Missing Et trigger at low luminosity

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Issue

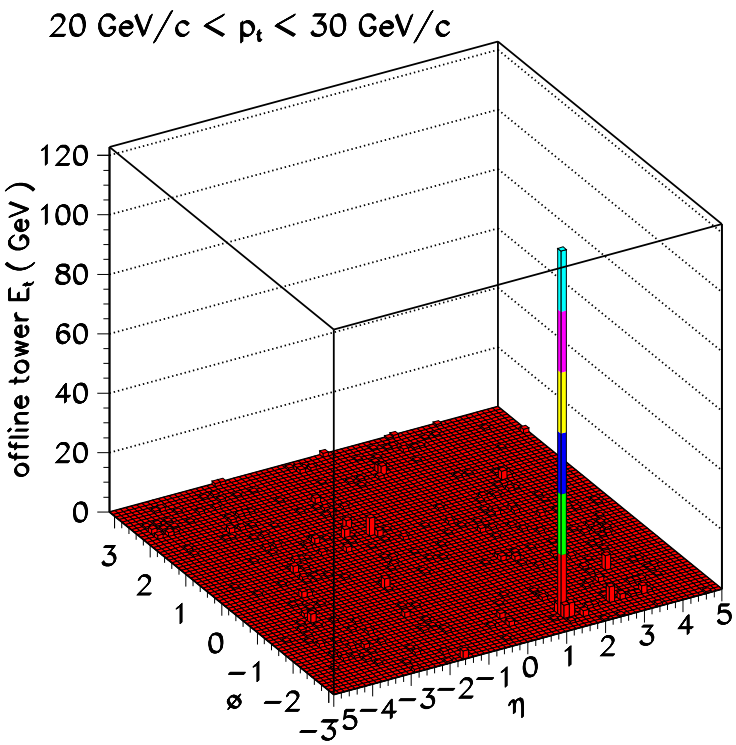
- HCAL ILOSS bug and curing it
- another ECAL bug and curing it
- source of generated met
- low luminosity rates
  - 2*10^33 cm^−2 s^−1, ~3.47 pile−up
  - pure met
- triggering on signals
  - invisible Higgs (m = 120 GeV/c2)
  - low mass SUSY(m0 = 250 , m1/2 = 200)

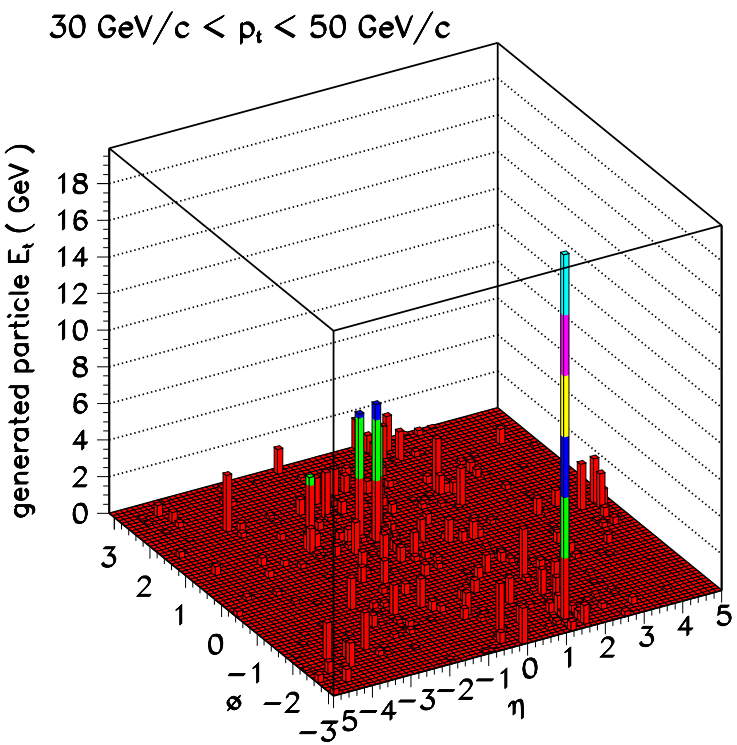
ILOSS bug

HCAL
JET
MET

big unphysical deposit in HCAL from a relatively big Et particle

5 pileup events (1 ; 10−20 GeV/c , 4 : 0−10 GeV/c)

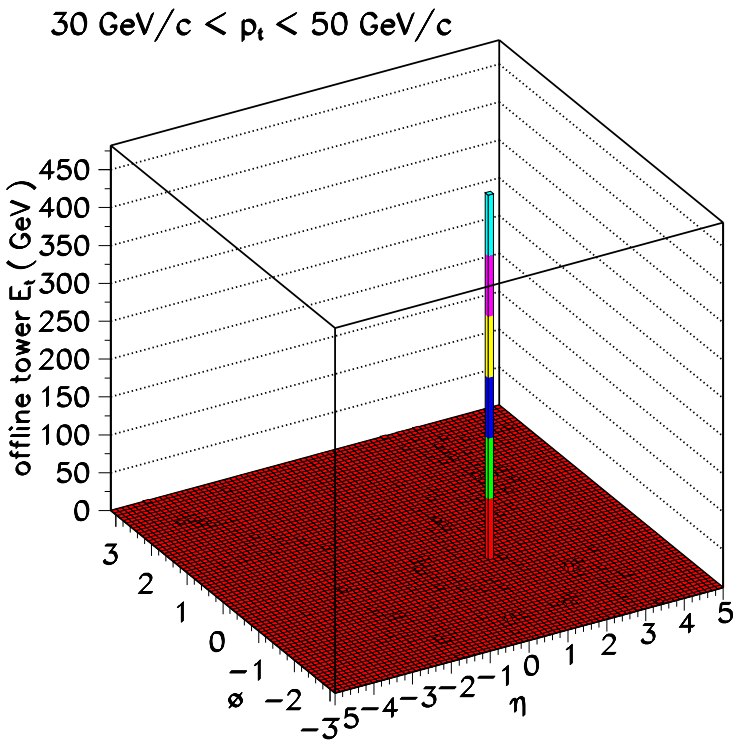


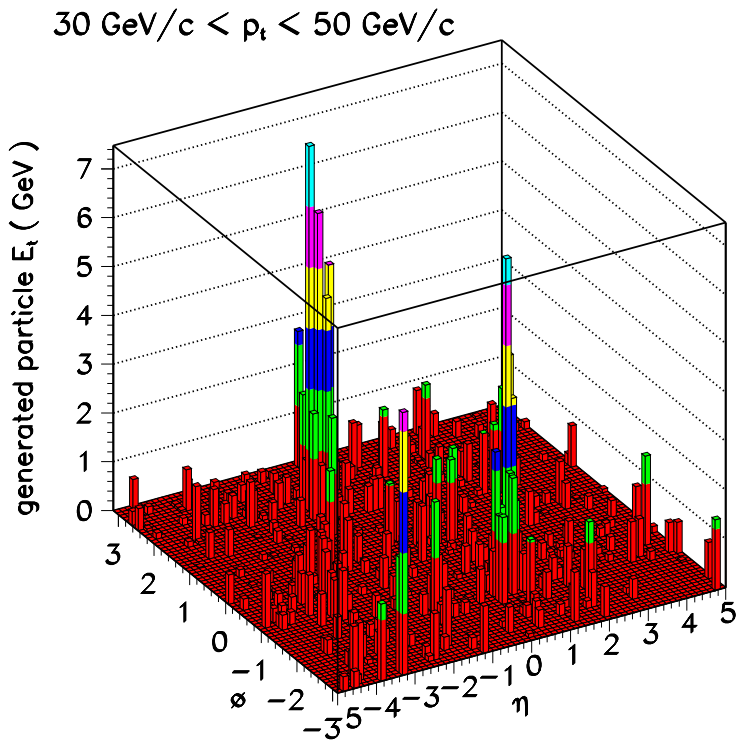


ECAL bug

HCAL
JET
MET

>3000 ECAL hits in a single crystal : Sum(Et) > 600 GeV/c
(relatively big signal particle is around)
7 pile−up events (2 : 10−20 GeV/c , 5 : 0−10 GeV/c)
Shuichi is going to check fz files − what is it ?





Discussion of Bugs

They are unphysical

- can not be cumulative effect of pile−up
- 10 k towers −> double occurance have 1/10M probability

They completely misguide the background rate

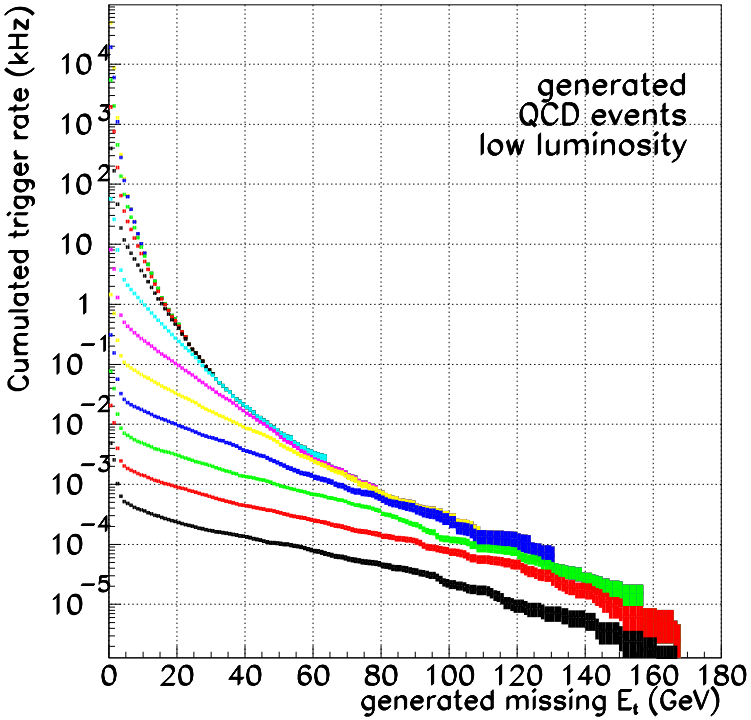
- They happen at ~ 1/10k event rate
- 1 instance can raise the rate by an order of magnitude

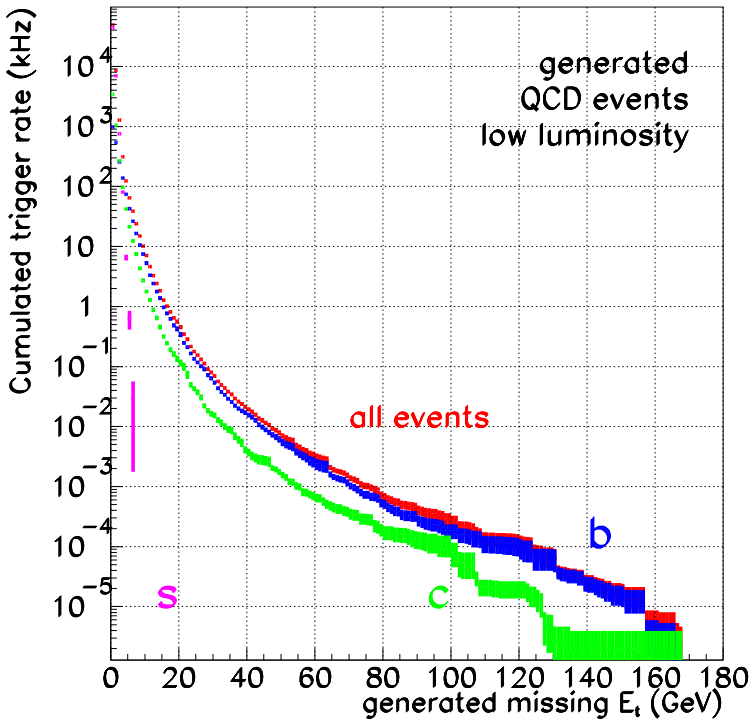
The cure is easy

- angular cut on Phi(highest Et jet,missing Et)
- they have anticorrelation
- this cut also fights single noisy channels

Generated MET

1 Hz is at 75 GeV by Pythia without top quark production
dominated by b production
correlation of jet and met direction ?





Phi(jet,met) correlation

HCAL
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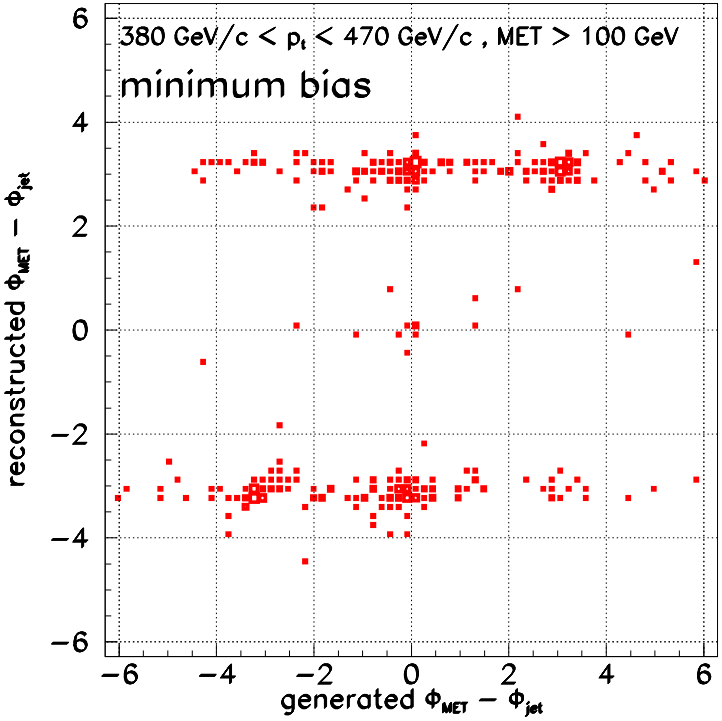
MET

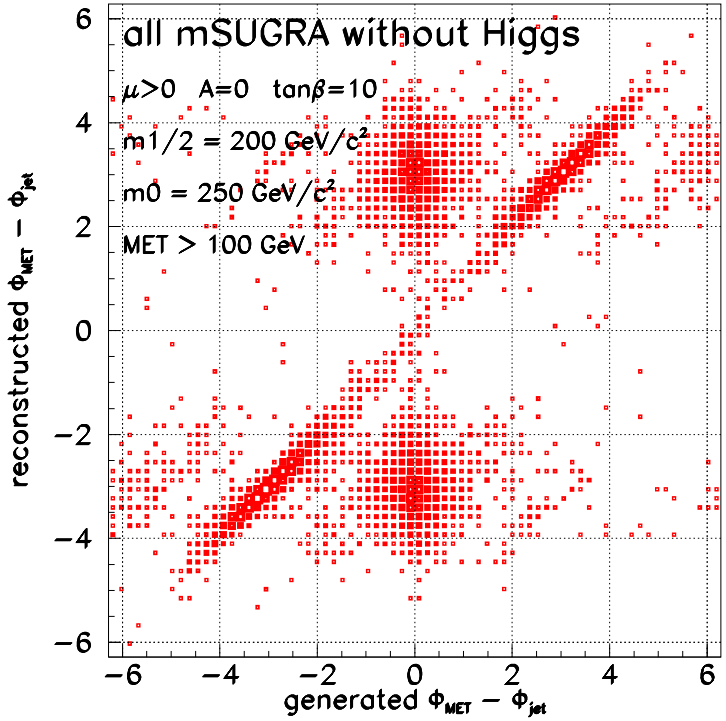
weak correlation – both jets are b jets

strong anticorrelation – bugs, bad measurement of 2nd jet

dPhi < 0.2 chosen for the moment

another cut is also necessary : ettower / et(3x3) < 0.94





Level 2.0 MET rate (Branson−weight)

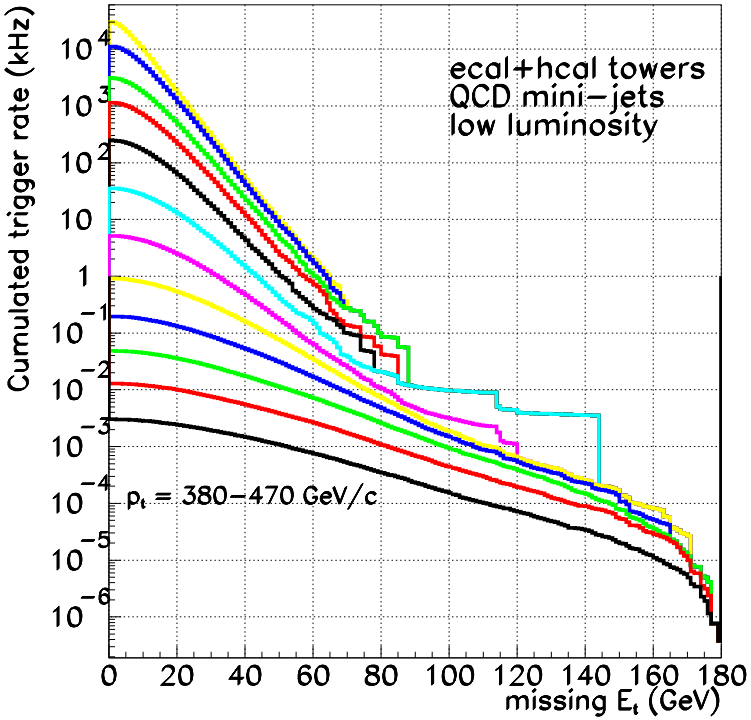
HCAL
JET
MET

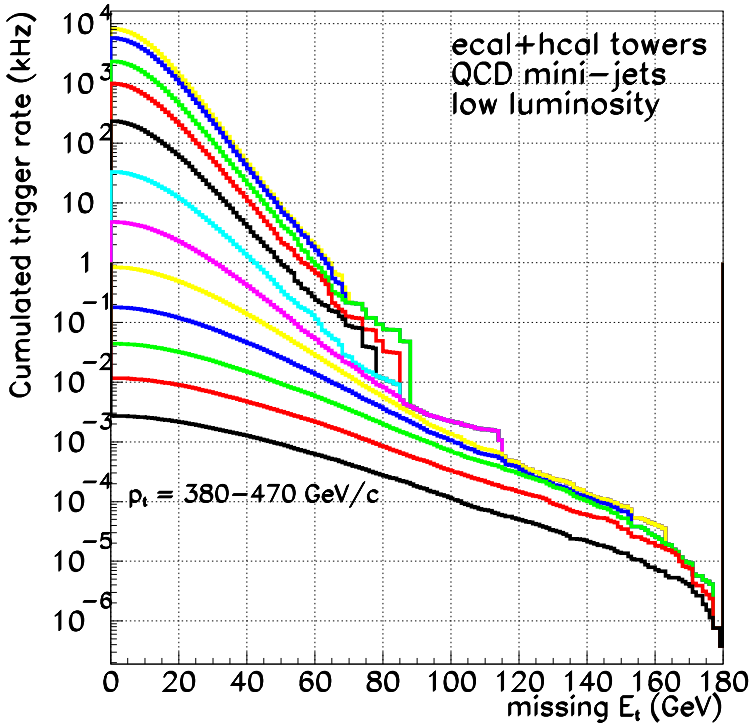
LEFT : rate without cuts − 1 Hz at 145 Hz − very bad

RIGHT : rate after angular cuts − 1 Hz at 115 Hz (7th bin 10% stat.)

1/3 of statistics, some bugs are not yet present !

the rest of the plots has been made by the old method





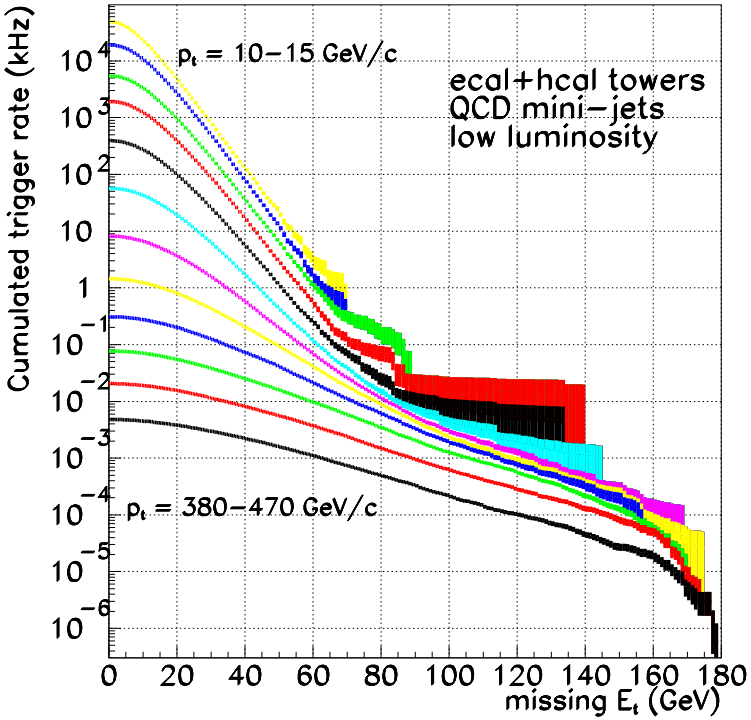
Level 2.0 MET rate (old bin weight)

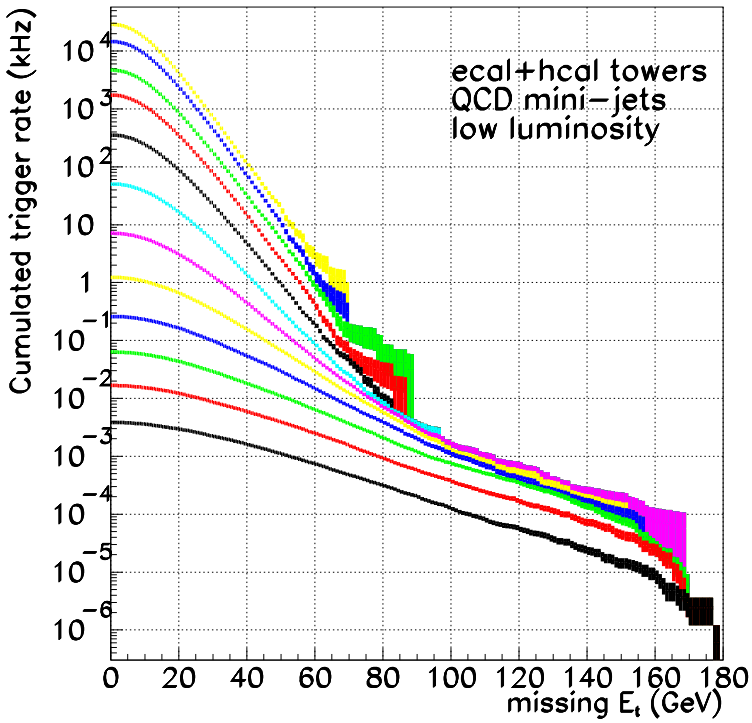
HCAL
JET
MET

it has full statistics

LEFT : rate without cuts

RIGHT : rate after angular cuts (d Phi < 0.2) 1 Hz at 110 GeV

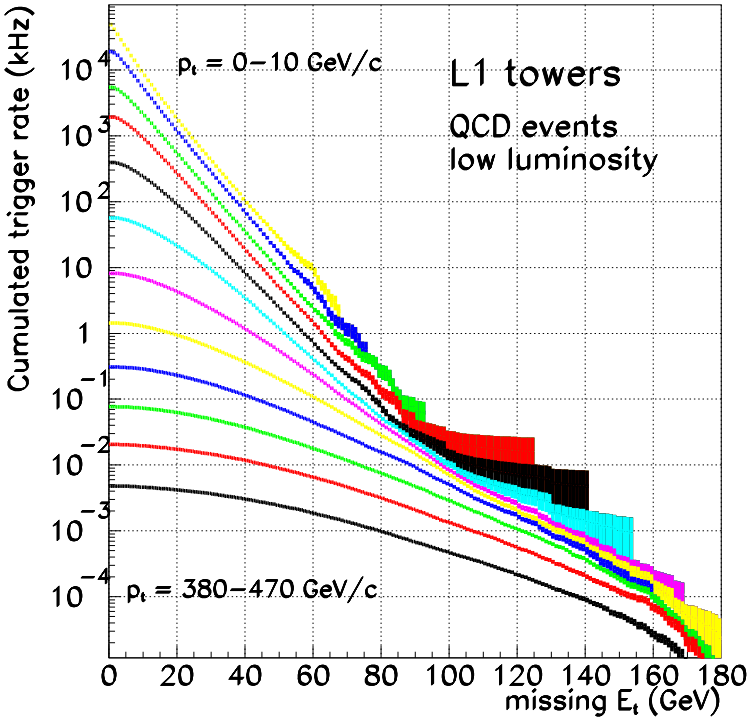


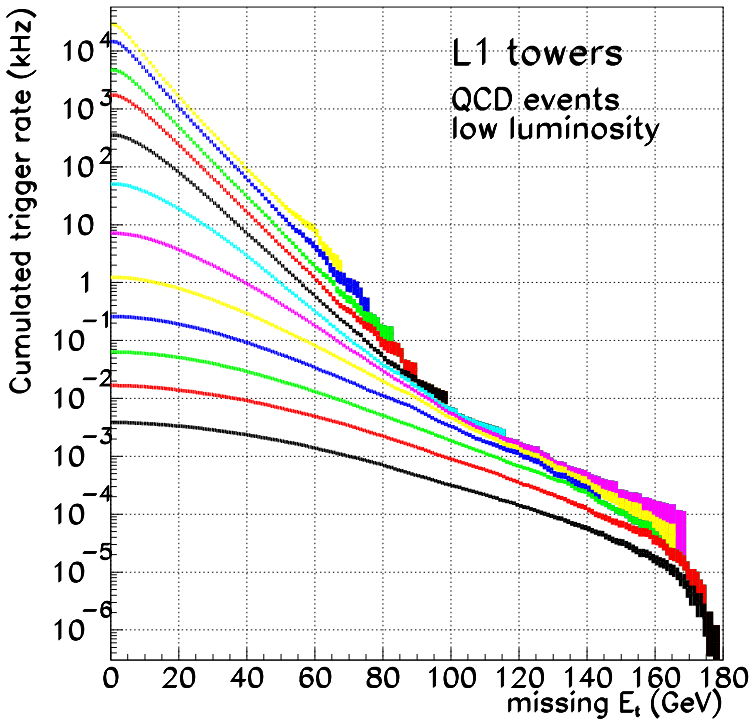


Level 1 MET rate

HCAL
JET
MET

LEFT : rate without cuts
RIGHT : rate after cuts – 1 Hz at 130 GeV
unfortunately these are Level 2 cuts





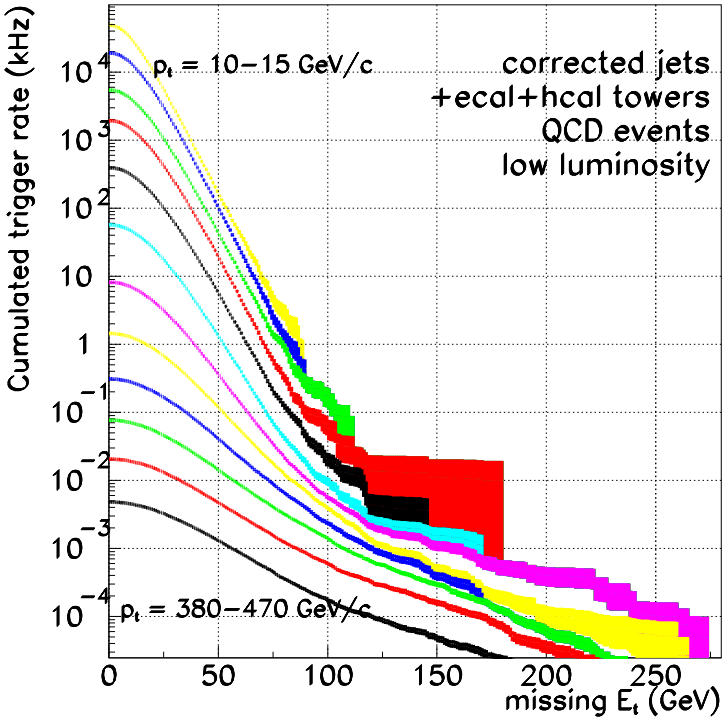
Level 2.2 MET rate

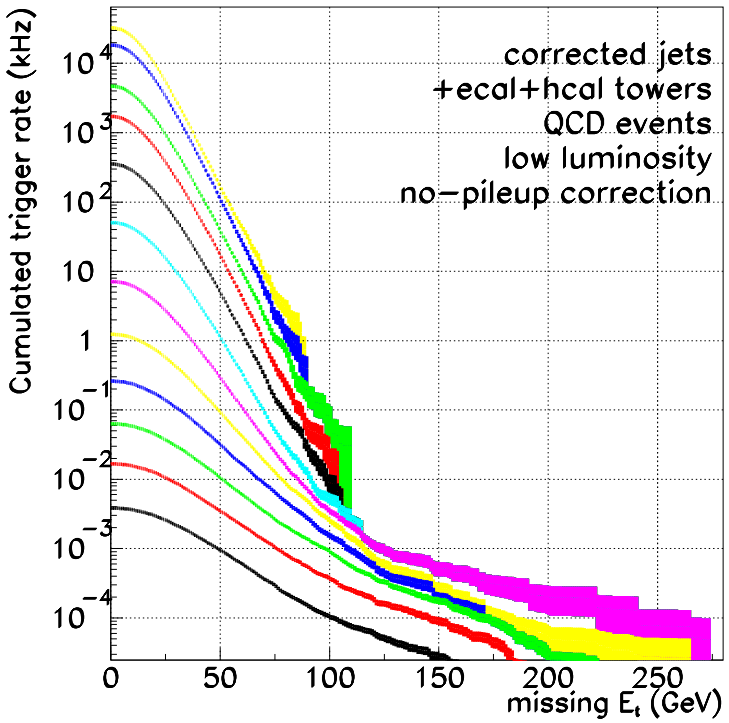
HCAL
JET
MET

type 2 correction : corrected jets (> 30 GeV) + corr. towers

LEFT : rate without cuts

RIGHT : rate after cuts – 1 Hz at 120 GeV





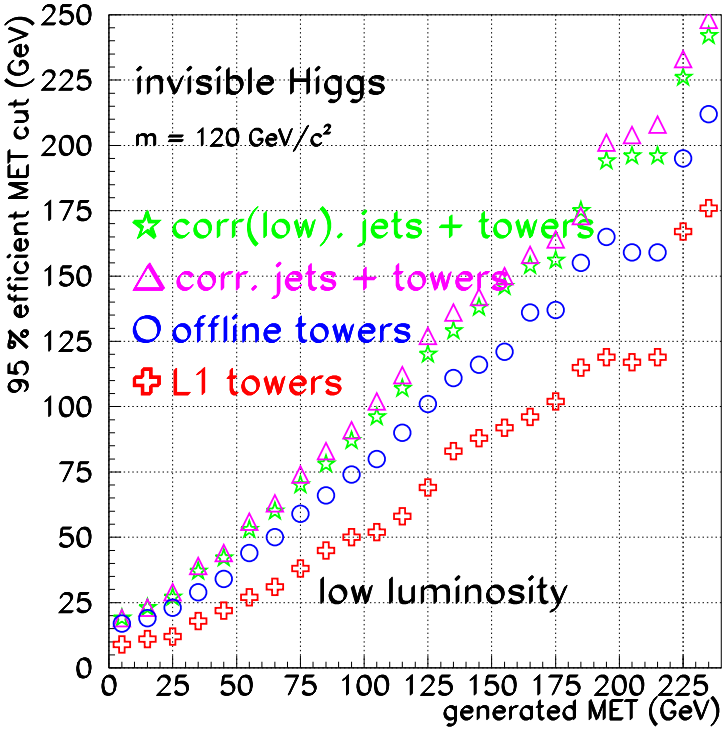
Invisible Higgs (120 GeV)

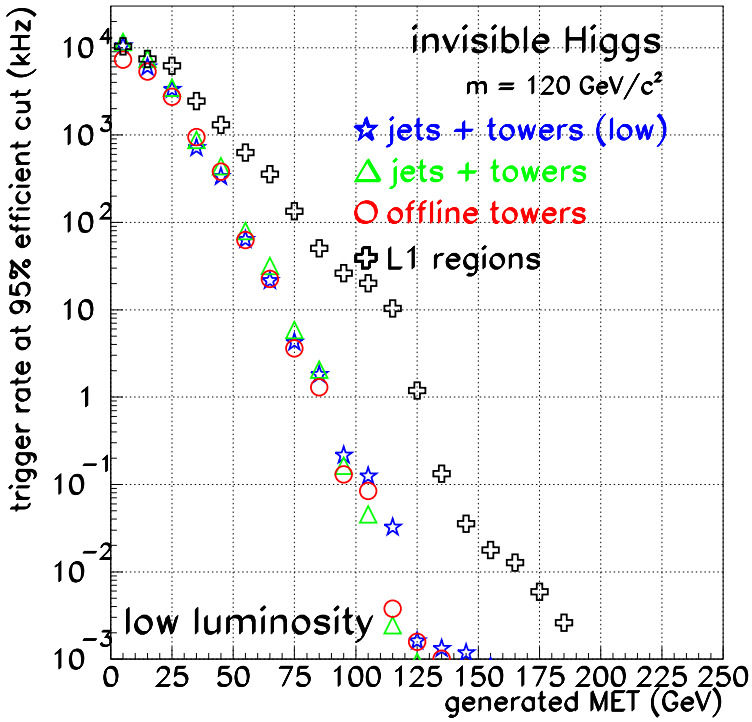
HCAL
JET
MET

after discovering and removing ECAL bug things are much better

110 GeV offline cut – 1 Hz background

20.7 +/– 0.2 % abs.efficiency – 95 % rel.eff. for genmet > 135 GeV





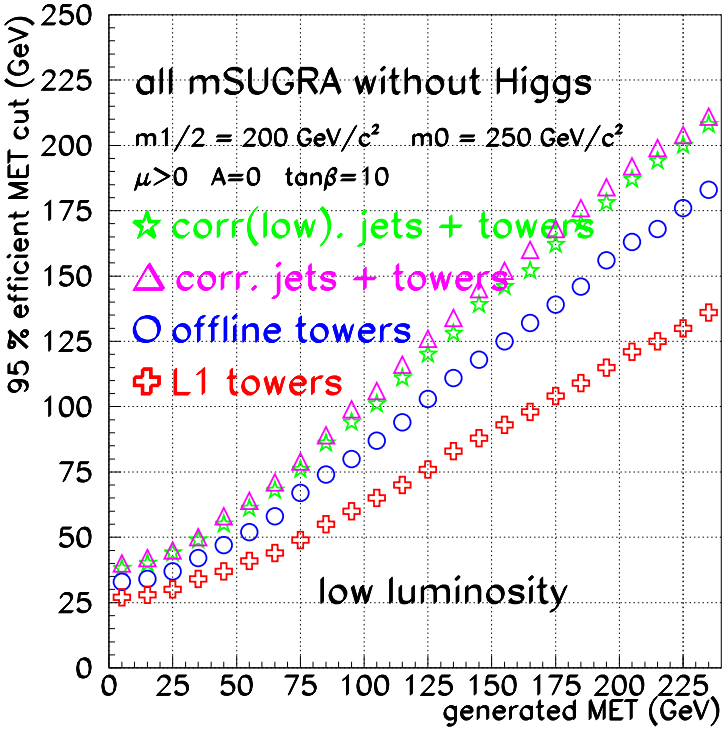
Low Mass Susy

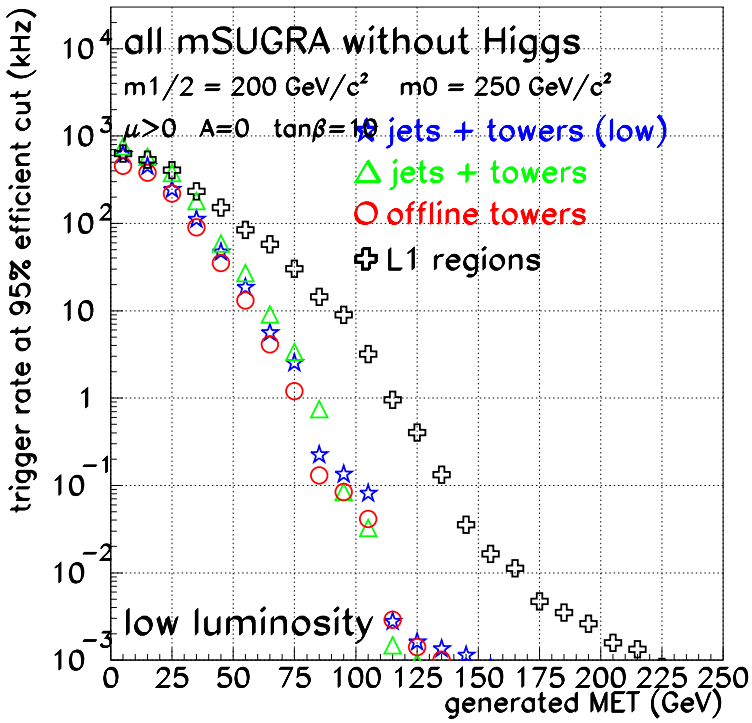
HCAL
JET
MET

m0 = 250 GeV/c2 m1/2 = 200 GeV/c2 tanbeta = 10

110 GeV offline cut – 1 Hz background

64.2 +/– 0.1 % abs.efficiency – 95 % rel.eff. for genmet > 135 GeV





Summary

Monte Carlo bugs causing big MET safely removed

- ettowermax / etsum(3x3) < 0.94
- | deltaPhi (MET, jet(1)) − Pi | > 0.2
- I am refining the cuts

Level 2.0 MET rate

- 1 Hz at 110 GeV
- main contribution : 2 b jet events
  - 80 % of MET rate
  - more efforts to fight it −> to lower the threshold

Low mass signals

- 95 % of MET > 135 GeV
- absolute efficiencies are very channel dependent
  - invisible Higgs (120 GeV) − 20.7 %
  - low mass SUSY (m0=250,m1/2=200) − 64.2 %

inclusion of MET only trigger in the chain is possible