Cern Women Activities on Top Analysis and Beyond…

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Outline:

- **Who are we?**
- **Nadjieh: Tag and Probe Efficiencies for Electrons**
- **Maryam: Jets or Electrons?**
- **Stephanie: Dead and Resuscitated!**
- **Rumors and Revelations…**

Who are we?

Nadjieh: PhD, starting in CMS ~1year ago:
Will work on cross section measurement vs JES in electron channel.
Start with some work on object to apprehend physics analysis: Tag and Probe efficiencies for electrons channel.
Then will move to analysis in itself (first basic selection for cross section measurement)

Maryam: PhD, starting in CMS ~1year ago:
Will work on top mass measurement vs b-tagging efficiency in electron channel.
Start with some work on object to apprehend physics analysis: What do we call a jet and what do we call an electron? Where is the border?
One presentation done in Egamma meeting, a note is on going, will converge once she is back.

Stephanie: Post-Doc, supervising at Cern the 2 PhDs…

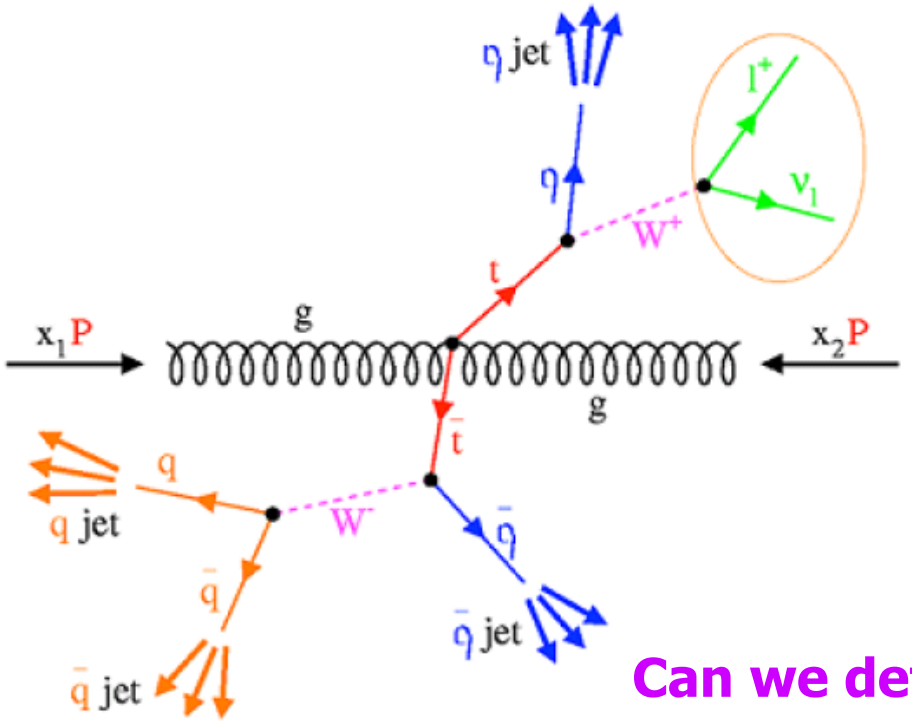
Tag and Probe

Motivation I

- $t\bar{t}$ cross section is obtained using :

$$\sigma = \frac{N}{L \times \varepsilon_{reconstruction} \times \varepsilon_{selection} \times Br(t\bar{t} \rightarrow FinalState)}$$

where N is total number of observed events.



For the electron in final state of semi-electronic decay mode :

$$\varepsilon^{e}_{selection} = \varepsilon^{e}_{isolation} \times \varepsilon^{e}_{identification}$$

Can we determine such efficiencies from data?

Tag and Probe

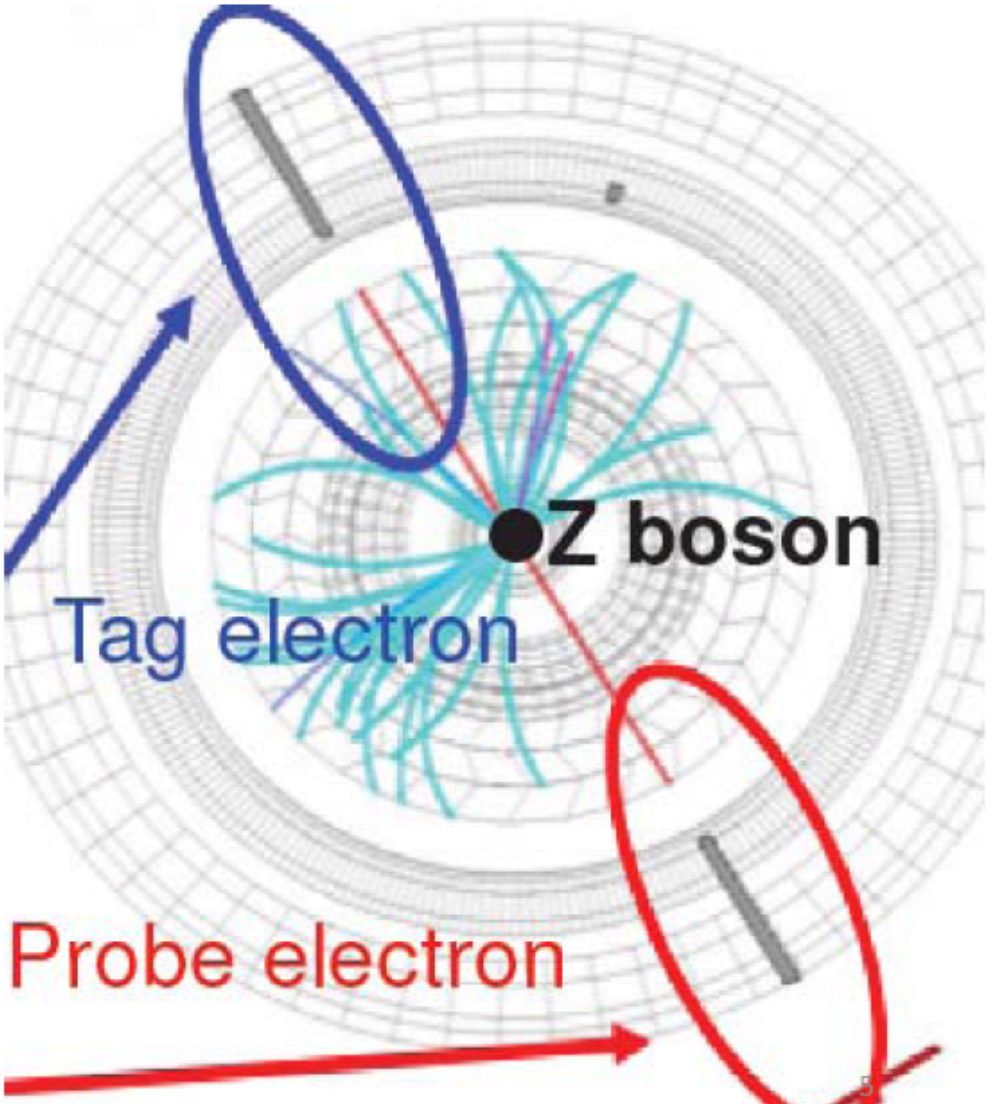
Brief review on Tag&Probe

- *"Tag"* is a well-defined electron.
  In CMS an electron that is
  - *Isolated* in tracker part of the detector
  - *Tight identified*

  is selected as *tag*.

- *"Probe"* is the other electron together with *"Tag"*, meet the criterion of
  - *60 GeV< InvMass(ee)<120 GeV*

- Using Z mass fit in each bin, all efficiencies of *"Probe"* , can be measured vs. η, ϕ, Pt, etc.



Are electrons coming from Z events identical to the ones in ttbar?

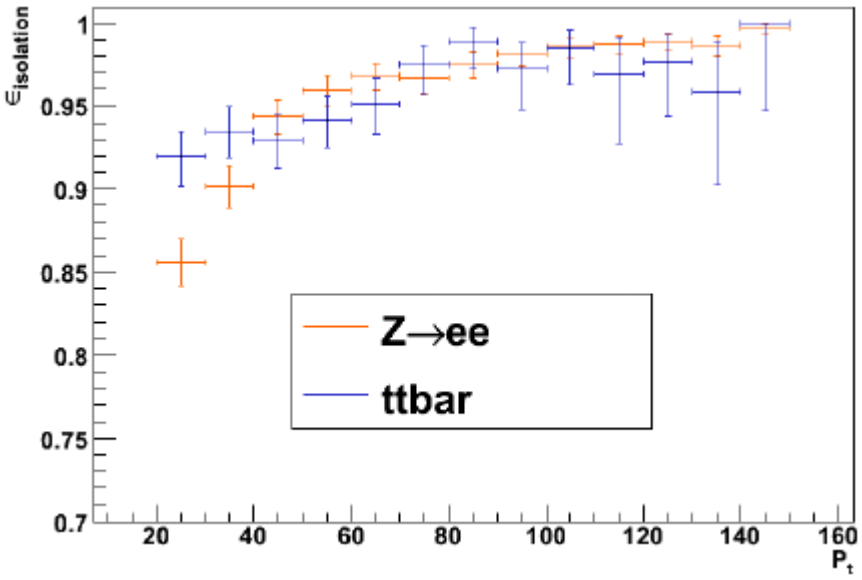
Tag and Probe

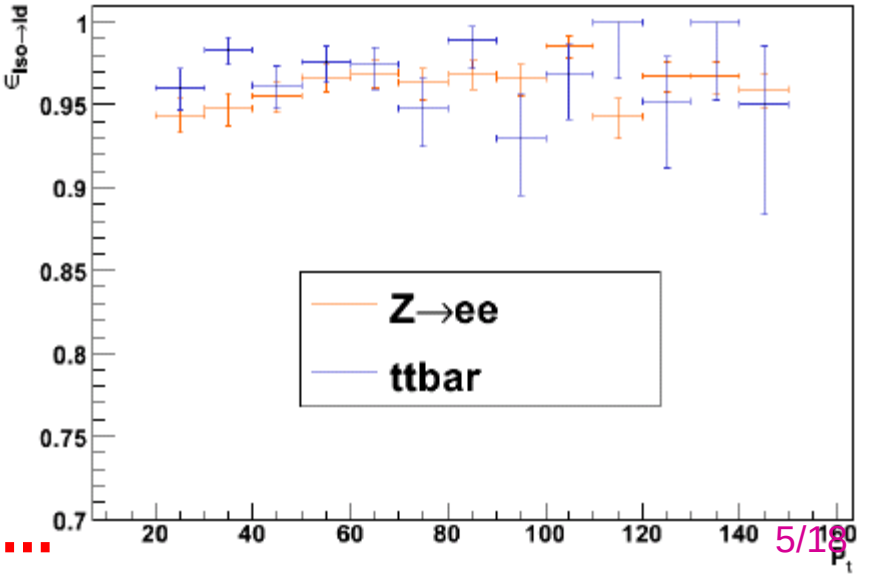
Electrons efficiencies are calculated in 2 steps:
- Isolation
- Electron Id

Z→ee events are selected with 3 jets in order to have the same number of calorimetric object un the final stage.

➔ So far the Z→ ee statistics do not reflect any luminosity estimation.
➔ Pseudo agreement but rather large error bars (ttbar statistics will be improved).
➔ Checks for possible kinematics bias will be the next steps

⇒ Studies are on going, code being finalized, need additional cross checks…



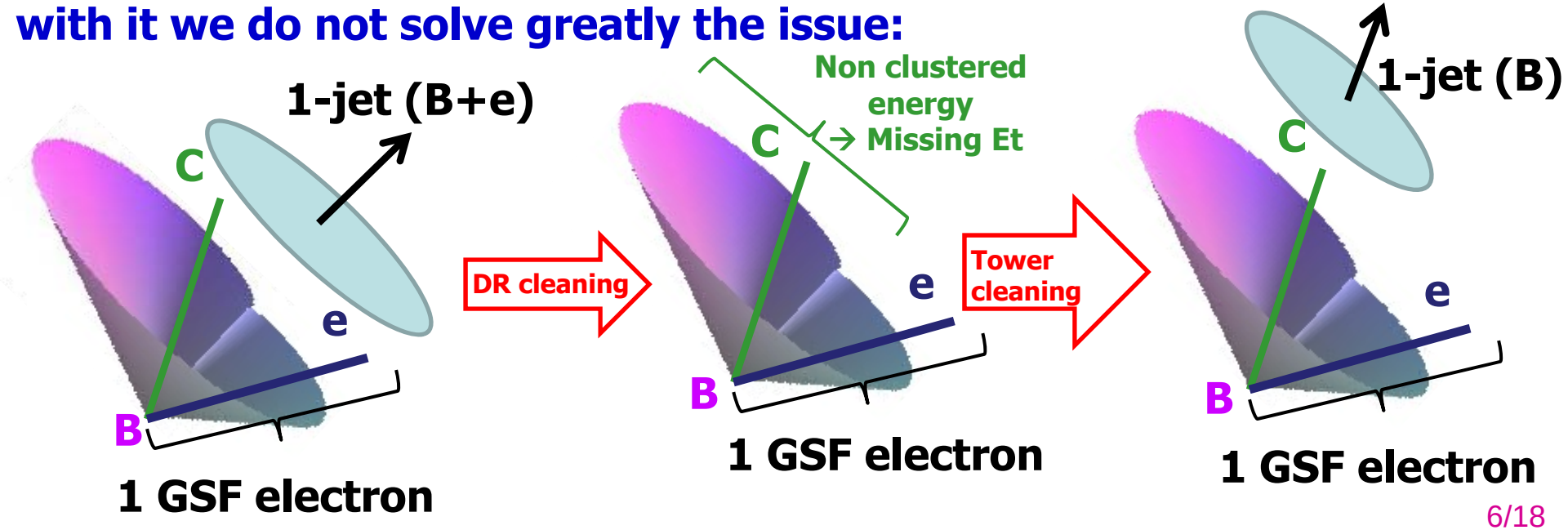


Jets or Electrons? That is the question…

Electrons are by definition also a jet (= jet is what ever make energy deposition greater than a few GeV in calorimeters).

So GsfElectrons are also reconstructed as Jets. When counting jets and electrons → Double counting… Can be problematic in e+jets analysis.

Could do a simple cleaning with a DR as most of people are doing but with it we do not solve greatly the issue:

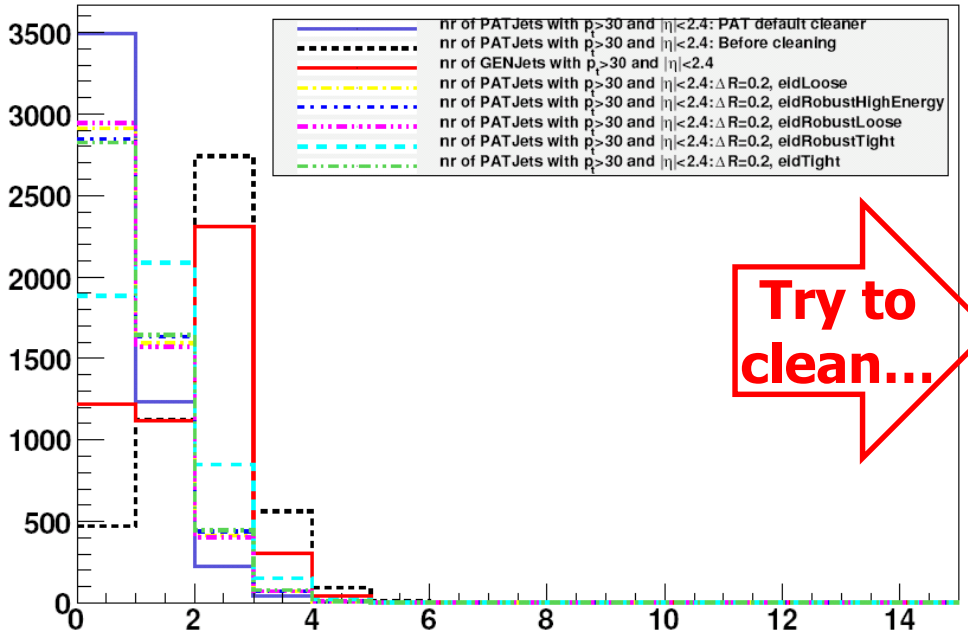


Jets or Electrons? That is the question…

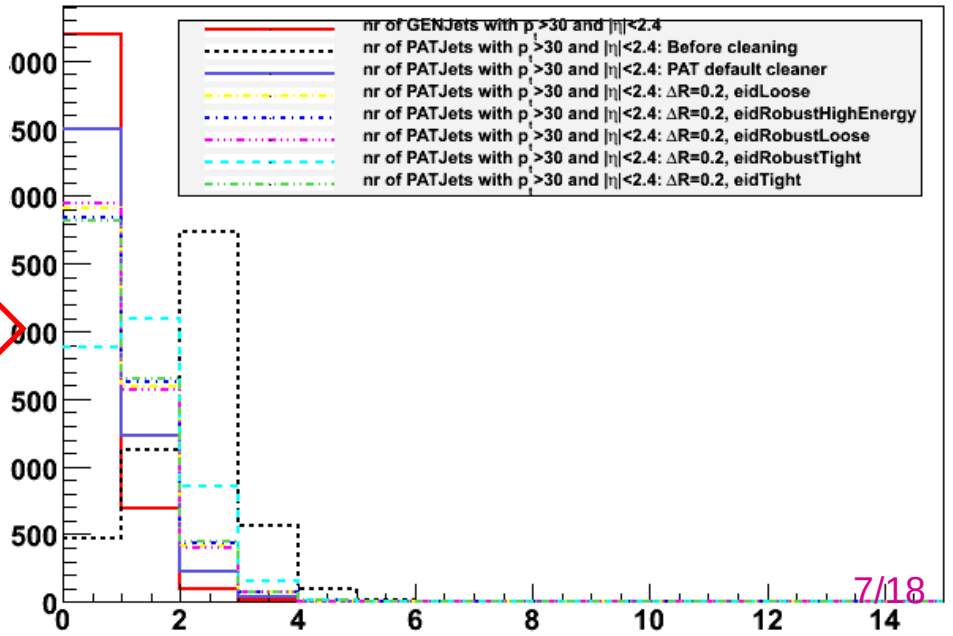
Two criteria can vary:
- DR cone to reject CaloTowers
- Electron Id to identify an electron

But no real ideal: MC truth jets also contain electrons…
Doing the DR cleaning at Gen level will bias towards the DR cleaning offline….

Z→ee events

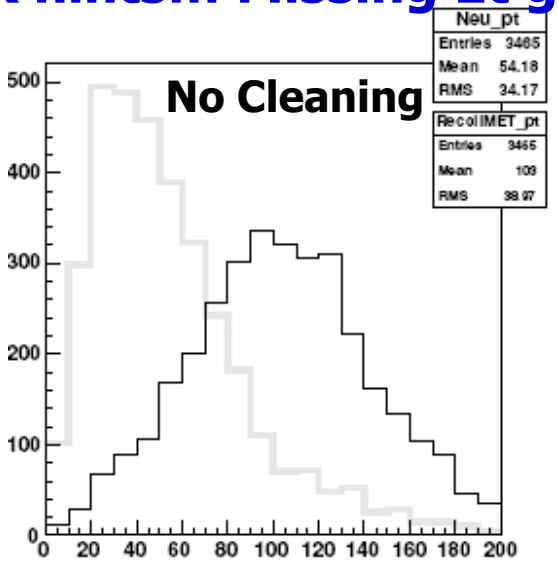


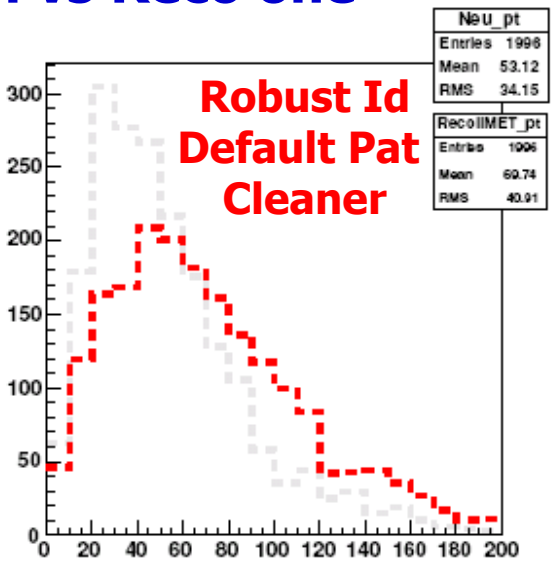
Try to clean…

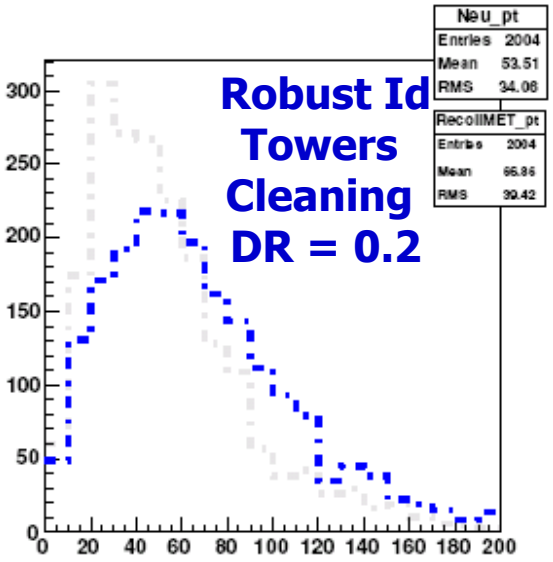


Jets or Electrons? That is the question…

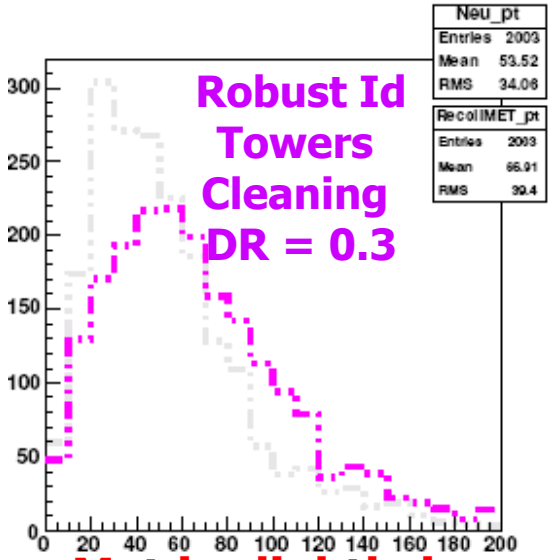
DR hints… Missing Et gen vs Reco one

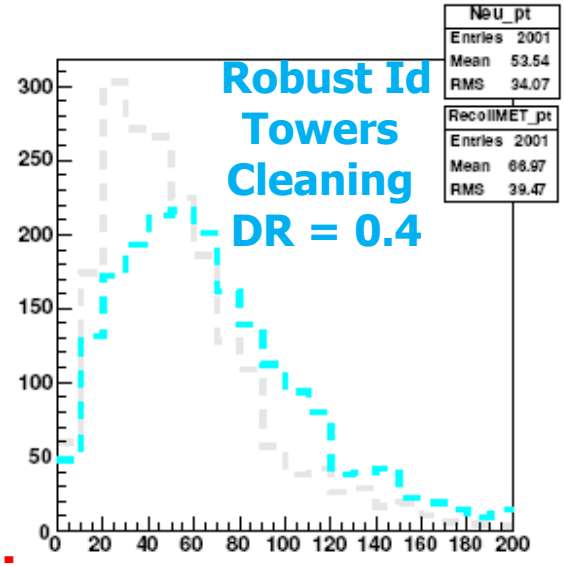


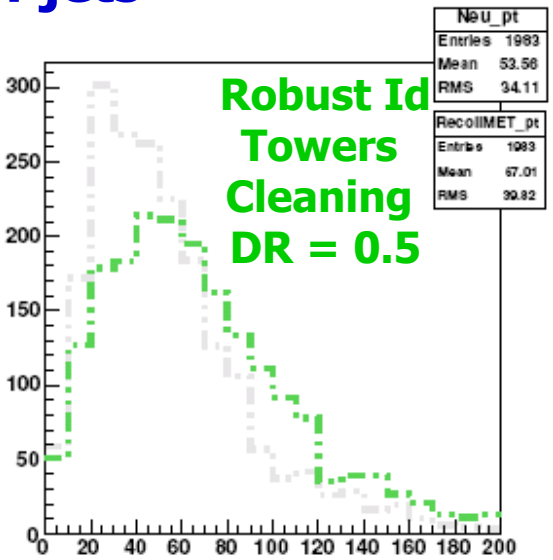




ttbar events: 1 electron + 4 jets



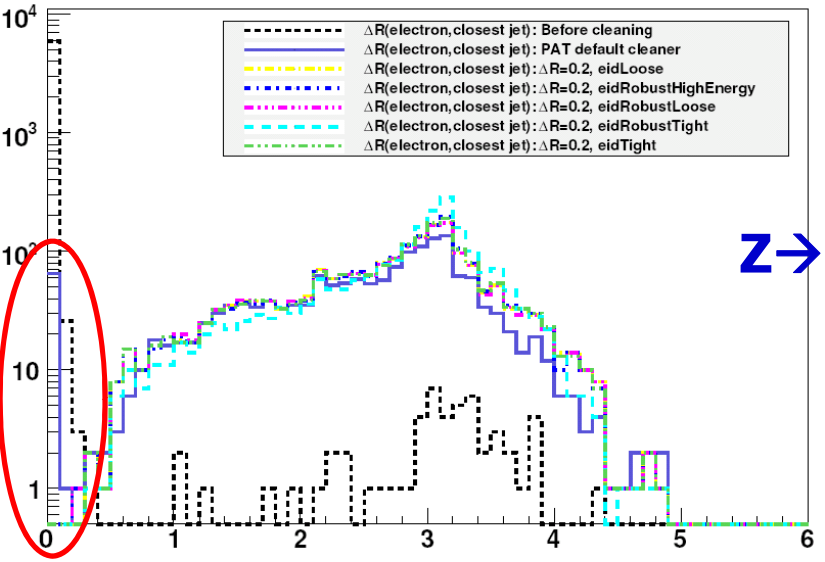




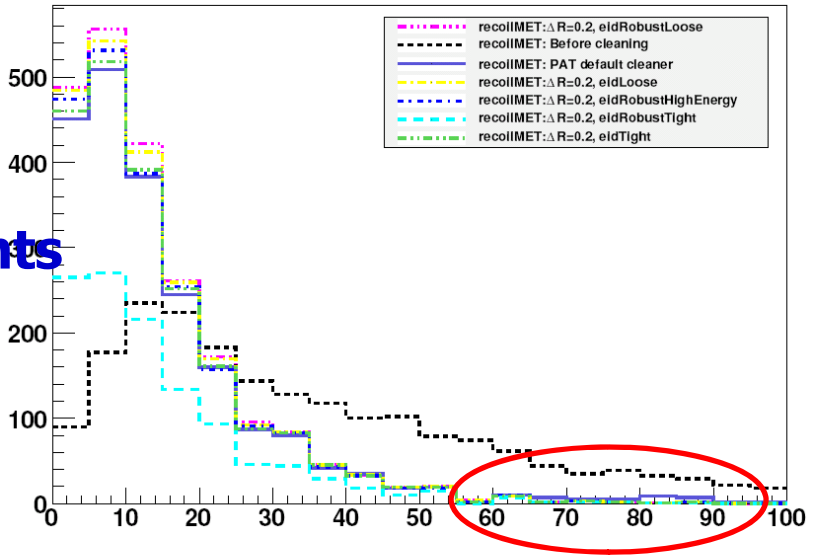
Reco Met is slightly increasing as measure as cone increase, statistic of events is going down…

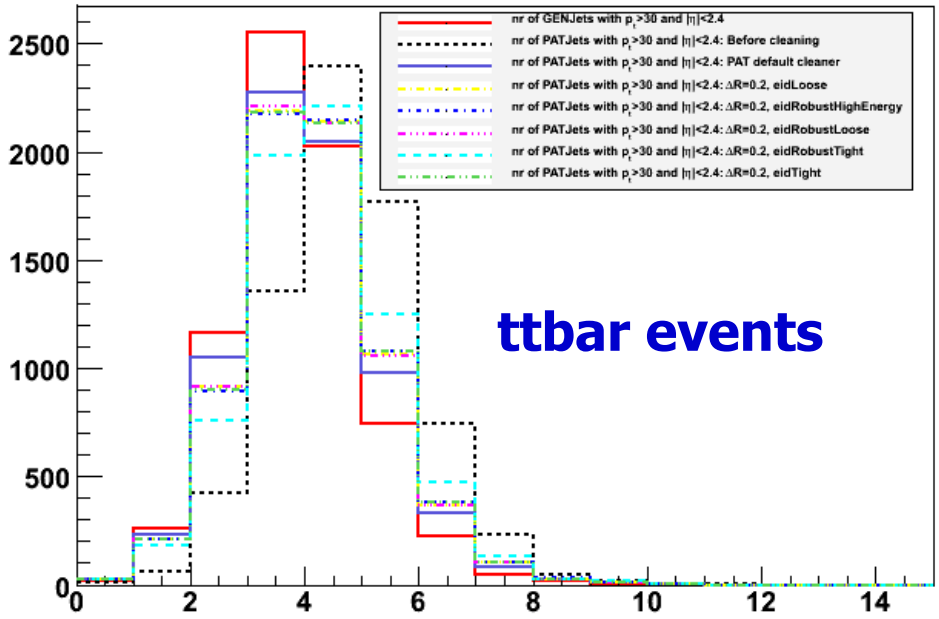
Jets or Electrons? That is the question…

Electron ID studies (DR = 0.2)



Z→ee events





ttbar events

Not so large differences, except with RobustTight which seems to be very strong…

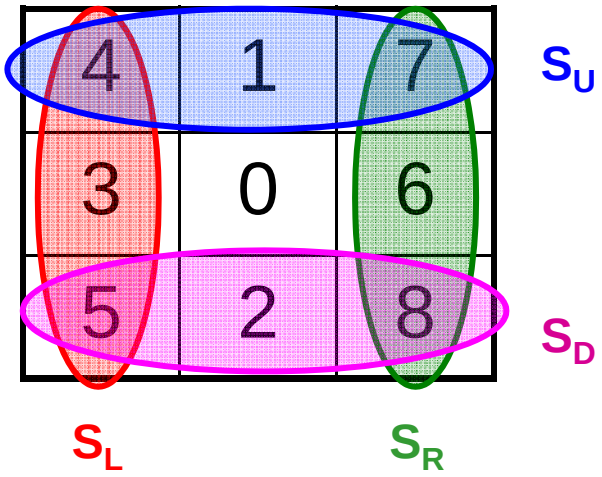
Work is on going and need mainly to find a good estimator to finally conclude.

Dead and Resuscitate!

Following Neural Network for TB2004 (see talk in ECAL-Egamma 13rd of July 2005)

Idea : use energy deposited around the missing channel to reconstruct the missing energy.

Use a neural network training with 3 variables :
- First step : consider the missing channel is the most energetic channel
Sum8/Sum24 = Sum of the 8 channels around the missing channel/sum24
LogX8 = Log(S_L / S_R)
LogY8 = Log(S_U / S_D)



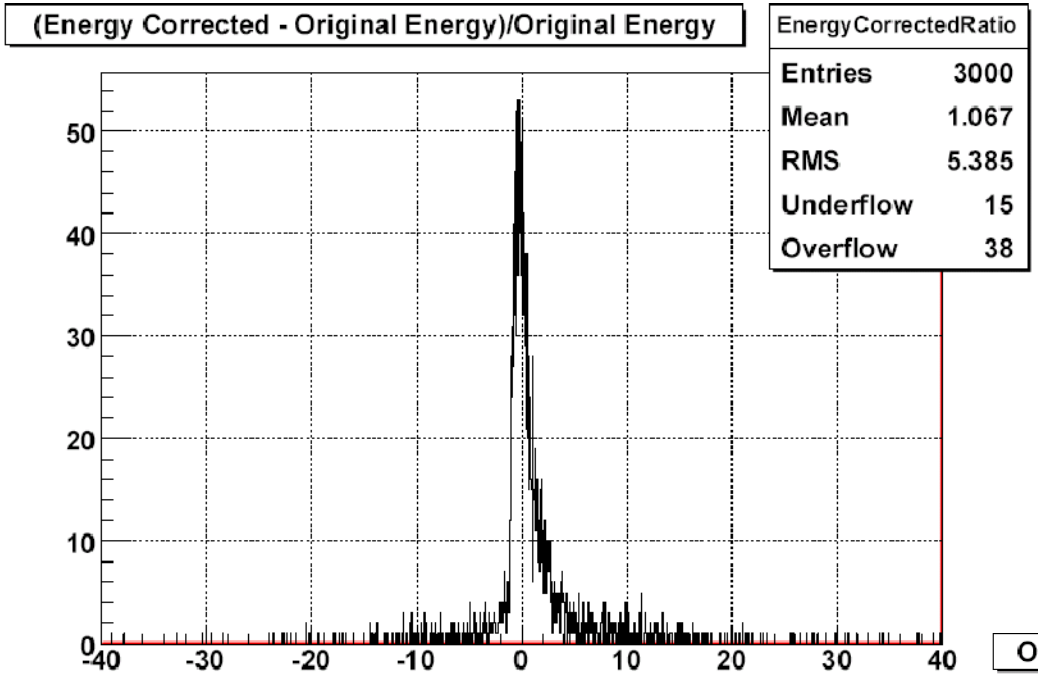
➔ All ratios of energy, roughly an energy independent Neural Network
→ better in case of a continuum of energy (as in real data taking)

First Results on RelVals…

Using Chiara config file (Thanks So Much!), Reconstruction is performed after the recovery of deadchannels
→Analyse with basic cuts using PAT:
- electrons |Eta| <2.4 and Pt>20 GeV
- jets |Eta|<2.5 and Pt>20 GeV
➔Dead Channel is corrected is sum8 > 8 GeV (arbitrary threshold so far)
➔ If Dead Channel not in 3x3, energy ==0 (no correction)

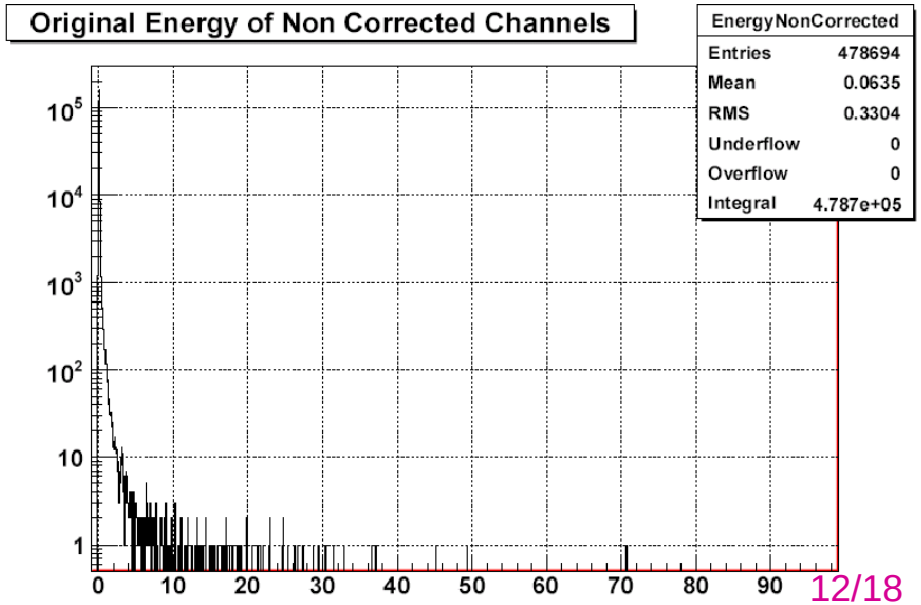
For the moment only run on 9000 events of RelVals Zee 228…

Looking at single channels



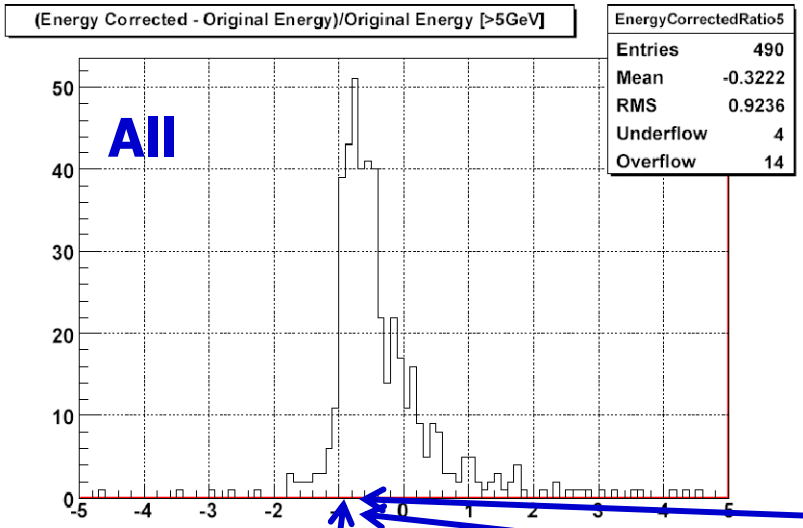
Events are Z→ee with electrons in |Eta| <2.4 and Pt>20 GeV

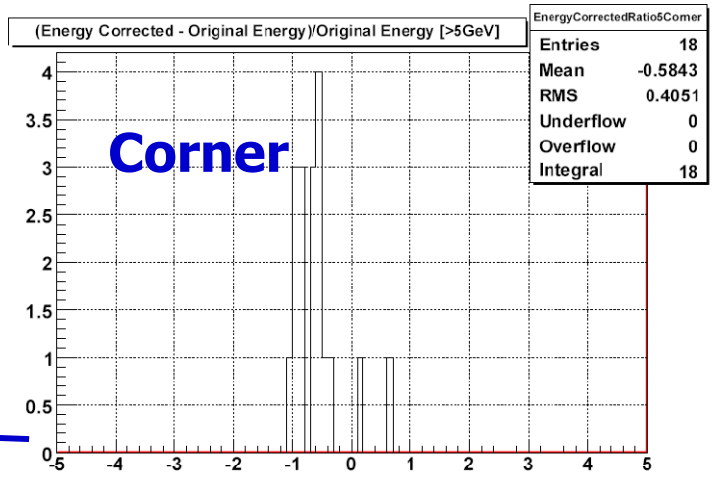
Over more than 480k, only 3k have a sum8> 8 GeV
→ Make sense

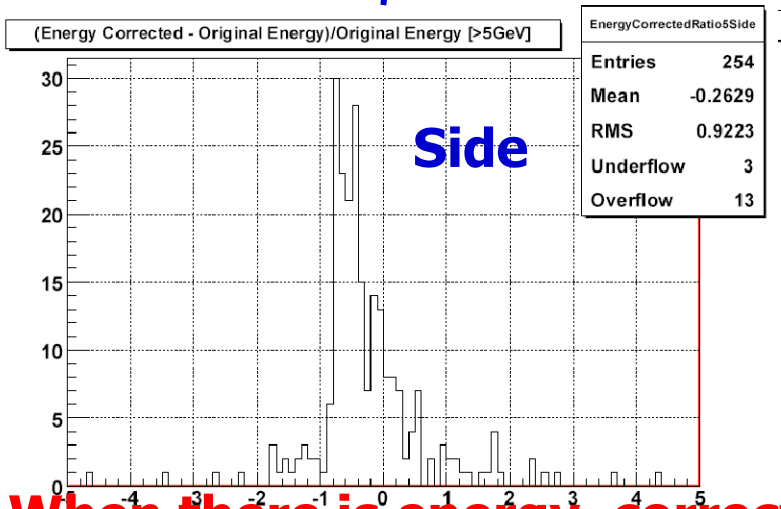


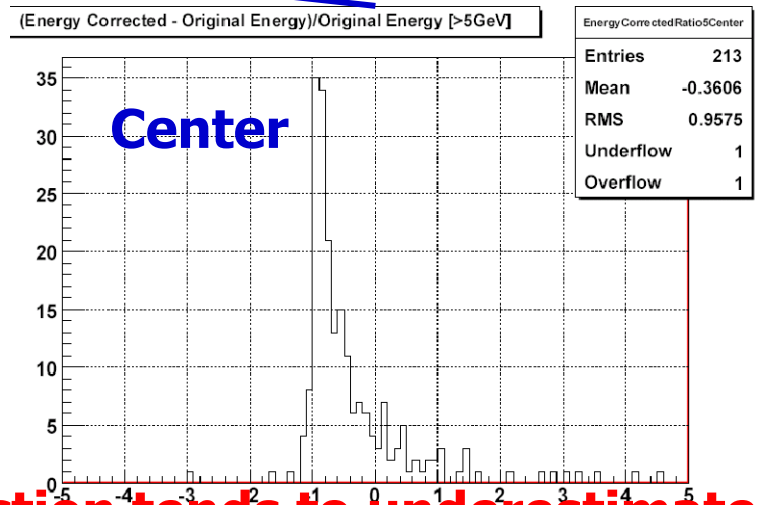
Correct only is sum8 > 8 GeV.
Only 1406/478694 = 0.3% channel have more than 1 GeV and are not corrected

Percentage of Correction when Initial Energy > 5GeV



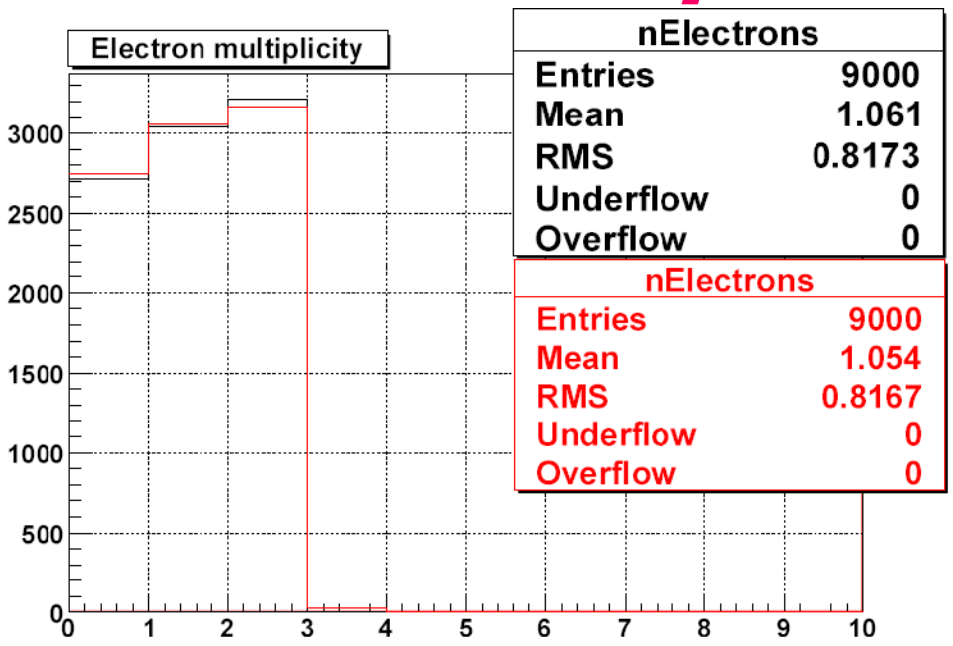


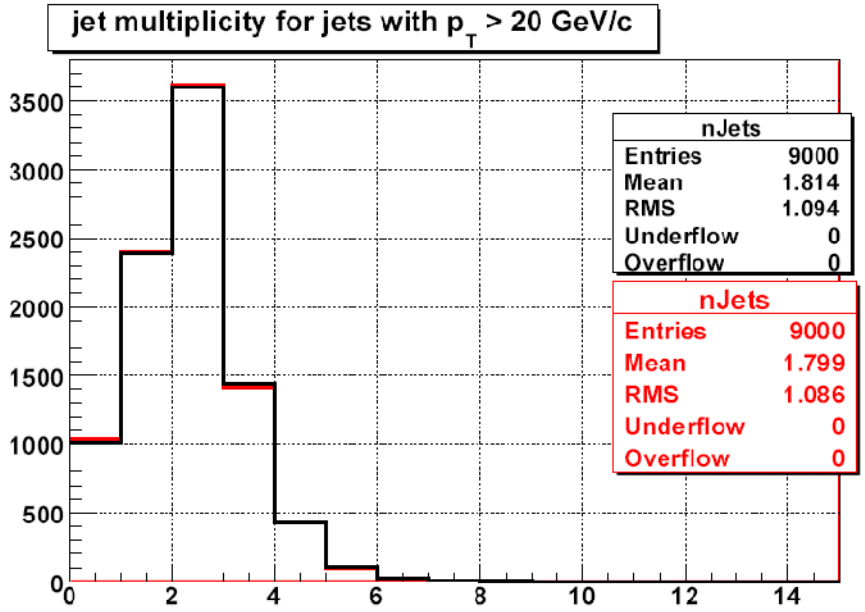




When there is energy, correction tends to underestimate…
But long tails….

Electron/Jets Multiplicity



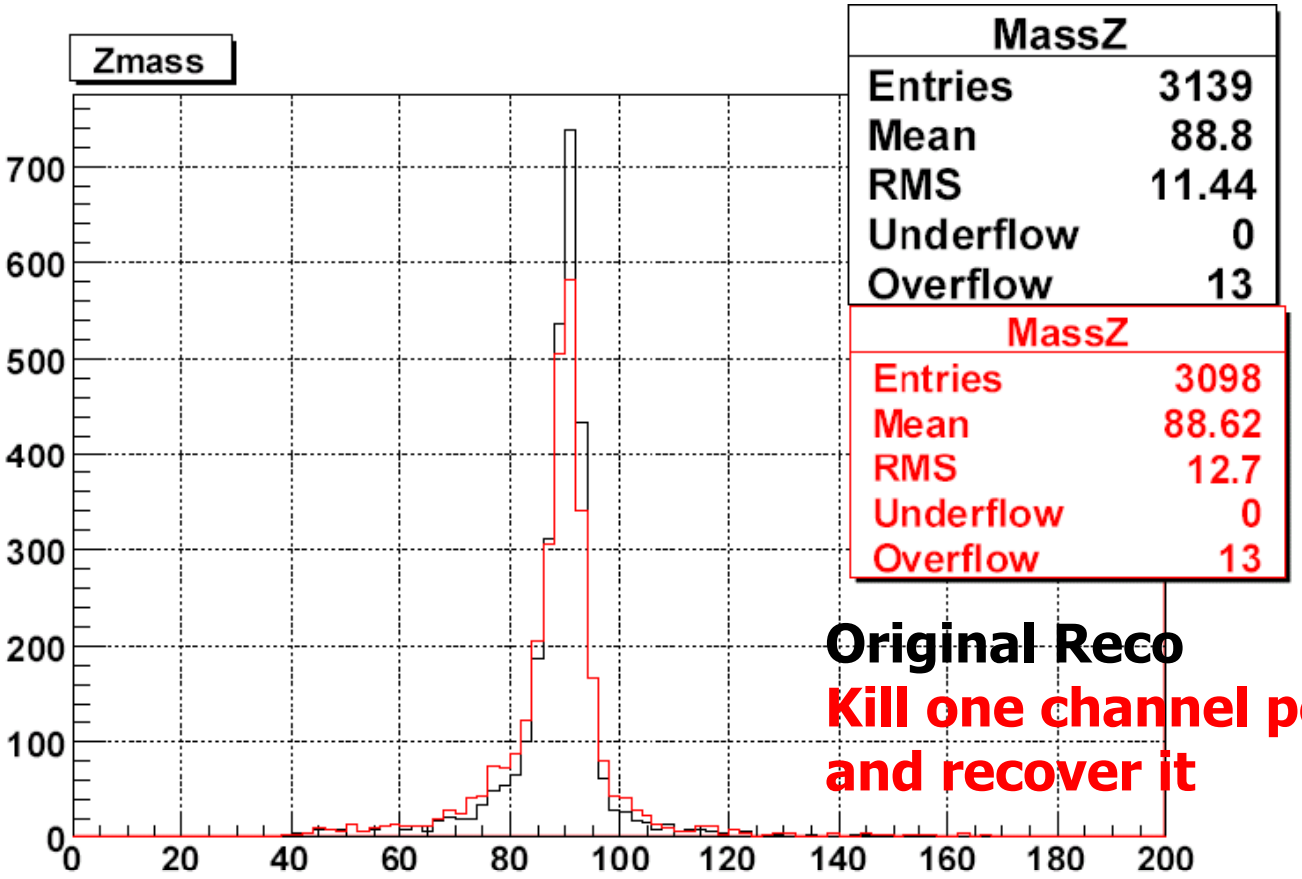


Original Reco

Kill one channel per TT and recover it

- **Small decrease of electrons and jets (electrons cleaning in jet collection not done)**

ZMass

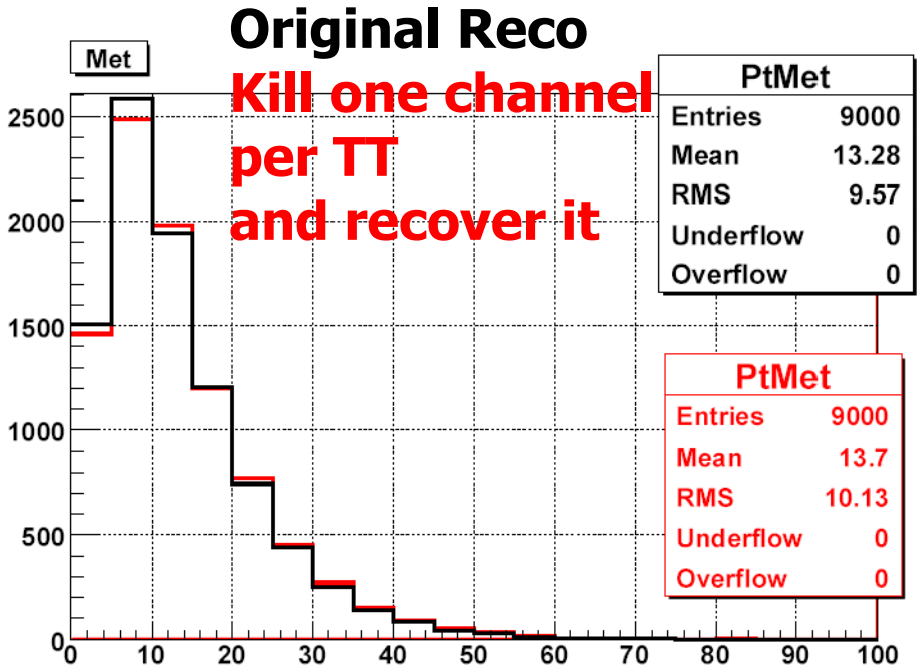


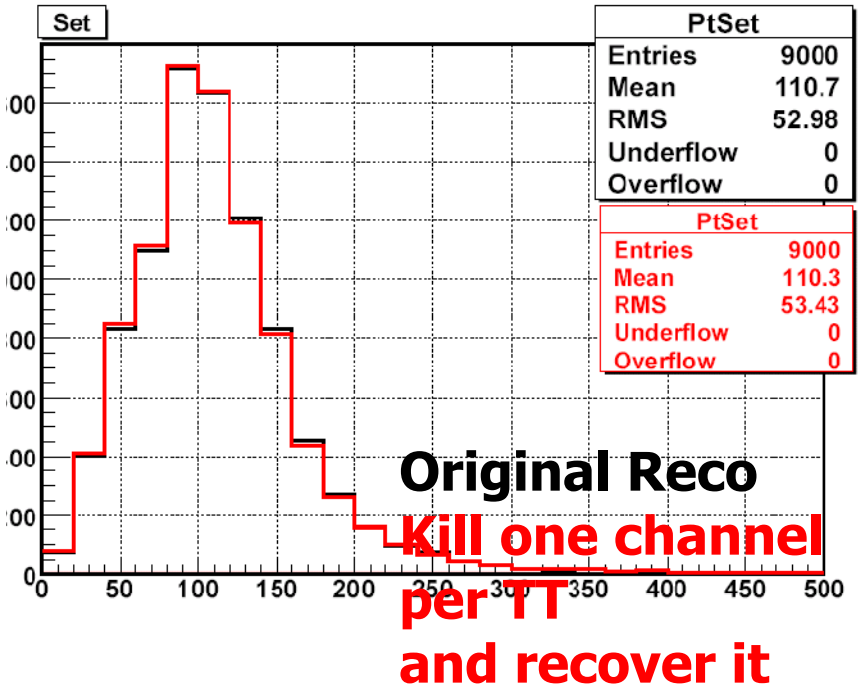
Original Reco

Kill one channel per TT and recover it

Loosing ~1% of Z→ee candidate (a lot of channels are killed).
Degradation of the mass resolution (correction are not tuned)…

Met/Set





Adding MET…. → Adding non cluster energy… But marginal addition…
No addition of SET → No "random" unclustered energy

Rumors and Revelations…

Global running:
Since march, Middle Week Global Runs (MWGR) happened every Wednesday and Thursday, every 2 weeks first and since Easter it is weekly.
- Before April, no real data (muons detector not fully in, Ecal not really in etc)
- Since beginning of May: MWGR are routine! All detectors are in (except tracker/Pixel) and looking for 1% level problems!

Known some:
- Ecal calibration events are going into main event stream
- DT is seeing some noise, thinking that it is coming from one of emergency lamps…
- DT should go to 10 FEDs (up to now was 5)
- Ecal is seeing some noise
- Preshower is in place, commissioning is starting.
- DT got fired in a rack last week…

Rumors and Revelations…

Releases…
Apparently 229 is not going to be the last one of the series… Mainly tag for re-reprocessing of last year CRAFT data.
226_HLT is NOT include in 227! So 229 do not have HLT!

310 is supposed to get out by 7th of May (and apparently will be)
BUT missing plently of components (Fast Sim, Pflow etc…)
Will have 1 month to fully validate it before MC prod…

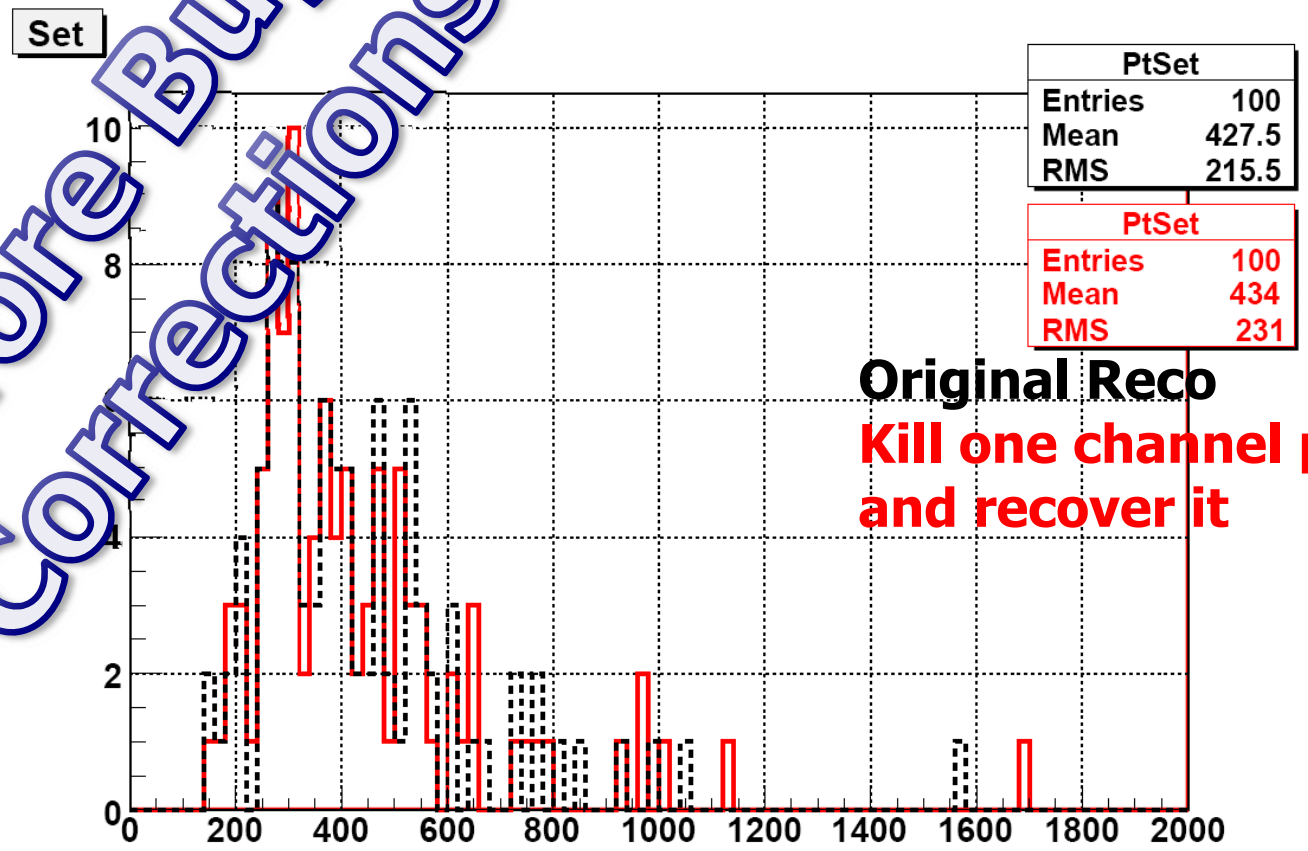
We can guess that 310 is going to be out of date very very quickly, but time is running so they will not be able to delay it too much…

Start splitting of releases: online releases will have different tag collectors to be able to react quickly if needed.
HLT is already applying tag on top of releases, and sometime ask for release….

More questions, do not hesitate to contact me!

SEt

Before Bugs Corrections



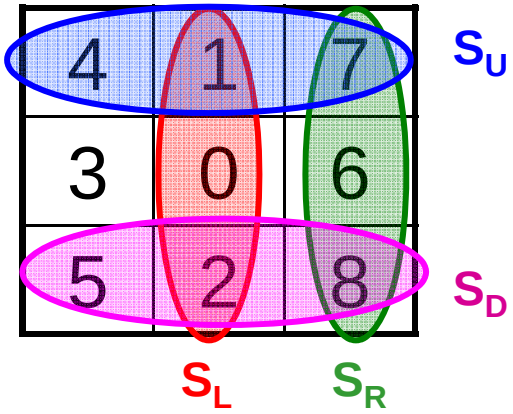
Adding SET…. ➔ Adding non cluster energy…

So far the example is stupid because we are killing to much dead channels. We should reproduce such distribution with realistics number of dead channel.

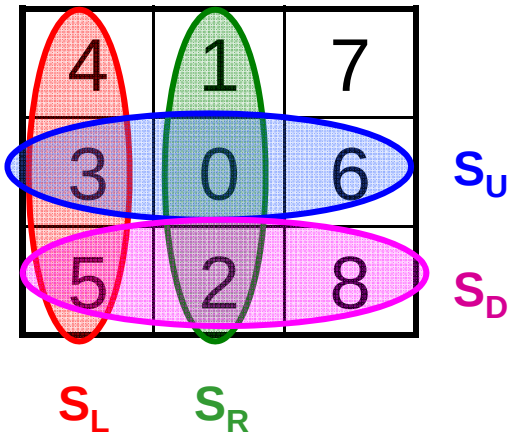
Dead Channel != Central

Considering that the shape is symmetric around central channel

Use a neural network training with 3 variables :
- First: consider the missing channel is on a side of the maximum energy one (Number 3)
Sum8 /Sum24= Sum of the 8 channels around the missing channel/Sum24
LogX8 = Log(S_L / S_R)
LogY8 = Log(S_U / S_D)



- Second: consider the missing channel is a corner to the maximum energy one (Number 7)
Sum8/Sum24 = Sum of the 8 channels around the missing channel/Sum24
LogX8 = Log(S_L / S_R)
LogY8 = Log(S_U / S_D)

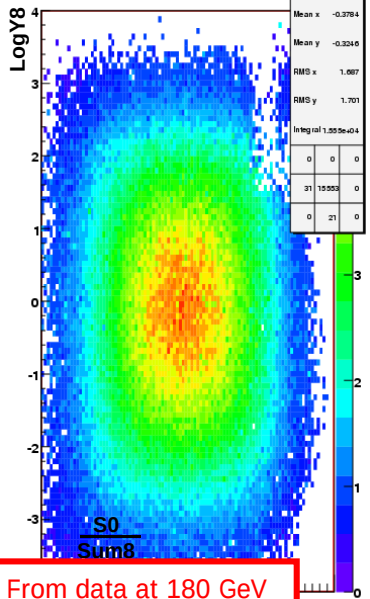


A fourth Neural Net determine the position of dead channel

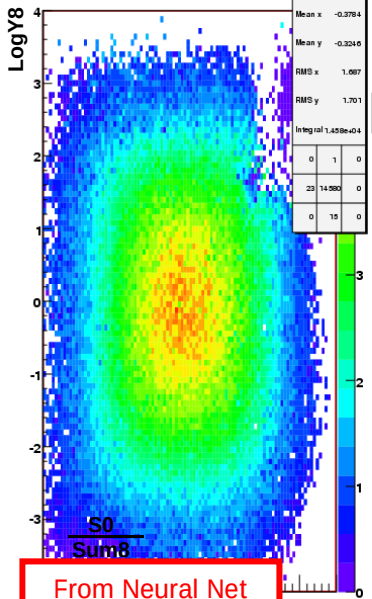
All Energy

Using the NN training at 120GeV energy and applied it to all energy file

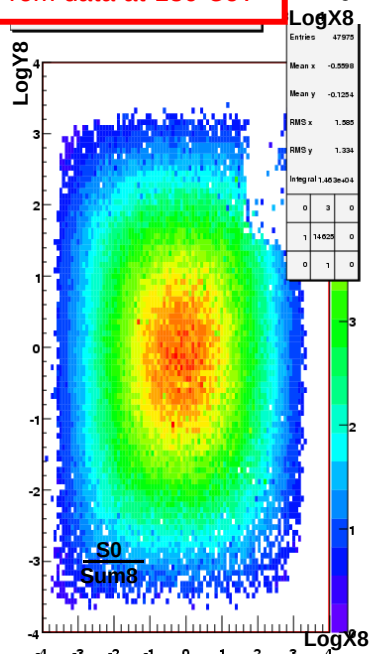
From data at 20 GeV



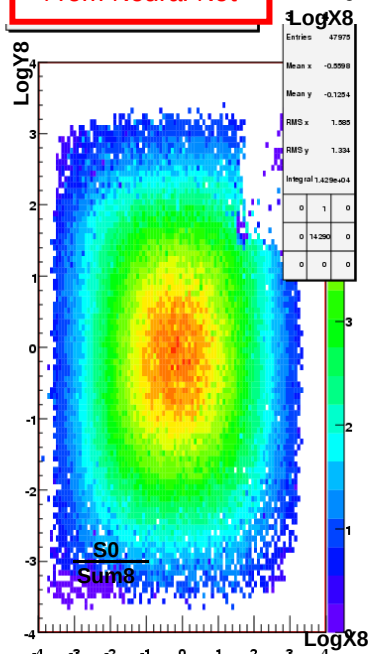
From Neural Net

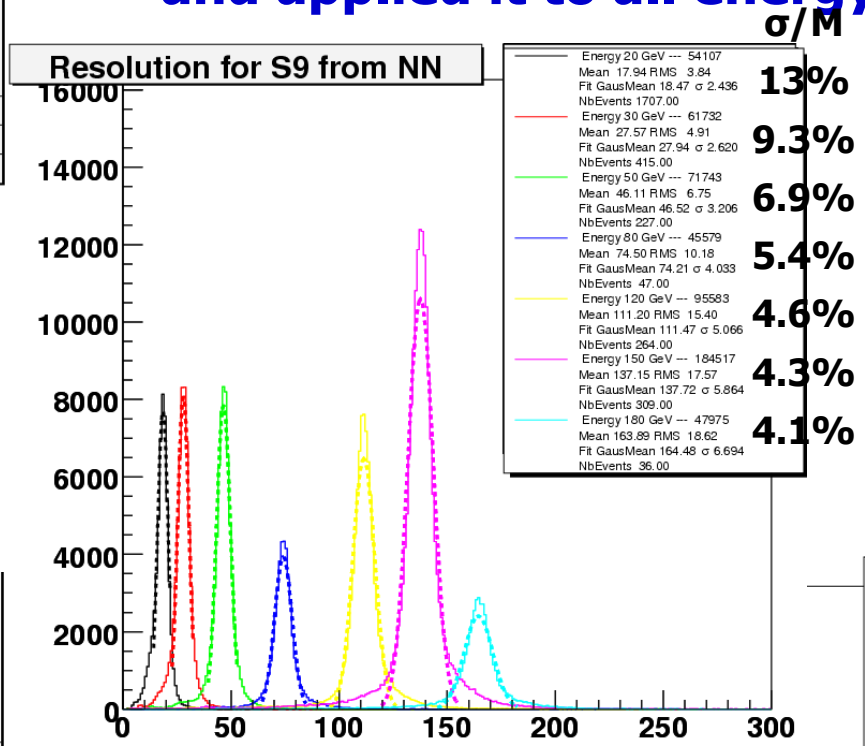


From data at 180 GeV

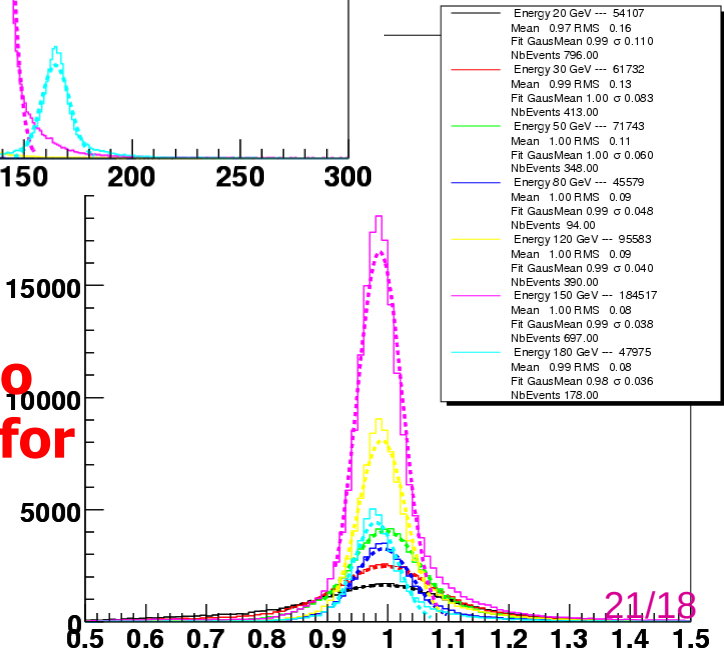


From Neural Net





Precision obtained is between 3% to 6% in Sum25 for energy higher than 50 GeV.

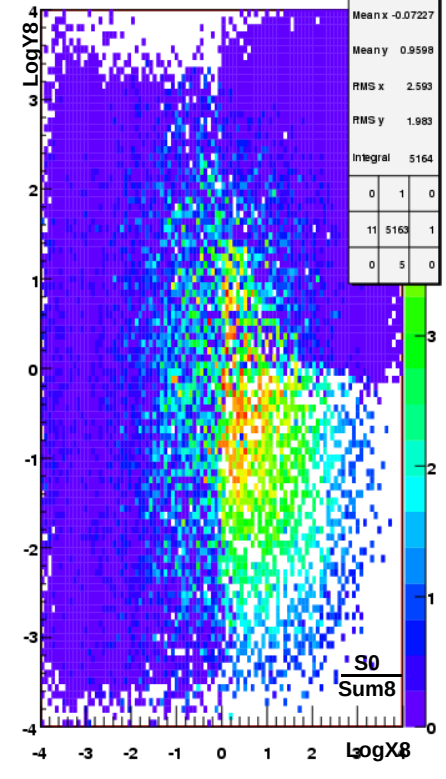


Where is missing Xtal

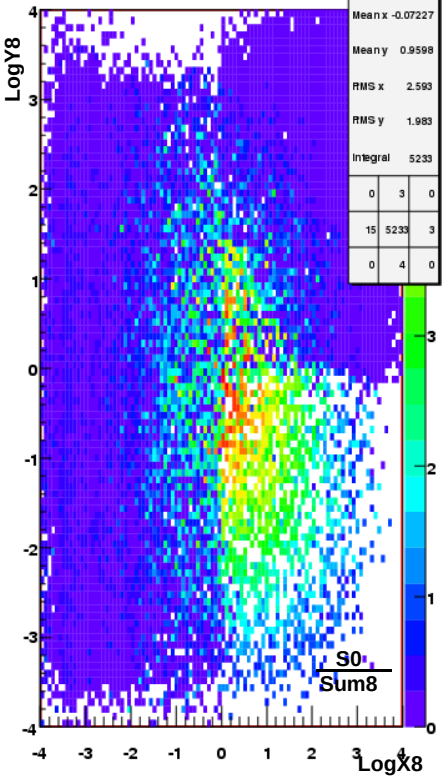
Using the NN training at 120 GeV and applied it to all energy file

Let's consider a random dead Xtal in order to reproduce all cases:

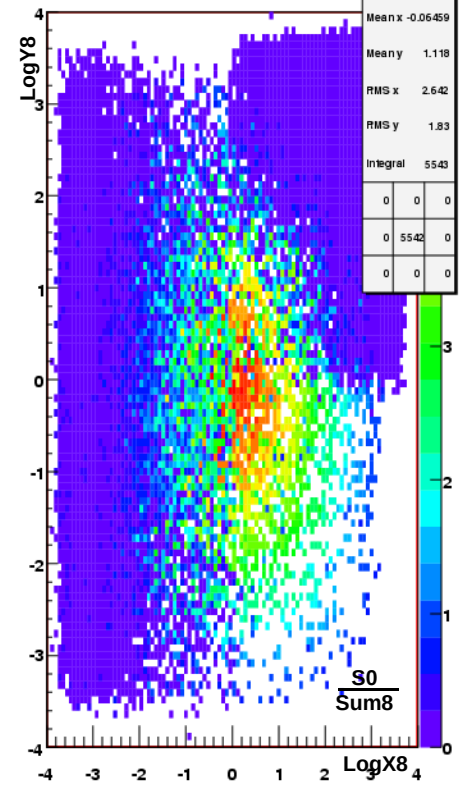
From data at 20 GeV



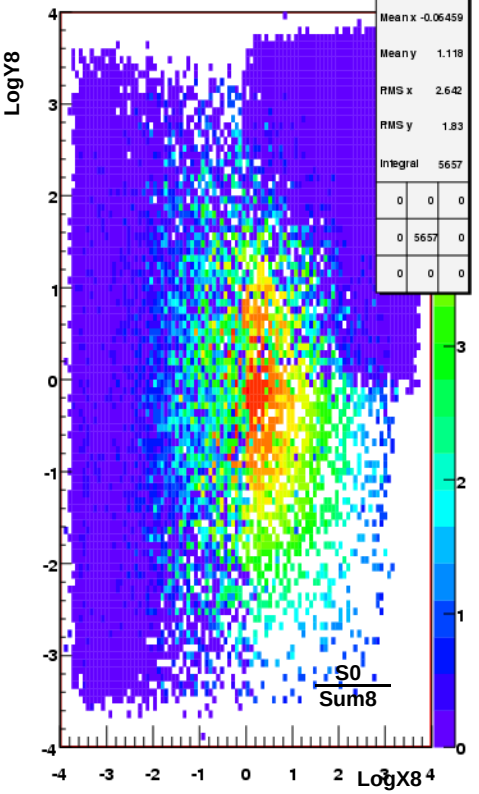
From Neural Net



From data at 180 GeV



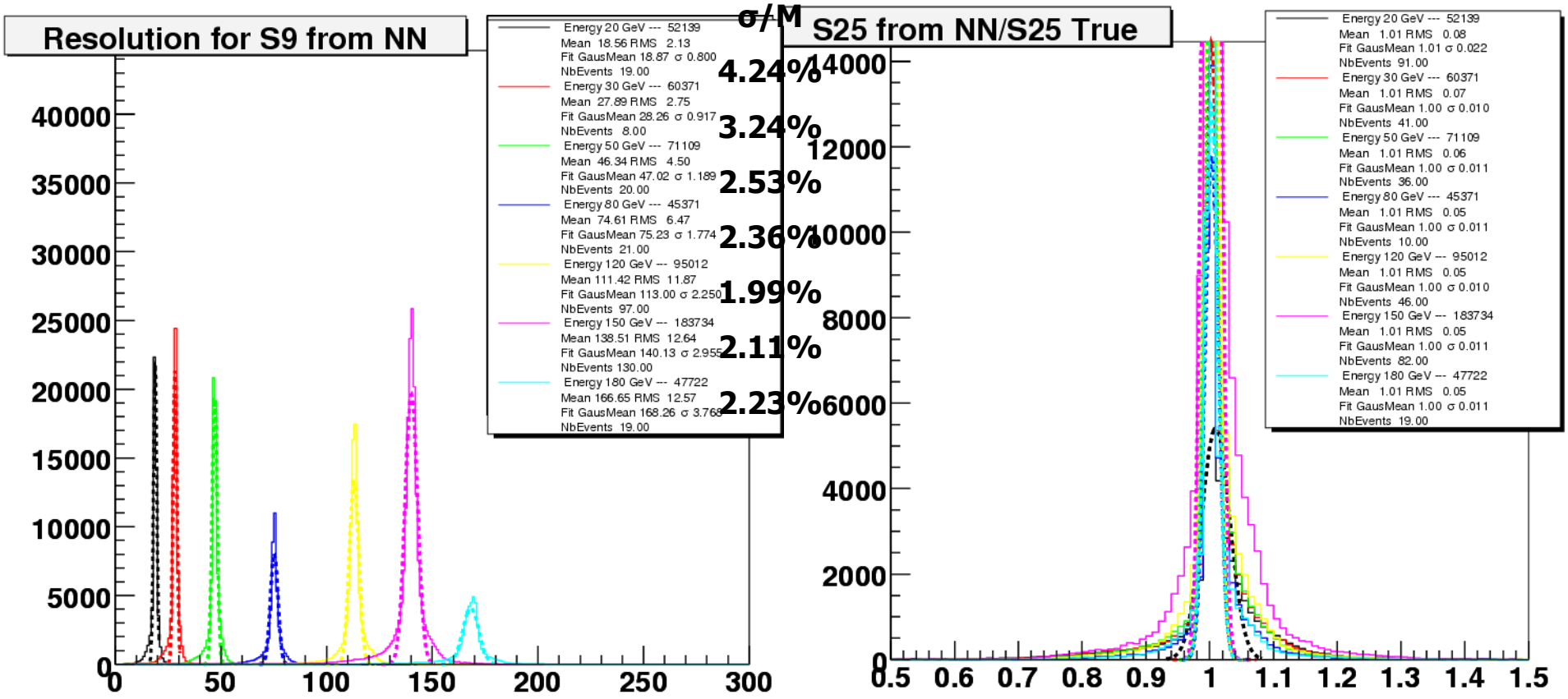
From Neural Net



➔ **The shape is described.**

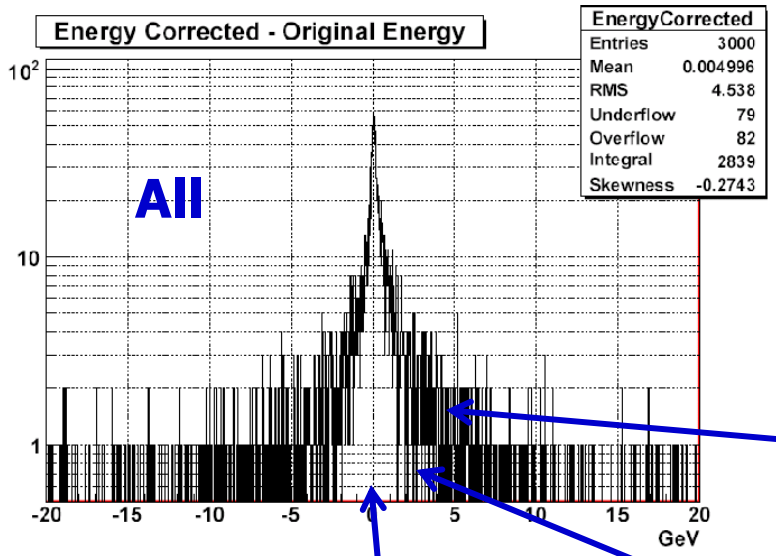
Where is missing Xtal

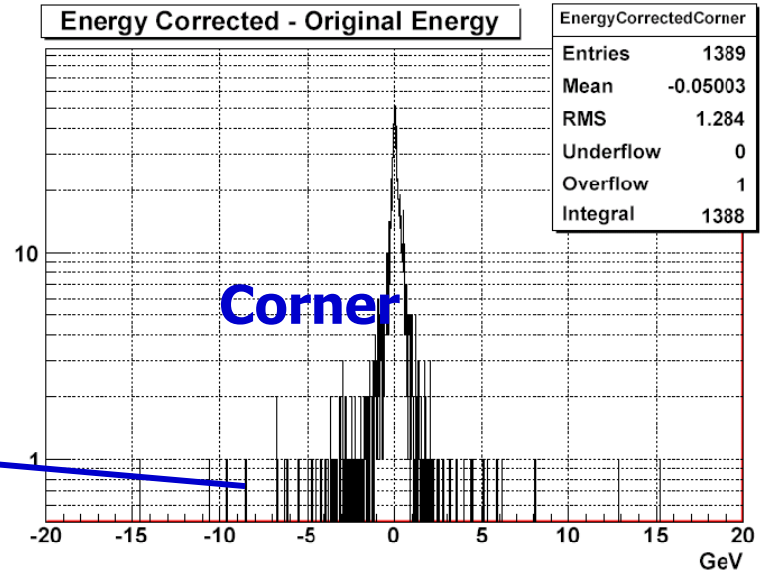
Missing Xtal = random in 3x3 matrix

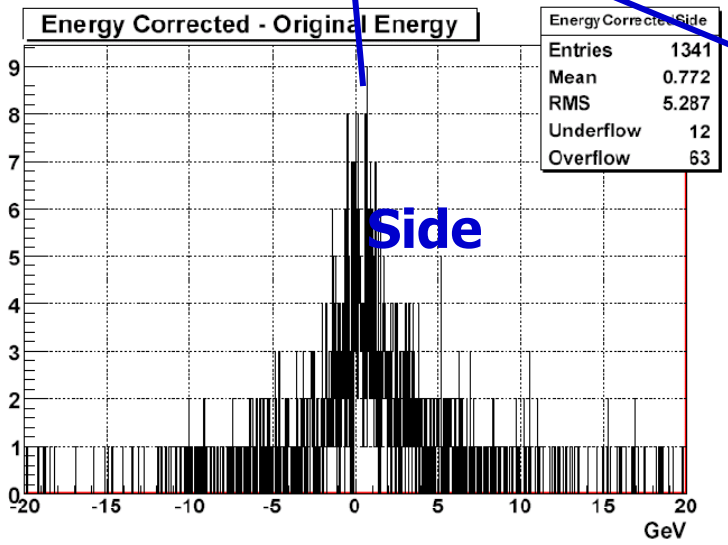


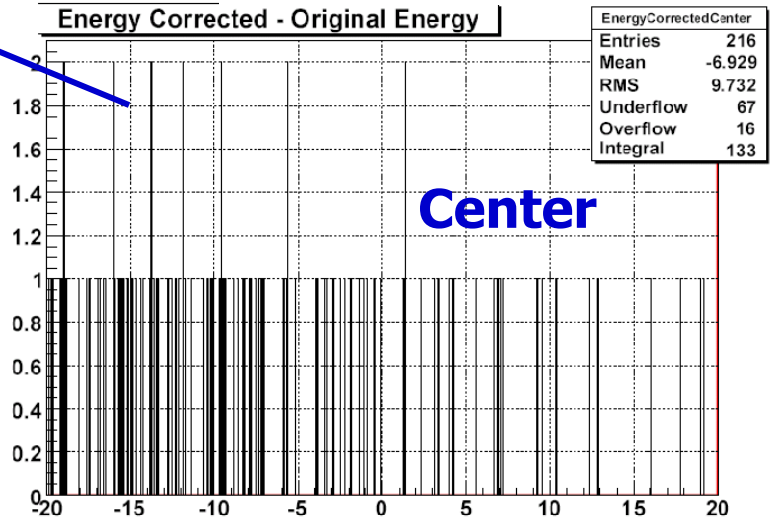
Resolution are reasonable at all energies and S25 is conserved

Energy Correction (All)









Corner correction seemed alright but center is off as well as side…