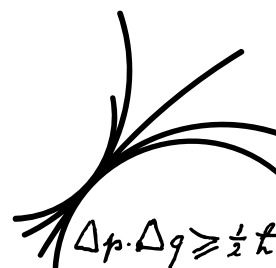




Comparison of FullSim and ATLFAST-II for Release 14

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■ Fast sim

mc08.105200.T1_McAtNlo_Jimmy.recon.AOD.e357_a68

■ Full sim (with HEC quadrant disabled)

mc08.105200.T1_McAtNlo_Jimmy.recon.AOD.e357_s462_r541

■ Full sim (with HEC quadrant enabled)

mc08.105200.T1_McAtNlo_Jimmy.recon.AOD.e357_s462_r579

Used ~150k events from each datasets, corresponding to $\sim 600\text{pb}^{-1}$ @ 10 TeV

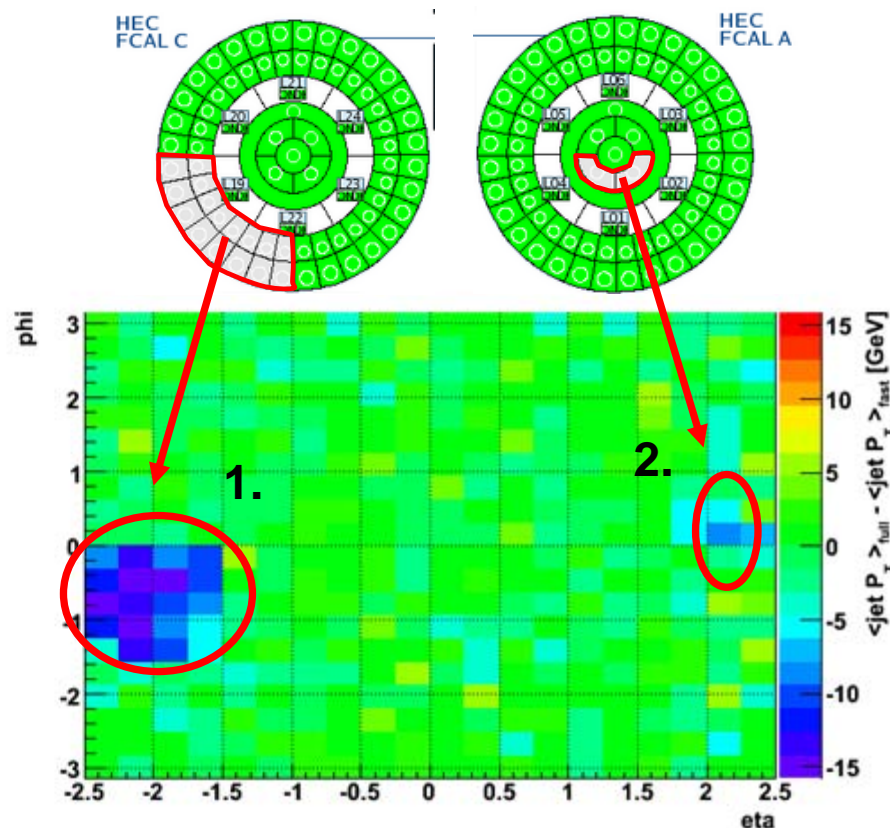
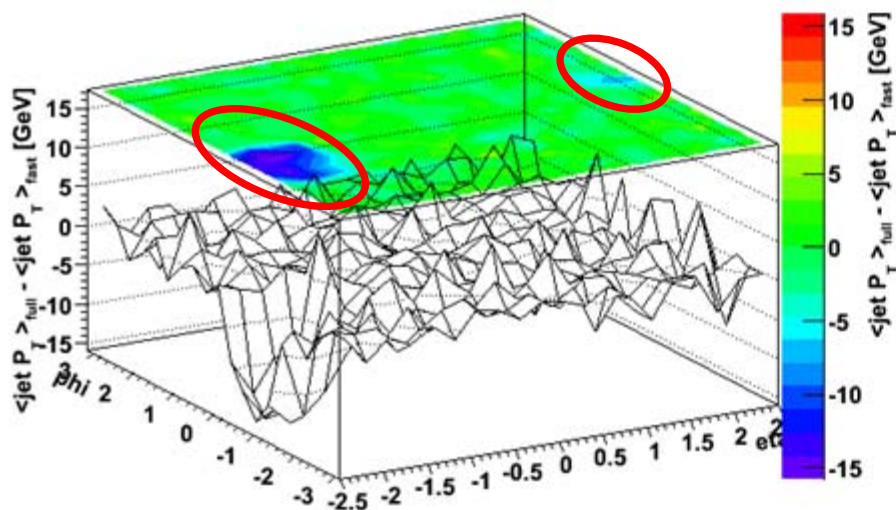
average jet pt vs eta, phi (HEC Q off)

Comparison of full (HEC Q off) and fast simulation:

- 1) Large discrepancies due to missing HEC quadrant observed in ECC
- 2) There is also an additional piece of the HEC off in ECA (FEB off)

As a consequence, jet P_T , jet η , missing E_T and missing $E_T \phi$ spectra are different.

This yields also discrepancies in the event selection efficiencies



In the plots: difference of the average jet P_T in full and fast sim, in the eta-phi plane

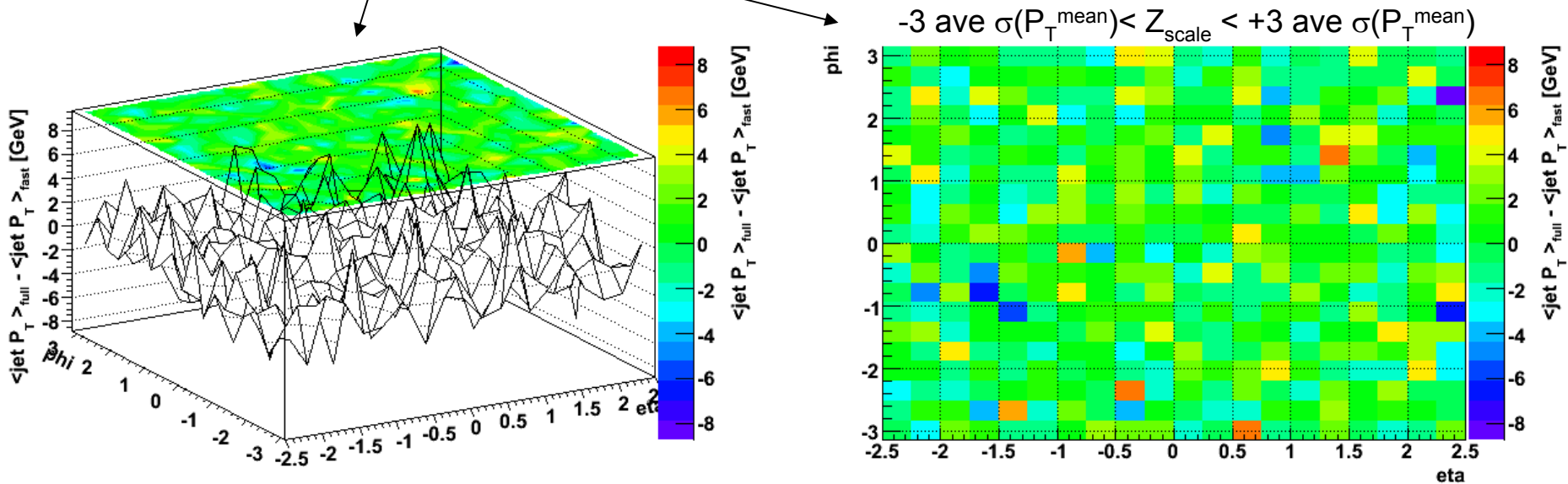
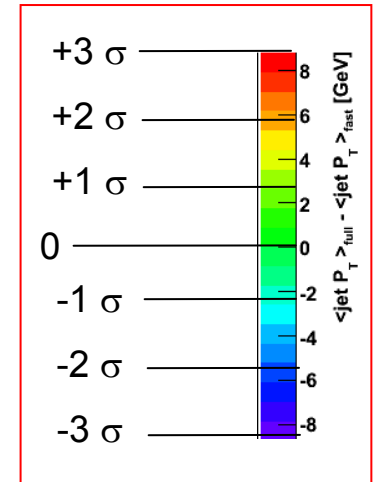
average jet pt vs eta, phi (HEC Q on)

Comparison of full and fast simulation with the complete detector

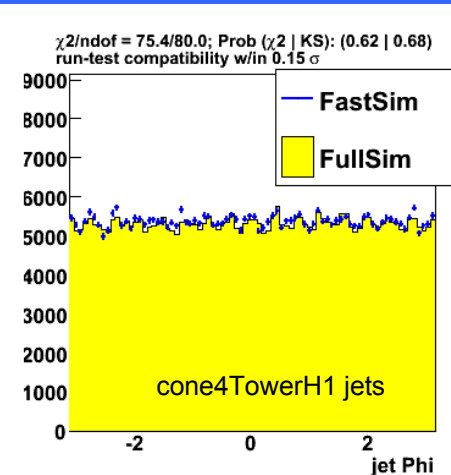
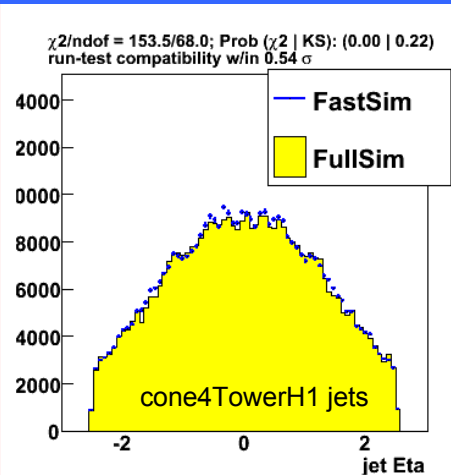
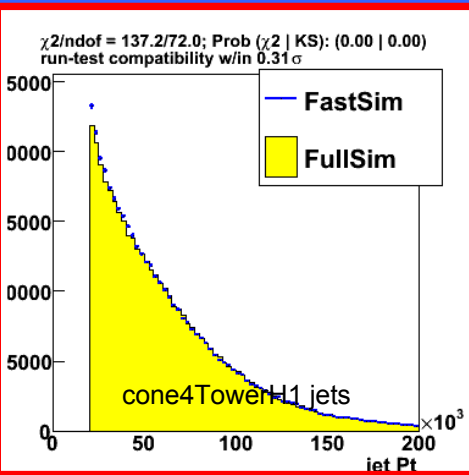
No clear structure visible in the eta-phi plane!
THIS IS GOOD!

The discrepancies of the mean P_T vs eta-phi
are within their uncertainty.

No systematic shift is observed in any
particular region

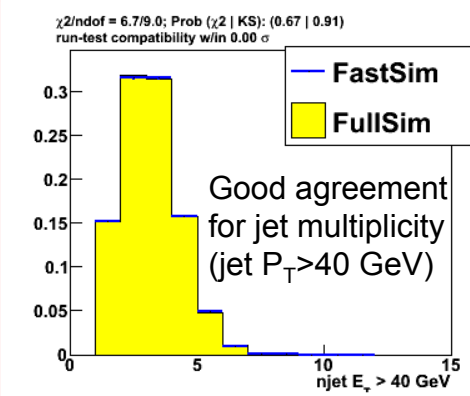
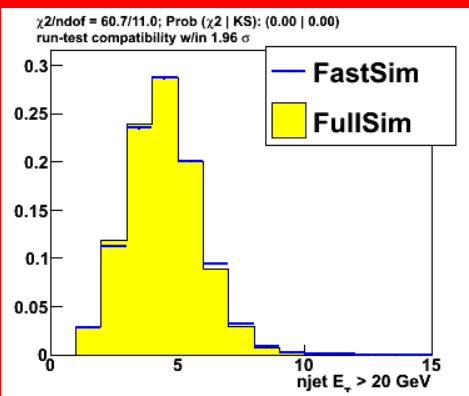


average jet pt vs eta, phi (HEC Q on)



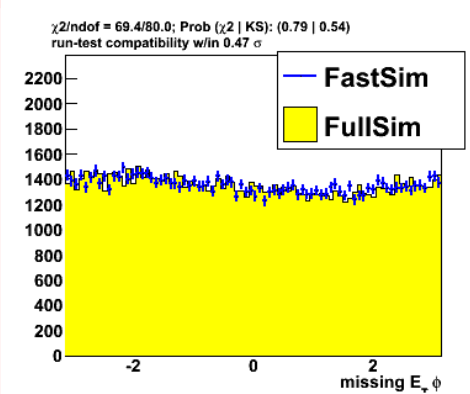
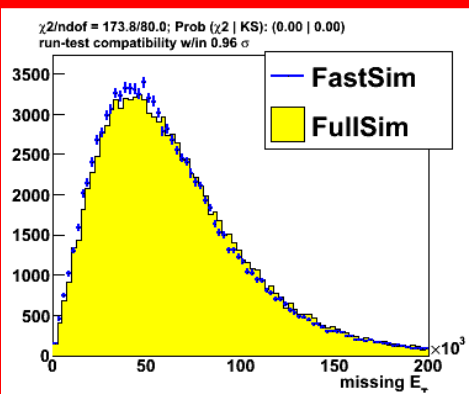
but still fast sim finds more low P_T jets (this is reflected in the MET distribution too)

Met ϕ distribution ok.

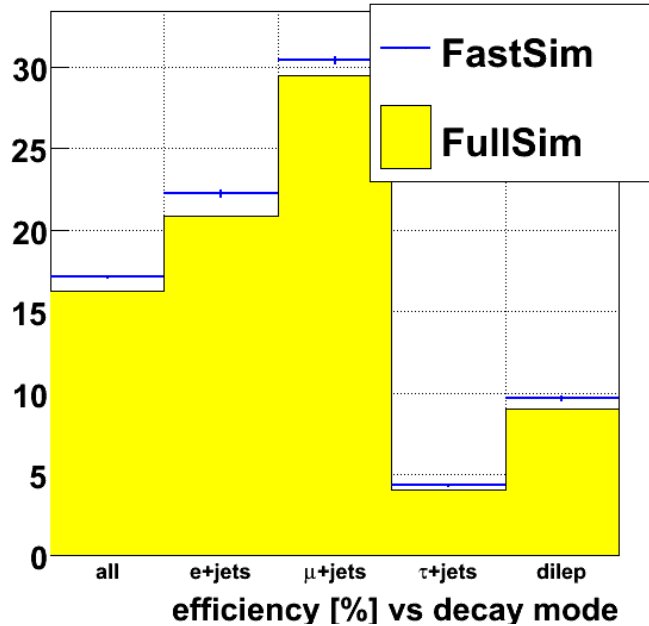


in these plots = bad

- Kolmogorov-Smirnov test: sensitive to shape differences
- χ^2 test: sensitive to both normalization and shape
- run-test: checks for the number of zones in which the two histograms are systematically above or below each other. Returns the compatibility within a given σ .

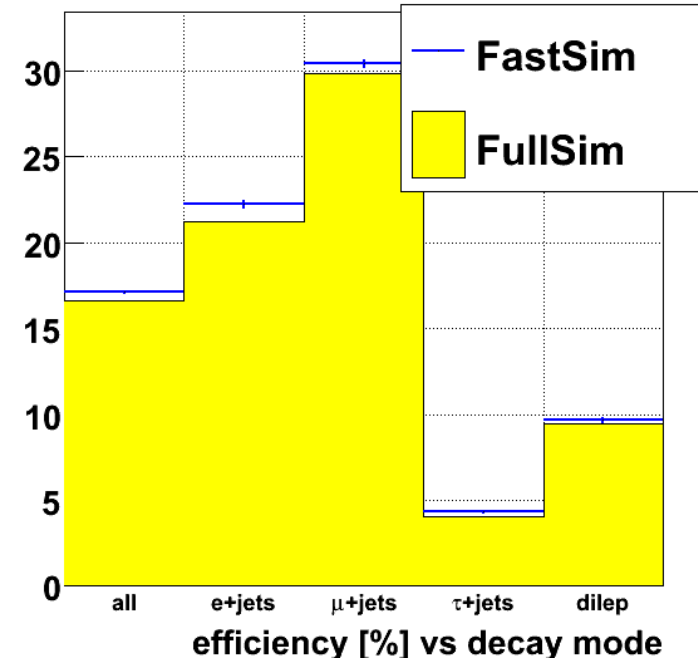


selection efficiencies



HEC Q off

HEC Q on



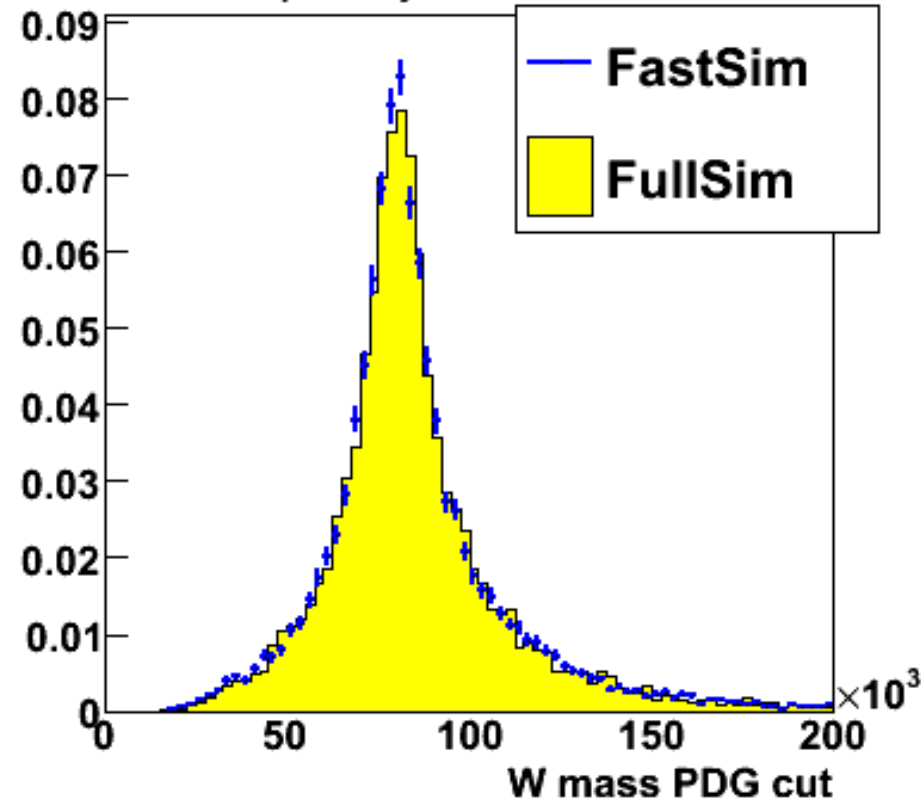
$\Delta\varepsilon$	all	e+jets*	μ+jets	τ+jets*	dilep*
HEC Q off	-5.1 ± 0.6	-6.7 ± 1.2	-3.1 ± 0.9	-6.7 ± 3.2	-6.6 ± 2.2
HEC Q on	-3.2 ± 0.6	-4.8 ± 1.2	-1.8 ± 0.9	-7.0 ± 3.2	-2.3 ± 2.2

where $\Delta\varepsilon = (\varepsilon^{\text{Full}} - \varepsilon^{\text{Fast}}) / \varepsilon^{\text{Full}}$

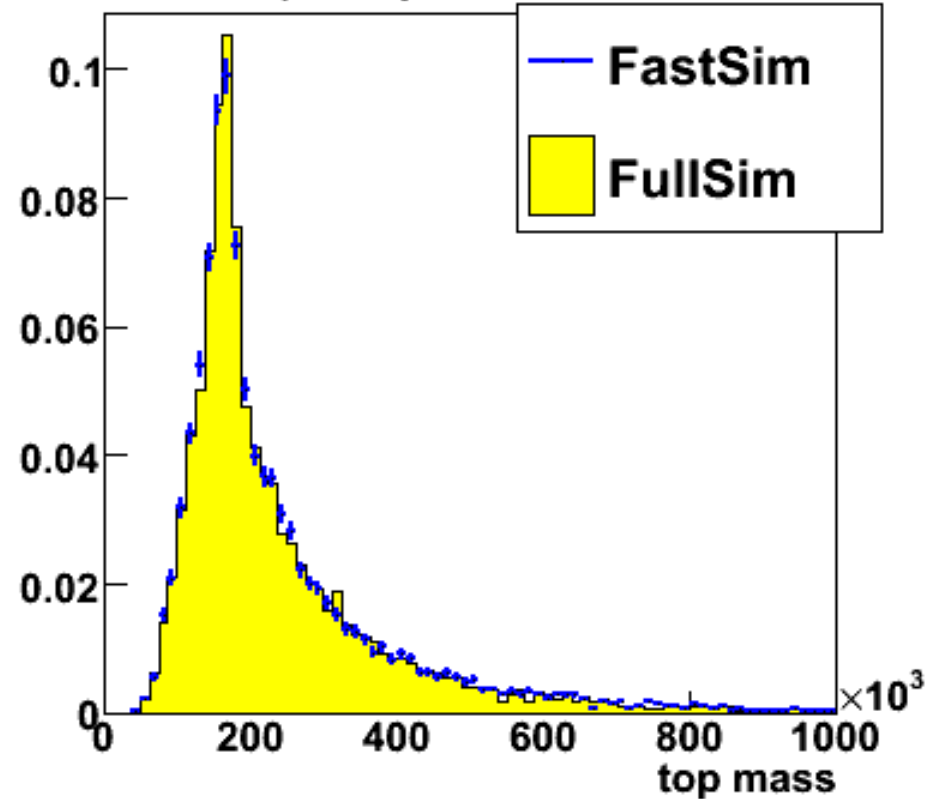
*AOD→AOD corrections for e/tau are not applied yet in fast sim

top and W mass HEC Q on

$\chi^2/\text{ndof} = 92.3/73.0$; Prob (χ^2 | KS): (0.06 | 0.89)
run-test compatibility w/in 0.09σ



$\chi^2/\text{ndof} = 71.0/77.0$; Prob (χ^2 | KS): (0.67 | 0.90)
run-test compatibility w/in 0.08σ



W and top mass shapes seem reasonable. We can use the shapes of the Fast sim and then calculate systematic uncertainties with respect to the Full simulation in the template method.

hand-made jet collections (skimming)

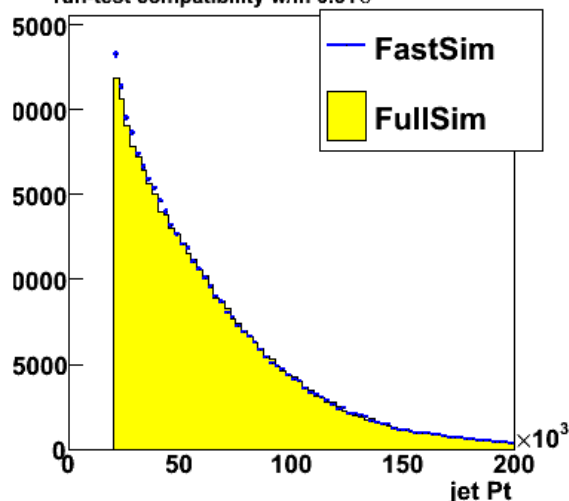
- In the AOD Cone4TowerH1 jets are present (were used in comparison shown in previous slides)
- During skimming we run new jet algorithms .
 - Kt4LCTopo
 - Cone4LCTopo
 - Fast jet etc..

Are jet distributions between fast and full simulation ok after jet remaking?

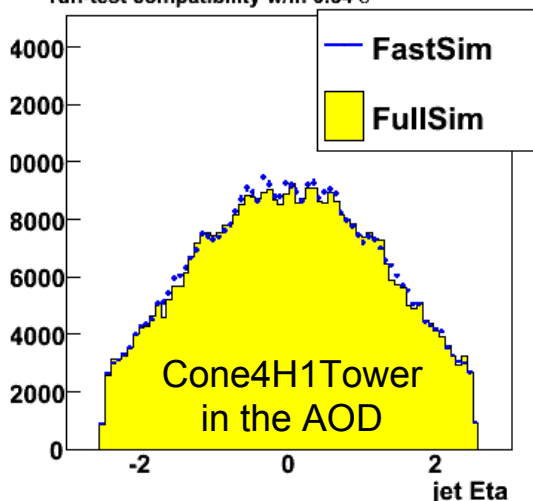
hand-made jet collections (skimming)

Comparison of Cone4H1Tower jets (in AODs) and Cone4LCTopo jets (hand-made from AODs) quantities between fast and full simulation:

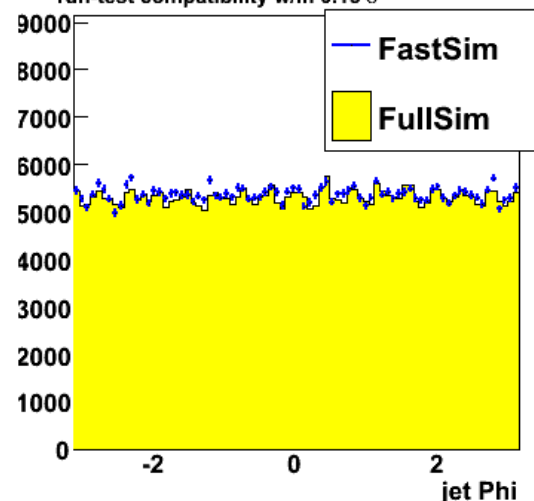
$\chi^2/\text{ndof} = 137.2/72.0$; Prob (χ^2 | KS): (0.00 | 0.00)
run-test compatibility w/in 0.31σ



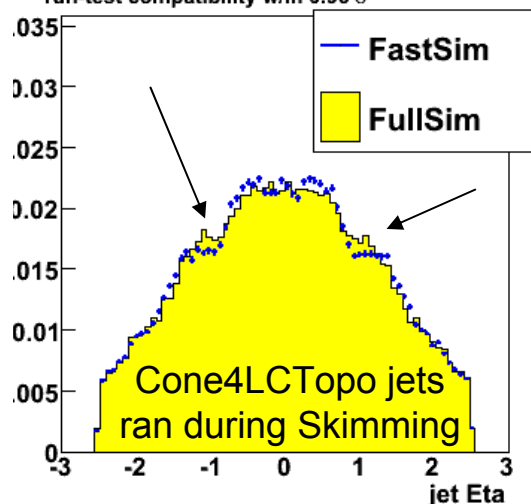
$\chi^2/\text{ndof} = 153.5/68.0$; Prob (χ^2 | KS): (0.00 | 0.22)
run-test compatibility w/in 0.54σ



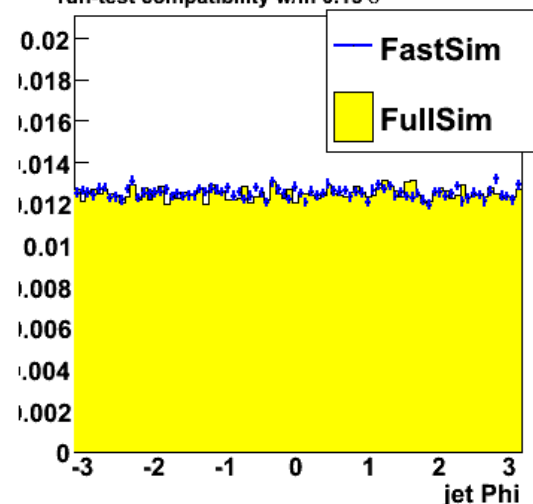
$\chi^2/\text{ndof} = 75.4/80.0$; Prob (χ^2 | KS): (0.62 | 0.68)
run-test compatibility w/in 0.15σ



$\chi^2/\text{ndof} = 264.2/68.0$; Prob (χ^2 | KS): (0.00 | 0.00)
run-test compatibility w/in 0.96σ



$\chi^2/\text{ndof} = 103.4/80.0$; Prob (χ^2 | KS): (0.04 | 0.25)
run-test compatibility w/in 0.15σ



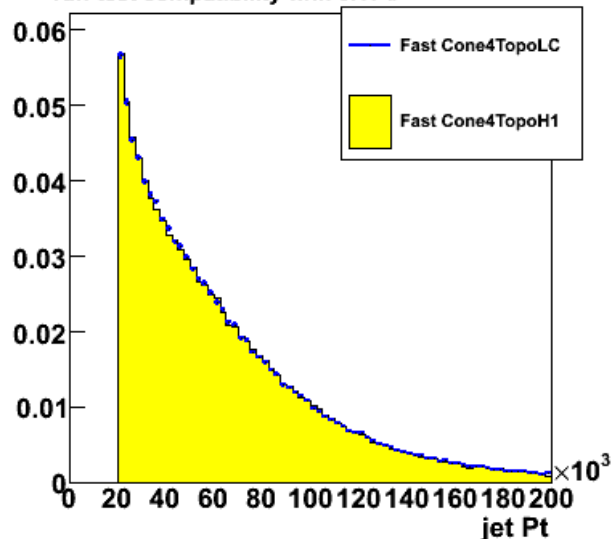
Clear disagreement in the jet Eta distributions... probably due to clusters differences between Fast and Full simulation (not due to calibrations themselves, see following slide)

in AODs

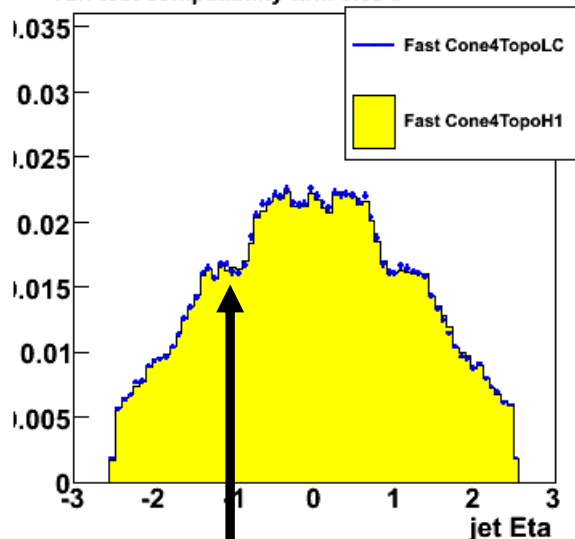
after skimming

hand-made jet collections (skimming)

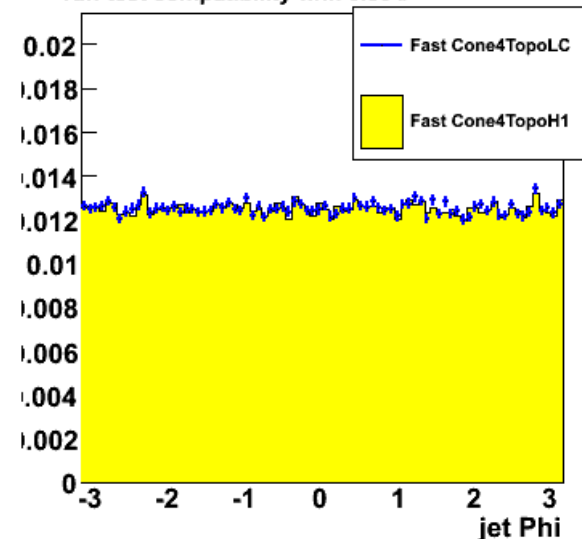
$\chi^2/\text{ndof} = 49.6/72.0$; Prob (χ^2 | KS): (0.98 | 0.60)
run-test compatibility w/in 0.17σ



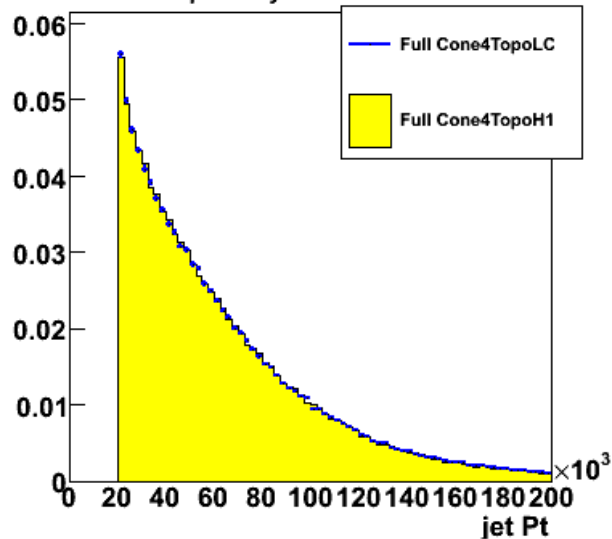
$\chi^2/\text{ndof} = 31.2/68.0$; Prob (χ^2 | KS): (1.00 | 0.69)
run-test compatibility w/in 0.65σ



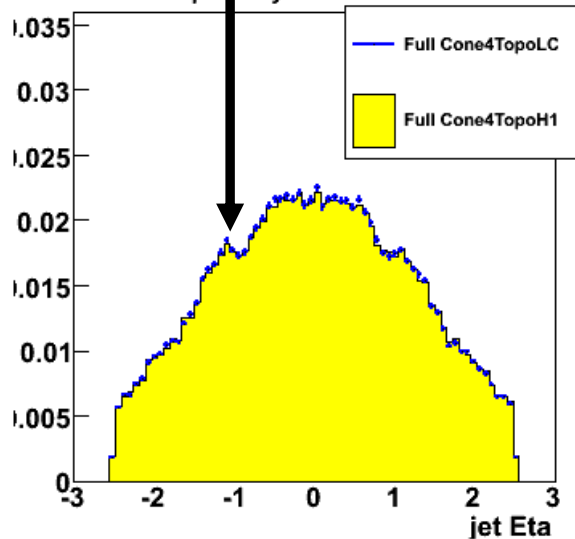
$\chi^2/\text{ndof} = 26.4/80.0$; Prob (χ^2 | KS): (1.00 | 1.00)
run-test compatibility w/in 0.80σ



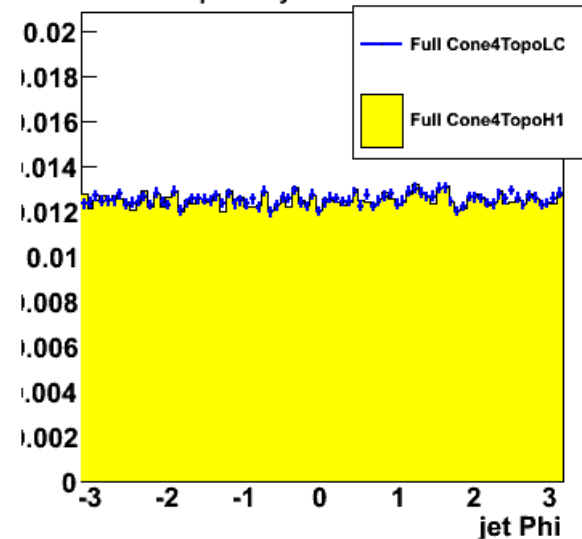
$\chi^2/\text{ndof} = 69.3/72.0$; Prob (χ^2 | KS): (0.57 | 0.97)
run-test compatibility w/in 0.16σ



$\chi^2/\text{ndof} = 36.8/68.0$; Prob (χ^2 | KS): (1.00 | 0.95)
run-test compatibility w/in 0.02σ



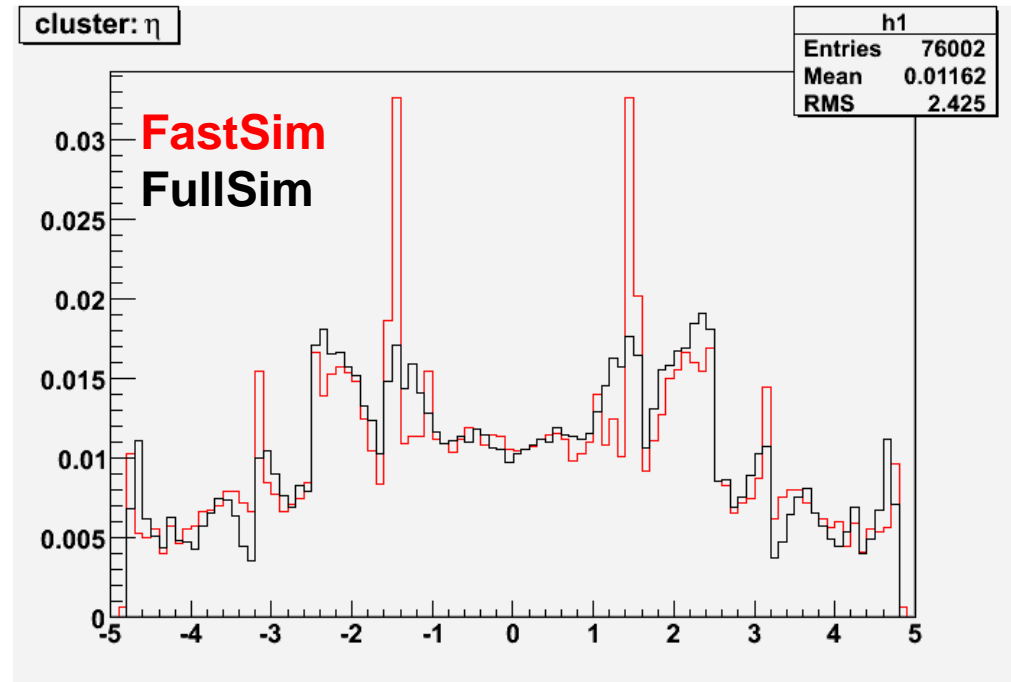
$\chi^2/\text{ndof} = 34.4/80.0$; Prob (χ^2 | KS): (1.00 | 1.00)
run-test compatibility w/in 0.40σ



Different calibration LC or H1 do not contribute to the difference

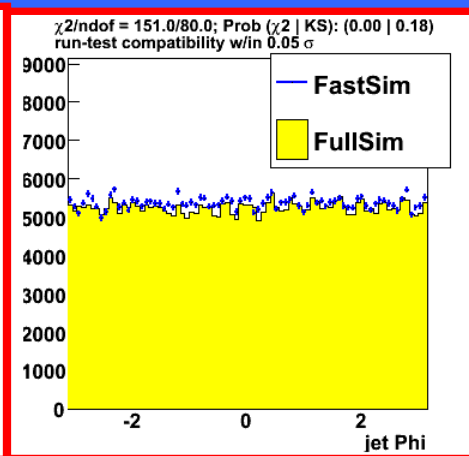
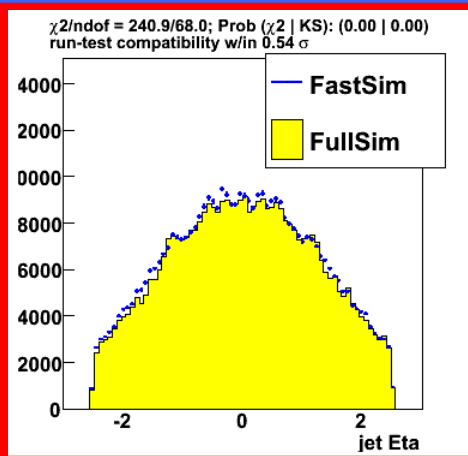
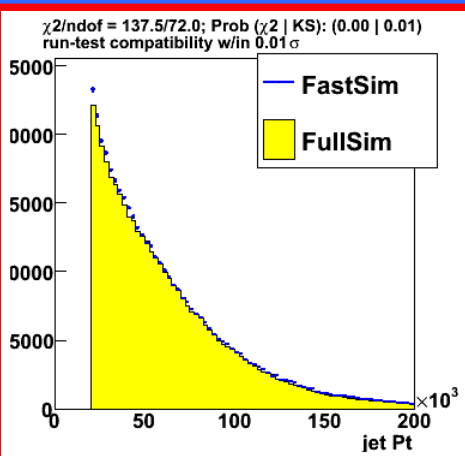
- Atlfast-II shows better agreement w.r.t. full simulation with HEC quadrant back on
- Atlfast-II still reconstructs more jets at low P_T with respect to the full simulation (especially in the region 20-40 GeV)
- Discrepancies in event selections are at the level of 3% considering full sim with the complete detector
- In general top/W mass shapes are in good agreement between full and fast sim
- The analysis suggests that no large bias/syst due to the use of Atlfast-II is expected in top mass measurements when using jet collection in the AODs (will further check this in the future). This needs to be confirmed for more than one mass point.

- When re-making jets during skimming, the agreement between AtfastII and Full simulation is largely reduced
- Preliminary investigations appear to indicate a problem in the clusters (see Andreas' checks)
- We will need to further understand this before relying on AtfastII jets collections in skimmed samples

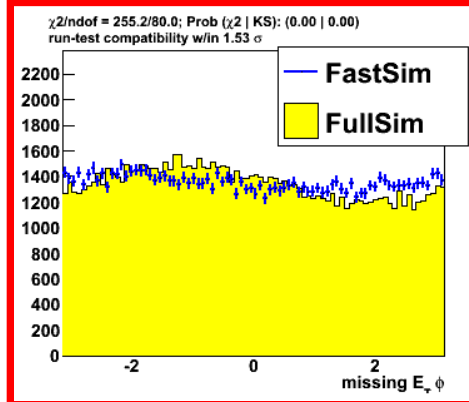
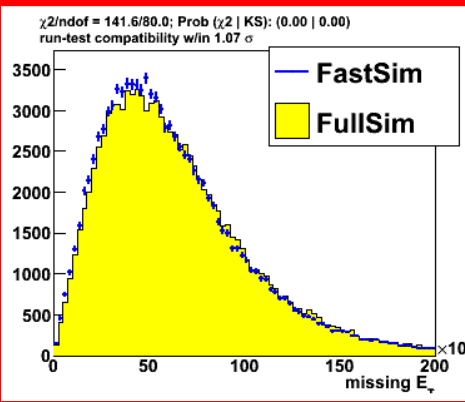
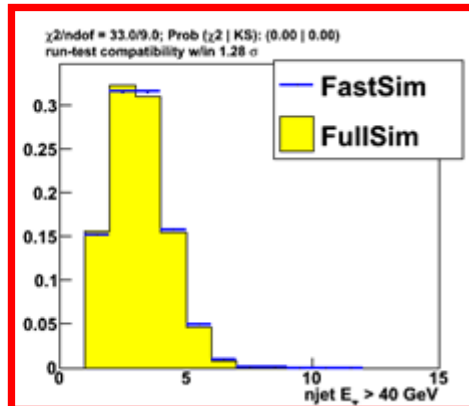
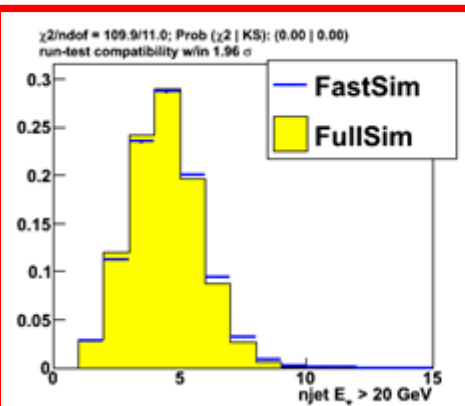


- backup slides -

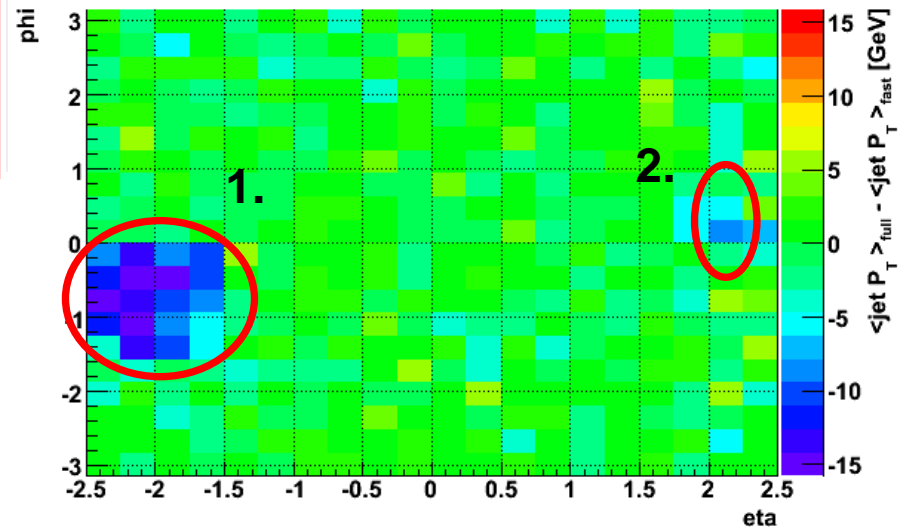
average jet pt vs eta, phi (HEC Q off)



- Kolmogorov-Smirnov test: sensitive to shape differences
- χ^2 test: sensitive to both normalization and shape
- run-test: checks for the number of zones in which the two histograms are systematically above or below each other. Returns the compatibility within a given σ .

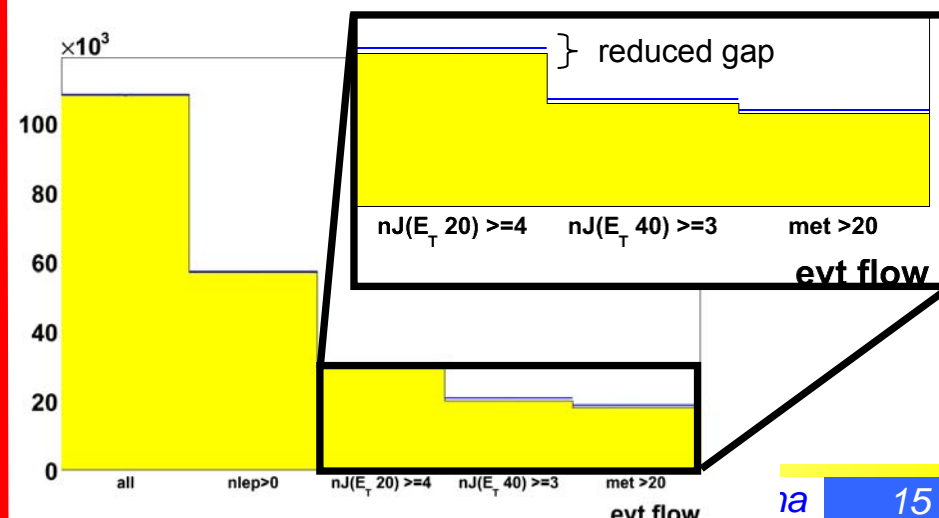
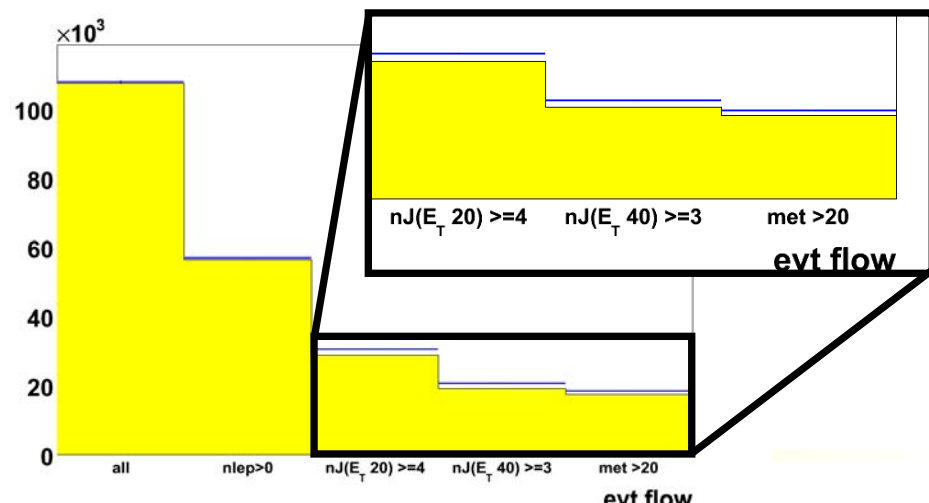
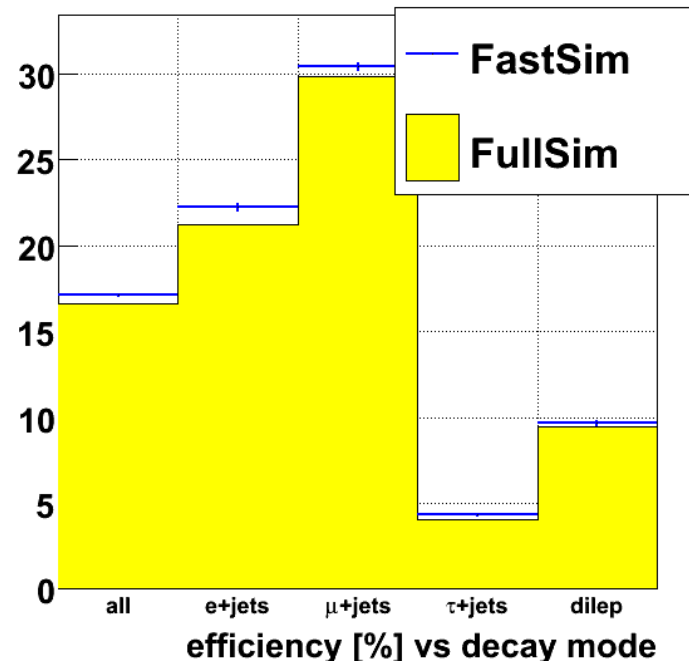
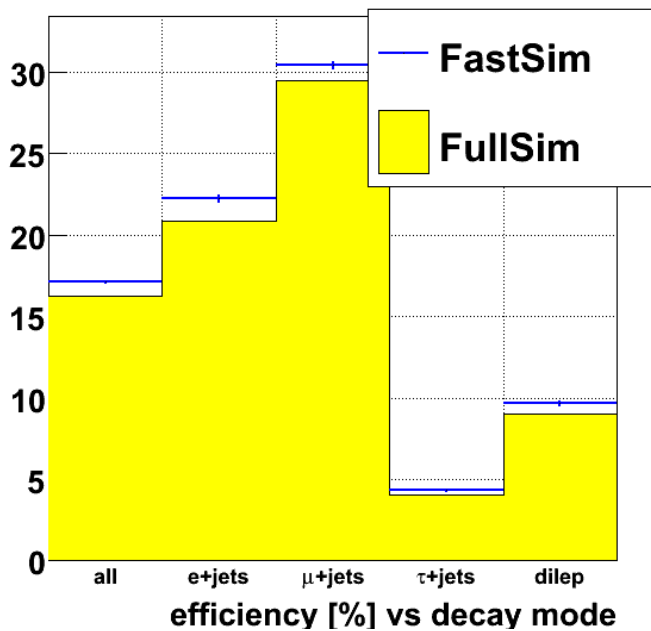


in these plots = bad



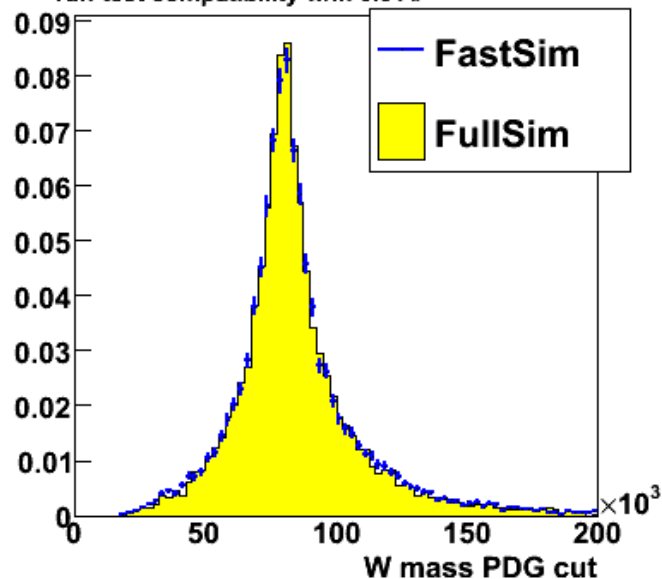
selection efficiencies/evt flow

HEC Q off
HEC Q on



top and W mass

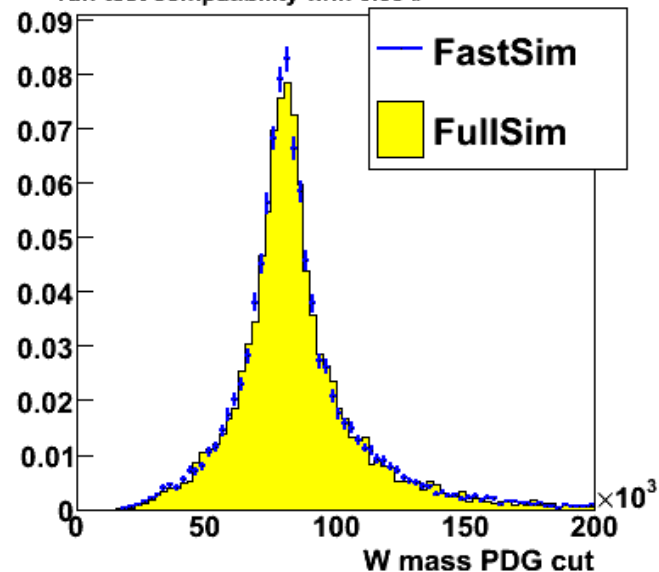
$\chi^2/\text{ndof} = 75.6/72.0$; Prob (χ^2 | KS): (0.36 | 0.61)
run-test compatibility w/in 0.01σ



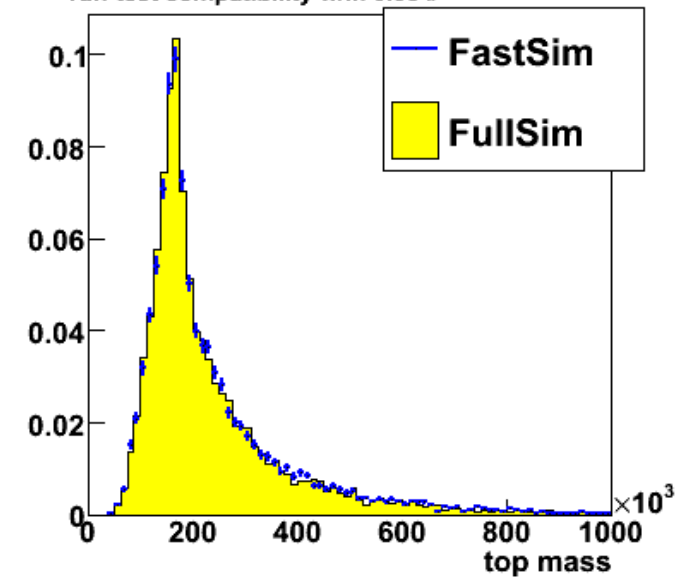
HEC Q off

HEC Q on

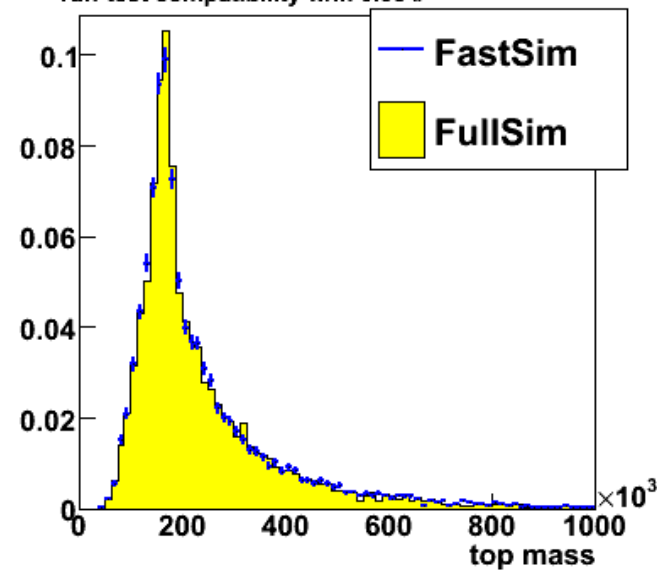
$\chi^2/\text{ndof} = 92.3/73.0$; Prob (χ^2 | KS): (0.06 | 0.89)
run-test compatibility w/in 0.09σ



$\chi^2/\text{ndof} = 88.3/76.0$; Prob (χ^2 | KS): (0.16 | 0.21)
run-test compatibility w/in 0.33σ

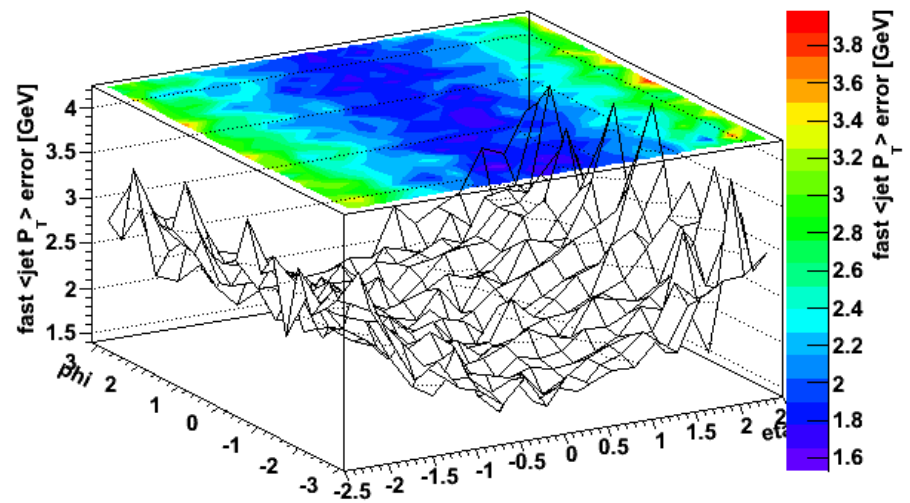
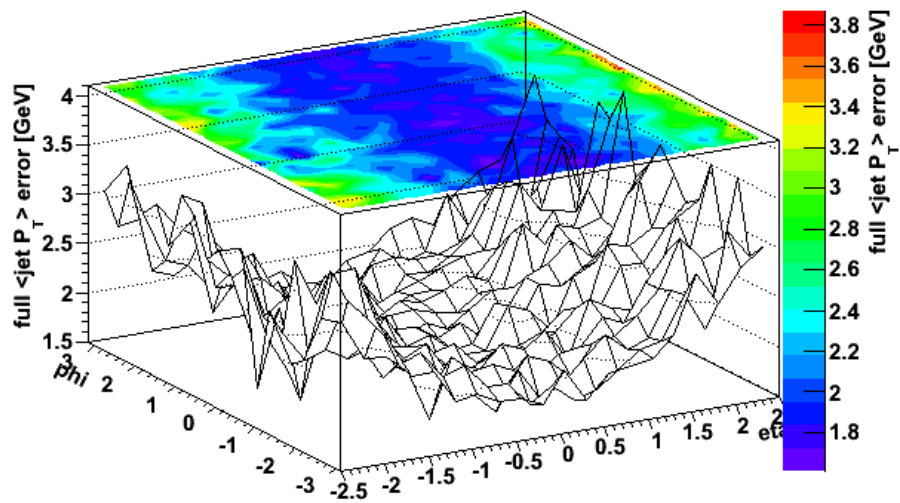


$\chi^2/\text{ndof} = 71.0/77.0$; Prob (χ^2 | KS): (0.67 | 0.90)
run-test compatibility w/in 0.08σ



uncertainty on jet P_T average vs eta, phi

average jet pt error vs eta, phi (HEC Q off)



average jet pt error vs eta, phi (HEC Q on)

