Trigger validation for 13.0.30.2

Event size
TrigDecision
Jets
Electrons

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Event Size

- Andrew Hamilton https://twiki.cern.ch/twiki/bin/view/Main/TriggerAODSizeInRel13
- Measured in sample A events:
  - 1000 events per sample
  - Numbers in kB/event (~5% uncertainty)
- Note trigger size for top events:
  - This grows mostly with size of menu and event complexity
  - Top events satisfy almost every signature
  - Trigger EDM actually much more optimised ("smaller") in rel.13, but menu much larger (~190 chains per level in 13.0.30.1, as opposed to ~40 in 12.0.7)
    - In 13.0.20, reduction from ~100kB/ev to ~50kB/ev for top events and for same menu
  - ~35% reduction can be achieved for top events with separate B-physics menu

Dataset (AOD)	total	event	truth	calo	indet	muon	met	jet	tau	eg	trig ger
5011.J2_pythia_jetjet	187	6.0	31.3	25.7	26.2	3.7	3.3	36.1	1.2	6.5	42.1
5144.PythiaZee	175	6.4	25.6	20.7	19.0	3.9	3.3	33.8	1.4	5.6	49.7
5702.PythiaB_BsJpsiphi	220	6.0	29.0	23.9	26.3	32.0	3.4	37.9	0.8	3.4	51.2
6384.PythiaH120gamgam	179	6.4	26.6	22.3	20.2	3.5	3.4	32.9	1.3	5.0	51.5
5200.T1_McAtNlo_Jimmy	418	8.1	53.7	36.8	45.8	17.6	3.8	65.6	3.4	18.2	158.0

TrigDecisionTool

- Problem found last week which affects L1 configuration info stored in the AOD
  - Empty L1 item IDs suppressed in AOD trigger config vector

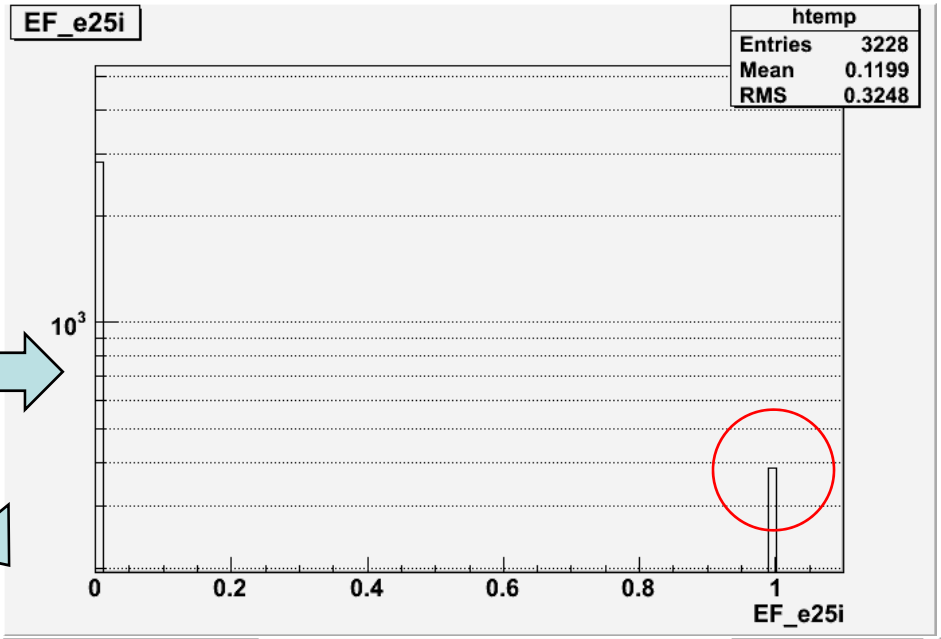
```
std::vector<L1 item> = {L1_EM05,…,L1_EM100,0,0,0,L1_MU04,…}
```

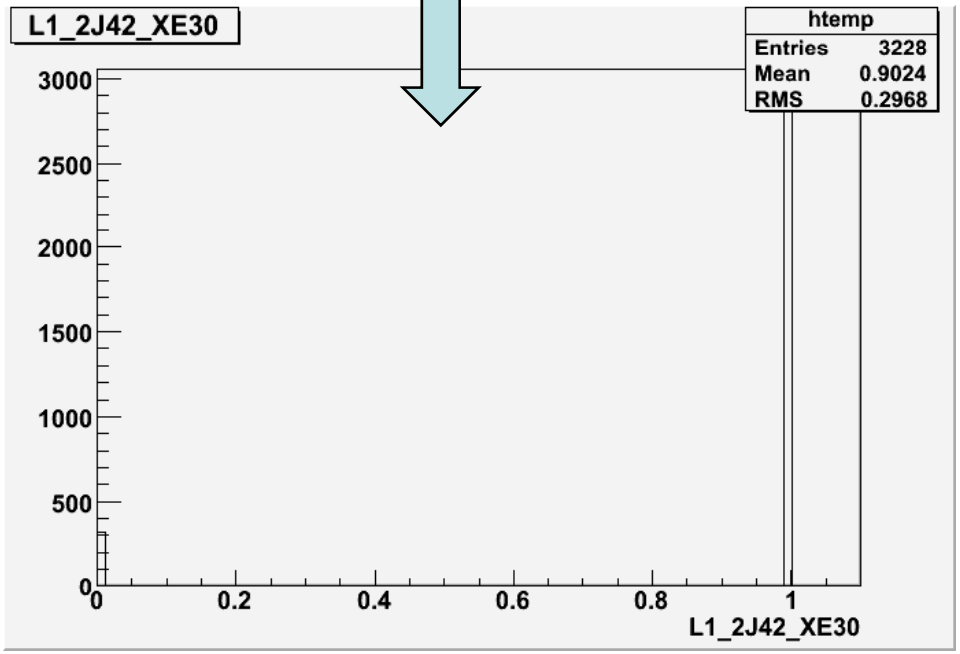
•To read AODs, TrigDecisionTool needs trigger configuration – position in vector taken as item ID → wrong due to “zero suppression”

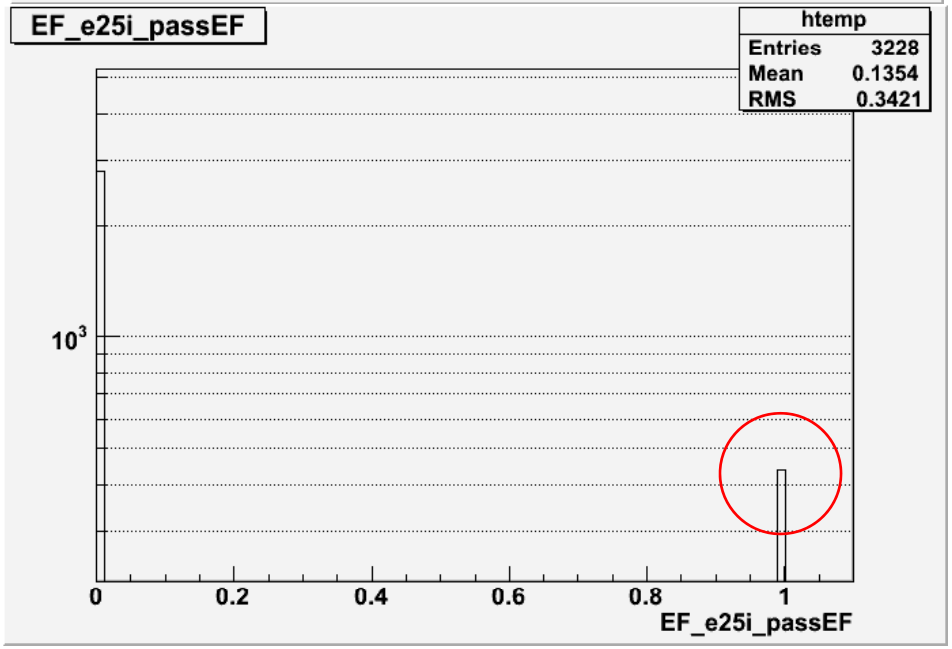
•Fix by Till eifert: need to check out TrigDecision-00-01-20 (two extra tags needed to work TAG)

https://twiki.cern.ch/twiki/bin/view/Atlas/BugFixForL1InTrigDecisionV13003001

- Example plots from Till
- “Sample A” SU3 data using TAG root file directly (TAG writing from AOD shows this bug is fixed)
- Testing passthrough in EF_e25i
- L2_2J42_XE30 should accept most events in the sample:

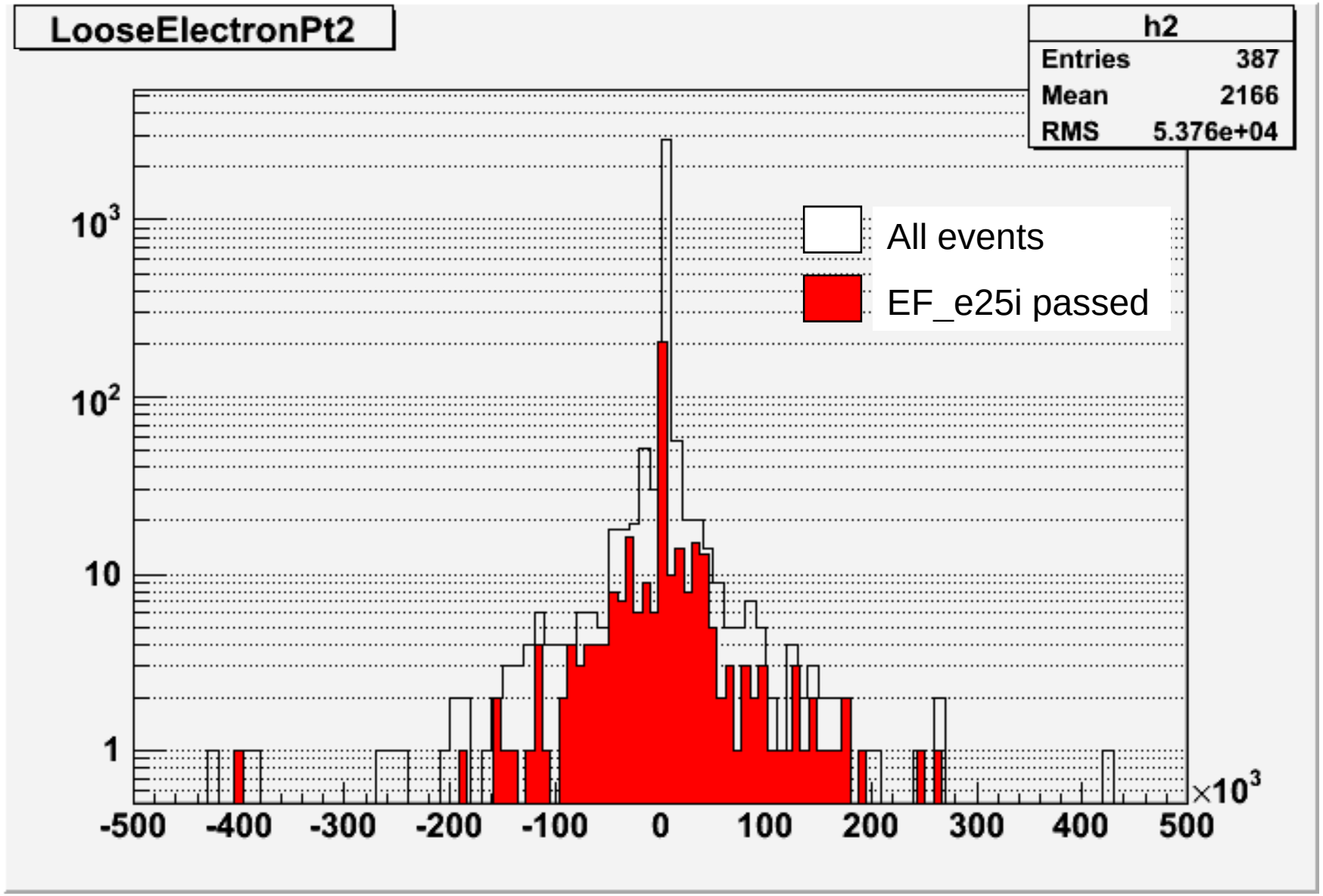






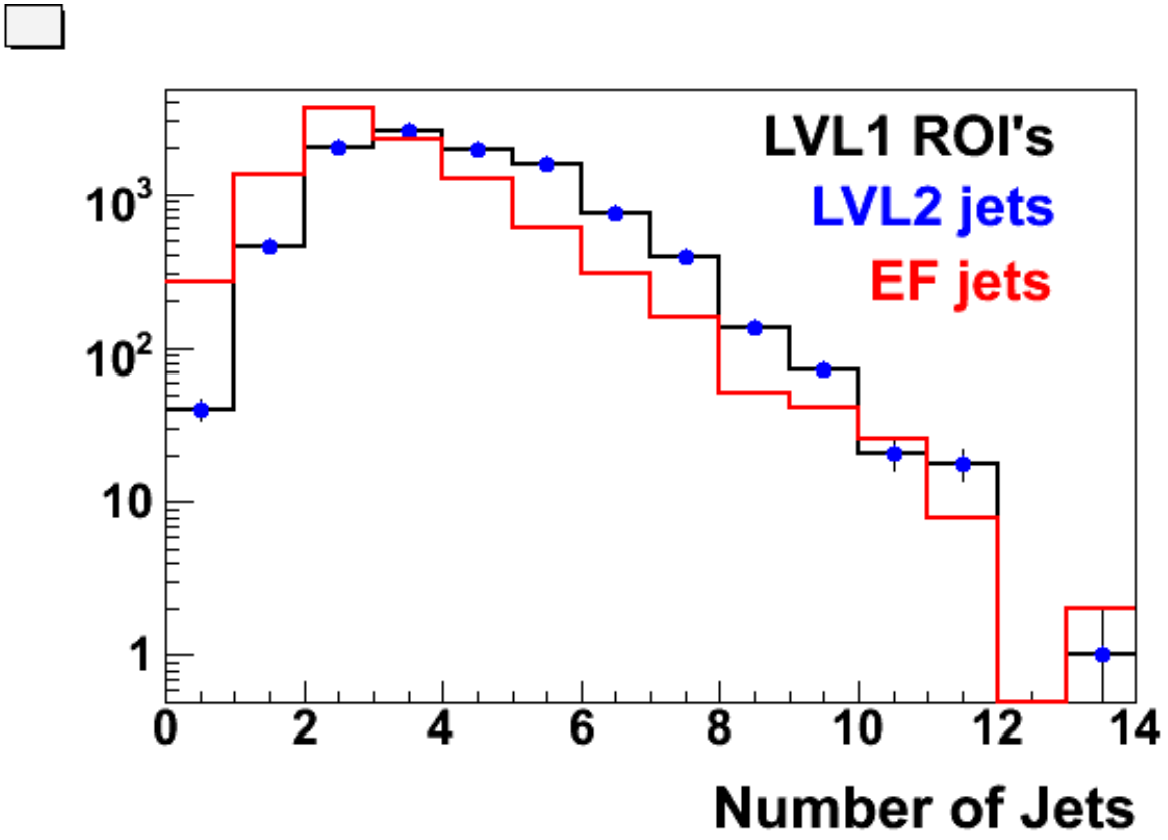
- Printout of a sequence of triggers
- L2_e20_xe15 starts from L1_EM18_XE15 ...
- Can clearly see rejection at higher trigger levels

```
root [16] CollectionTree->Scan("L1_EM18_XE15:L2_e20_xe15:EF_e20_xe15")
************************************************
*    Row   * L1_EM18_X * L2_e20_xe * EF_e20_xe *
************************************************
*        0 *          1 *          0 *          0 *
*        1 *          1 *          0 *          0 *
*        2 *          1 *          0 *          0 *
*        3 *          1 *          1 *          1 *
*        4 *          1 *          0 *          0 *
*        5 *          1 *          0 *          0 *
*        6 *          1 *          0 *          0 *
*        7 *          1 *          0 *          0 *
*        8 *          1 *          0 *          0 *
*        9 *          1 *          1 *          0 *
*       10 *          1 *          1 *          1 *
*       11 *          1 *          1 *          0 *
*       12 *          1 *          0 *          0 *
*       13 *          1 *          0 *          0 *
*       14 *          1 *          0 *          0 *
*       15 *          1 *          0 *          0 *
*       16 *          1 *          0 *          0 *
*       17 *          1 *          1 *          1 *
*       18 *          1 *          0 *          0 *
*       19 *          1 *          1 *          1 *
*       20 *          1 *          1 *          0 *
*       21 *          1 *          0 *          0 *
*       22 *          1 *          1 *          1 *
*       23 *          1 *          1 *          0 *
```


LooseElectronPt2
h2
Entries 387
Mean 2166
RMS 5.376e+04
All events
EF_e25i passed
10^3
10^2
10
1
-500 -400 -300 -200 -100 0 100 200 300 400 500
×10^3

Jet slice

- Level 2 and Event Filter compared (Patricia Conde Muiño)
- Number of jets/event
- Level 1 (nr. Of RoIs) same as Level 2 jets (a L2 jet object always created)
- L2 applied selection → EF has less jet RoIs
- EF may reconstruct 2 jets in 1 L2 RoI

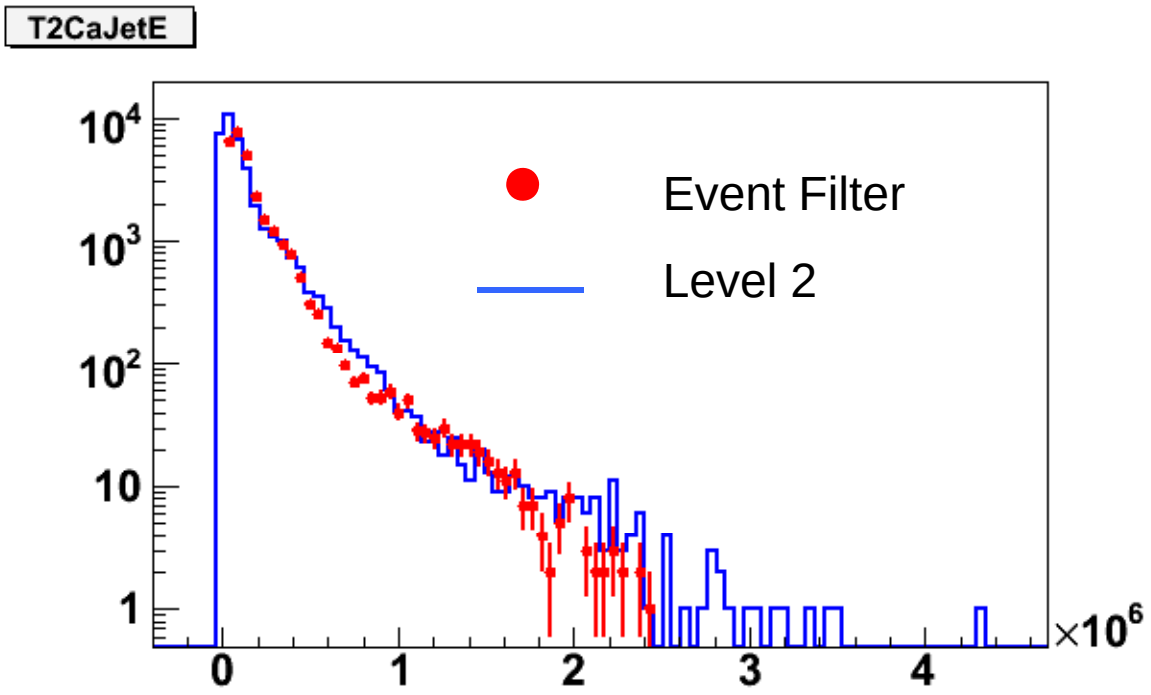


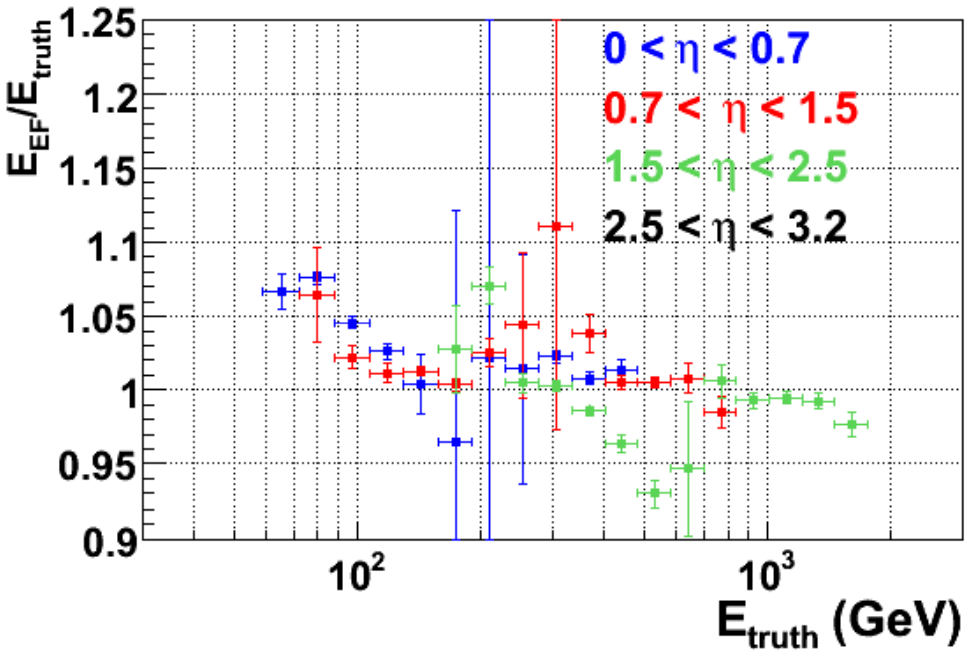
Top:

- Low-ET cut by L2 + migration to higher ET (resolution) at EF low-end

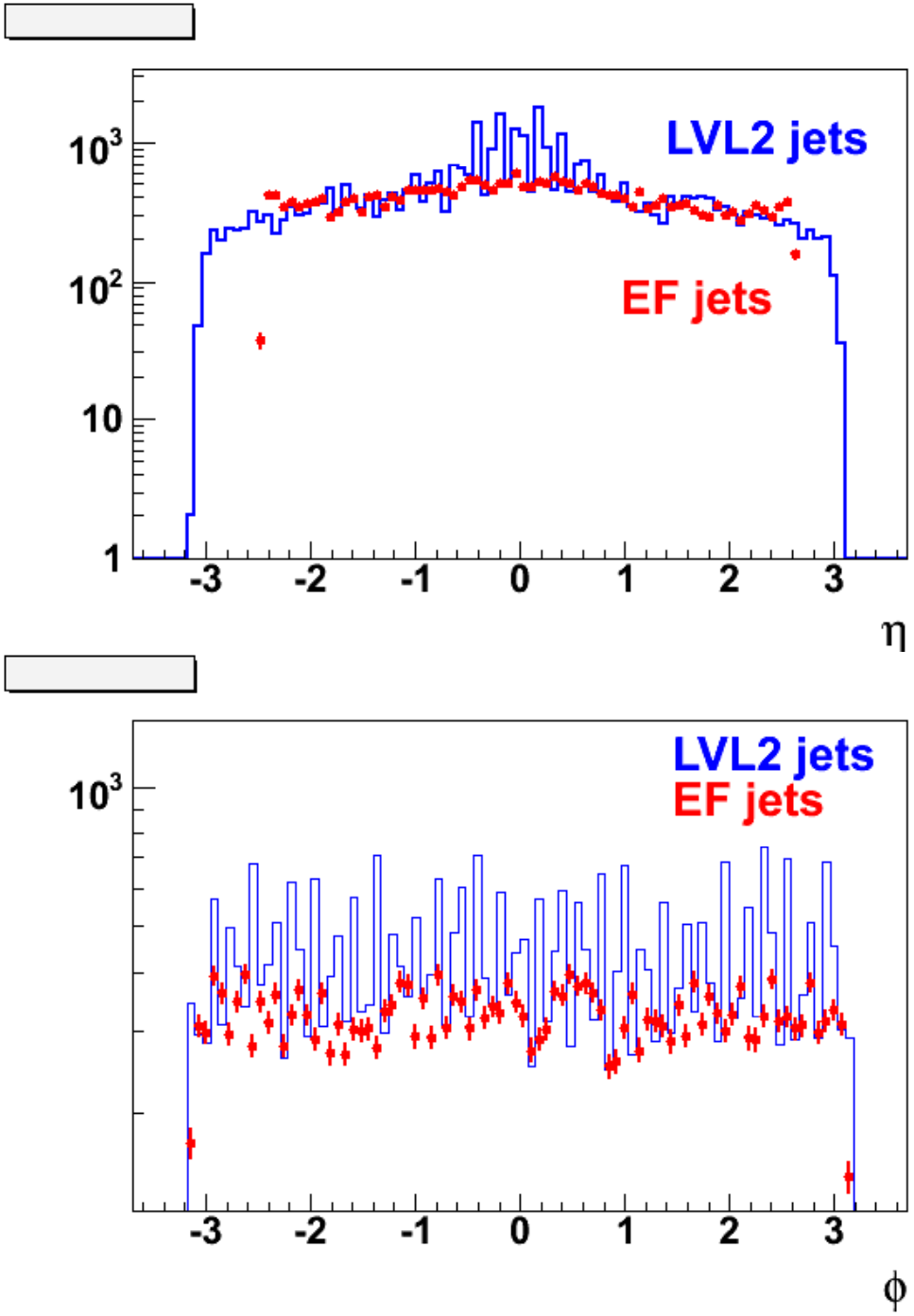
Bottom:

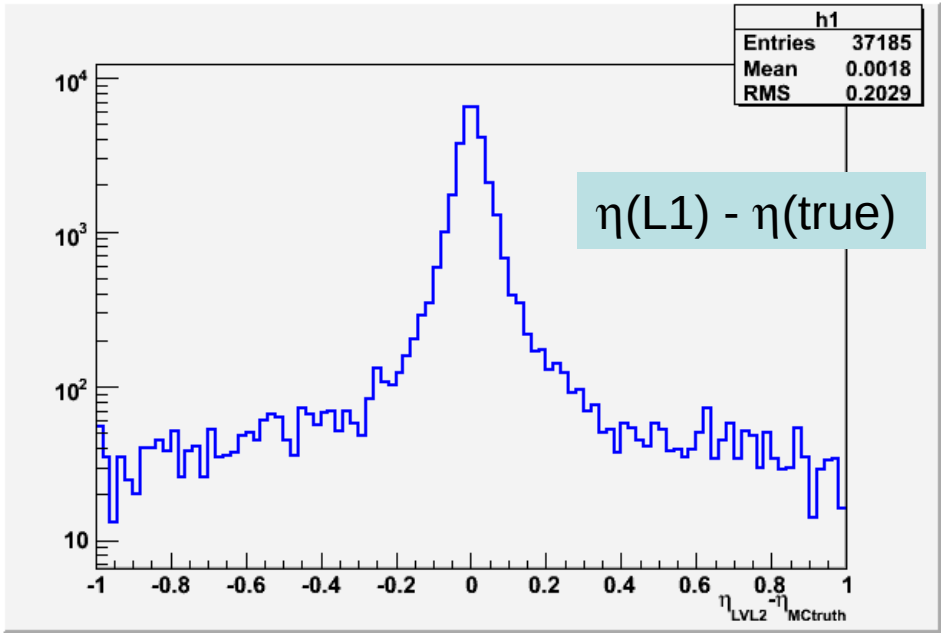
- EF energy scale variation ~5%
- Similar for L2
- Large errors (low stats) in middle-ET sample

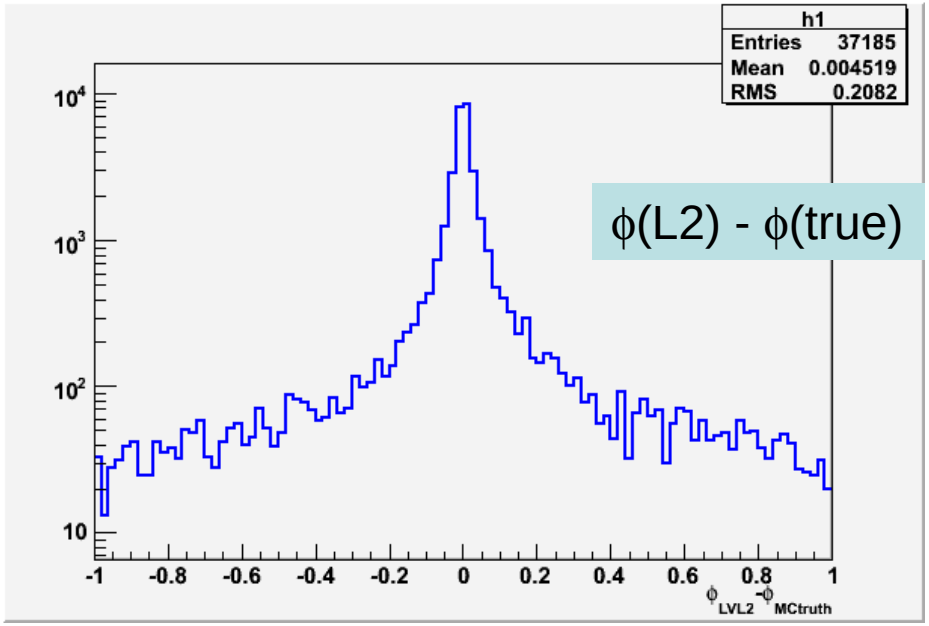


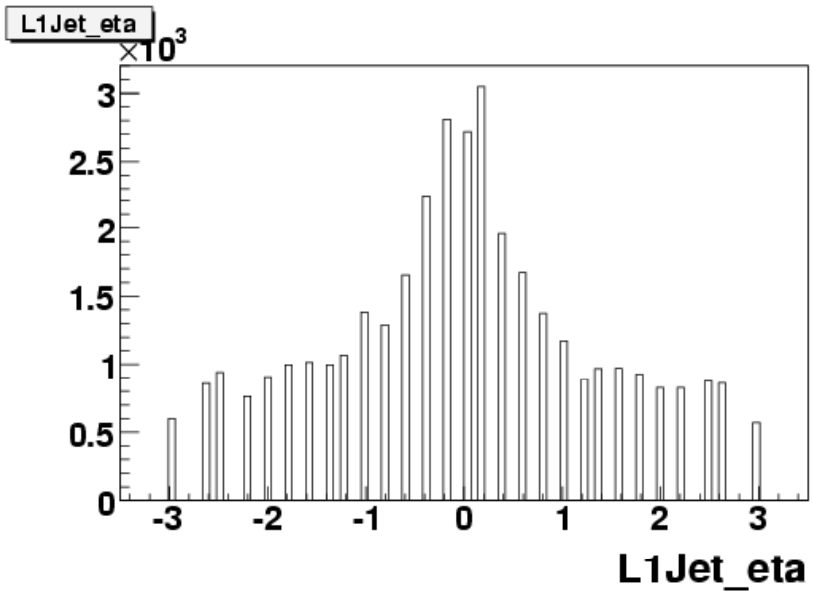


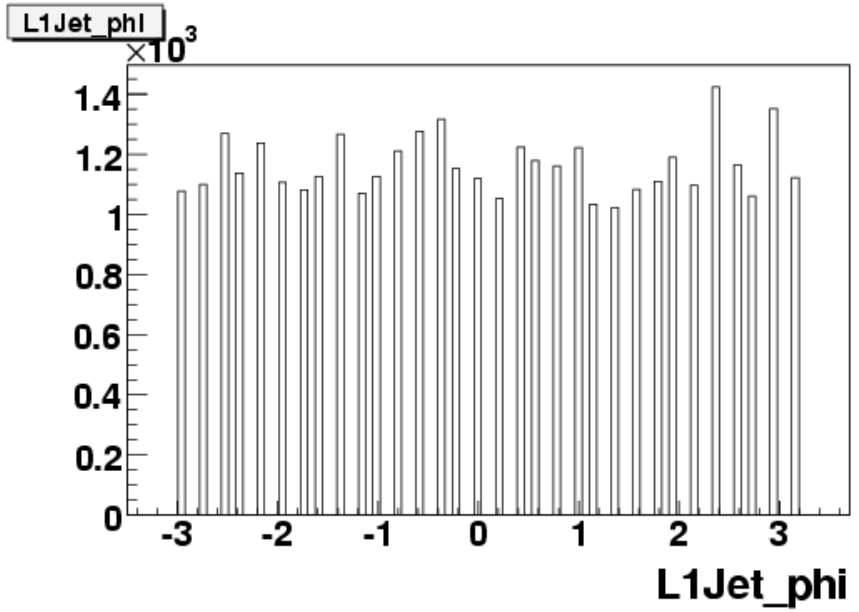
- EF doesn't reconstruct jets between η=2.5 and η=3.2 (?!!!)
  - Under investigation
- Periodic structure at L2 (0.2 in eta and phi) probably due to L1 bias (L1 ROIs, see next page)
- Experts say all is as expected
- Also: menu checked and looks as expected




h1
Entries 37185
Mean 0.0018
RMS 0.2029
η(L1) - η(true)
$\eta_{LVL2}-\eta_{MCtruth}$

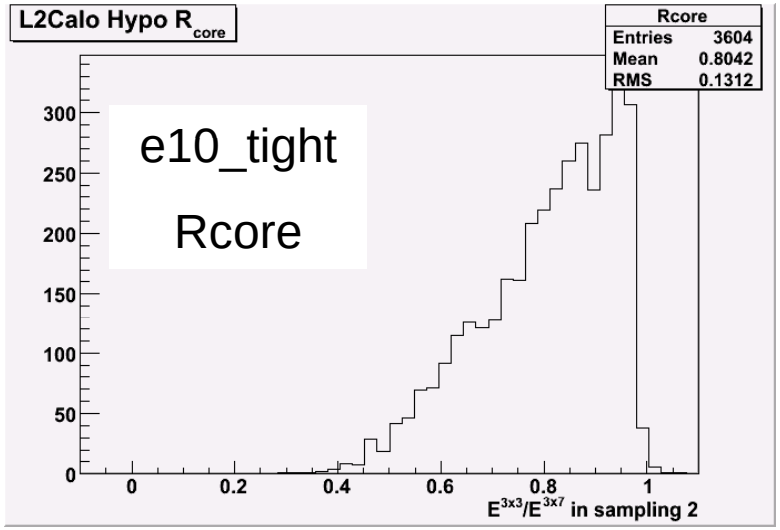

h1
Entries 37185
Mean 0.004519
RMS 0.2082
ϕ(L2) - ϕ(true)
$\phi_{LVL2}-\phi_{MCtruth}$

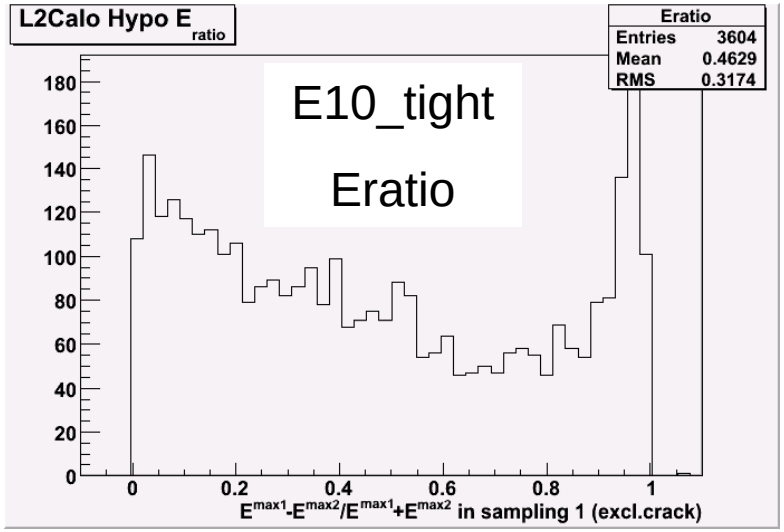

L1Jet_eta
L1Jet_eta

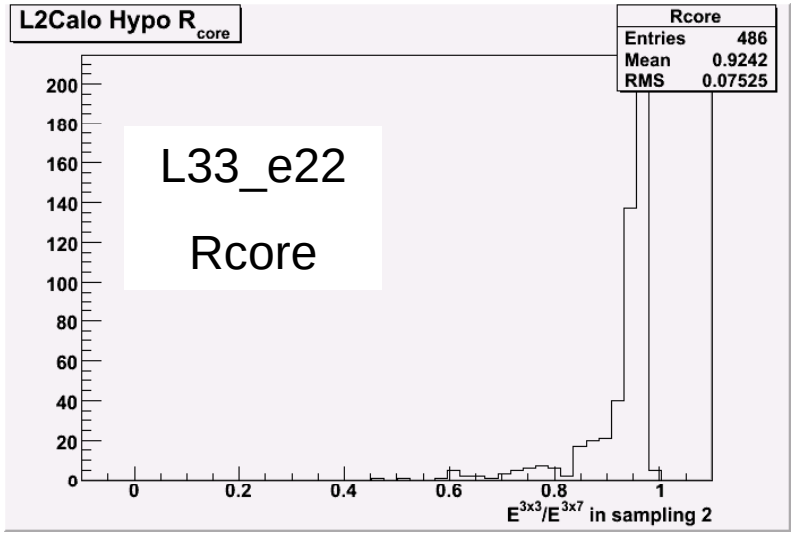

L1Jet_phi
L1Jet_phi

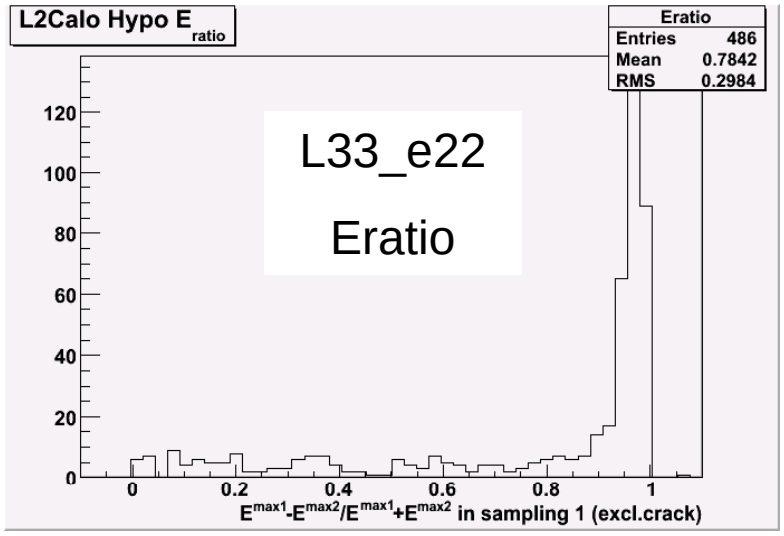
L2 electrons (calorimeter only: L2CaloHypo)

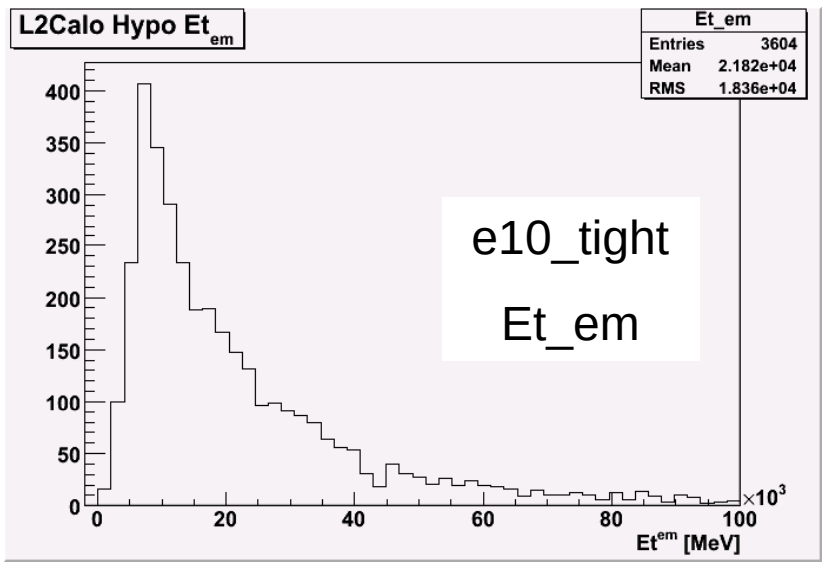
- Monitorng histos from nightly RTT tests (rel_2 pcache)
- All normal as far as I could see

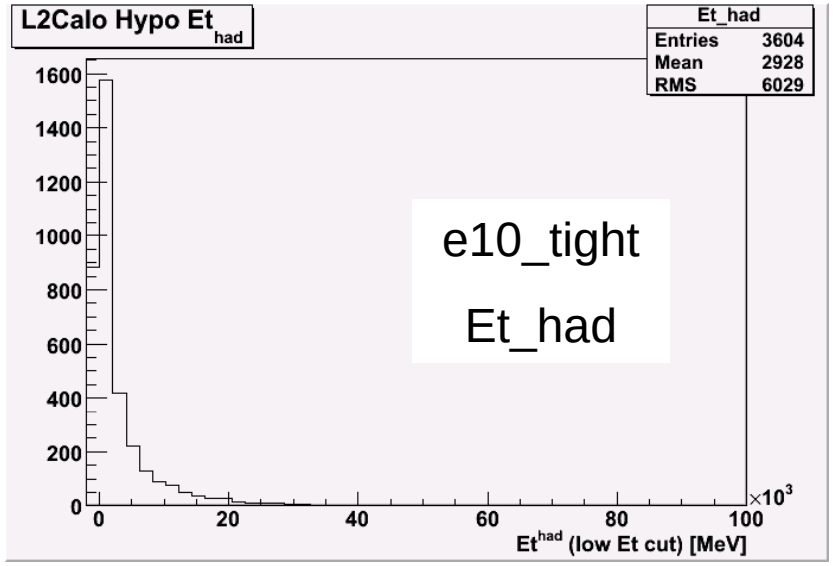


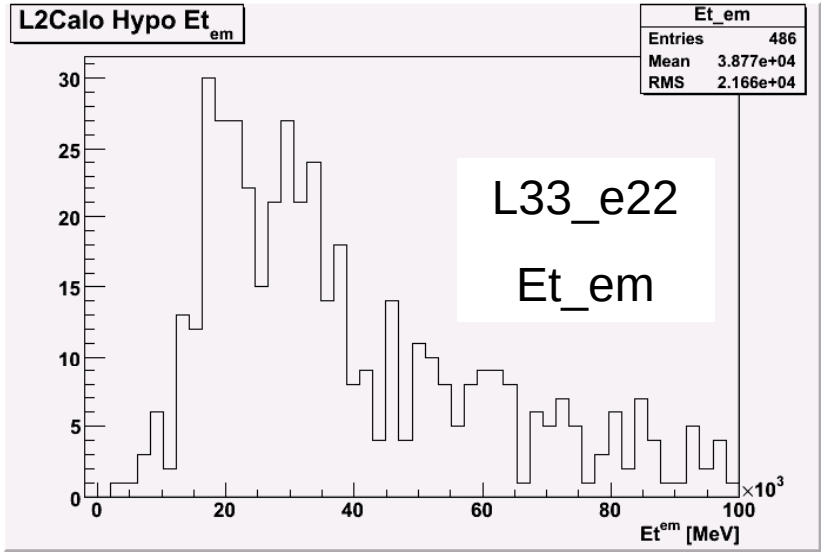


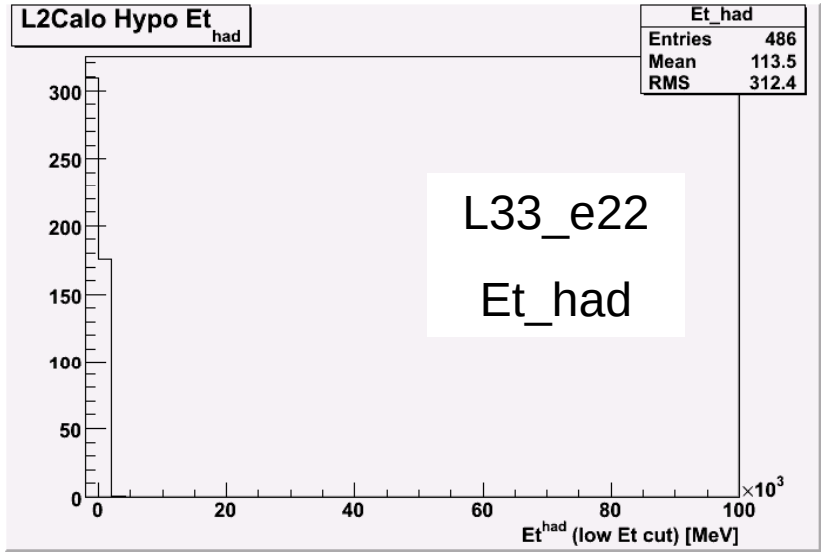





L2Calo Hypo Et em
Et_em
Entries 3604
Mean 2.182e+04
RMS 1.836e+04
e10_tight
Et_em
Et^em [MeV]
×10^3


L2Calo Hypo Et had
Et_had
Entries 3604
Mean 2928
RMS 6029
e10_tight
Et_had
Et^had (low Et cut) [MeV]
×10^3


L2Calo Hypo Et em
Et_em
Entries 486
Mean 3.877e+04
RMS 2.166e+04
L33_e22
Et_em
Et^em [MeV]
×10^3


L2Calo Hypo Et had
Et_had
Entries 486
Mean 113.5
RMS 312.4
L33_e22
Et_had
Et^had (low Et cut) [MeV]
×10^3

What's missing…

- For detector paper there are no known showstoppers
- Issues with small impact on performance (e.g. overlap removal for tau signatures) should be fixed in 13.0.30.2
- If possible, menus need to be completed for 13.0.30.2 (for use in FDR) – 10^{31} and 10^{32}
- Next time, have more tests in place to check "offline integration"
  - Tests for RDO→AOD/ESD were there late
  - Tests for RDO→TAG and AOD→TAG needed