FastSim vs FullSim

and

PileUp Studies

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JetMET, Feb 14 2008

FastSim vs FullSim

Comparison of FullSim (CMSSW 1.5.2) and FastSim (CMSSW 1.6.8)

FullSim: read data files and run analysis code

FastSim: generate events and run *same* analysis code

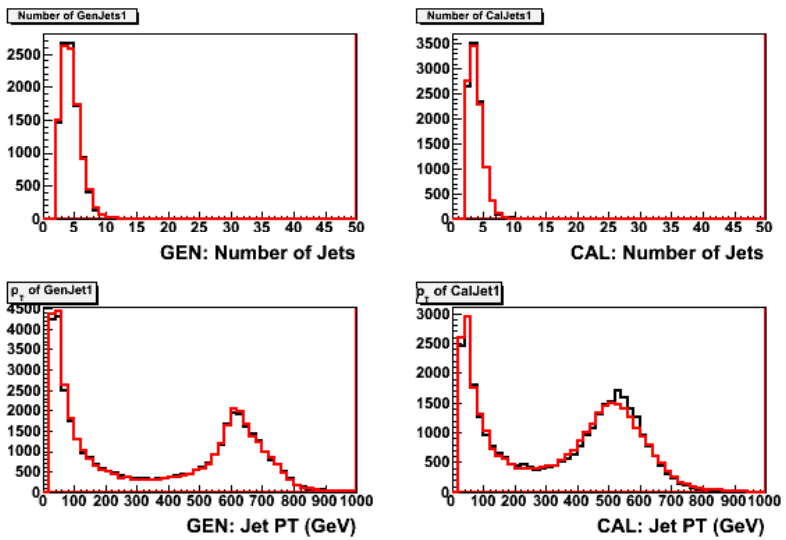
Looked at three QCD samples

pT = (80 – 120)
pT = (600 – 800)
pT = (3500 – inf)

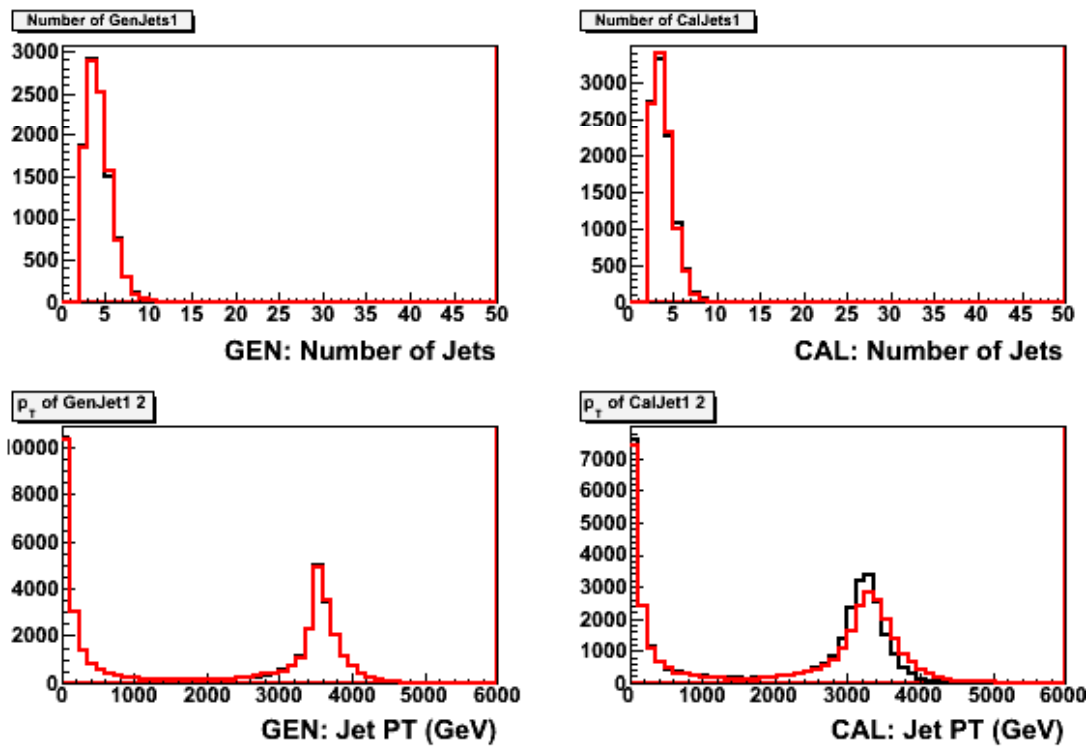
FastSim vs FullSim

Looked at many other distributions

http://ncdf76.fnal.gov/~chlebana/CMS/FastSim



Generated quantities agree…



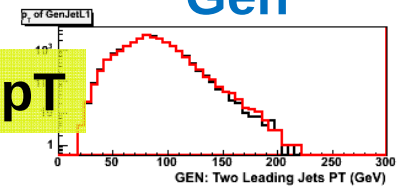
Jet are constructed with higher pT in the high pT sample

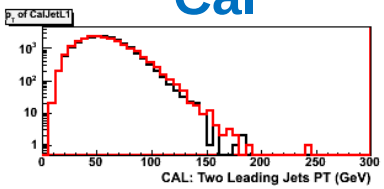
FastSim vs FullSim

pT = 80 – 120 GeV

Gen **Cal**

pT





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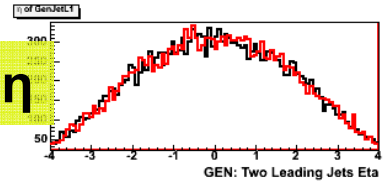

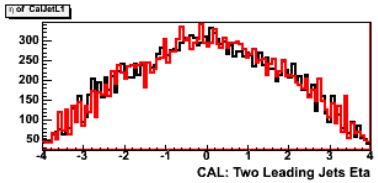

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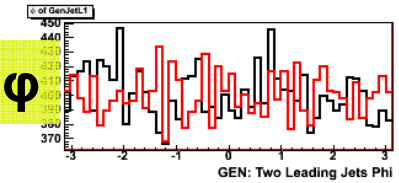
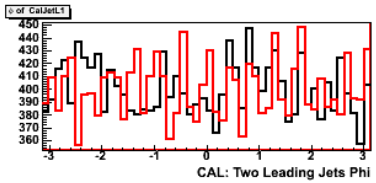




See better agreement for Cal quantities in the low pT sample

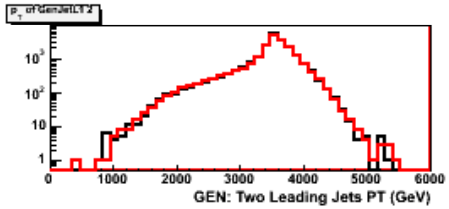
Comparison of Gen and Cal quantities

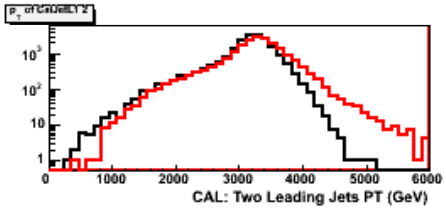
Gen quantities agree in both samples

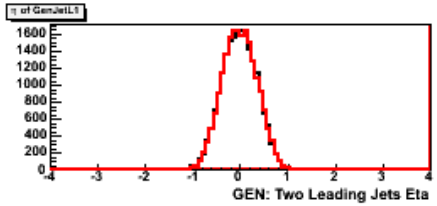
Black: fullsim

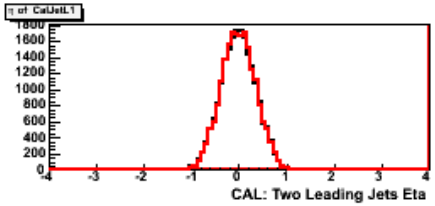
Red: fastsim

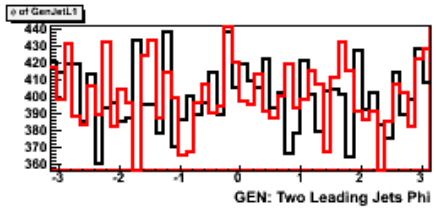
pT = 3500 – inf GeV

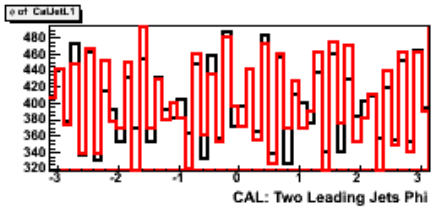




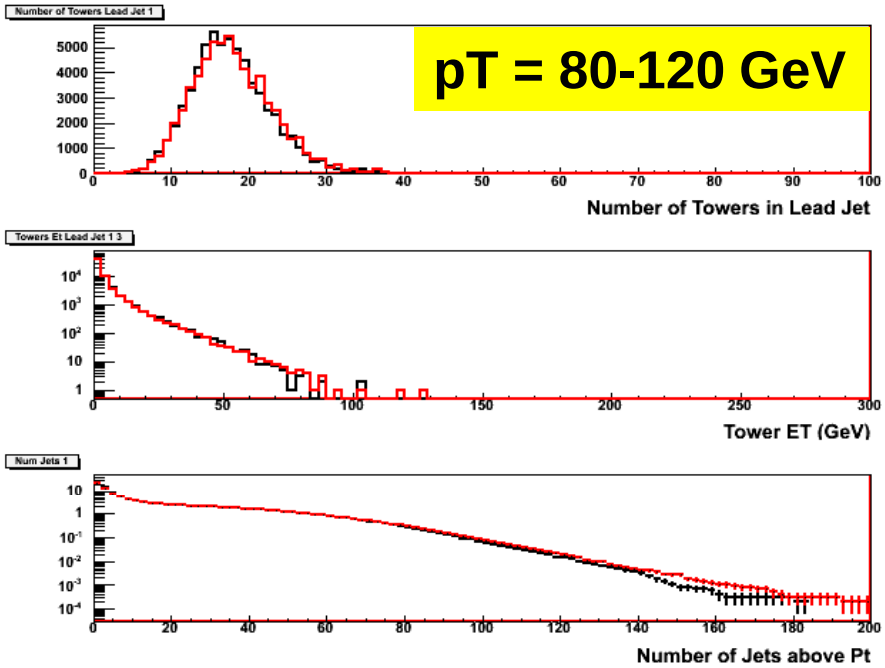




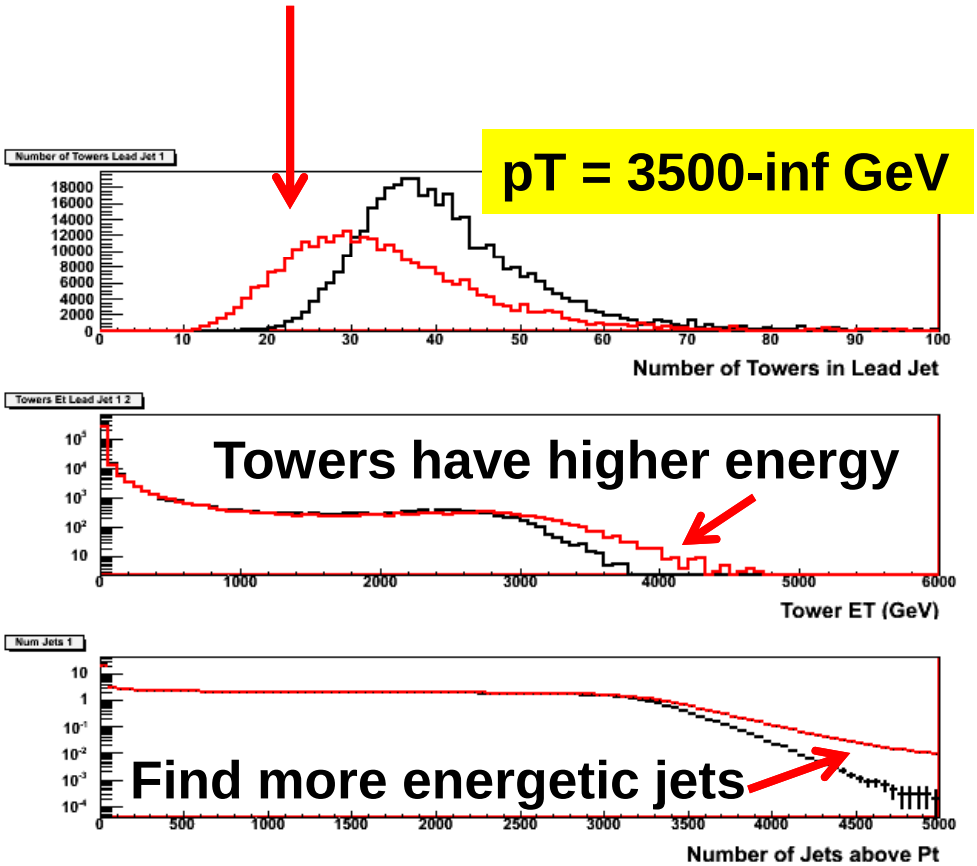




FastSim vs FullSim

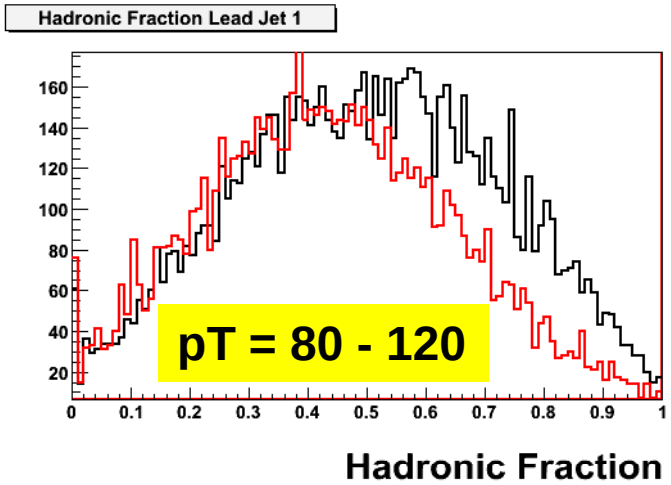


At higher pT we see fewer towers

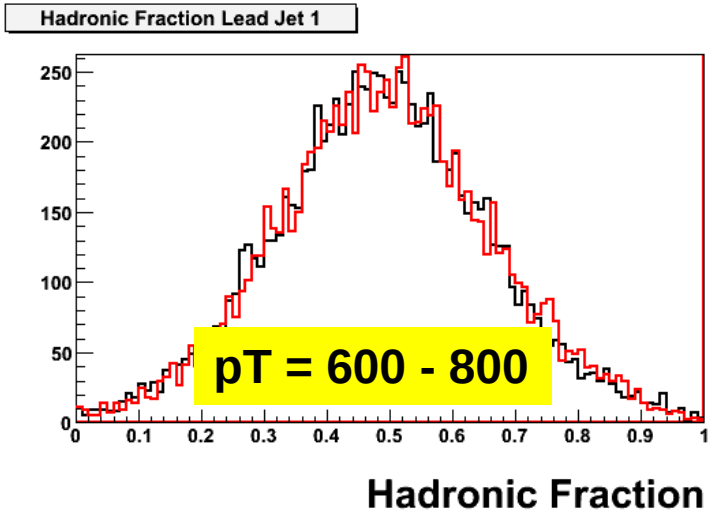


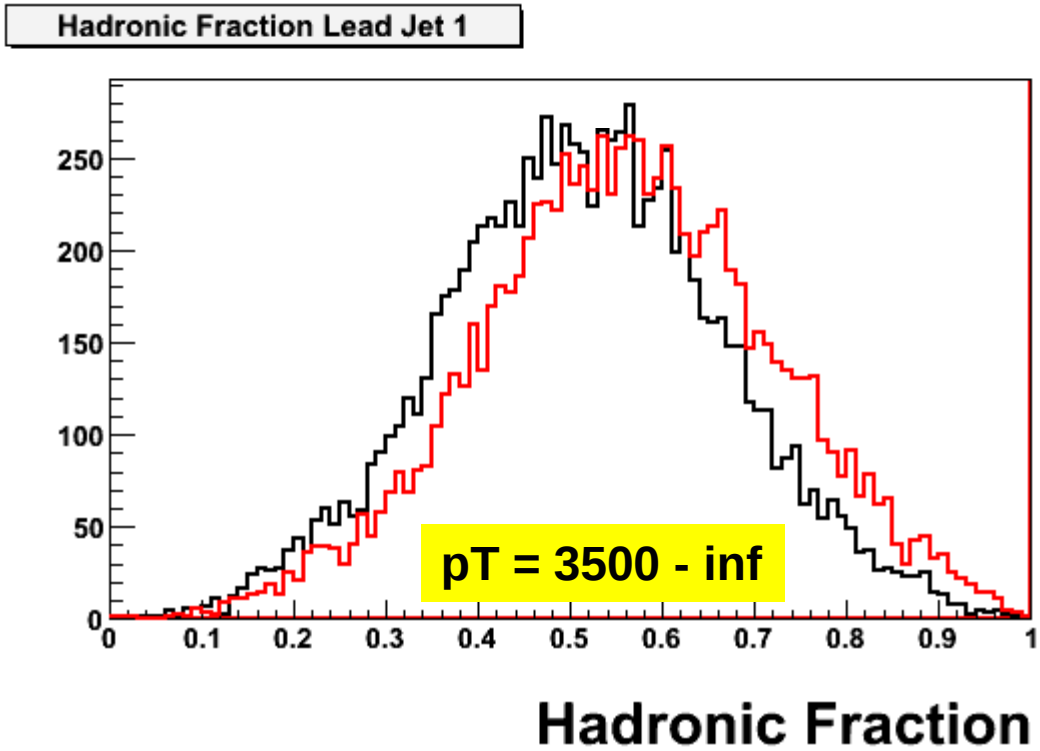
See better agreement in the low pT sample

FastSim vs FullSim



Hadronic fraction of the Leading Jet is smaller in the low pT sample and higher in the high pT sample

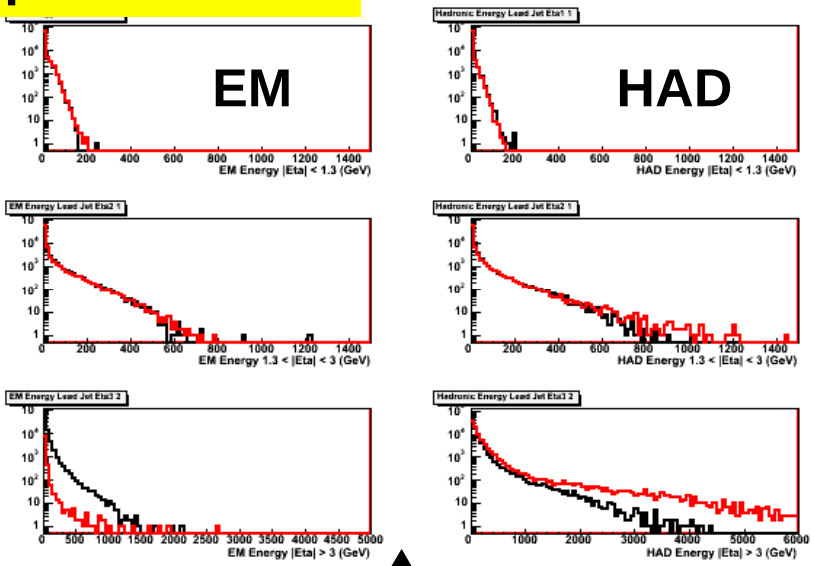




FastSim vs FullSim

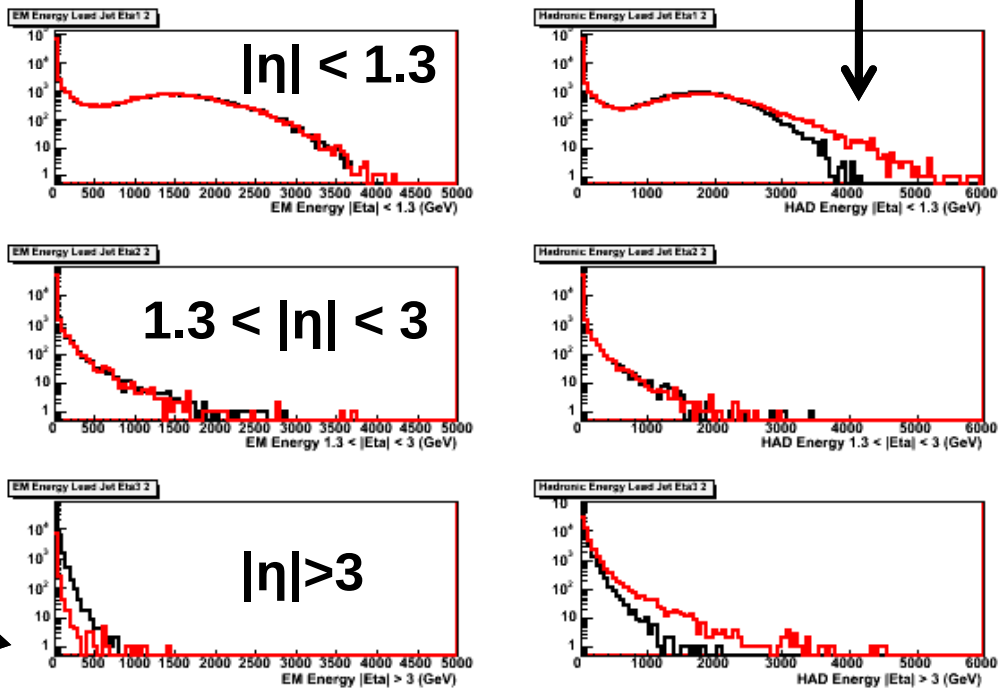
EM and HAD energy in three η regions

pT = 80 – 120



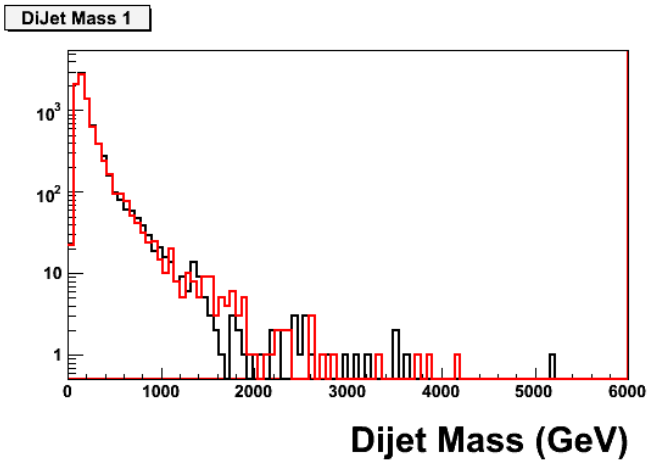
For |η| < 1.3: HAD high

pT = 3500 – inf

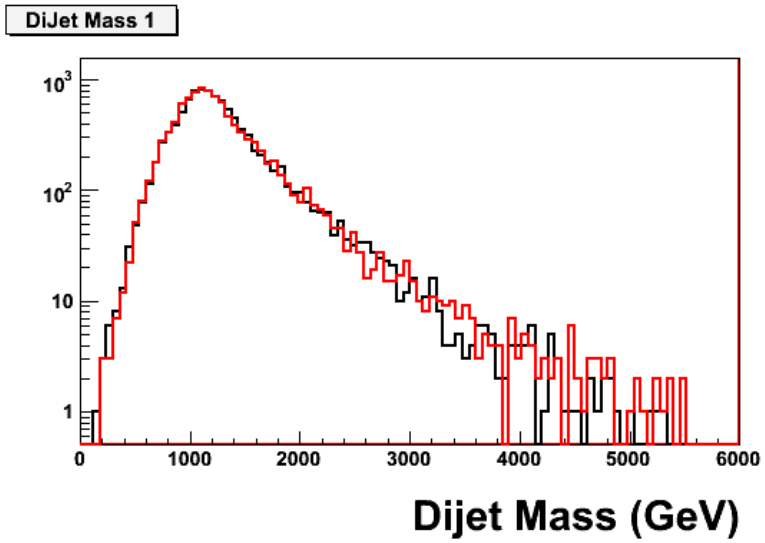


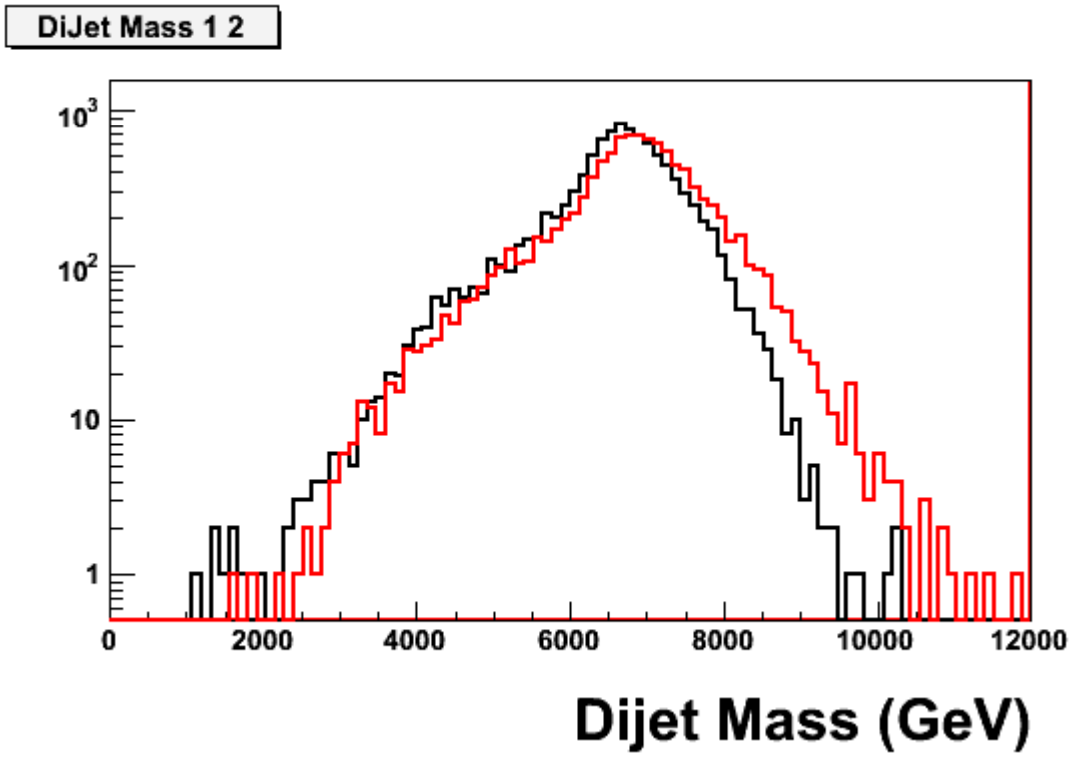
For |η| > 3: EM low, HAD high

FastSim vs FullSim

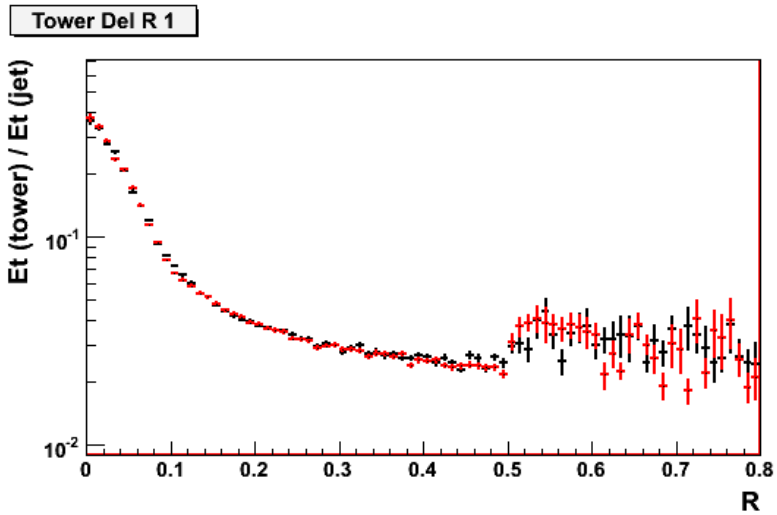


Dijet Mass from the two leading jets

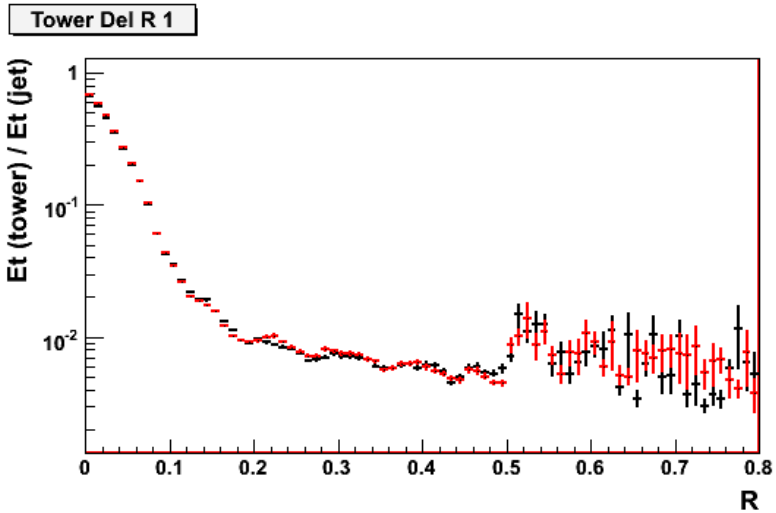


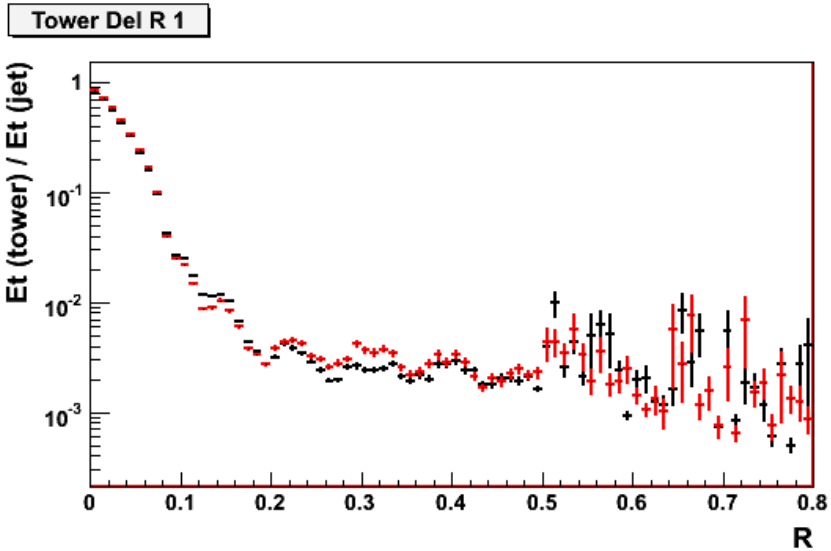


FastSim vs FullSim



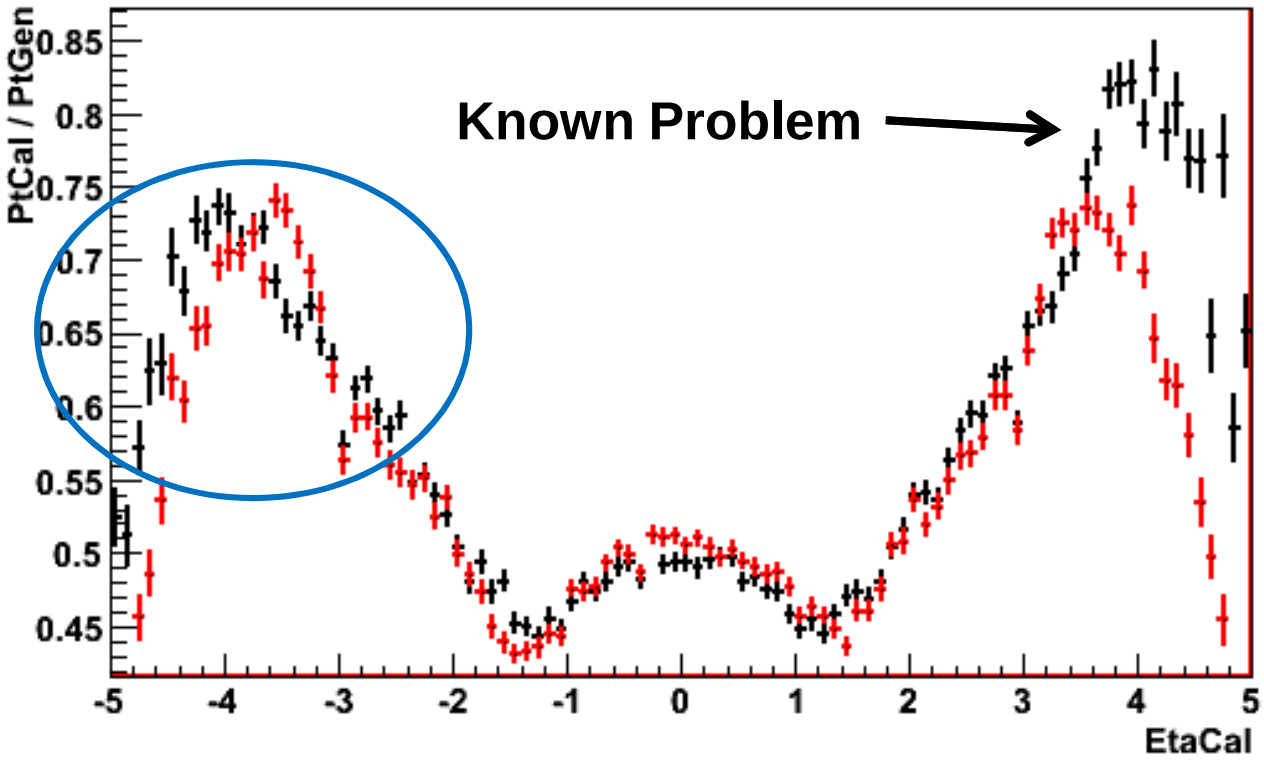
Et(tower) / Et (Jet) vs R





FastSim vs FullSim

Jet Response vs Eta

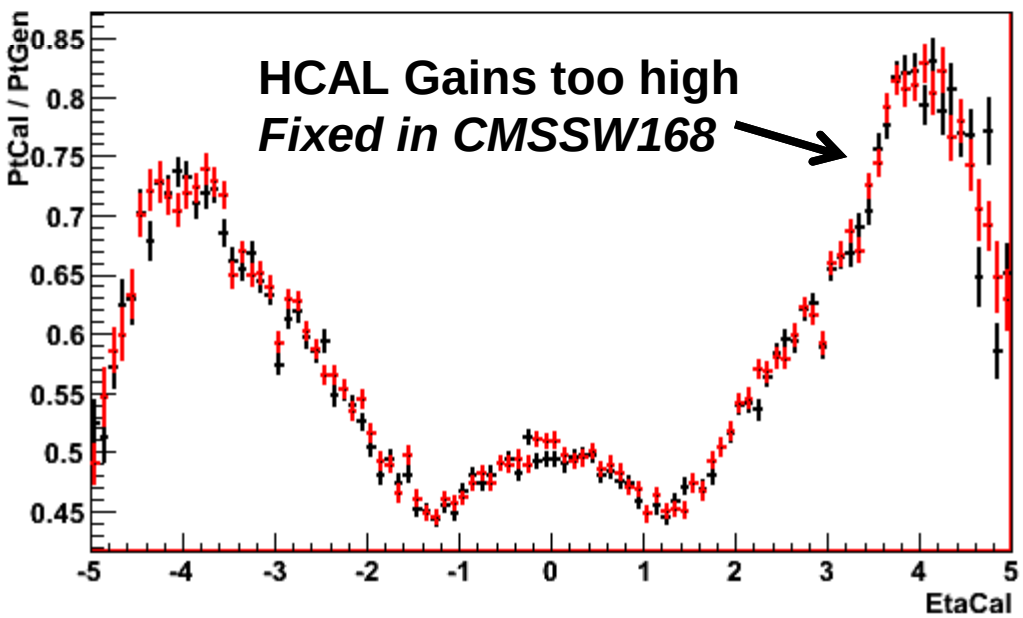


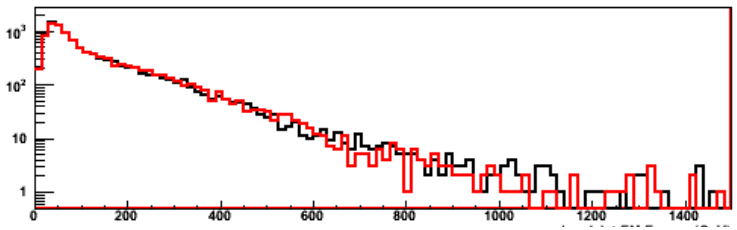
CMSSW152 vs CMSSW167

Working with the CMSSW152 samples because they are easier to get at and cover a wider pT range

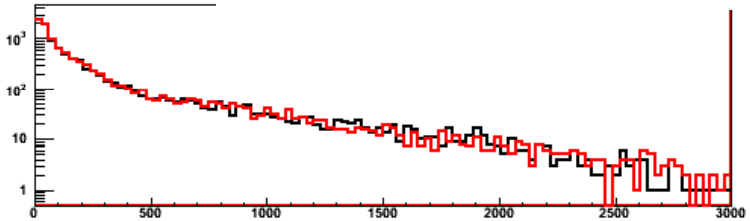
Compared CMSSW152 (black) with CMSSW167 (red), pT = (80 – 120)

→ distributions look very similar





Lead Jet EM Energy



Lead Jet HAD Energy

FastSim vs FullSim

Results have been shown to experts… several email exchanges

<u>High pT sample</u> (first time looking at high pT)

See fewer towers *and* towers *<u>have more energy</u>*

- ***Lateral shower spread***

FastSim jets are *<u>more energetic</u>*

- ***Energy scale/linearity***

FastSim jets have a *<u>larger hadronic component</u>*

- ***Longitudinal shower***

<u>Forward Region</u> (known issue)

- ***FCAL short/long fibre geometry not properly simulated***

PileUp Studies

Study pileup effects using FastSim

Saw differences in response for FastSim vs FullSim but should be ok for pileup studies

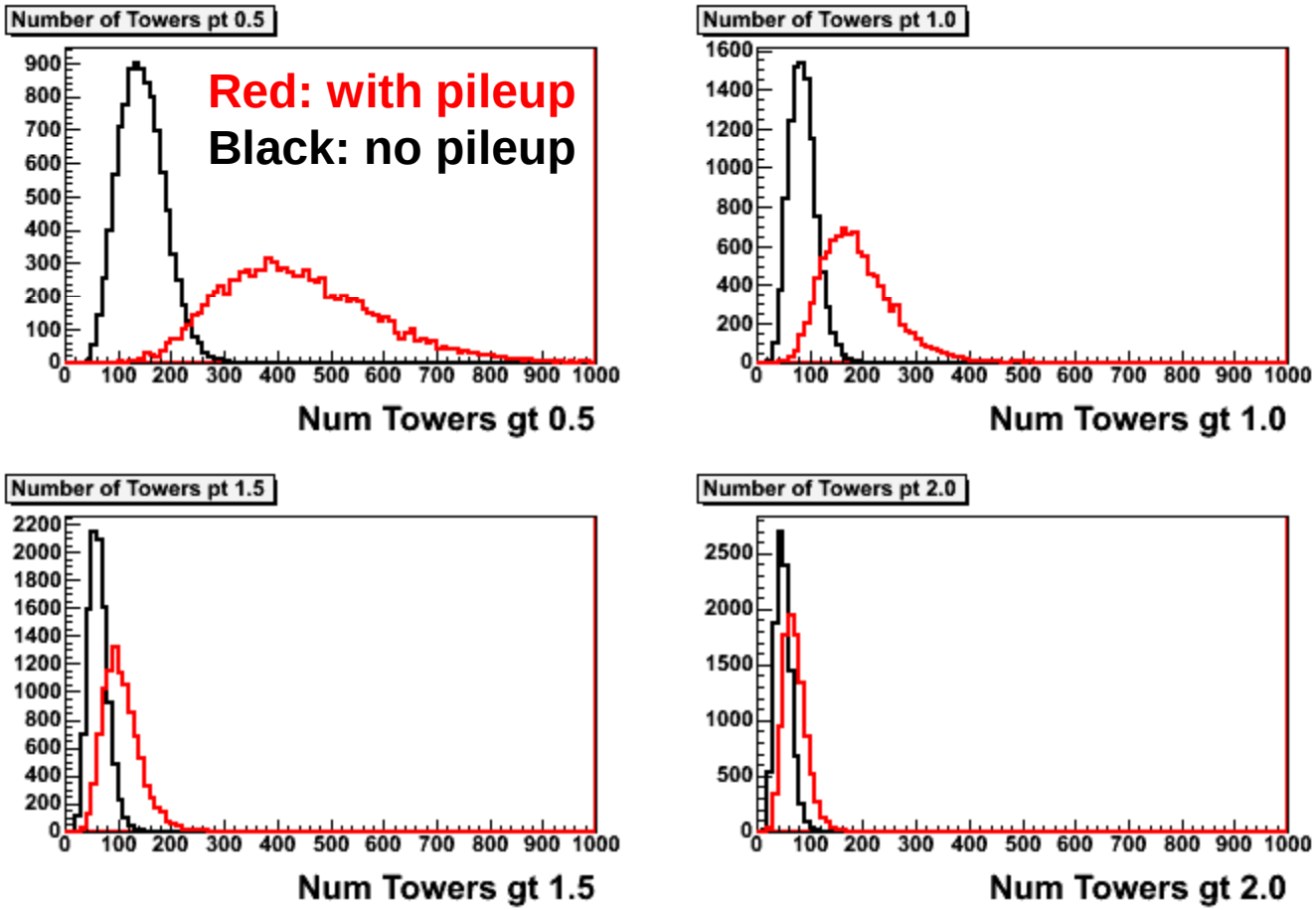
FastSim pileup simulation only includes in-time pileup

Compared evts=0 with evts=20

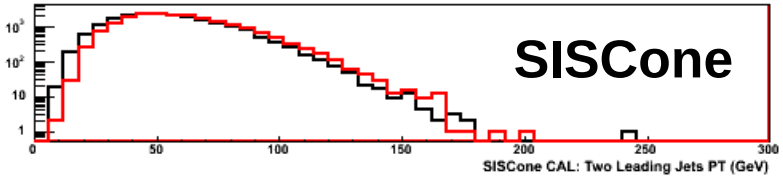
Goal is to demonstrate that the performance of SISCone is not compromised when PileUp is present (If that is really the case….)

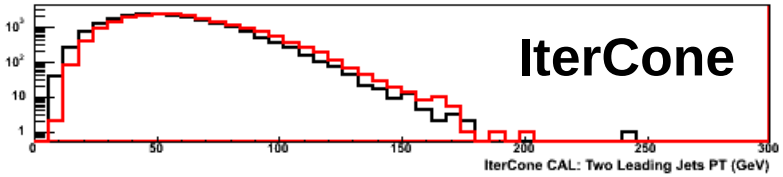
PileUp Studies

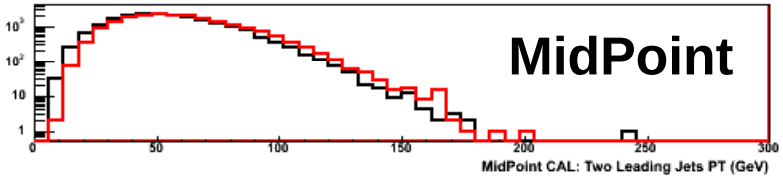
QCD: pT = 600-800 GeV



PileUp Studies

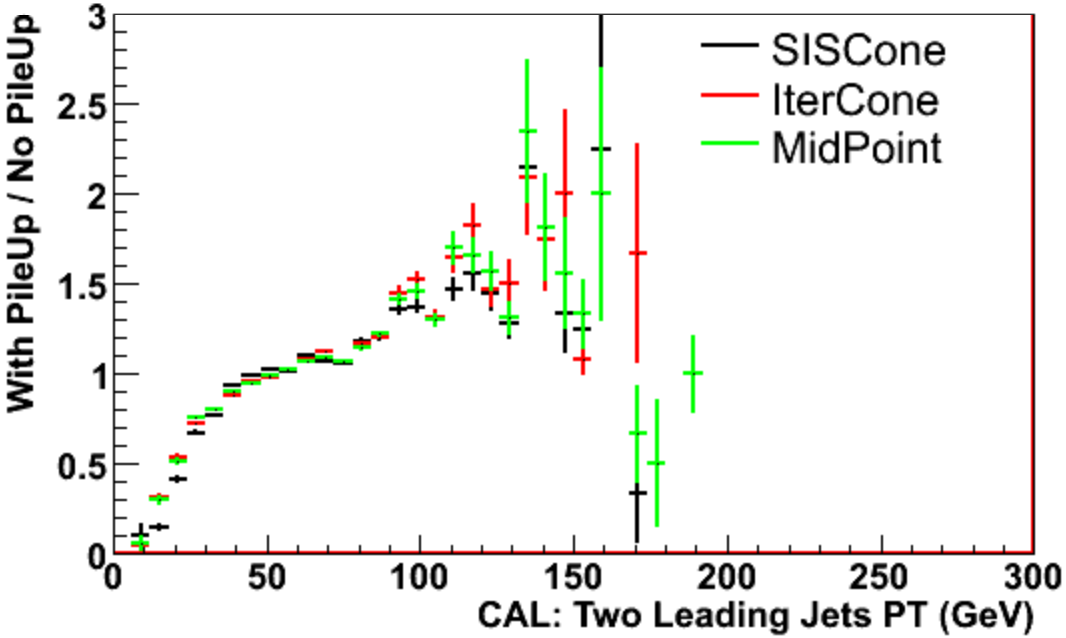






pT distribution of <u>two leading jets</u>

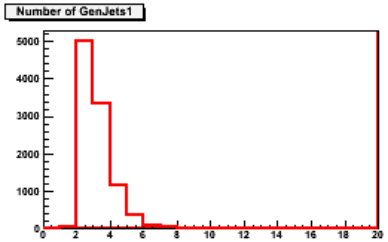
no pileup: black
with pileup : red

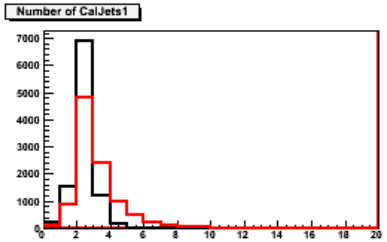


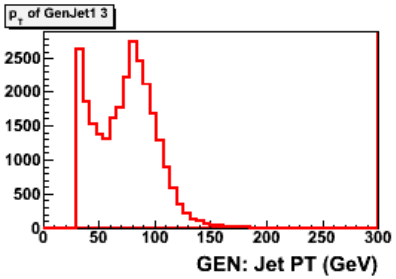
Change in the pT distribution in the presence of pileup looks similar for the different jet algorithms

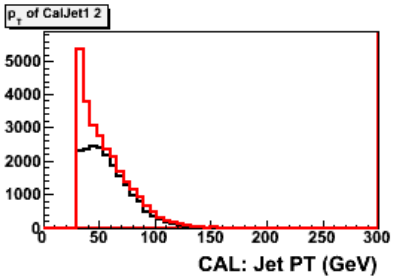
PileUp Studies

pT = 80 - 120





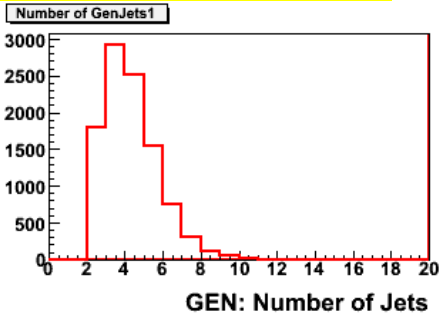


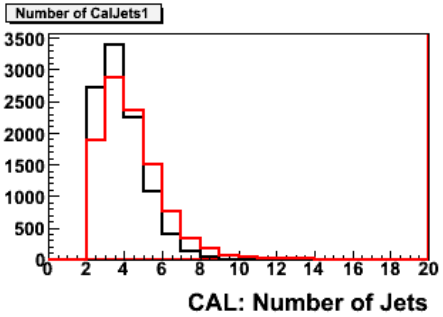


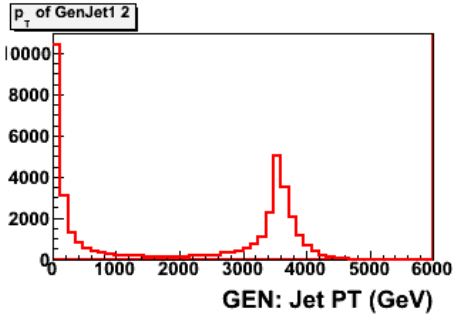
Distributions look reasonable

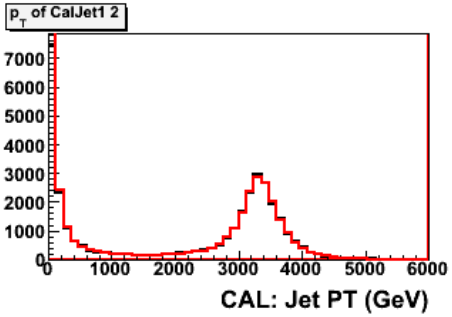
More lower pT jets (as expected)

pT = 3500 - inf

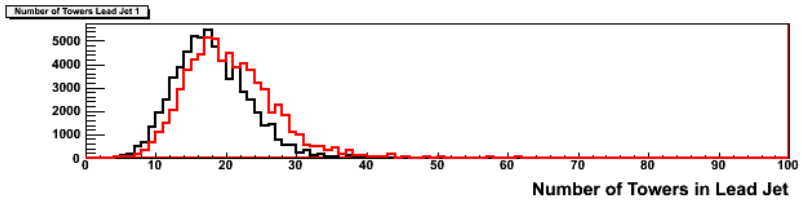


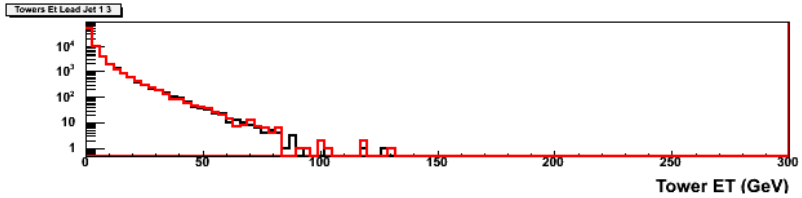


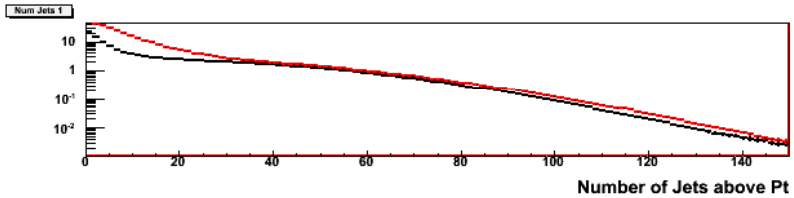




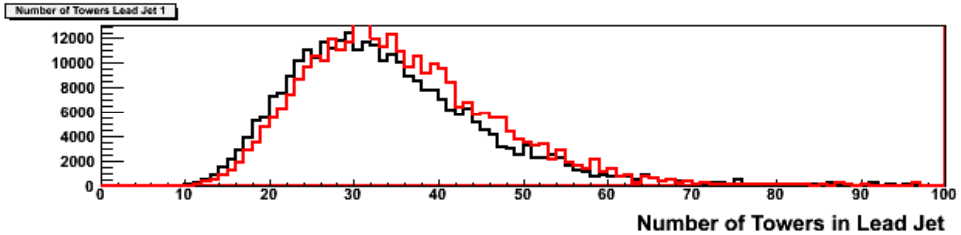
PileUp Studies

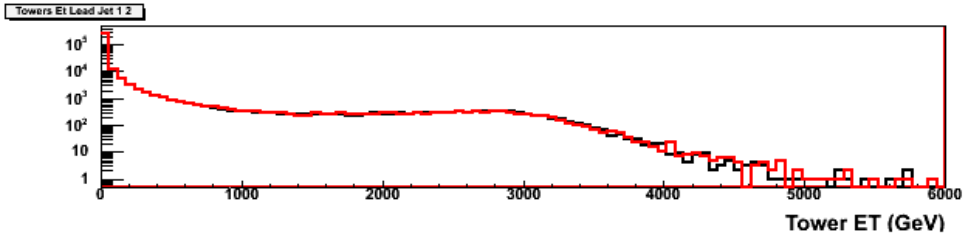


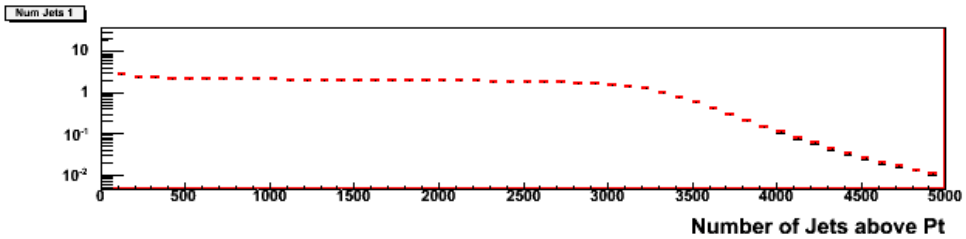




Jets have slightly more towers *(as expected)*

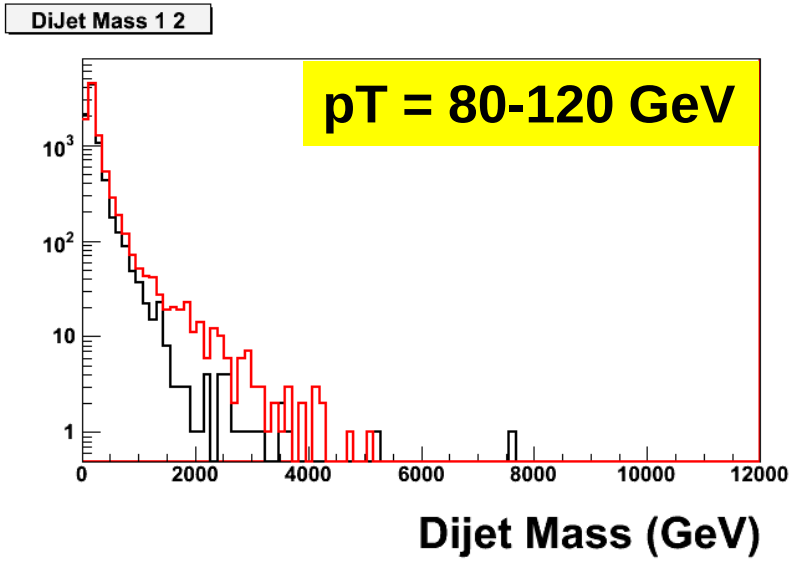


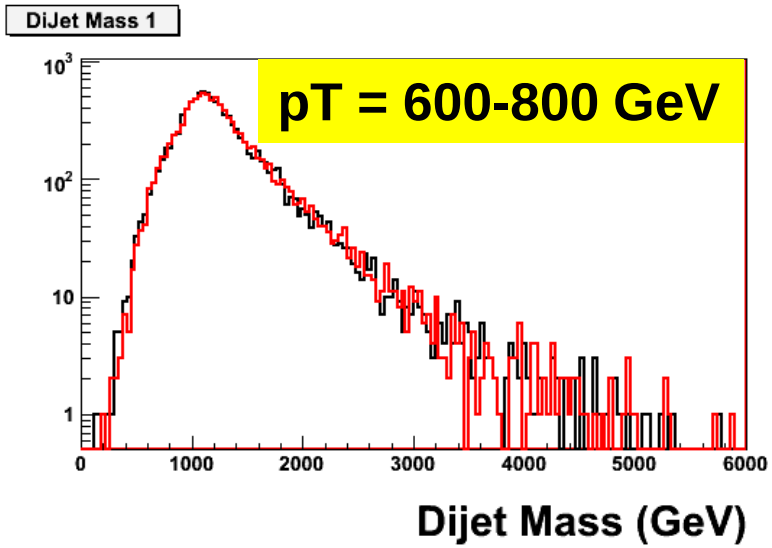




Finding more jets with lower pT

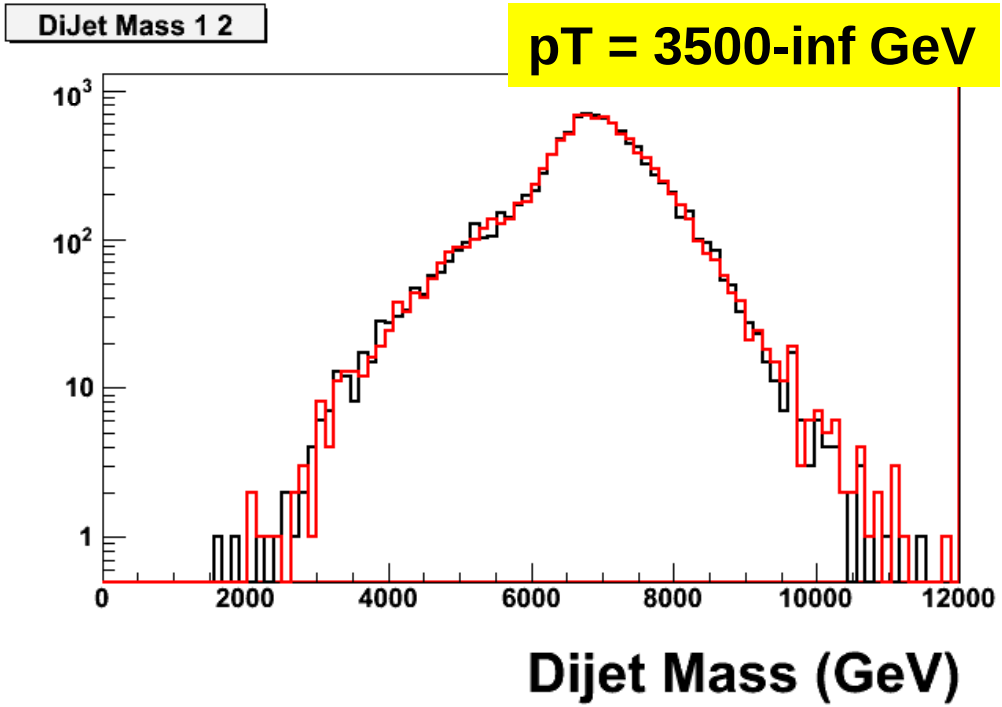
PileUp Studies



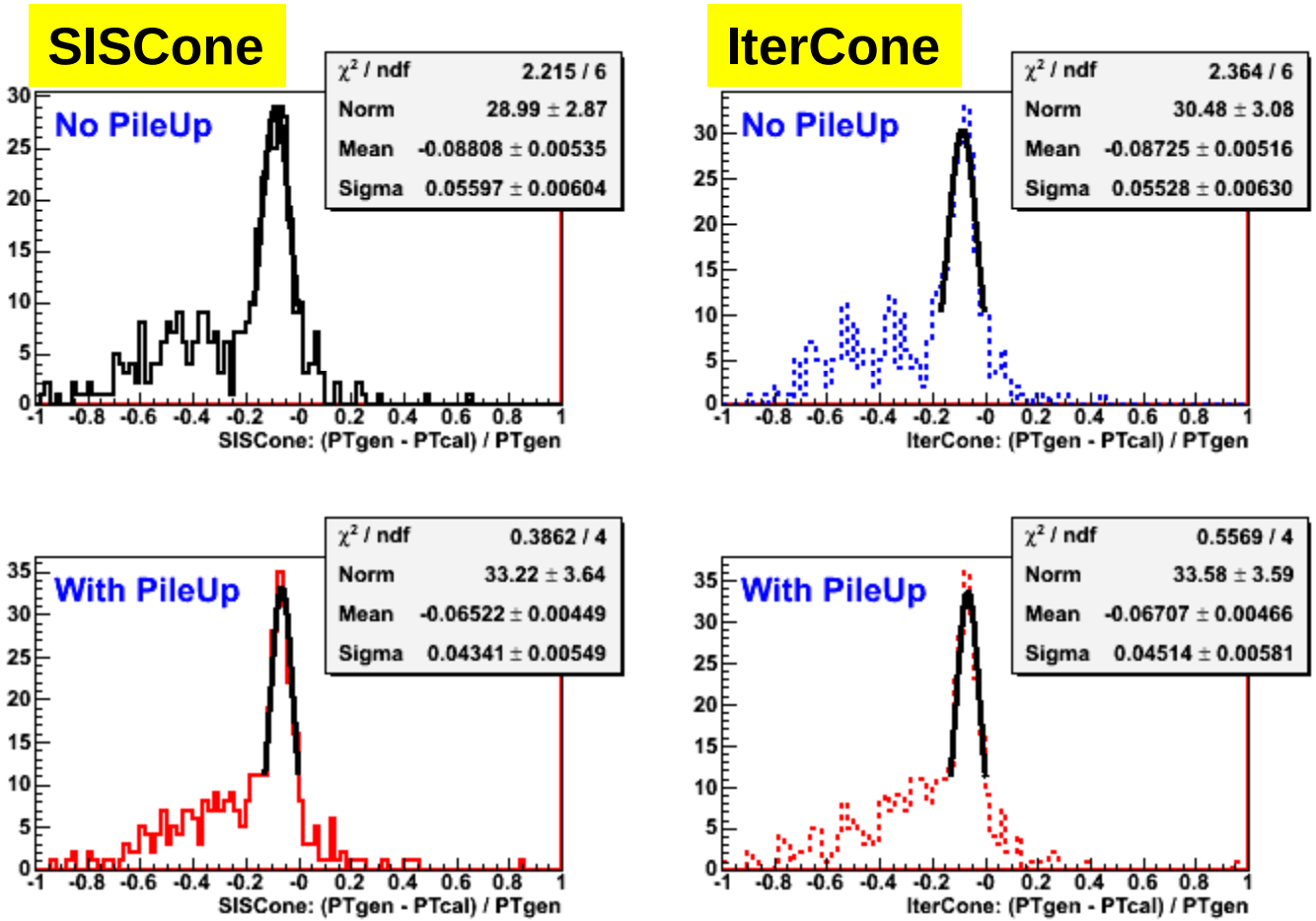


Dijet mass determined from the two leading jets

Similar distributions with and without pileup…



pT Resolution



PileUp Studies: Summary

Using FastSim to study the effects of PileUp on the jet algorithms

So far see that results for SISCone, MidPoint, and IterCone are very similar

More plots can be found at:

http://ncdf76.fnal.gov/~chlebana/CMS/PileUp