Testing calorimetric Missing Transverse Energy reconstruction with random and cosmic data

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Summary of ATLAS note ATL-PHYS-INT-2009-045 for E_T^{miss} ,
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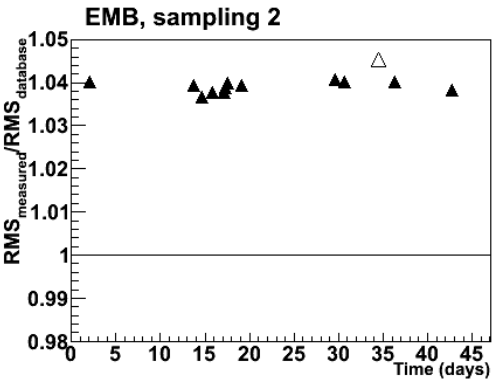
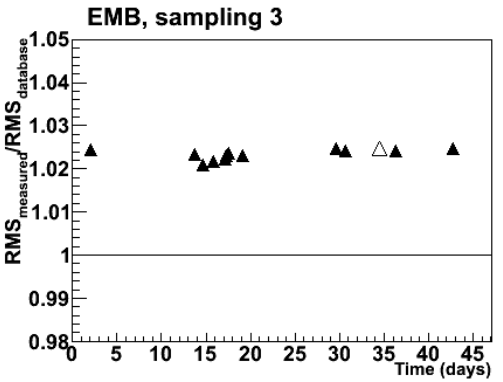
Time stability of cell noise and pedestal

❑ Noise

- $RMS_{measured}$ and $RMS_{database}$: both calculated as the RMS of each cell distribution from random events
- Database filled at the end of period (10/21)
- Fair agreement below 5% except for samplings 2 and 3 of EM calorimeters

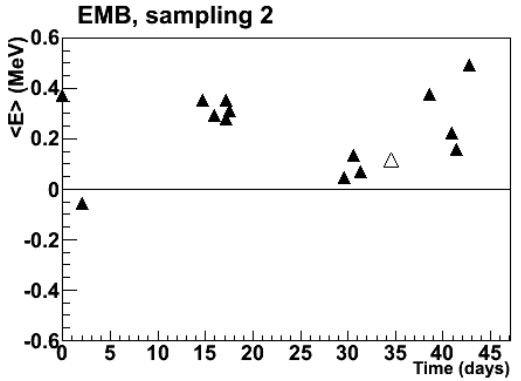


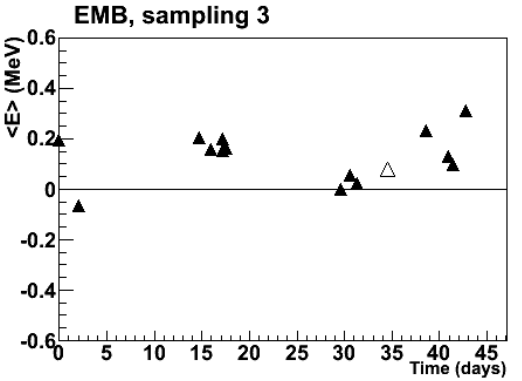


➔ Stable with time but systematically biased

❑ Pedestal

- Database (one pedestal for all the runs) filled at the beginning of the period (09/13
- Some unstability with time (<1 MeV)

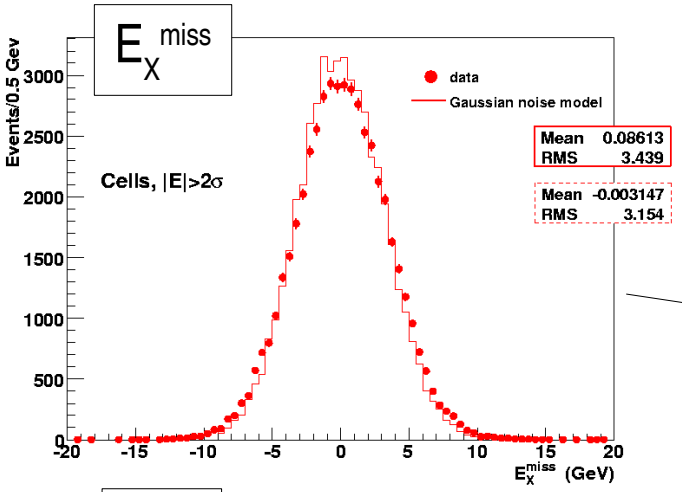


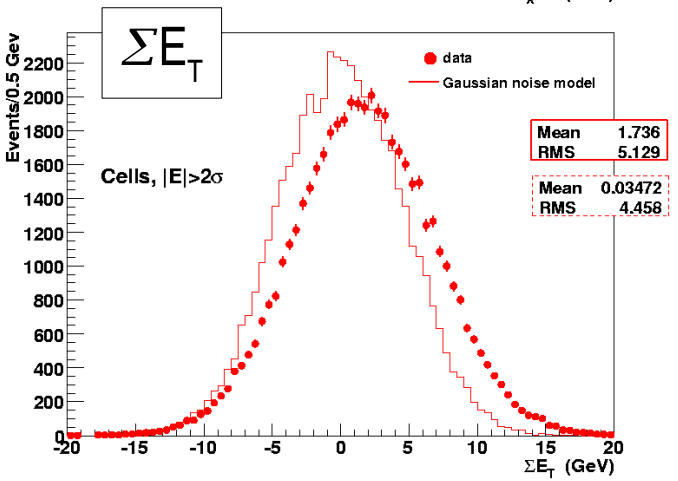


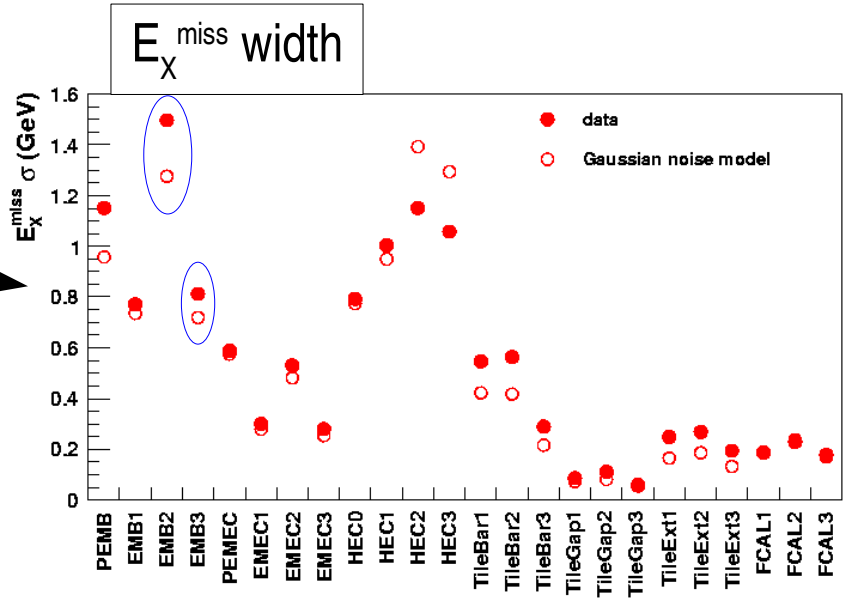
➔ Pedestal variation: small, but consequencies on E_T^{miss}

RNDM: Cell based, |E|>2σ, E_T^{miss} (1)

Run 91639







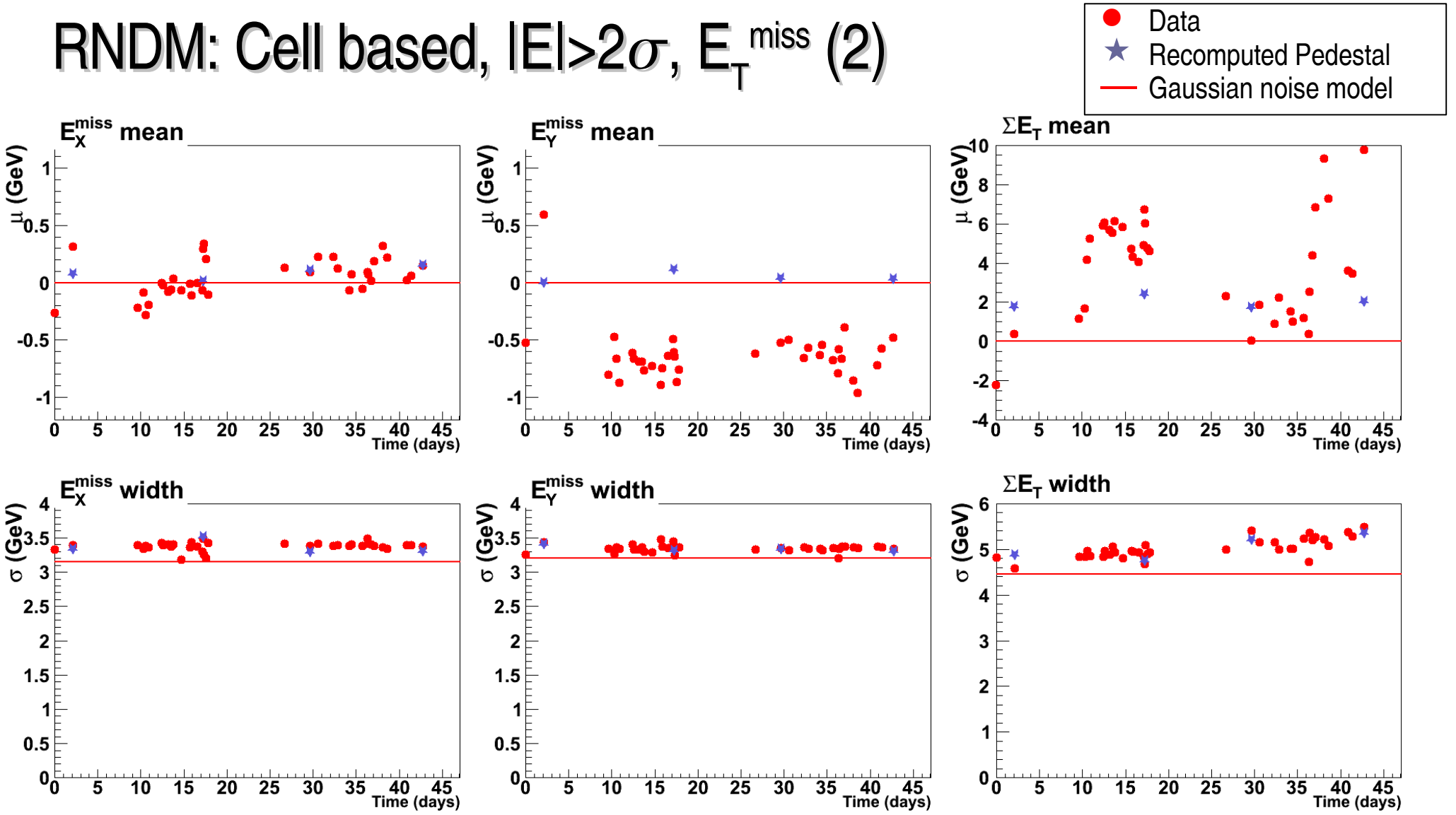
- Agreement remains for each subdetector
  - ↳ Increases by 50% for Tile (non Gaussian tails)
  - ↳ Increases for samplings 2 and 3 of EM calorimeters (5% more selected cells because of database noise underestimation)

➔ Gaussian distributions . Fair agreement between data and Gaussian noise model

➔ Width slightly higher (because of low noise database)

➔ Uncorrect pedestal causes $E_Y^{miss}/\Sigma E_T$ mean shift

RNDM: Cell based, |E|>2σ, E_T^{miss} (2)

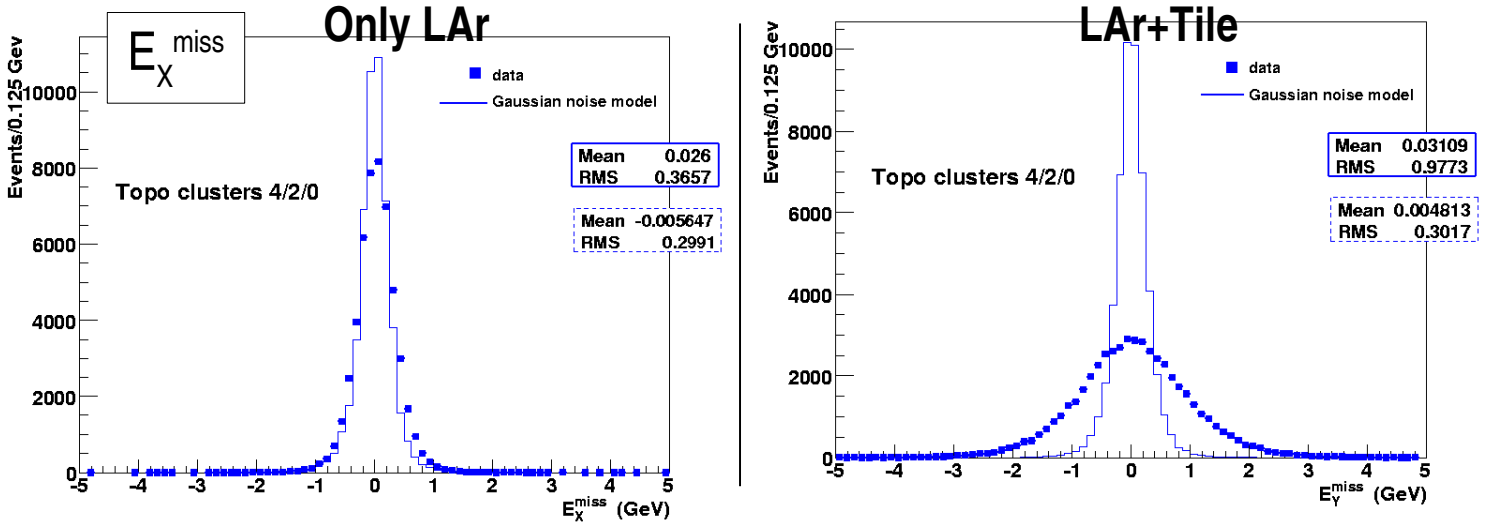


➔ Results stable (±0.3 GeV) and close to expectations when use of recomputed pedestal for each run. Regular update of pedestals foreseen

➔ Remaining ΣE_T mean shift due to energy reconstruction bias

Those problems would disappear with LHC data

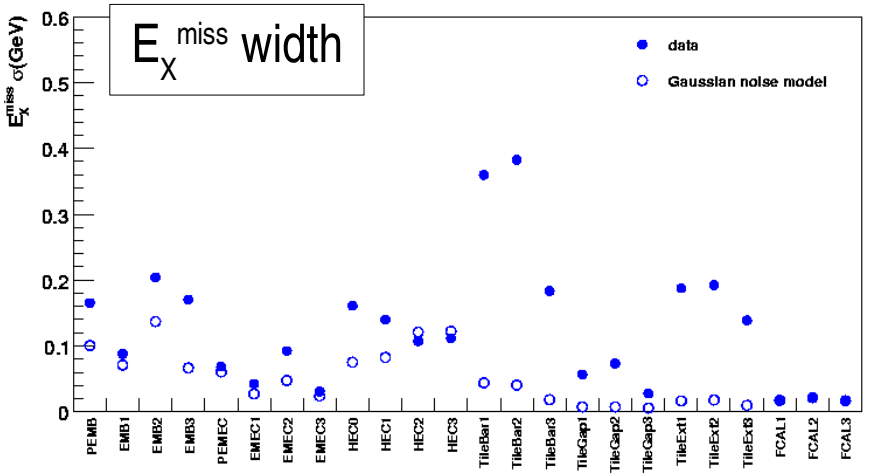
RNDM: Topocluster-based E_T^{miss} (1)



➔ Gaussian distributions for $E_X^{miss}/E_Y^{miss}/\Sigma E_T$

➔ Width divided by 10 compared to cell based method

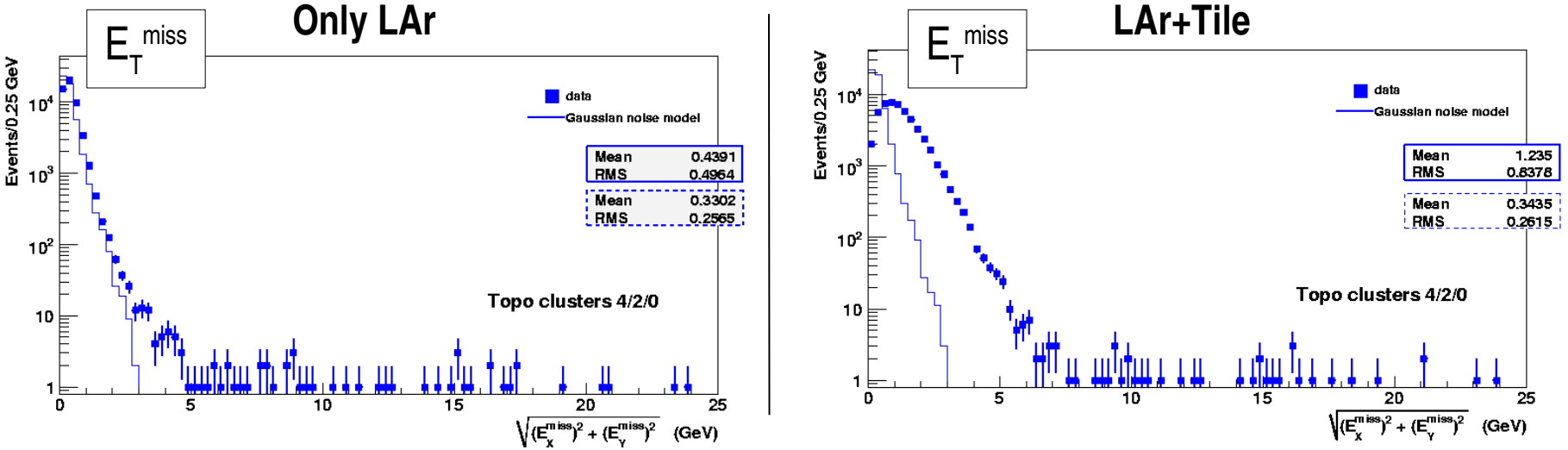
➔ Good agreement between data and Gaussian noise model only for LAr



➔ Good agreement remains for all LAr subdetectors

➔ Tile-layer widths similar for both |E|>2*σ and topocluster noise suppression cuts

RNDM: Topocluster-based E_T^{miss} (2)



➔ Good agreement Data/Gaussian noise model when removing Tile

➔ Tails due to coherent noise in a given region of the EM presampler (repared during shutdown)

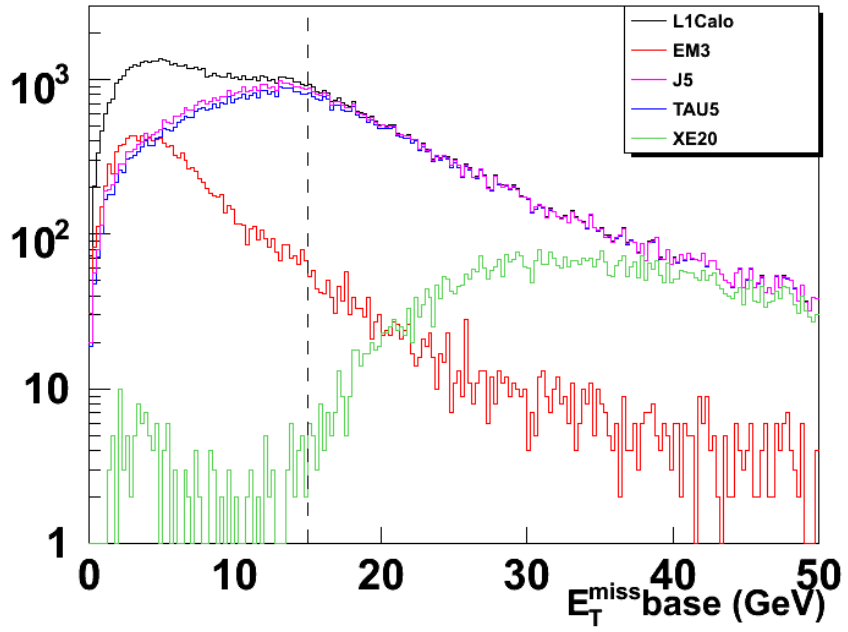
Conclusions for random data:

➔Basic calorimeter E_T^{miss} variables *at EM scale* under control (at least for LAr)

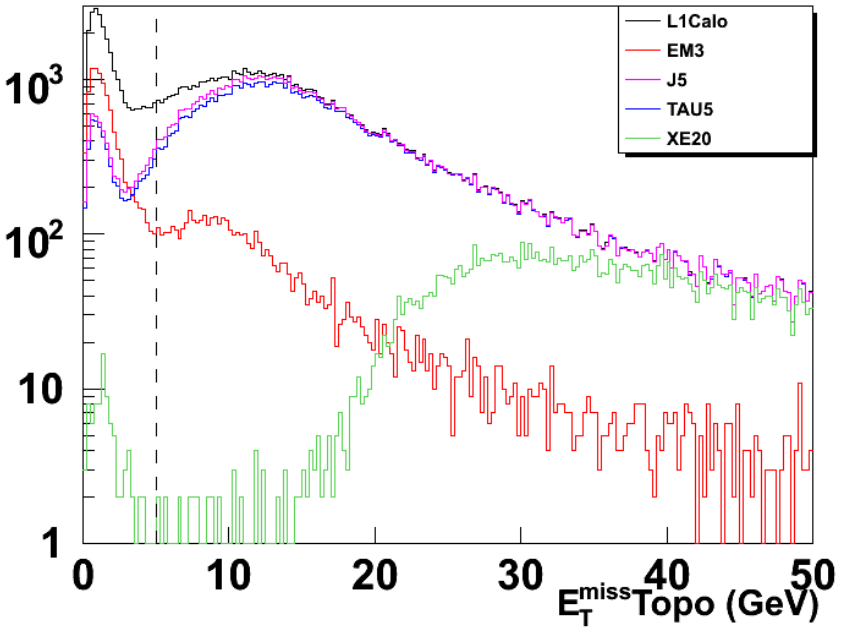
➔Detailed comprehension of the calorimetric system

➔Control plots available for early data

L1Calo triggered events



Contribution of noise: up to 15 GeV



Contribution of noise: up to 5 GeV

➔XE20 trigger:

↪ when fired, E_T^{miss}>20 GeV in more than 96% of the events

↪ Peak at 0: probably due to non-working electronics

➔Small contribution of EM trigger: most of the energy deposited in Tile

➔Clear separation from noise