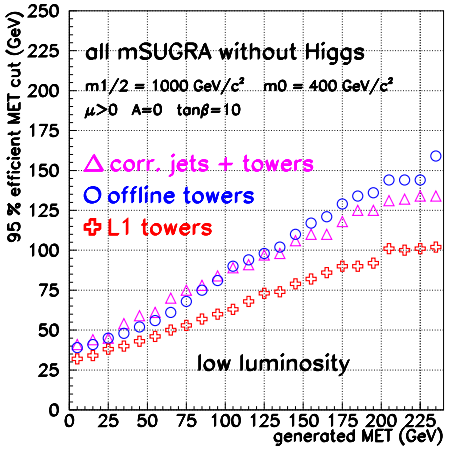
Missing Et correction

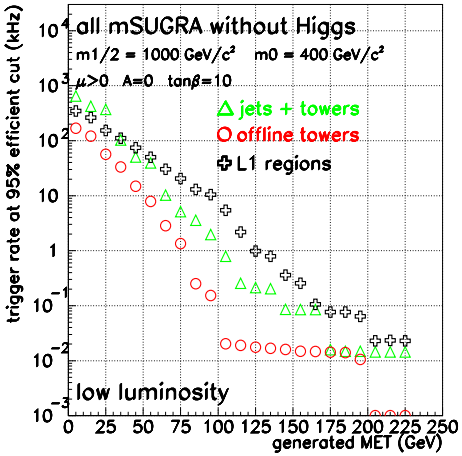




- jet + out−of−cone constituent correction
  - jet Et > 30 GeV
  - tower as if 30 GeV jet
- after correction
  - puts the average met to 0
    - we need it for neutrino reconstruction
  - makes sigma worse
    - we will see why : detector resolution dominates missing Et resolution

Signal efficiency





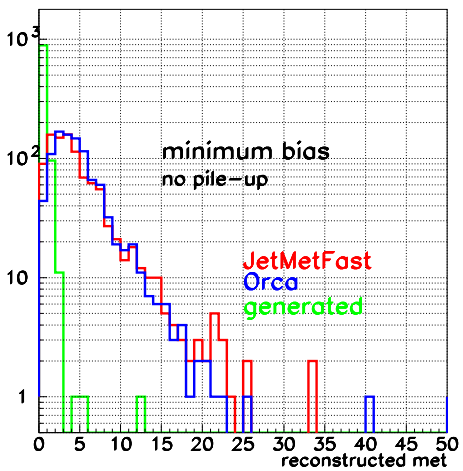
- **correction does not perform well for rates**
  - **adds met to average**
    - corrects nonlinear response
  - **does not change relative resolution**
    - because energy measurement resolution is dominant
    - nonlinearity, magnetic field, angular coverage are lesser (minor) effects for met resolution
  - **increases background at bigger met**
- **uncorrected L2 is much better than uncorrected L1**

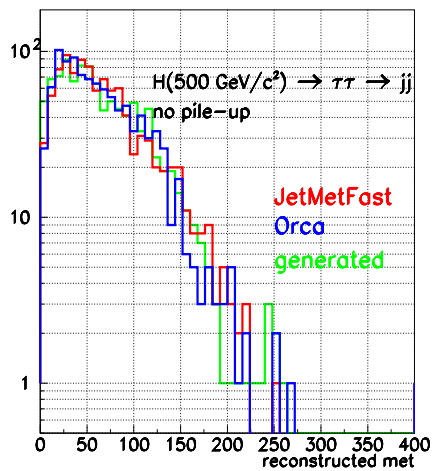
JetMetFast

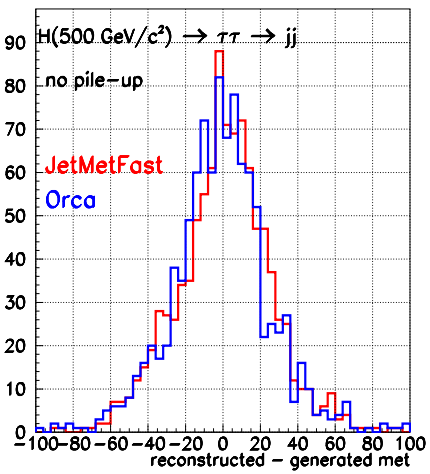
- fast calorimeter reconstruction (ecal + hcal united)
  - barrel, endcap, forward(extendable)
  - pessimistic TDR response (nonlinearity)
    - 0.95/(1+3GeV/E) for charged , 1.00 for photon and electron
  - pessimistic TDR resolution (charged pion, photon, electron)
  - magnetic field
  - the parameters above can be tuned runtime
  - no noise yet
  - no eta−phi segmentation (infinite angular resolution) (OK)
- fast event generator
  - the framework is there
  - double particle generator
  - want to include Dan's minimum bias generator
- framework
  - A : CARF − reading "real" MC + fast calorimeter
  - B : JetMetFastFrame −reading fast generator + fast calorimeter

Verification

- excellent match
  - 1 −fake missing Et of minimum bias
  - 2 −real missing Et of H−>tau tau −> jet jet
  - 3 −missing Et resolution (reconstructed − generated) of H







Source of missing Et

- met resolution for H−>tau tau −> jet jet (no pile−up)
- four effects examined
  - A : beam hole (extending forward calo from eta = 5 to eta = 13)
  - B : magnetic field (4 or 0 Tesla)
  - C : E resolution (TDR or 0 sigma Gaussian)
  - D : E response (TDR or 100% linear)
- if all effects are on (realistic calorimeter)
  - sigma = 23.40 GeV
- if only 1 effect is on (almost ideal calorimeter)
  - A : 5.76 B : 7.23 C : 21.51 D : 12.20
- if only 1 effect is off (almost realistic calorimeter)
  - A : 23.64 B : 22.50 C : 14.41 D : 22.20
- score
  - 1 : C −dominates if present, 2 : D, 3 : B, 4 : A