Report from the TSG workshop

Simone Gennai

workshop agenda

- ☐ Real workshop atmosphere

  - ☐ lively discussions

  - ☐ Reports from all POGs (and not only)

    - ☐ long list of studies, improvements and new developments

  - ☐ full agenda can be found at this link

- ☐ The main goal for 2013 is to improve the HLT reconstruction to be as much as possible as the offline one

  - ☐ in order to apply tighter cuts (more similar to offline analyses) improving the purity of the trigger path without loosing signal acceptance.

- ☐ Short summary Good News:

  - ☐ we will have improved objects at HLT in 2015

- ☐ Short summary Bad News:

  - ☐ it may not be enough to reduce the rate as much as we need

  - ☐ Improving the trigger strategy is mandatory to reduce the overall rate

    - ☐ i.e. develop less inclusive triggers and apply cross triggers whenever is possible

POG task list

- As already said the plan is to improve the HLT performance

  - moving to the use of Particle Flow reconstruction as much as possible

- At the same time the Particle Flow itself (@ HLT) must be improved to:

  - have better performances

  - improve the timing

    - a special intra-pog group (GED) is working to coordinate the effort

- Full task list can be found at this link

  - man power is needed, please volunteer!

Just an example

	ACTIVITY	ASSIGNED TO	START DATE	TIME SCALE / ESP	
	Muons				
	Level-2				
	fix and develop standalone/L2 seeding (offline + online), find an expert and contact person: adapt for CSC and RPC upgrade; improve seeding algorithm; fix close-by muons inefficiency	H. Brun; A. Hernandez Almada, E. De La Cruz Burelo, J. Mejia Guisao	01/03/2013	~ 6m (3m + 3m) (shared with offline)	6 (= 3+3)
	use of unmatched Level-1 seeding; use of Exhaustive Trajectory Builder; implementation of segment-based fit; changes in the stepping helix propagator; use of online beam-spot; try complete refit (smoothing) of tracks (offline + online)	M. Herndon, D.T.	01/03/2013	~ 6m (1m + 1m + 2w + 2w + 1m + 2m) (shared with offline)	~ 9 (= 1 + 1 + 2 + 2 + 1 + 2)
	Level-3				
	understand and fix pileup dependent inefficiency in L3 reconstruction	Purdue (H. Yoo, S. Dutt)	01/03/2013	3m	3
	better use of the PV position in regional seeding	Purdue (H. Yoo)	01/03/2013	1m	1
	regional seeding with a better use of the PV position	Purdue (S. Dutt)	01/03/2013	1m	1
	refined seeding algorithm (to match what is done in offline)	Purdue (S. Dutt, N. Neumeister)	01/03/2013	2m	2
	improved L2-L3 matching	Purdue (S. Dutt, N. Neumeister)	01/03/2013	1m	1
	changes in the stepping helix propagator	TBD	-		
	Tracker Muon				
	Use Tracker Muon in trigger also for single muons	J. Sekaric		3m	3
	PF and Isolation				
	improve L3 isolation (moving to PF-based isolation, pile-up corrections)	S. Fiorendi		3m	3
	High pt muons				
	More detailed studies of triggering on high PT muons	TBC		2m	3
	DQM/Validation				

Muons

☐ Improvements in both L2 and L3 muon reconstruction

☐ HLT reconstruction getting more and more similar to offline one

☐ We will be able to apply tighter HLT cuts w/o signal efficiency loss

• tag-and-probe with Z, two tight-ID muons, loose PFIso, tag matched to IsoMu24
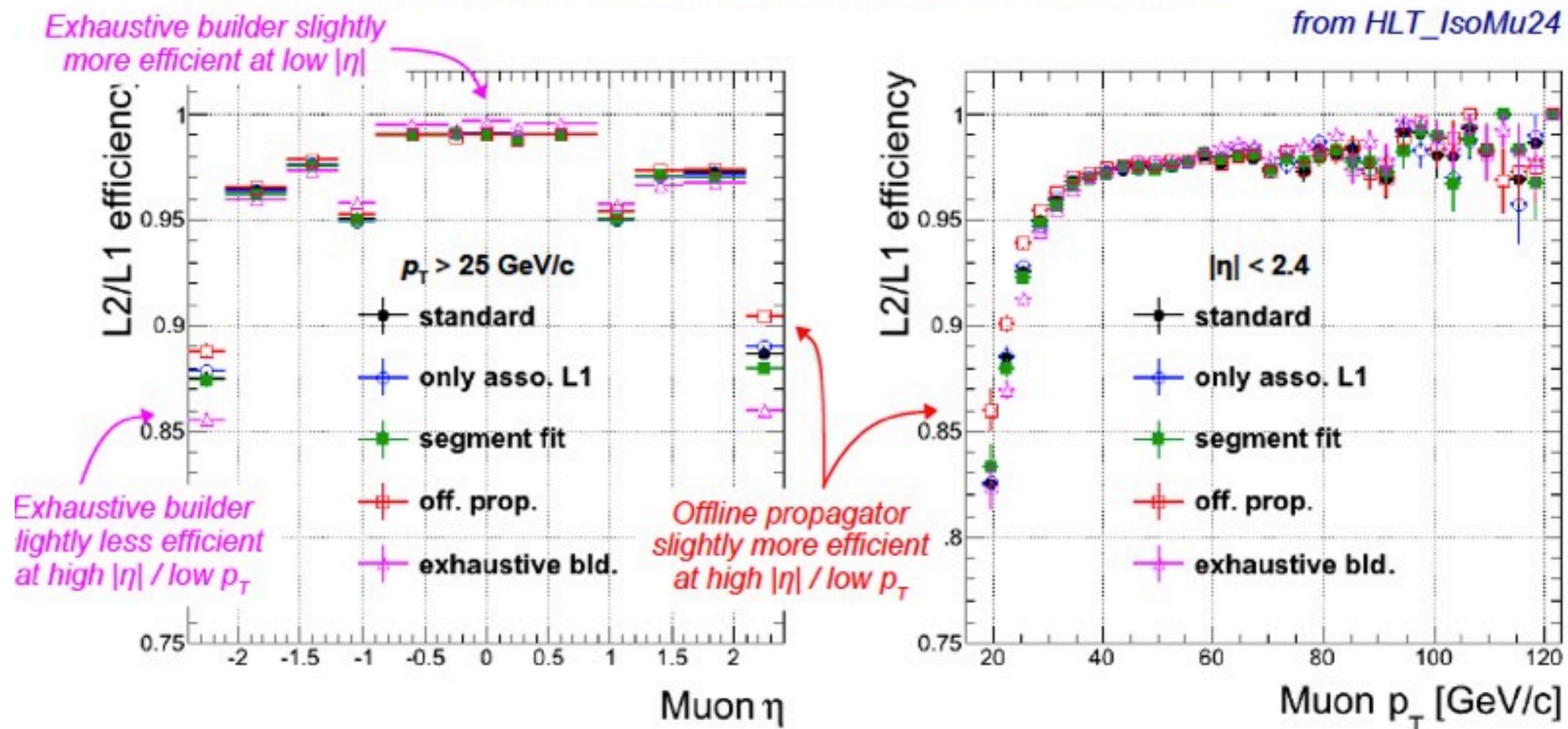
L3 Muon reconstruction

☐ Modified L3 reconstruction allows efficiency recovery wrt 2012 standard reconstruction

- Switching to **Chi2Estimator**
  - 41% failing events are recovered (56% in $Z \to \mu\mu$)
  - negligible effect on passing events

- Enabling also the **new cascade logic**
  - extra efficiency recover, for a total gain of > 50% (80% for $Z \to \mu\mu$)
 - no effect on passing events
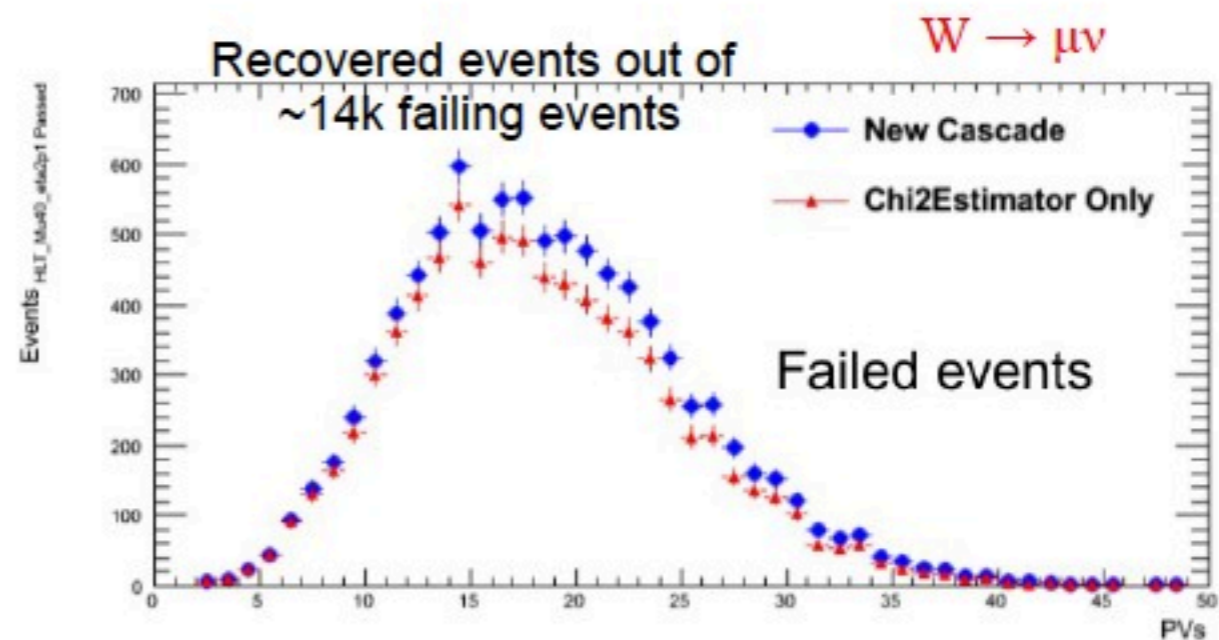
# EGamma PFClustering

	STD				PF		
FILTER	PASS	FAIL			PASS	FAIL	
L1Seed	6804	342	4.79%		6795	351	4.91%
ET Filter	5894	910	13.37%		5839	956	14.07%
Cluster Shape	5741	153	2.60%		5671	168	2.88%
Ecal Iso	5699	42	0.73%		5641	30	0.53%
HoE	5659	40	0.70%		5604	37	0.66%
Hcal Iso	5637	22	0.39%		5575	29	0.52%
PixelMatch	5438	199	3.53%		5366	209	3.75%
EoP	4785	653	12.01%		4718	648	12.08%
Deta	4757	28	0.59%		4664	54	1.14%
Dphi	4728	29	0.61%		4642	22	0.47%
Tk Iso	4661	67	1.42%		4578	64	1.38%

The new clustering has been also checked on Ttbar events and everything seems OK.

EGamma isolation

- Every POG is moving toward PFlow based isolation

  - improved bkg suppression is expected

- Preliminary results on (ecal only) isolation are promising

  - at the same efficiency rate is reduced by more than 33%

BARREL

ENDCAP
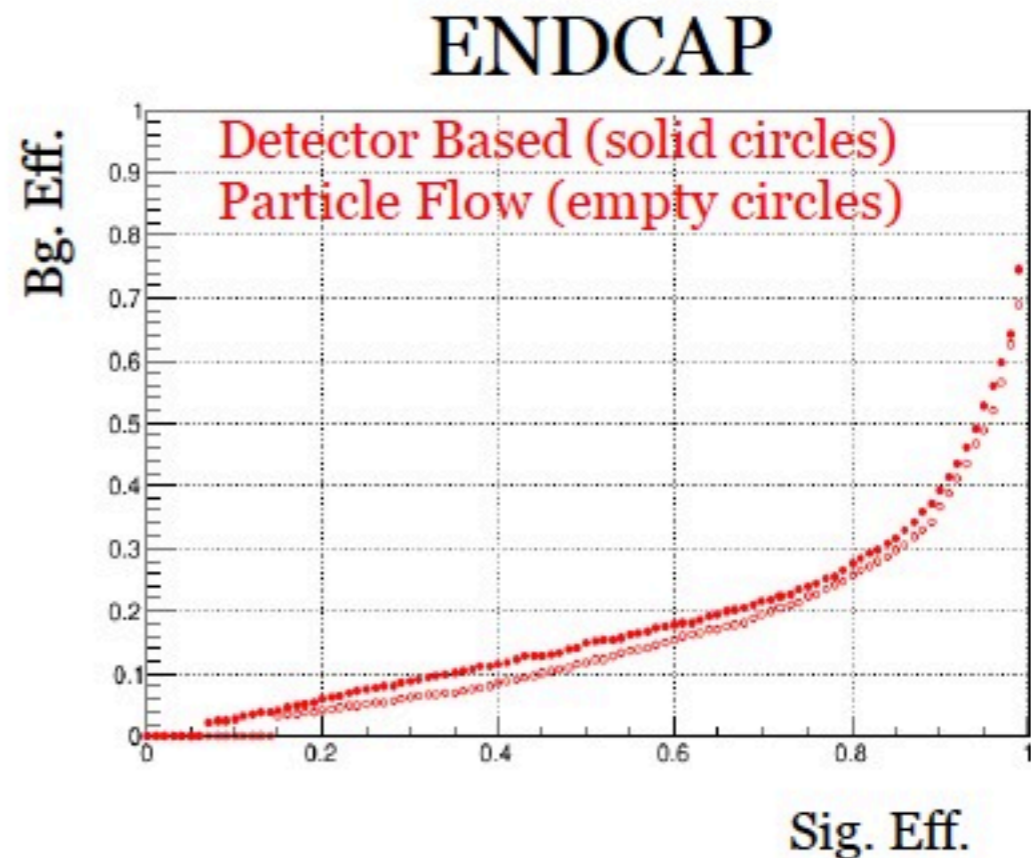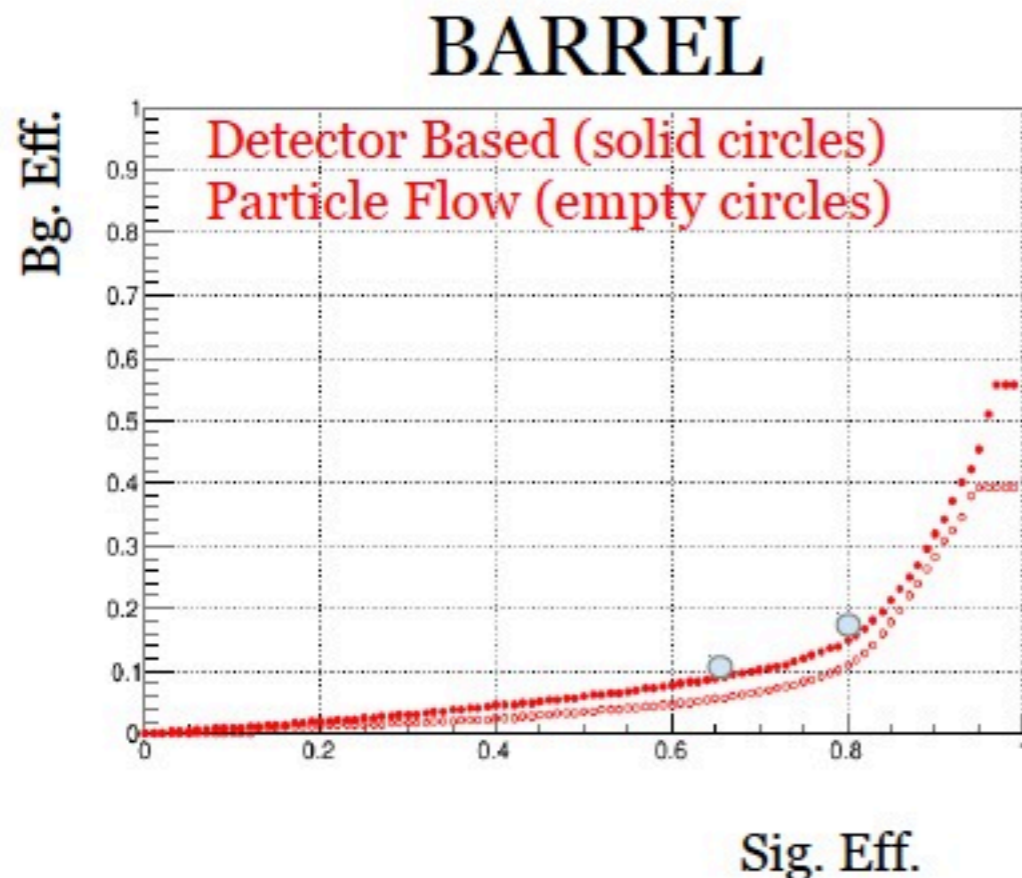
Electron GSF tracking @HLT

- ☐ GSF tracking finally available at HLT

  - ☐ rate reduction of about 10%-20% for high pT

    - ☐ 80 GeV electrons

  - ☐ need to evaluate the impact for lower pT electrons
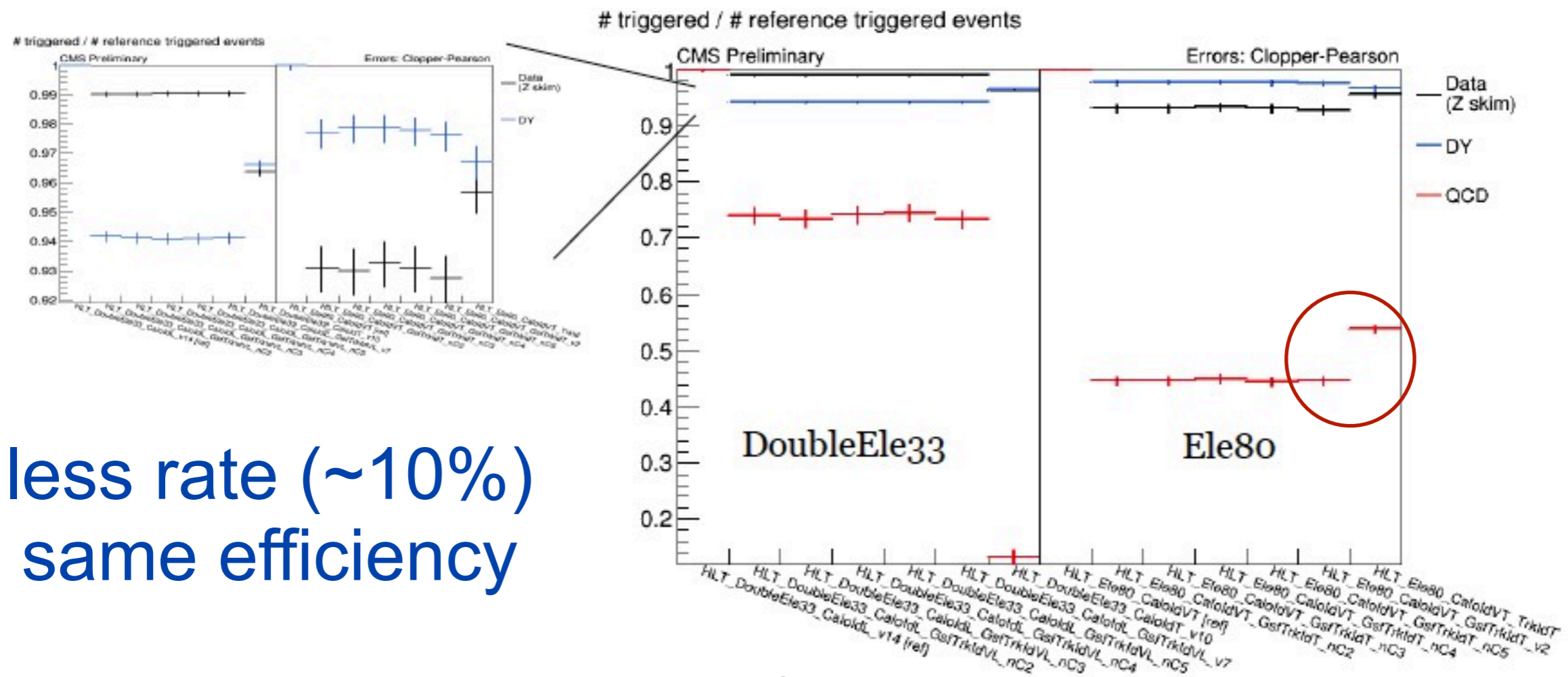
less rate (~10%)
same efficiency

JETMET

- New group of people started to work on the JETMET

- Quite a long task list, for the moment foscusing on

  - Jet Energy Corrections

  - improving the use of Particle Flow objects

  - MET rate reduction

- While on the JET side we are still warming up, MET studies already shown possible improvements

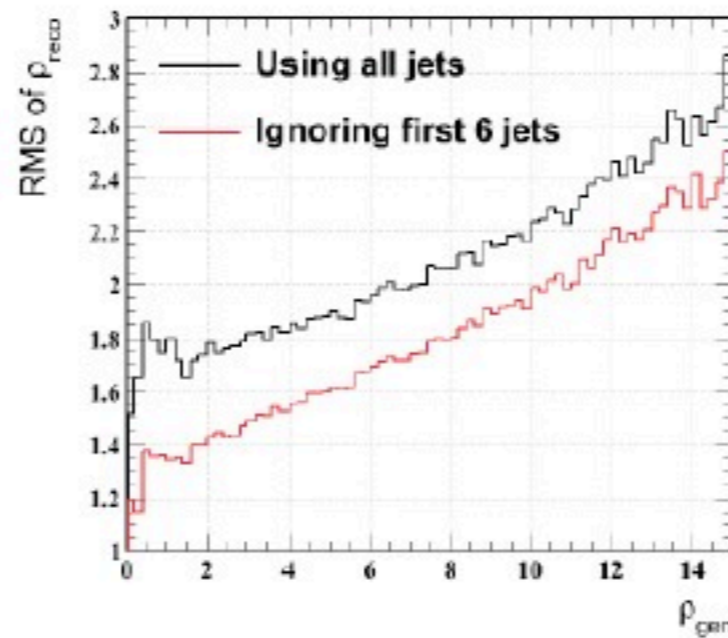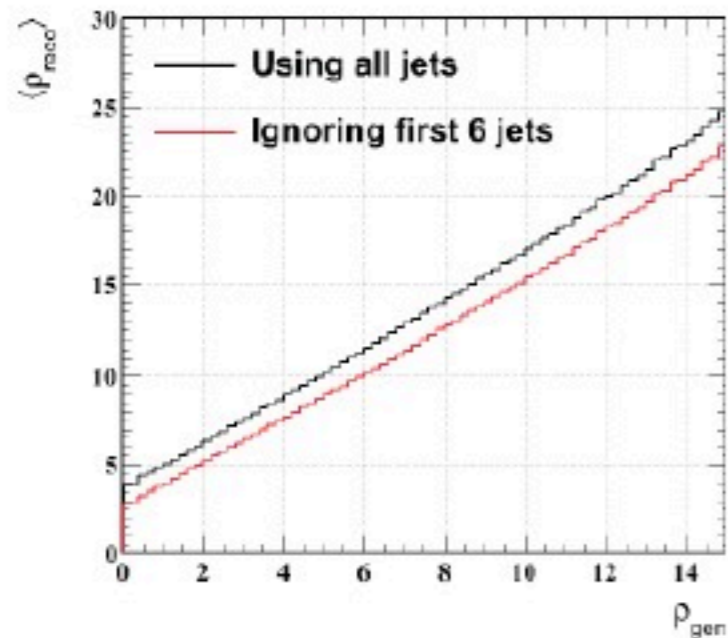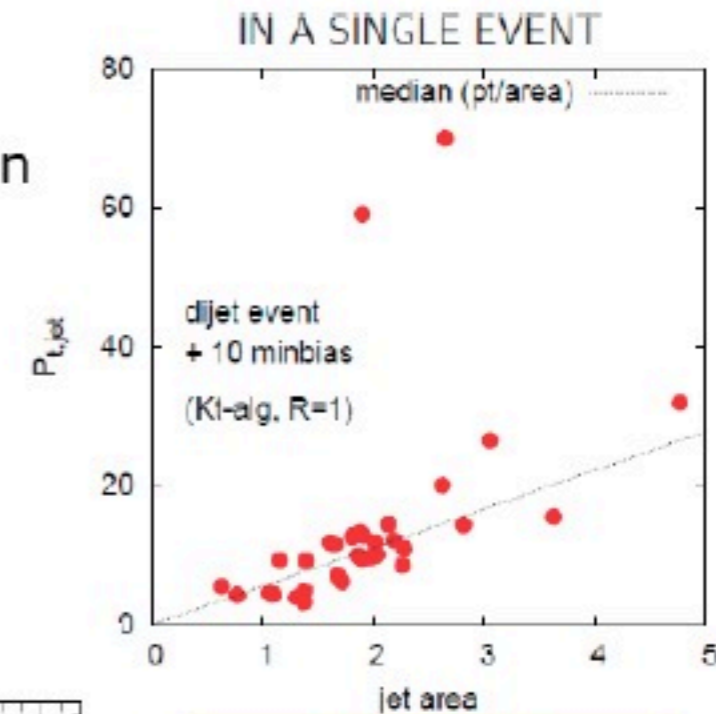 - extra MET type, as trackMET, are being investigated as well

Effect of PU on jet turn on

□ The work "just" started

 □ need to understand the features present in the present reconstruction
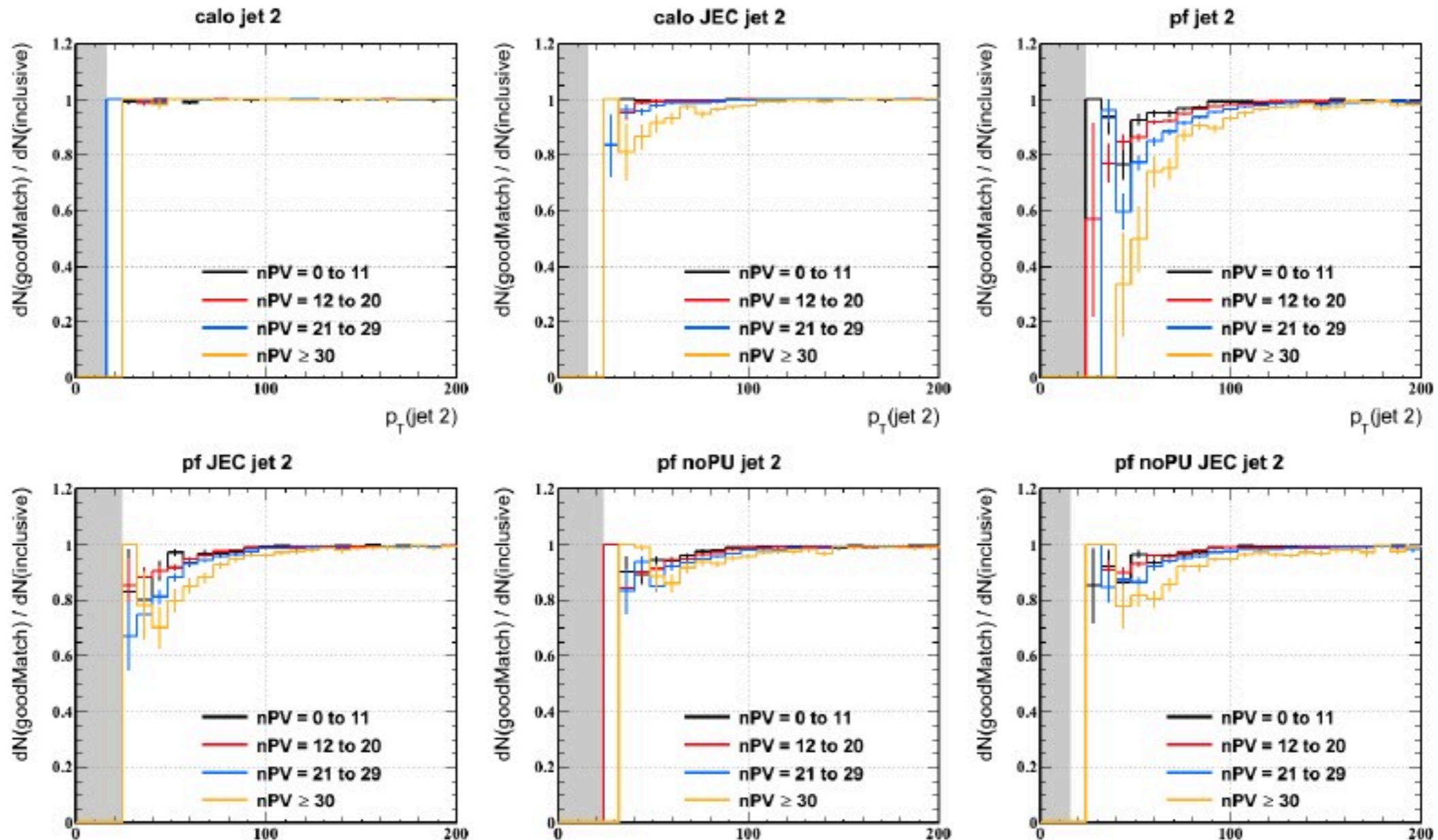
  □ not an easy job!

Effect of PU on jet turn on

- ☐ The work "just" started
    - ☐ need to understand the features present in the present reconstruction
        - ☐ not an easy job!

- ☐ JEC seems not to work properly on low pT jets
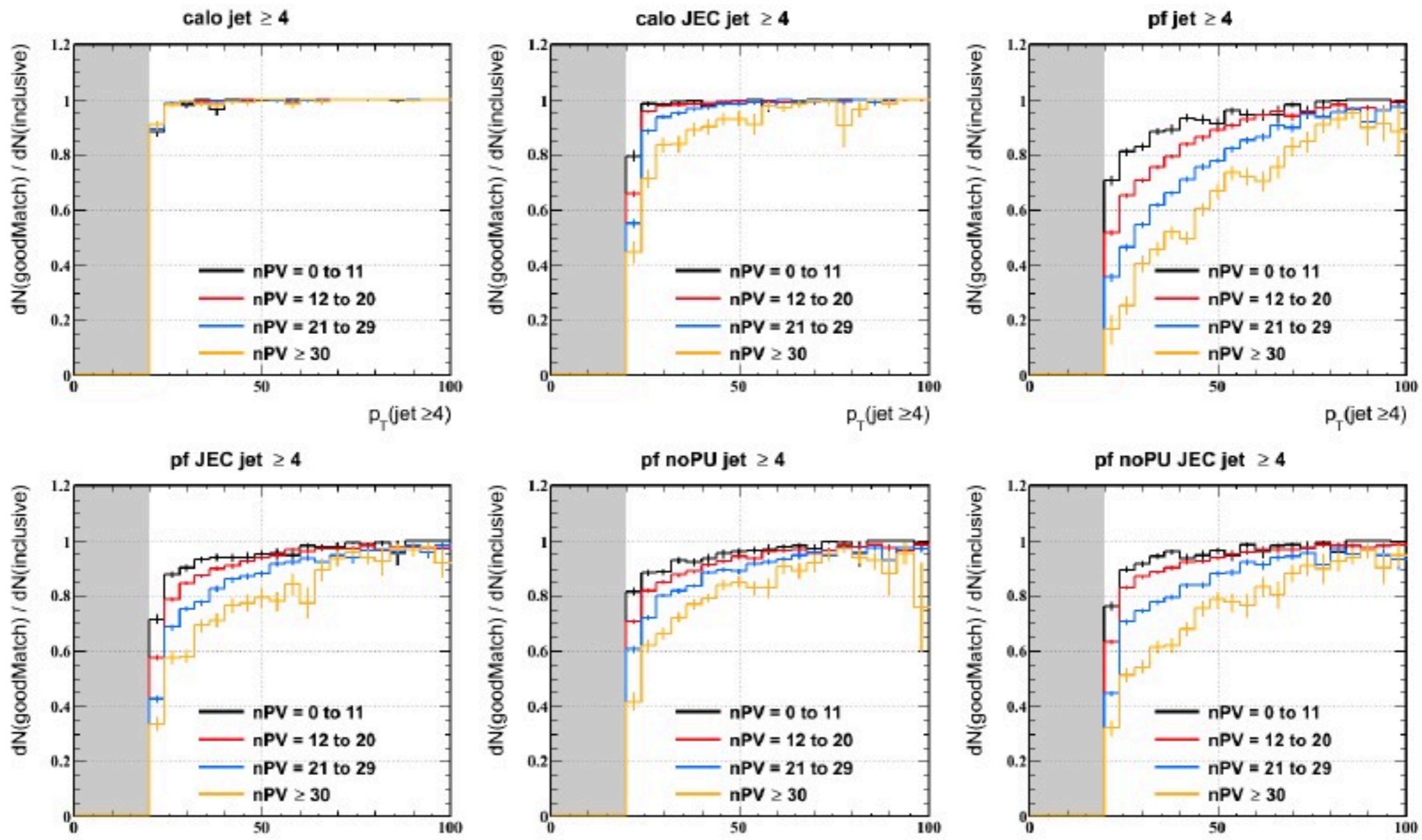
PU substruction

- Try to reduce inefficiencies due to PU-subtraction
  - Under study
  - Pileup density is currently estimated using the median of the pt/area distribution
  - Idea is to exclude "Signal" jets from ρ calculation which can lead to over-subtraction
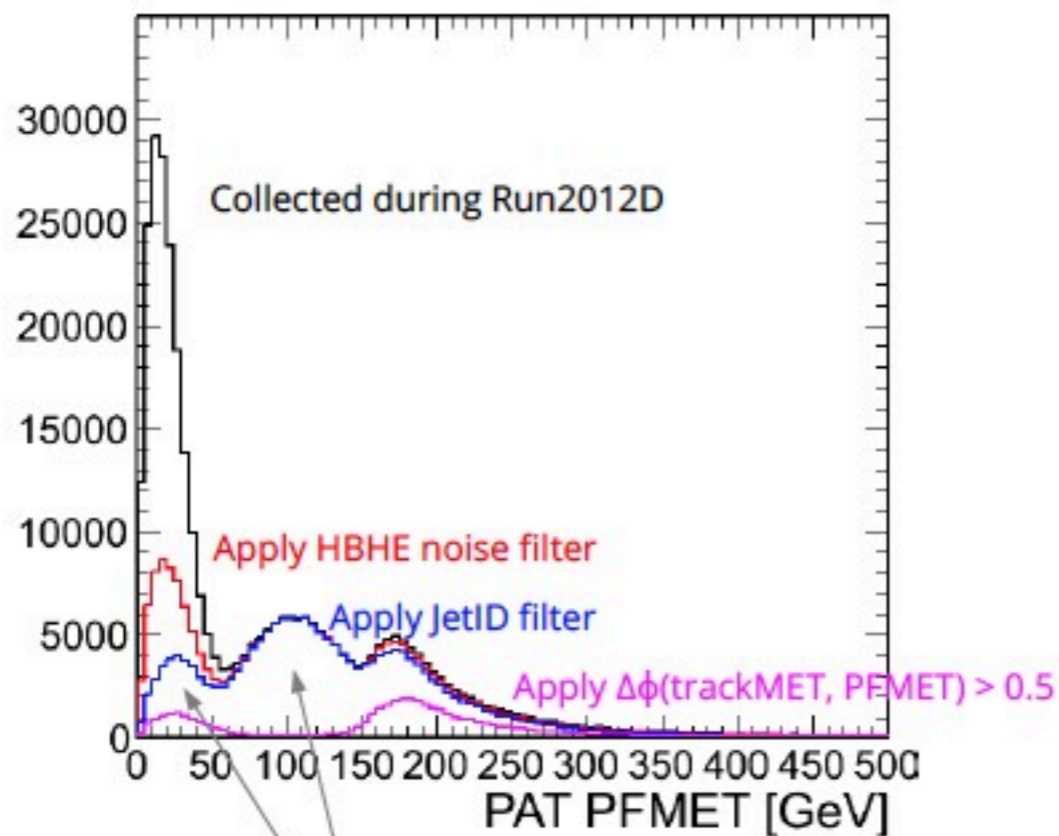
IN A SINGLE EVENT

median (pt/area)

dijet event
+ 10 minbias

(Kt-alg, R=1)

$P_{t,jet}$

jet area

Estimate ρ:

$$\rho \simeq \underset{\{jets\}}{\text{median}} \left[\frac{p_{t,jet}}{A_{jet}} \right]$$

— Using all jets
— Ignoring first 6 jets

⟨ρ_reco⟩

ρ_gen

— Using all jets
— Ignoring first 6 jets

RMS of ρ_reco

ρ_gen

Noise Cleaning at HLT

- Let's study METdata, pfMET150 online

Without any offline cleaning

Collected during Run2012D

Apply HBHE noise filter

Apply JetID filter

Apply $\Delta\phi$(trackMET, PFMET) > 0.5

PAT PFMET [GeV]

still trying to figure out the origin of these events
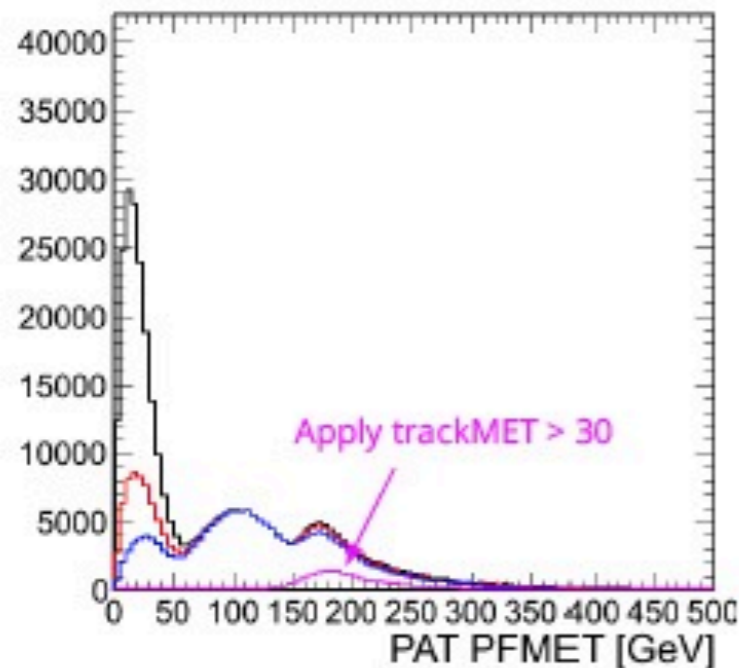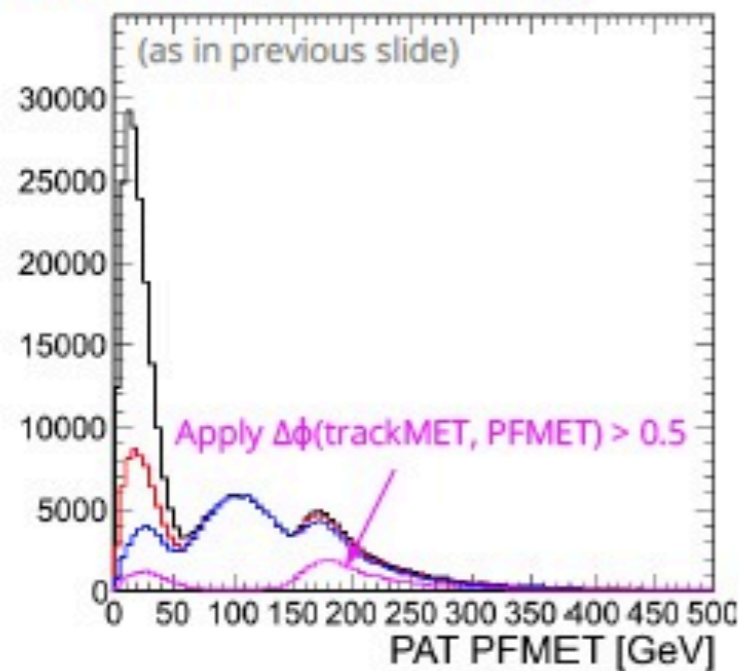
Status of noise rejection.
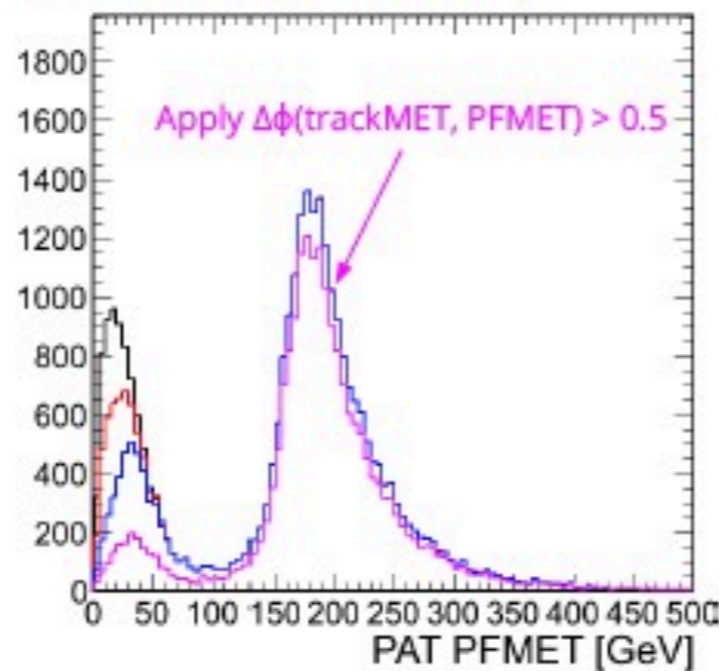After applying HBHE & JetID filters, 64% of the survived events have offline PFMET < 150 GeV.

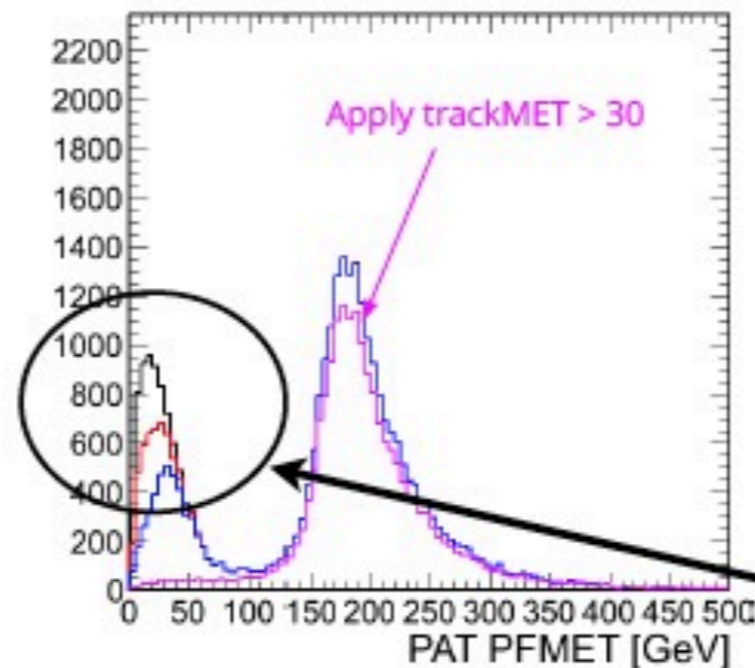With trackMET $\Delta\phi$ < 0.5 requirement, it becomes 30%

Noise Cleaning at HLT

Without any offline cleaning

After offline noise cleaning

Even with offline noise cleaning (note the # events), 25% have offline PFMET < 150 GeV. With trackMET Δϕ requirement, it becomes 15%.
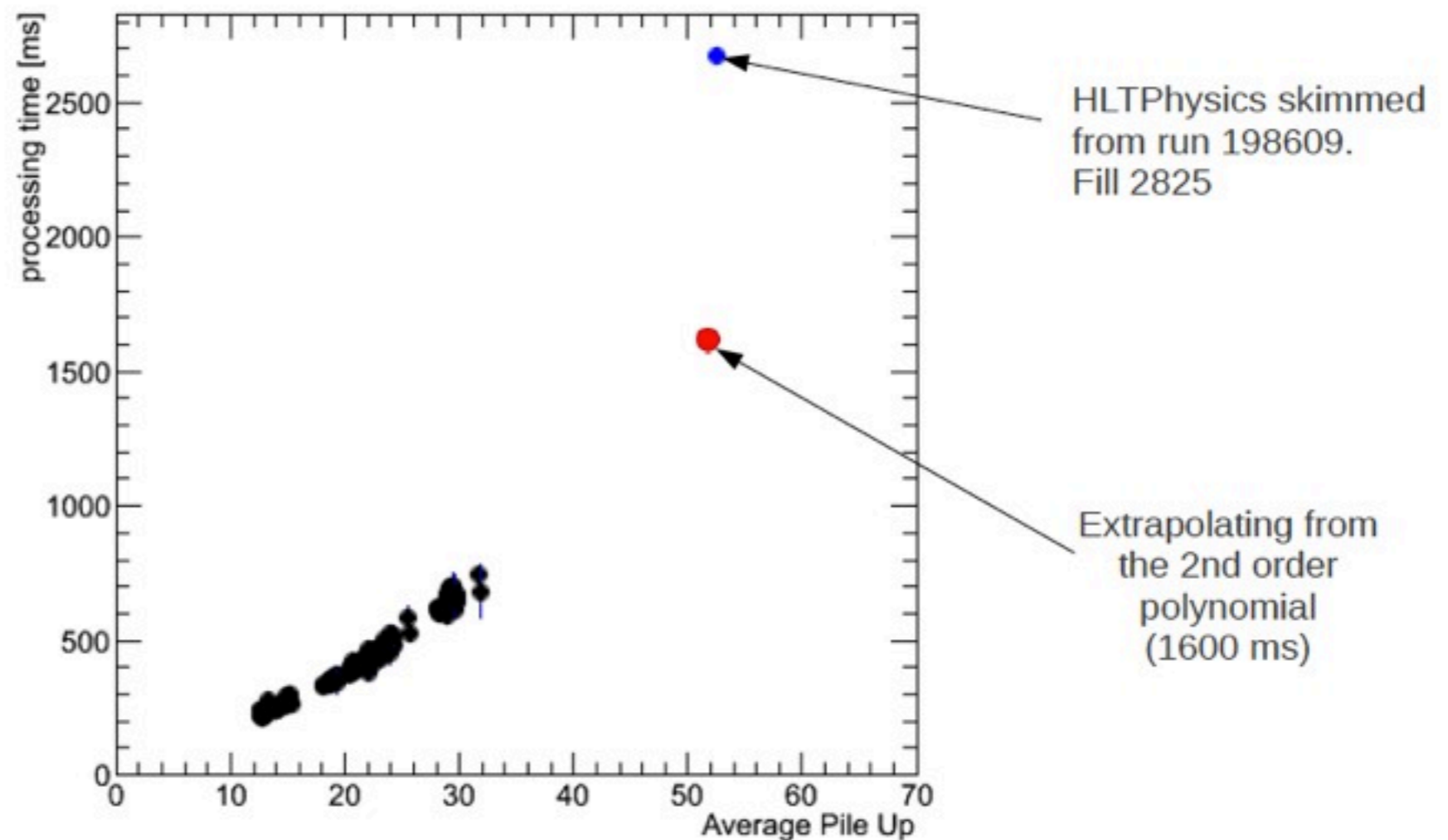
With trackMET > 30 GeV requirement, it becomes 11%

so, this are events with online CaloMET>80, PFMET>150 but trackMET~0 (and at least one jest>30 with one calohit with all the energy)

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Tracking

☐ Quite a lot of work is ongoing to try to reduce the timing at HLT

   ☐ still far from optimization

   ☐ stay tuned!

HLTPhysics skimmed from run 198609. Fill 2825

Extrapolating from the 2nd order polynomial (1600 ms)

Conclusions

- □ 2013 is devoted to improve object reconstruction @ HLT

  - □ main goal is to increase the use of Particle Flow reconstruction

    - □ improving the HLT version as much as possible

  - □ a lot of work have done, but still a lot in front of us

- □ Still the development of less inclusive triggers is mandatory

  - □ even if we can apply tighter cuts online, we still may need to use combined triggers

    - □ in order not to loose important phase space

      - □ especially for bkg estimation

- □ Improvements on Tracking, PFlow isolation and JETMET are expected soon

  - □ if interested in contributing to the work let us know!