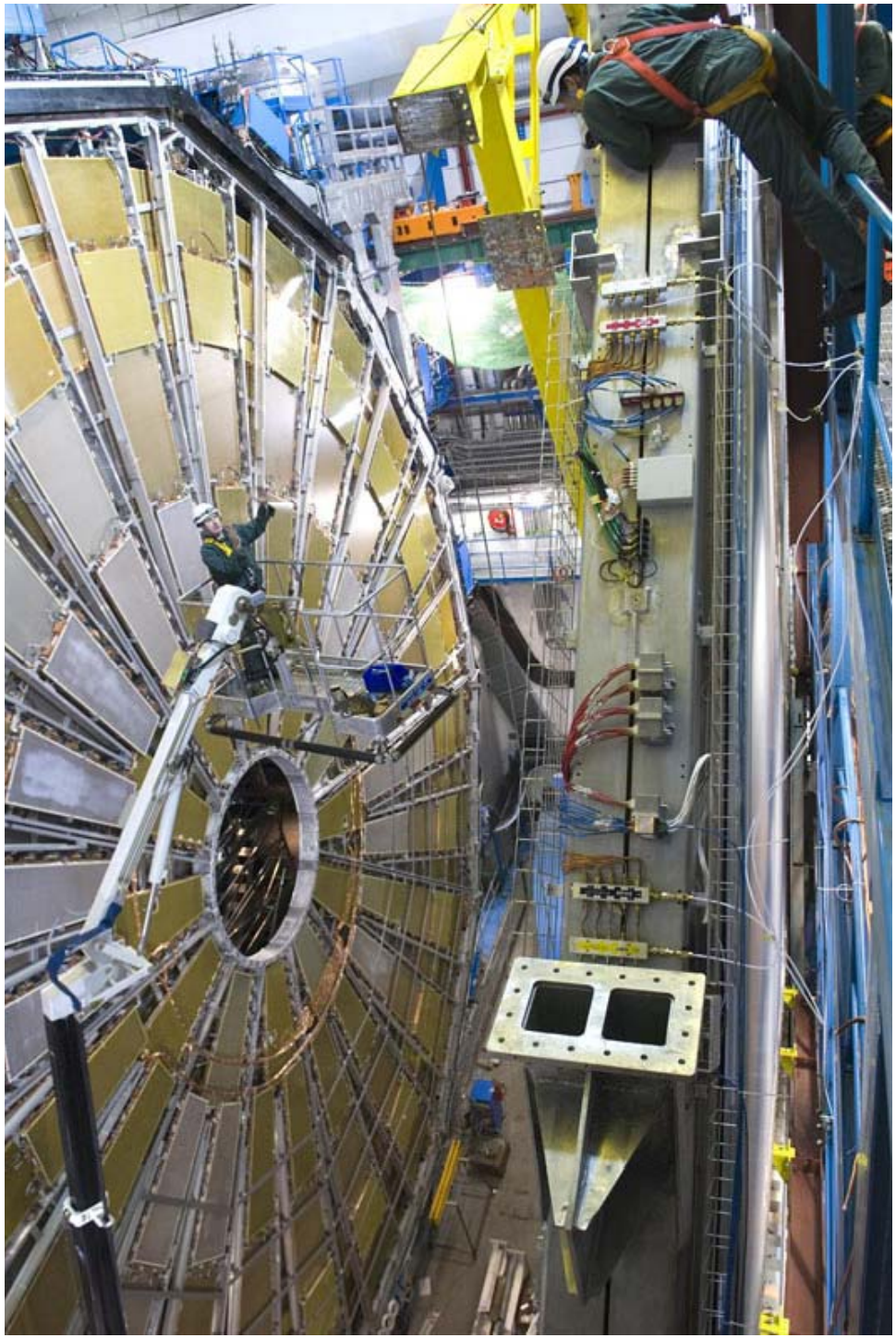


Trigger Validation
Status and plans for rel.13

Outline:

- Status of the infrastrucure
- Monitoring histograms
- Viewing results
- Standalone tools
- Status and plans for 13.0.30
- Conclusions

Olga Igonkina (U.Oregon) and Ricardo Gonçalo (RHUL) on behalf of several people

Physics Validation – August 28, 2007

Packages in Trigger/TrigValidation

- TriggerTest: (CPC tags ✓)
  - AtlasTrigger project
  - **60 ATN tests** running from RDO/BS: roughly (9 slices+3 detectors+3 BS tests) x 2 job options (standalone / RecExCommon) x 2 Python menu configurations
  - **18 RTT tests** running from RDO/BS
  - Both ATN and RTT: producing **monitoring** histograms for algorithm validation / **steering** histograms (“rate” for each signature) / algorithm **timing** histograms / **BS** / ntuple for performance monitoring (**mem leaks**)
  - Job options and test configuration generated by python scripts

- TrigAnalysisTest: (CPC tags ✓)
  - AtlasAnalysis project
  - 22 ATN and 2 RTT tests running on RDO and **producing ESD/AOD** plus valid. Histos

- **Note on ATN tests:**
  - ATN tests are based on **Perl scripts**
  - Now **migrating to xml** configuration: most changes in VAL but **bug introduced**, probably in generation scripts (under investigation)

Packages in Trigger/TrigValidation

- TrigEgammaValidation: (CPC tags ✓)
  - AtlasAnalysis project
  - 5 RTT tests
  - Estimate efficiencies for **single electrons**, **Z → ee**, **H → γγ**
  - Monitor L2 e/gamma algorithm performance; being extended to EF
  - Post-processing actions comparing histos to reference
  - Publish comparison results in dedicated www page

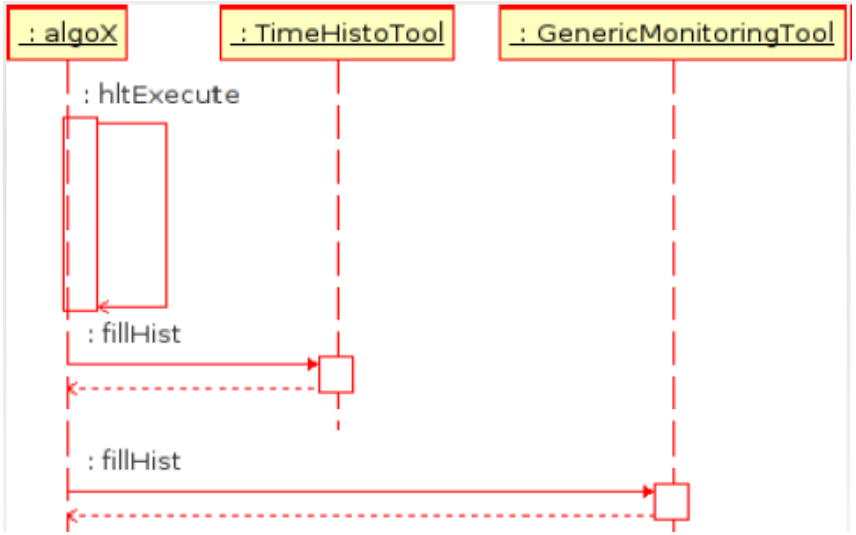
- TrigInDetValidation: (CPC tags ✓)
  - AtlasTrigger project
  - 1 RTT test
  - 1 action producing dedicated ntuple and histograms for L2 InDet algorithm validation

- TrigValTools:
  - Python, ROOT, Java macros for post processing of histos and ntuples

- TrigBjetValidation: inactive
- TrigBphysValidation: inactive
- TrigTauValidation: inactive

Monitoring infrastructure

- HLT algorithms instrumented to produce histograms of internal variables
- Monitored **variables exposed** by the algorithm derived class and **collected after the execute()** method
- **Primitive type** variables, **objects** (through accessor) and **collections** can be monitored
- Used both for **online** monitoring/data quality and offline **software validation**



See: Tomasz's talk in http://indico.cern.ch/conferenceDisplay.py?confId=13869

More info at: https://twiki.cern.ch/twiki/bin/view/Atlas/TriggerValidationHistograms

Monitoring infrastructure (cont.)

- Easy to add to algorithms
- Just declare variables to be monitored
  - Relevant methods in HLT algos base class
- Declare wanted histograms
  - No overhead if undeclared
- Advisable to reset variables every event with unphysical values

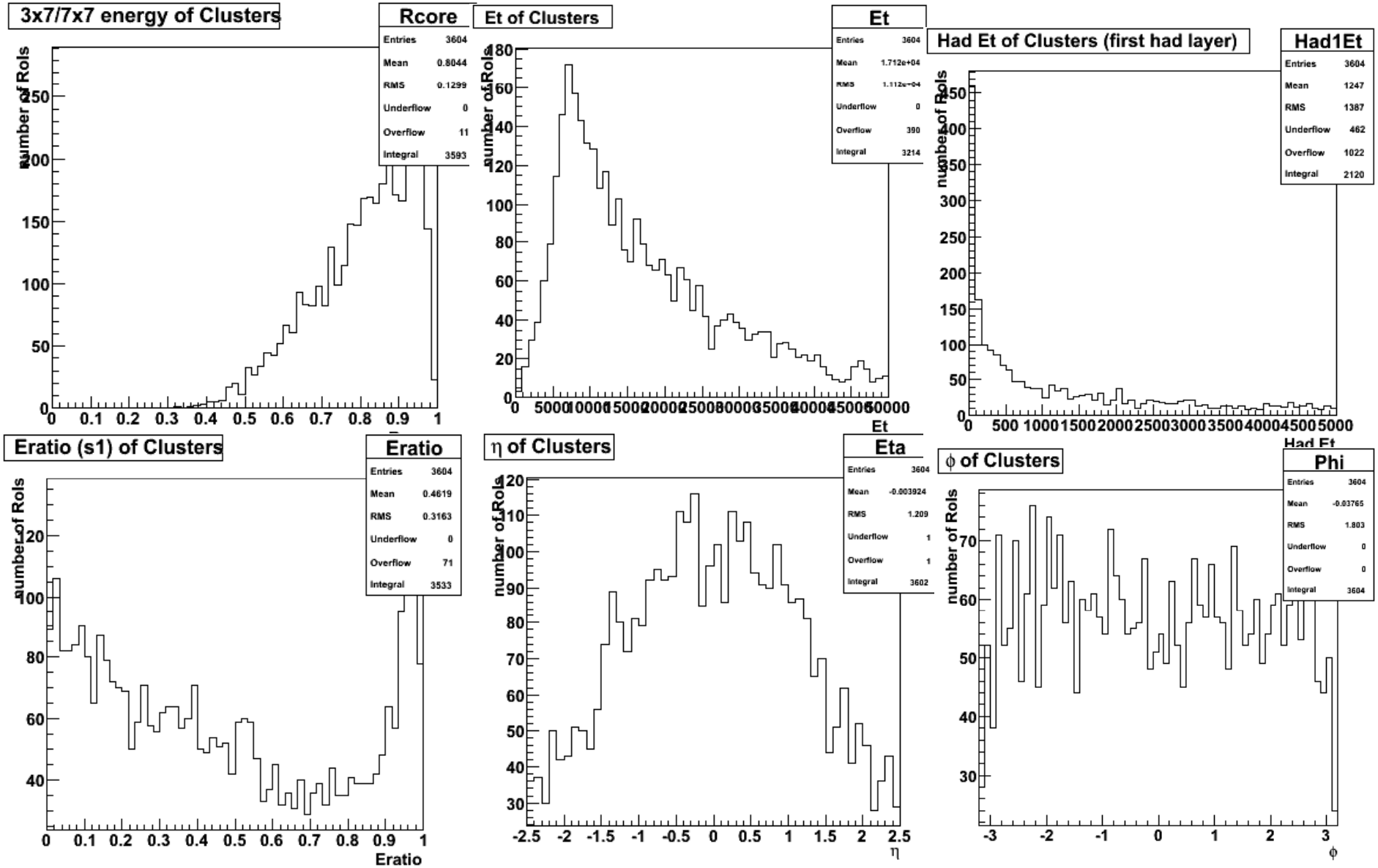
```
#include "TrigT2CaloTau/T2CaloTau.h"

#include <TH1F.h>
#include "AthenaKernel/errorcheck.h"

class ISvcLocator;
class AlgFactory;

T2CaloTau::T2CaloTau(const std::string & name, ISvcLocator* pSvcLocator):
  T2CaloNewBase(name, pSvcLocator){

  declareProperty("TrigTauClusterKey", m_trigTauClusterKey = "T2CaloTrigTauCluster");

  declareMonitoredVariable("Eta",m_Eta        );
  declareMonitoredVariable("Phi",m_Phi        );
  declareMonitoredVariable("EtaL2vsL1",m_EtaL2_L1   );
  declareMonitoredVariable("PhiL2vsL1",m_PhiL2_L1   );
  declareMonitoredVariable("EMRadius",m_EMRadius   );
  declareMonitoredVariable("IsoFrac",m_IsoFrac    );
  declareMonitoredVariable("StripWidth",m_StripWidth );
  declareMonitoredVariable("EtCalib",m_EtCalib    );
  declareMonitoredVariable("EME",m_EME        );
  declareMonitoredVariable("HadE",m_HadE       );
}

T2CaloTau::~T2CaloTau(){
}
```

```
#-----------------------------------------------------
#  T2CaloTau monitoring.
#-----------------------------------------------------
include.block("TrigT2CaloTau/jobOfragment_TrigT2CaloTau_mon.py")
theApp.Dlls += [ "TrigT2CaloTau" ]


Algorithm("T2CaloTau_g4_L2").AthenaMonTools +=  ["TrigTimeHistTool/TimeHisto" ]
Algorithm("T2CaloTau_g4_L2").AthenaMonTools +=  ["TrigGenericMonitoringTool/Mon" ]
Algorithm(  "T2CaloTau_g4_L2.Mon").Histograms = []
from TrigMonitorBase.TrigGenericMonitoringToolConfig import defineHistogram

Algorithm("T2CaloTau_g4_L2.Mon").Histograms = [ defineHistogram('Eta', type='TH1F', title="L2CaloTau FEX Eta; Eta; nevents", xbins=40, xmin=-4, xmax=4) ]
Algorithm("T2CaloTau_g4_L2.Mon").Histograms += [ defineHistogram('Phi', type='TH1F', title="L2CaloTau FEX Phi; Phi; nevents", xbins=50, xmin=-3.2, xmax=3.2) ]
Algorithm("T2CaloTau_g4_L2.Mon").Histograms += [ defineHistogram('EtaL2vsL1', type='TH1F', title="L2CaloTau FEX Eta_L2 - Eta_L1; dEta; nevents", xbins=50, xmi
Algorithm("T2CaloTau_g4_L2.Mon").Histograms += [ defineHistogram('PhiL2vsL1', type='TH1F', title="L2CaloTau FEX Phi_L2 - Phi_L1; dPhi; nevents", xbins=50, xmi
```

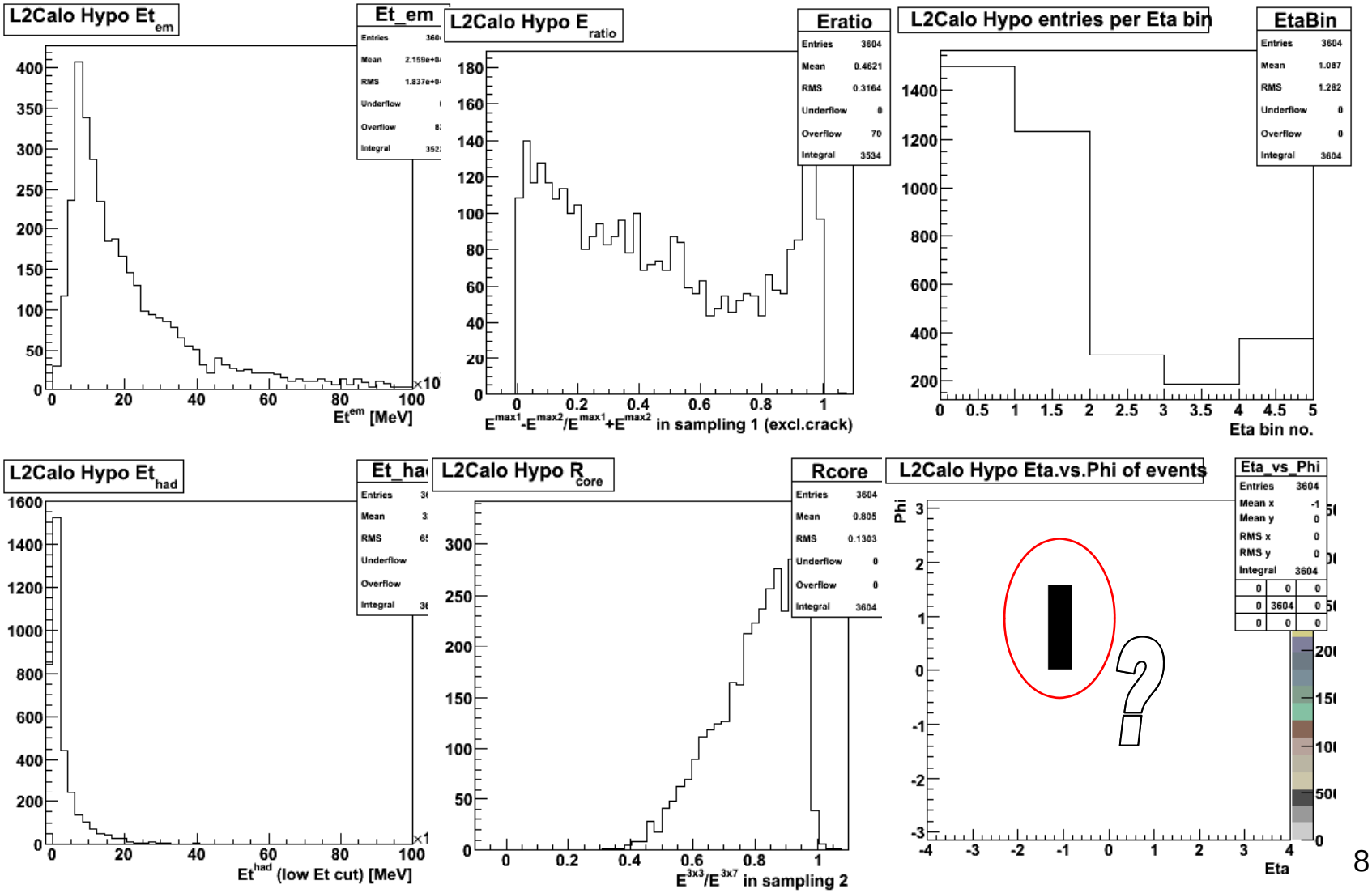
Trigger	p_T threshold(*)	Obs
Electron	5,10,15,	Prescale
Electron	20,25,100	No presc
Di-electron	5,10	Prescale
Di-electron	15	No presc
Photon	10,15,20	Prescale
Photon	20	No presc
Di-photon	10	Prescale
Di-photon	20	No presc
Jets	5,10,18,23,35,42,70	Prescale
Jets	100	No presc
3 Jets	10,18	B-tag
4 Jets	10, 18	B-tag
4 Jets	23	Express
τ	10, 15, 20, 35	
Di- τ	10+15,10+20,10+25	
Muon	4, 6, 10, 11, 15, 20, 40	Muon spectr.
Muon	4, 6, 10, 11, 15, 20, 40	ID+Muon
Di-muon	4, 6, 10, 15, 20	Passtthr.
ΣE_T	100, 200, 304	prescale
ΣE_T	380	No presc

Trigger	p_T threshold(*)	Obs
ΣE_T (jets)	?	?
E_T^{miss}	12, 20, 24, 32, 36, 44	Prescale
E_T^{miss}	52, 72	No presc
$J/\Psi \rightarrow ee$	Topological	B-phys
$\mu\ \mu$	4	B-phys
$J/\Psi \rightarrow \mu\ \mu$	Topological	B-phys
BsDsPhiPi	Topological	B-phys
$B\gamma X$		B-phys
e + E_T^{miss}	18+12	Prescale
μ + E_T^{miss}	15+12	No presc
Jet + E_T^{miss}	20+30	No presc
2 Jets + E_T^{miss}	42+30	No presc
Jet+ E_T^{miss} +e	42+32+15	No presc
Jet+ E_T^{miss} + μ	42+32+15	No presc
4 Jet + e	23+15	No presc
4 Jet + μ	23+15	No presc
τ + E_T^{miss}	15+32,25+32, 35+20,35+32	
τ + e	10+10	Express
τ + μ	10+6	Express
2 τ + e	10+10	Express

L2 electron slice: e10 T2Calo_egamma on 1k ttbar events
Other hypotheses similar (but less events)

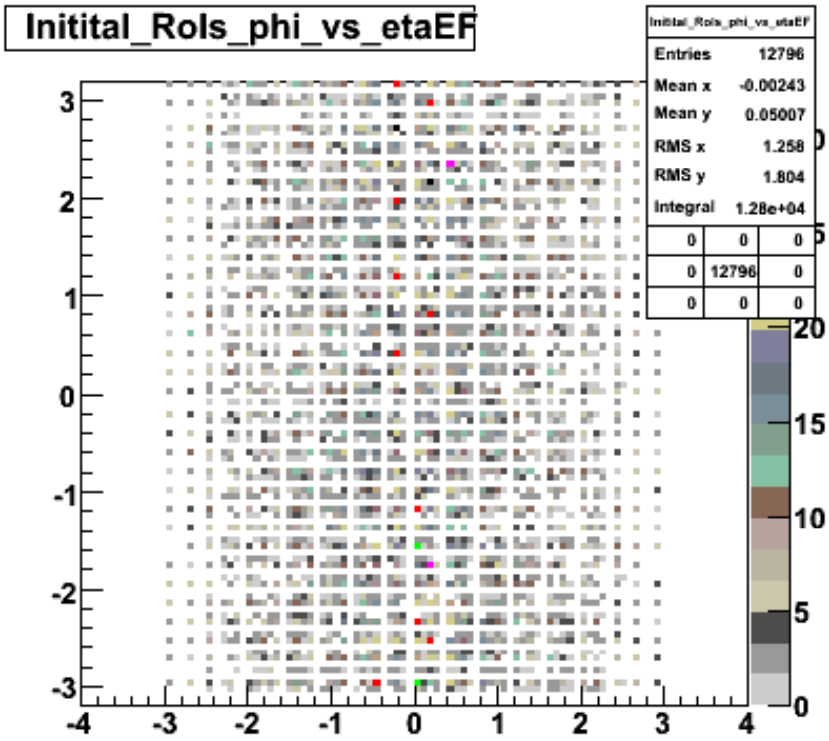


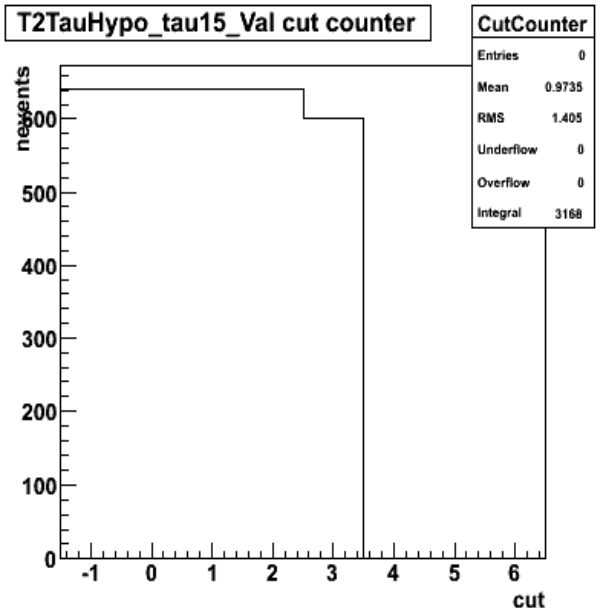
L2 electron slice: L2CaloHypo

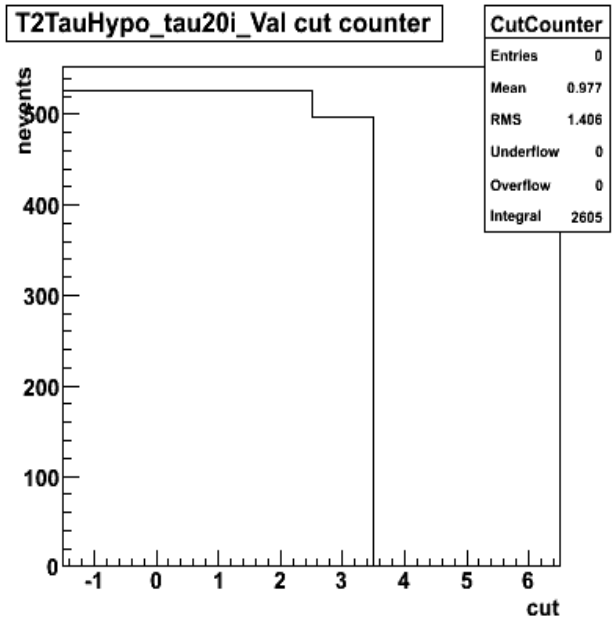


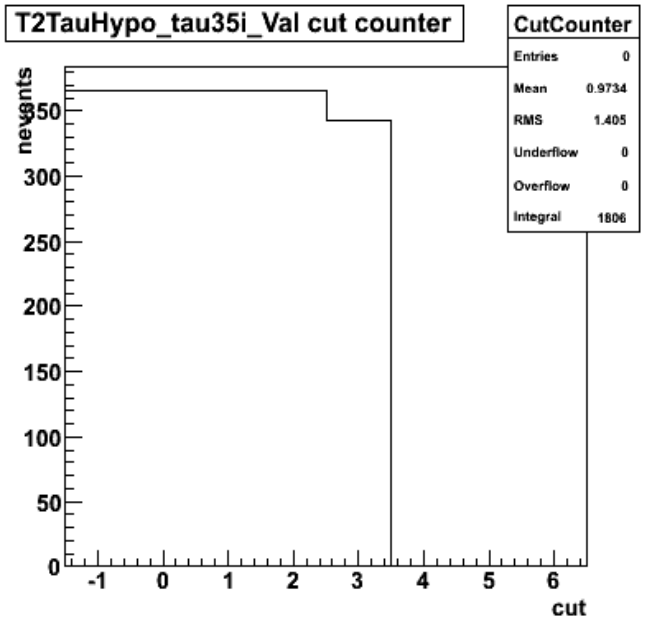
Other things:

- Steering monitoring:
  - RoI eta vs phi
  - Events passed at each chain step
  - etc…
- Step counters (for Hypo algorithms):
  - For algorithm experts: where do most events get rejected…

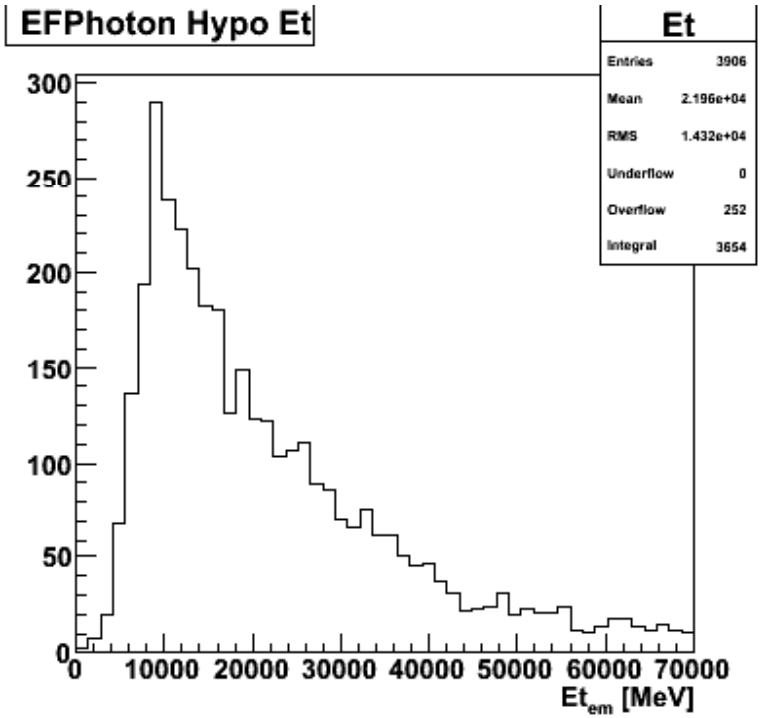


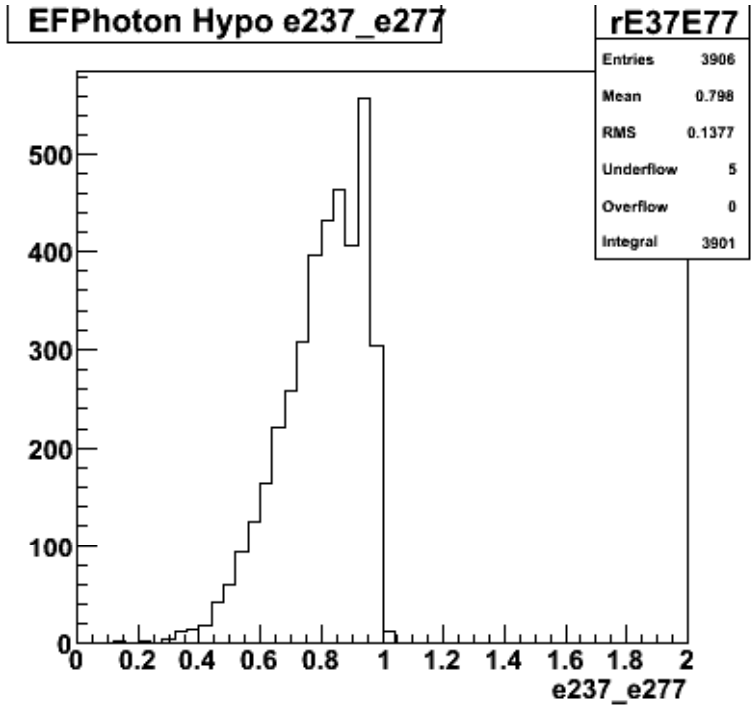


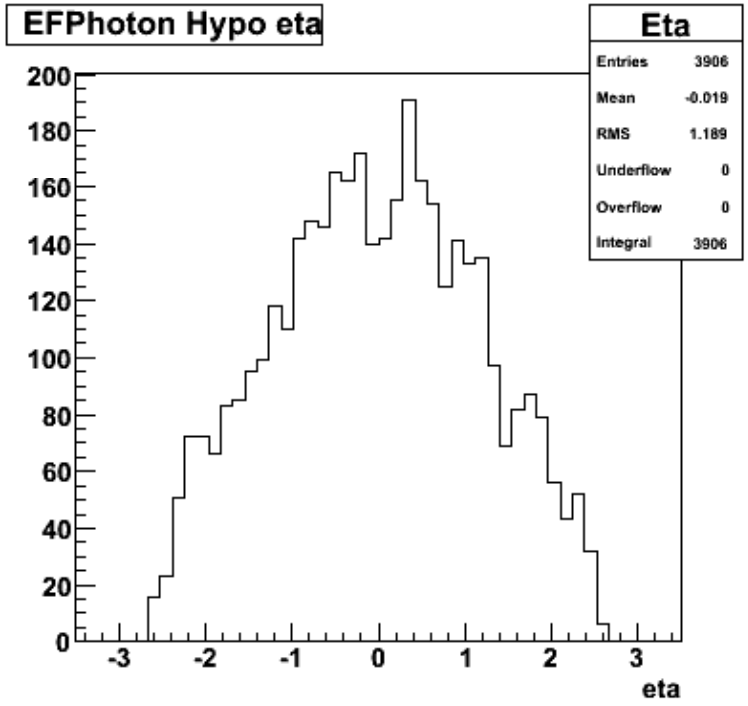


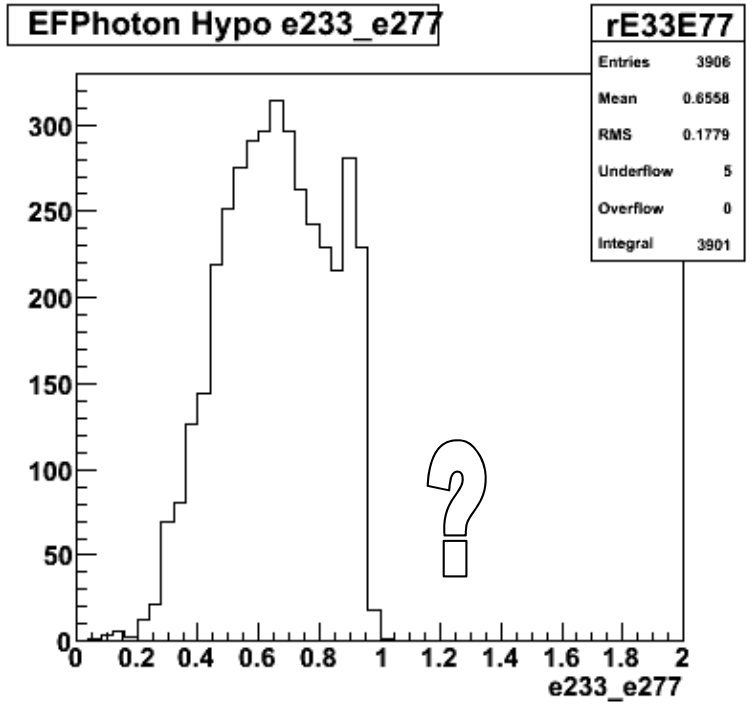


EF Photon Hypo



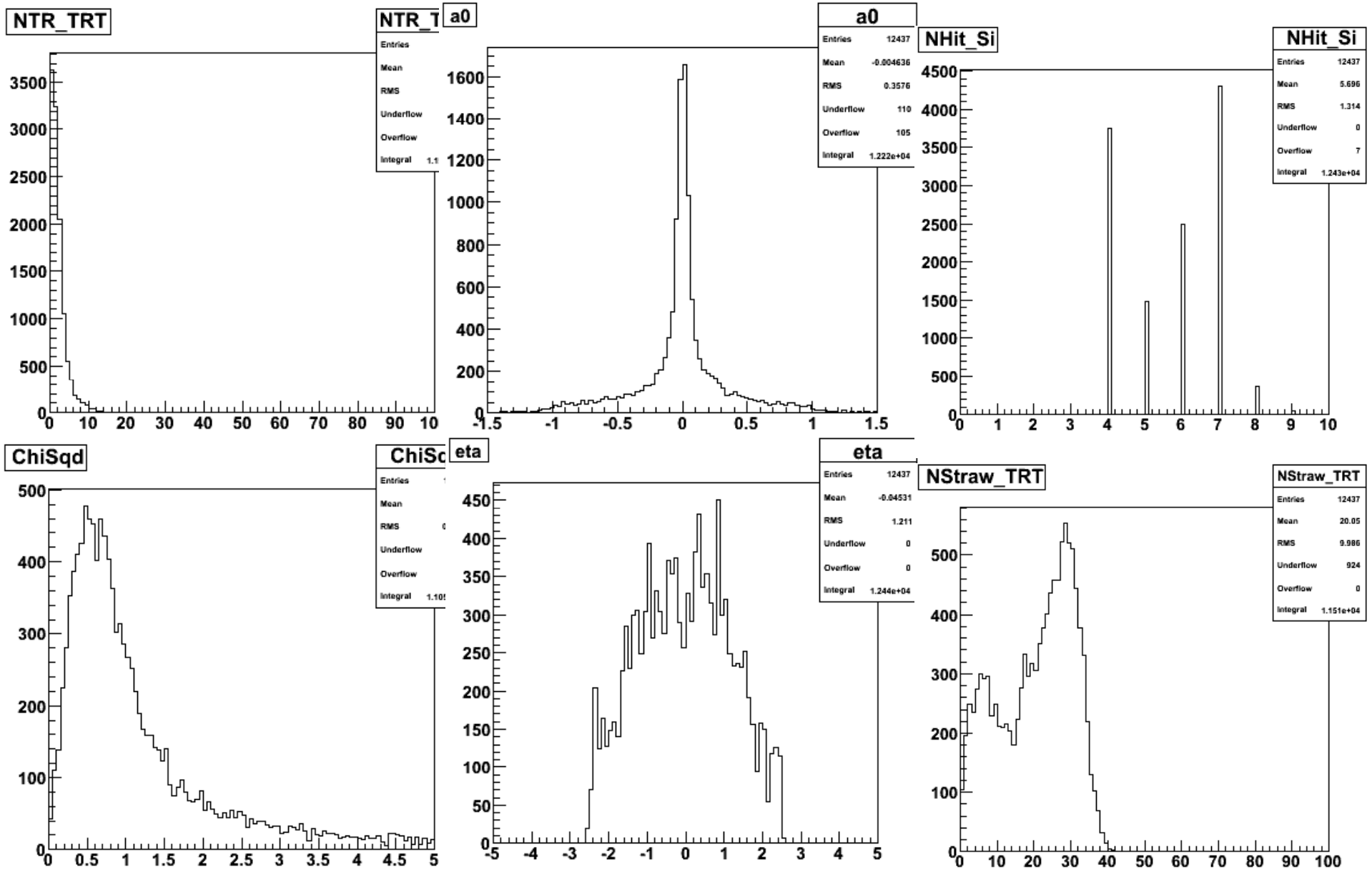






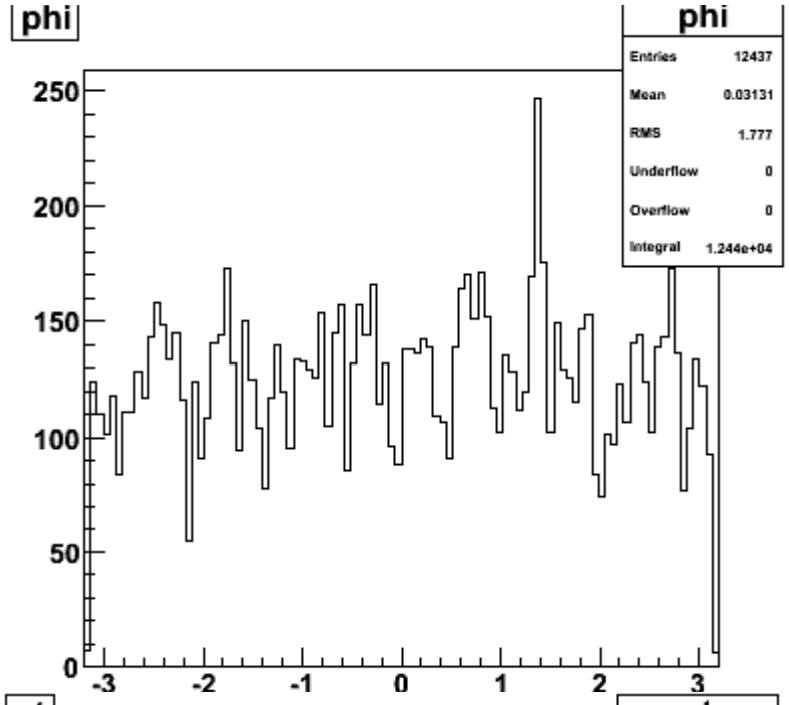
28 Aug 07

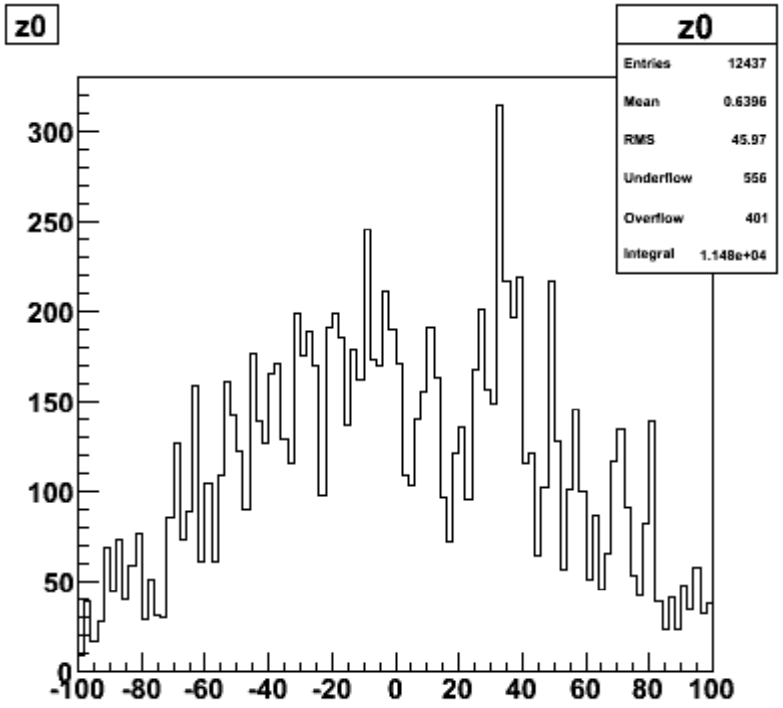
L2 tracking for e/gamma (IDScan)

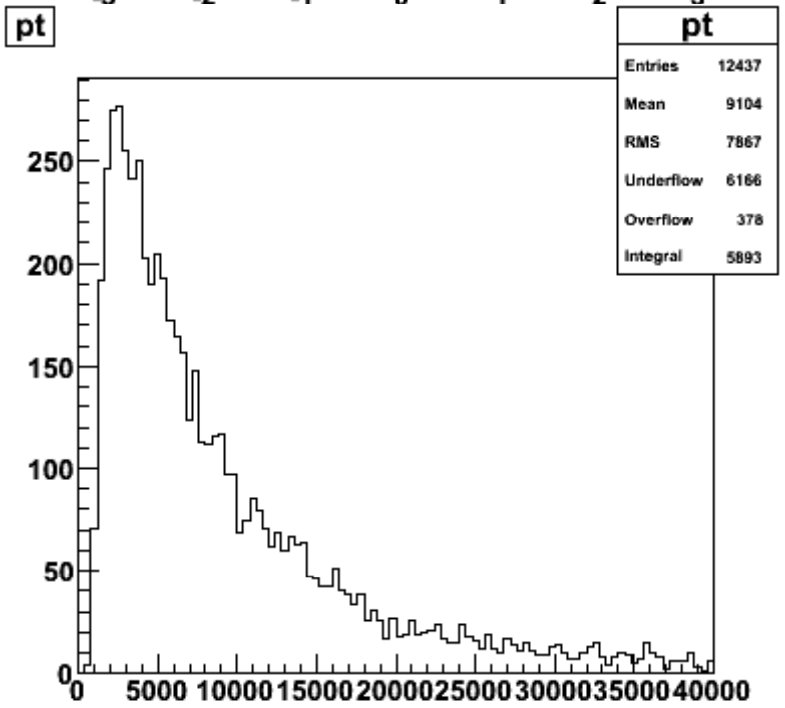


IDScan (cont.)

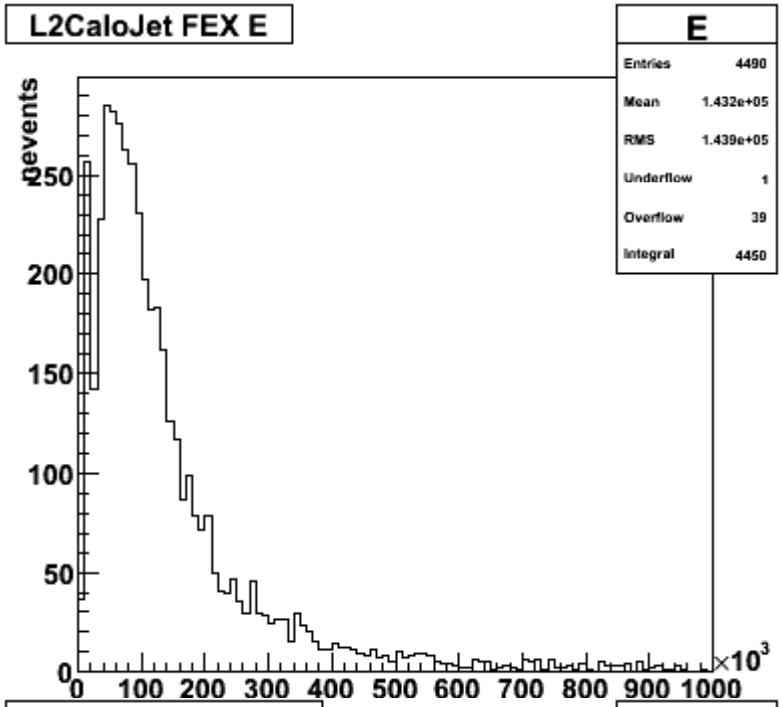
Missing histograms in IDCaloHypo (track-cluster matching)

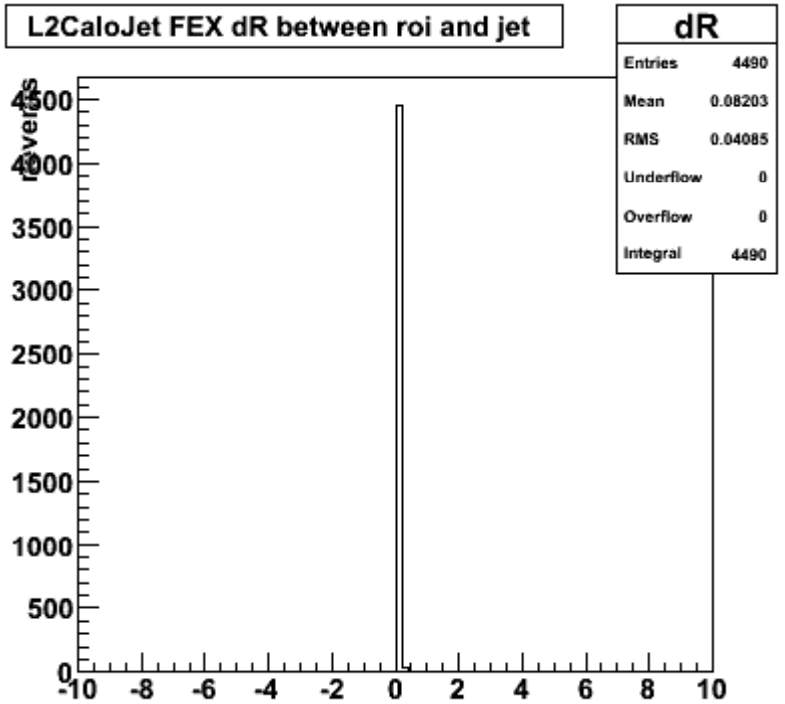


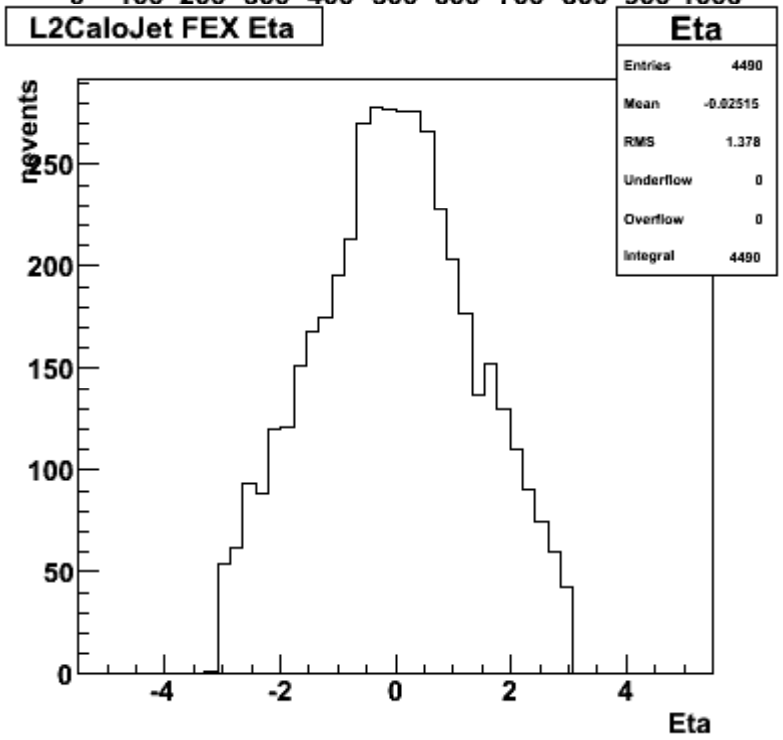


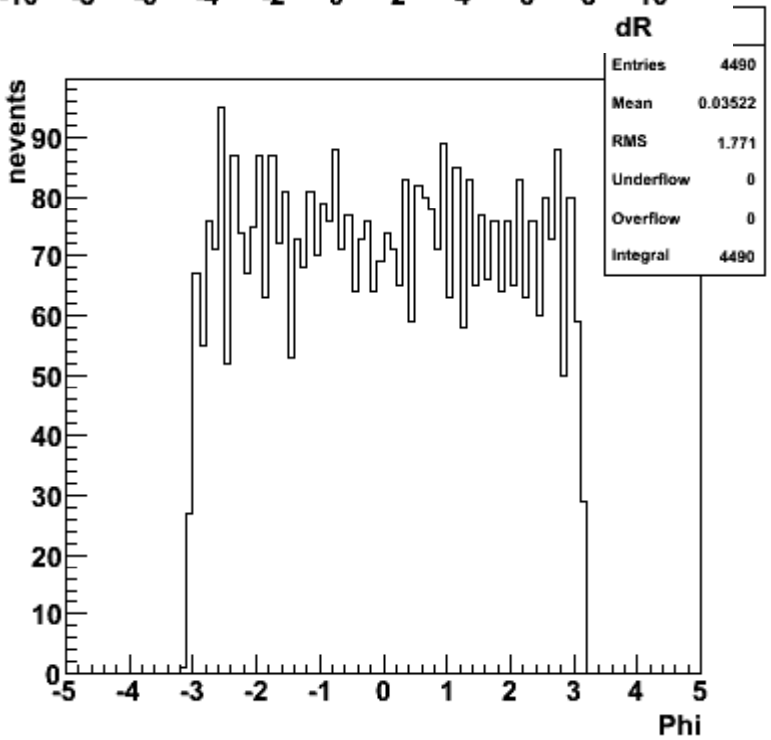


T2Calo_Jets



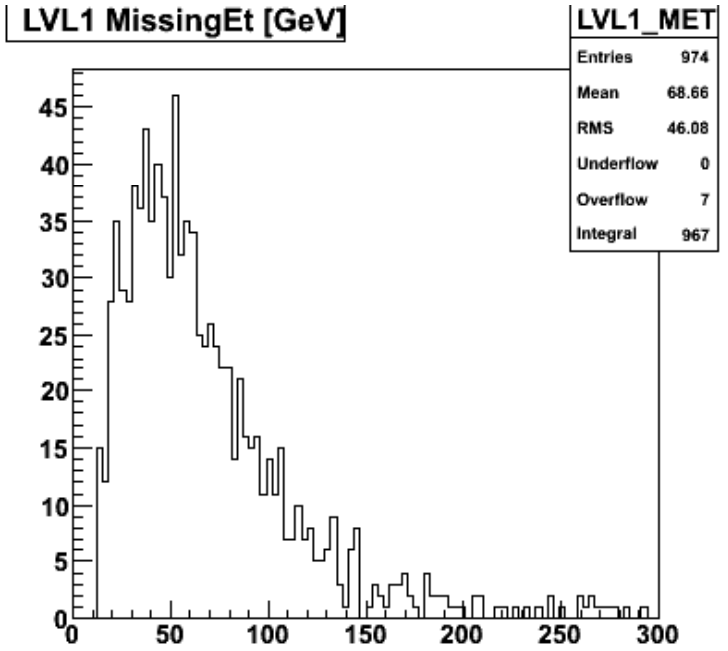


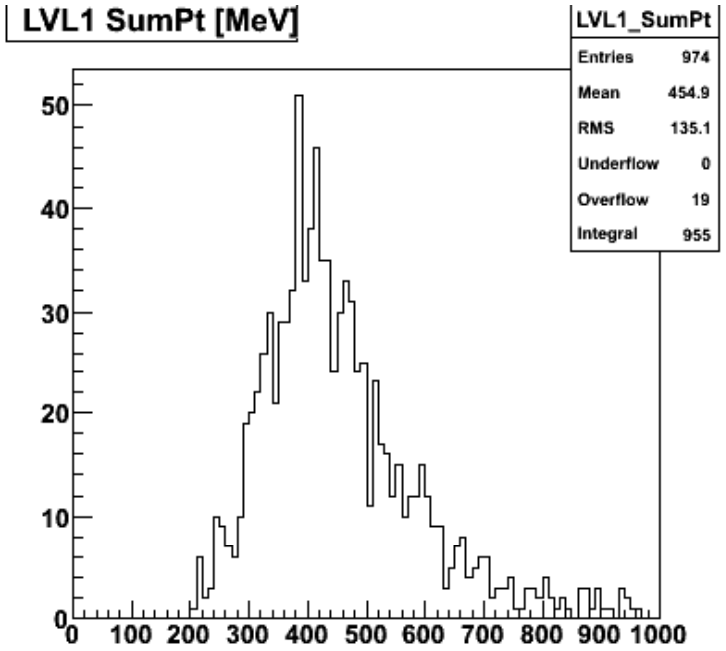


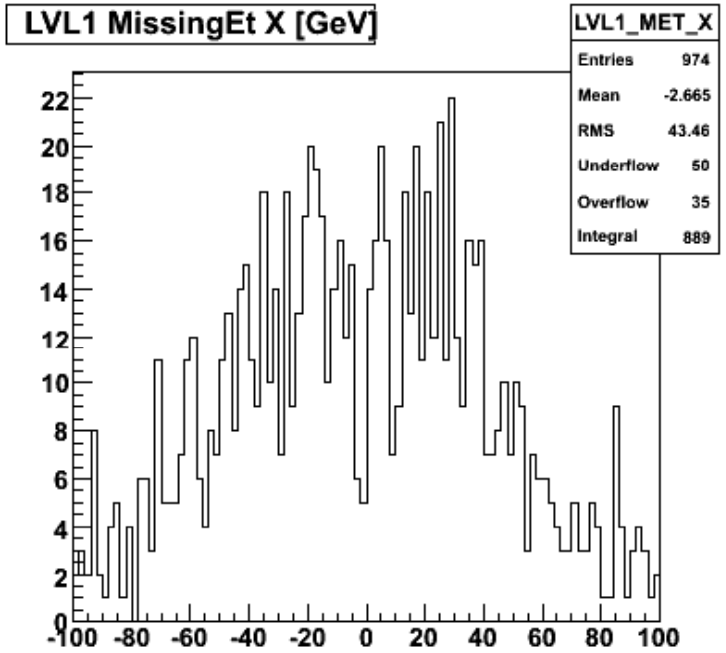


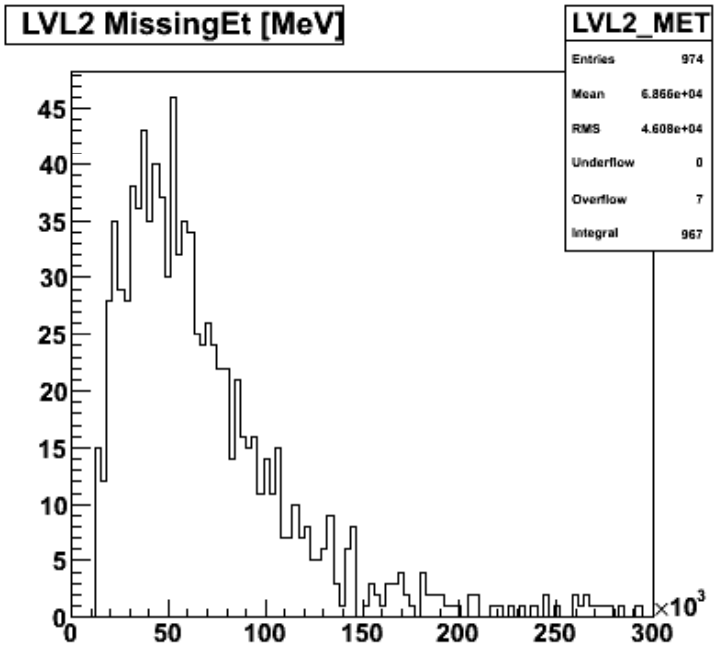
ation

Missing ET

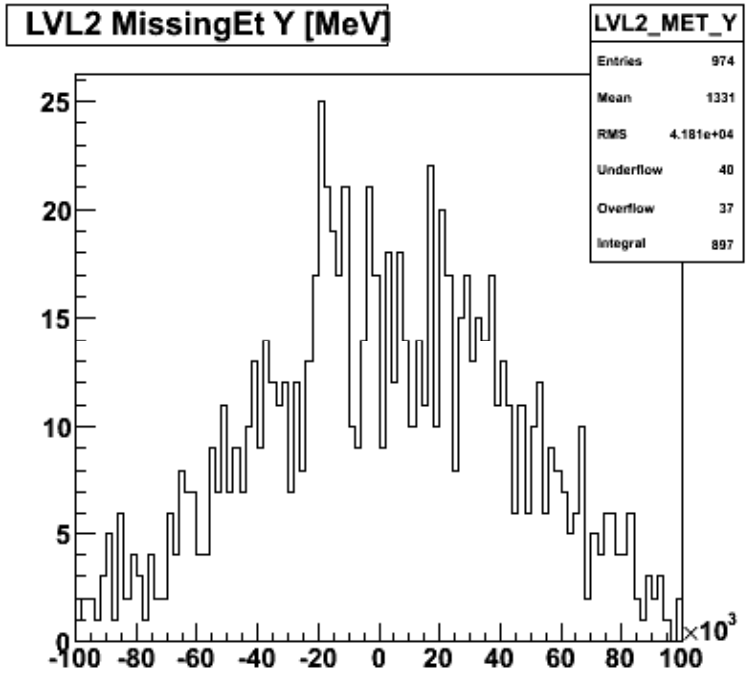

LVL1 MissingEt [GeV]
LVL1_MET
Entries 974
Mean 68.66
RMS 46.08
Underflow 0
Overflow 7
Integral 967

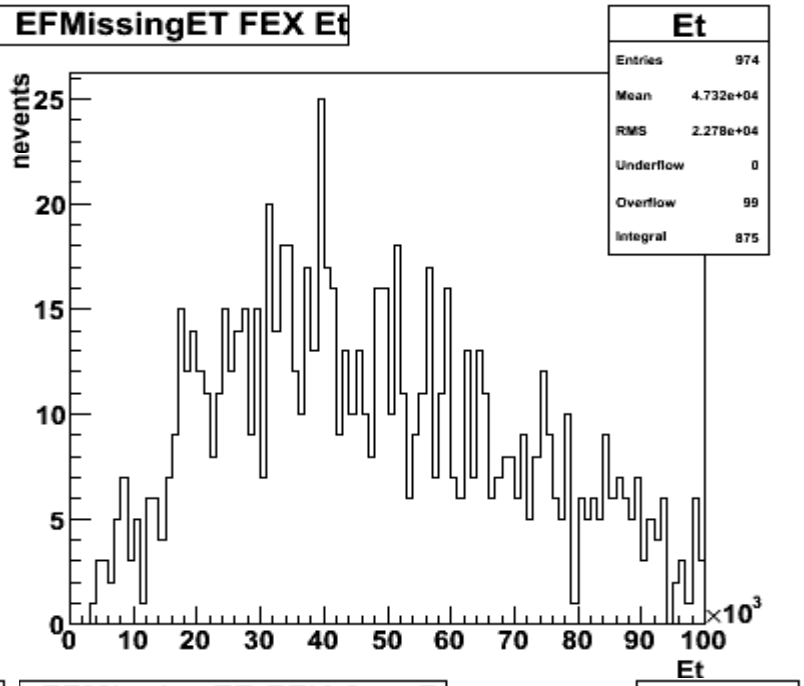

LVL1 SumPt [MeV]
LVL1_SumPt
Entries 974
Mean 454.9
RMS 135.1
Underflow 0
Overflow 19
Integral 955

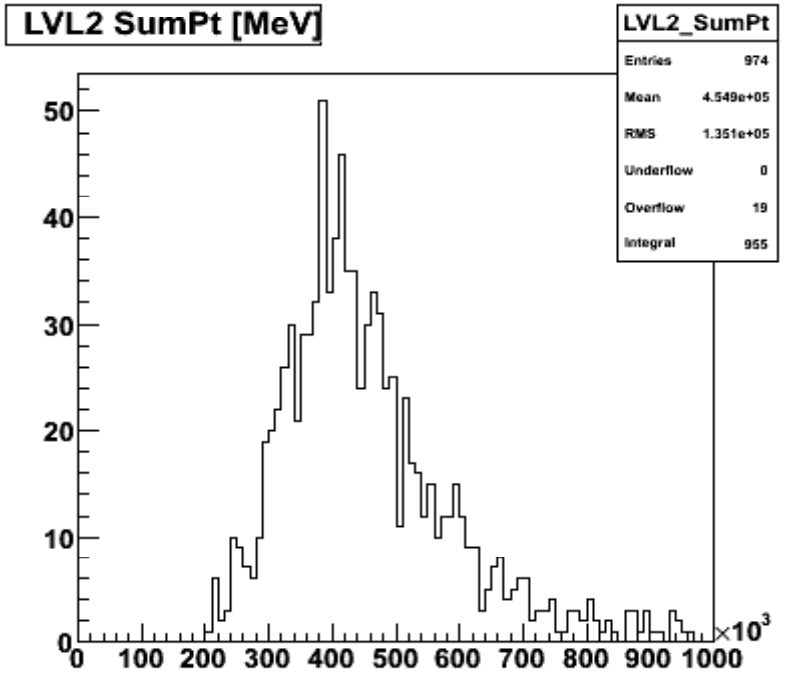

LVL1 MissingEt X [GeV]
LVL1_MET_X
Entries 974
Mean -2.665
RMS 43.46
Underflow 50
Overflow 35
Integral 889

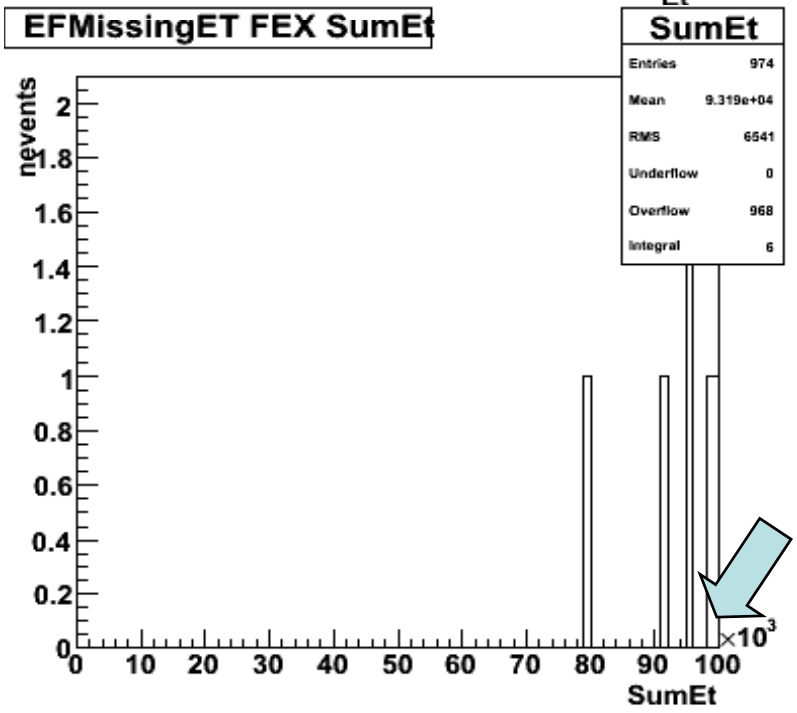

LVL2 MissingEt [MeV]
LVL2_MET
Entries 974
Mean 6.866e+04
RMS 4.608e+04
Underflow 0
Overflow 7
Integral 967
×10³

Missing ET


LVL2 MissingEt Y [MeV]
LVL2_MET_Y
Entries 974
Mean 1331
RMS 4.181e+04
Underflow 40
Overflow 37
Integral 897
×10^3

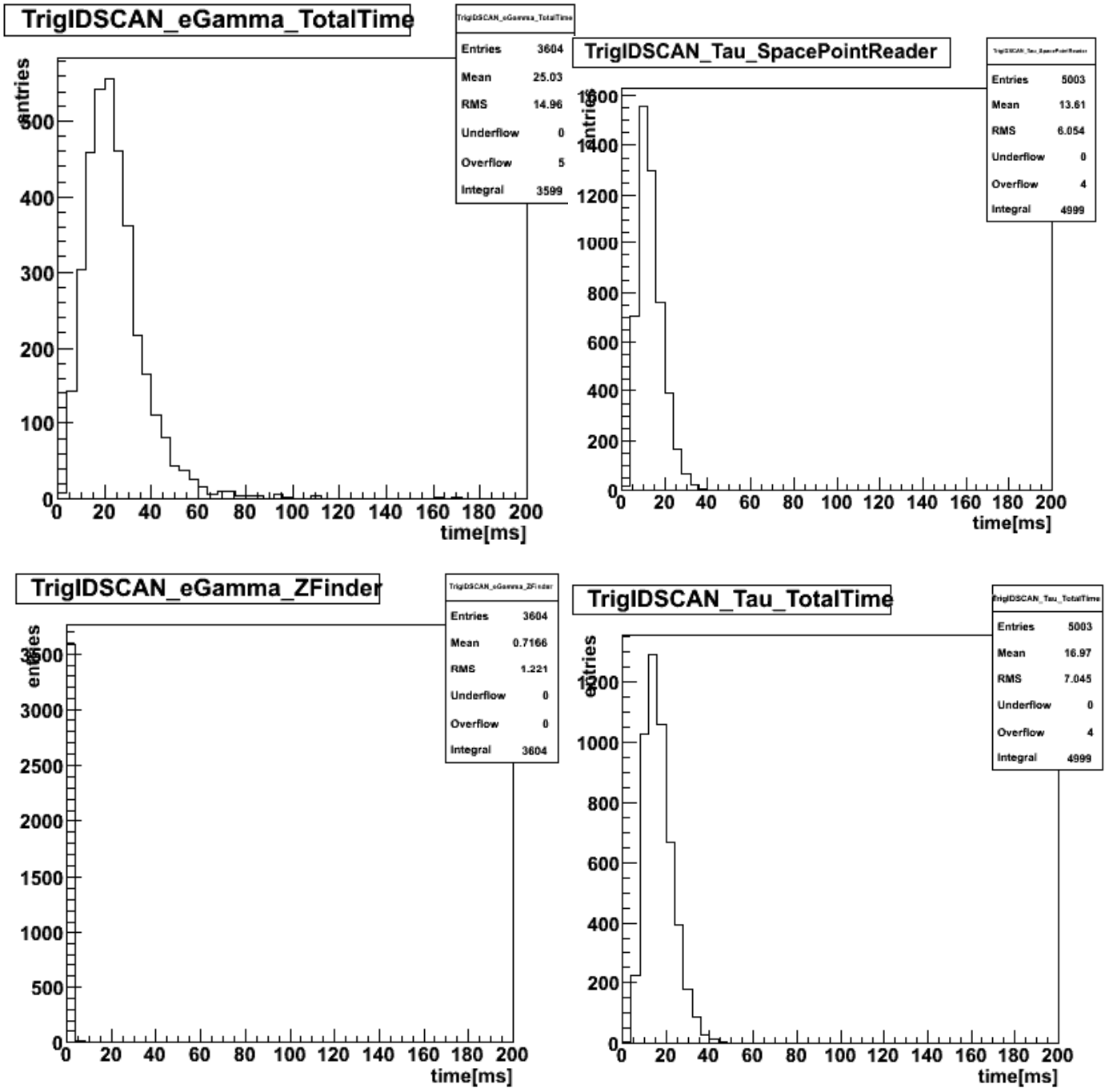

EFMissingET FEX Et
Et
Entries 974
Mean 4.732e+04
RMS 2.278e+04
Underflow 0
Overflow 99
Integral 875
nevents
Et
×10^3


LVL2 SumPt [MeV]
LVL2_SumPt
Entries 974
Mean 4.549e+05
RMS 1.351e+05
Underflow 0
Overflow 19
Integral 955
×10^3


EFMissingET FEX SumEt
SumEt
Entries 974
Mean 9.319e+04
RMS 6541
Underflow 0
Overflow 968
Integral 6
nevents
SumEt
×10^3

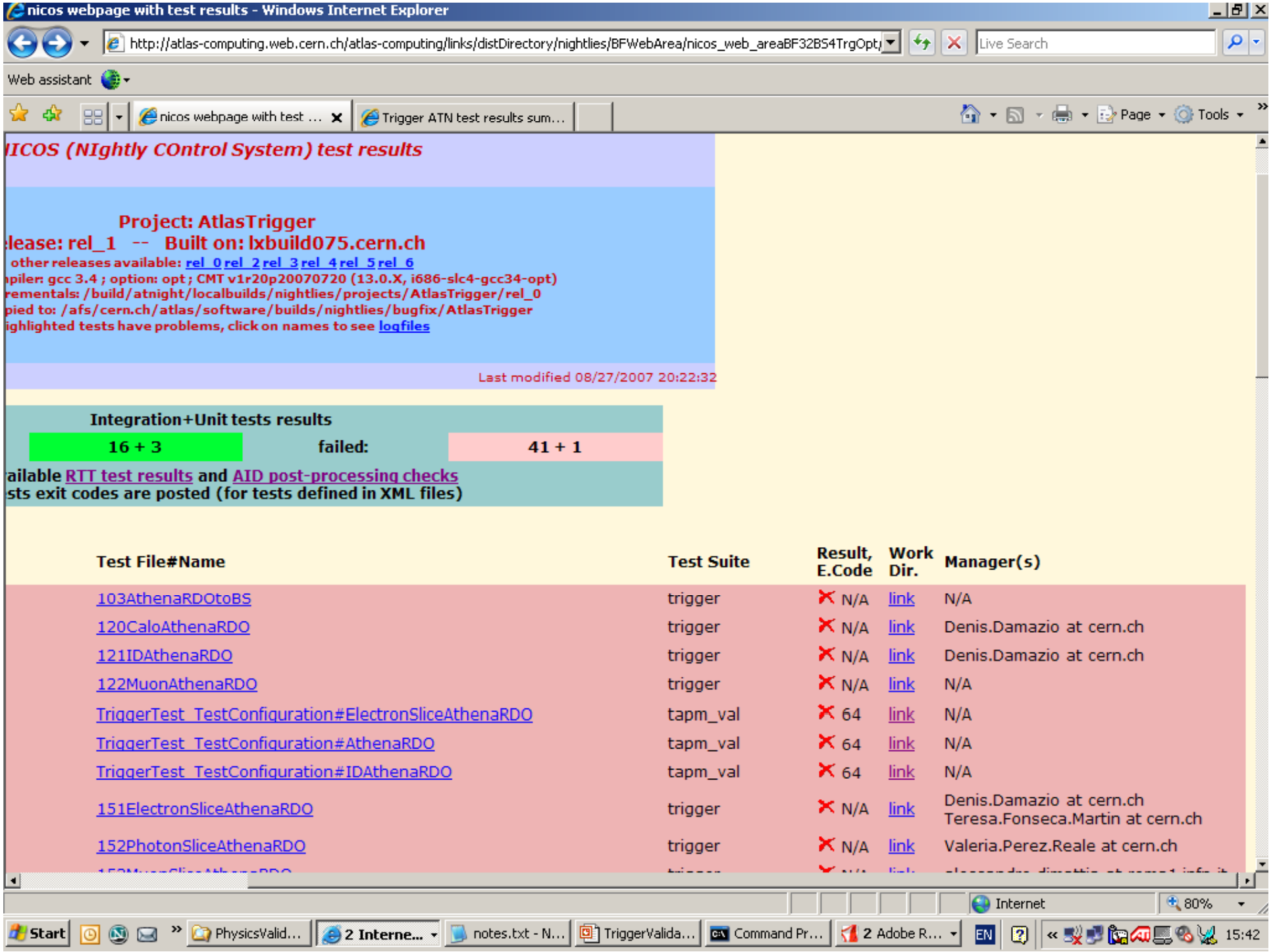
Timers

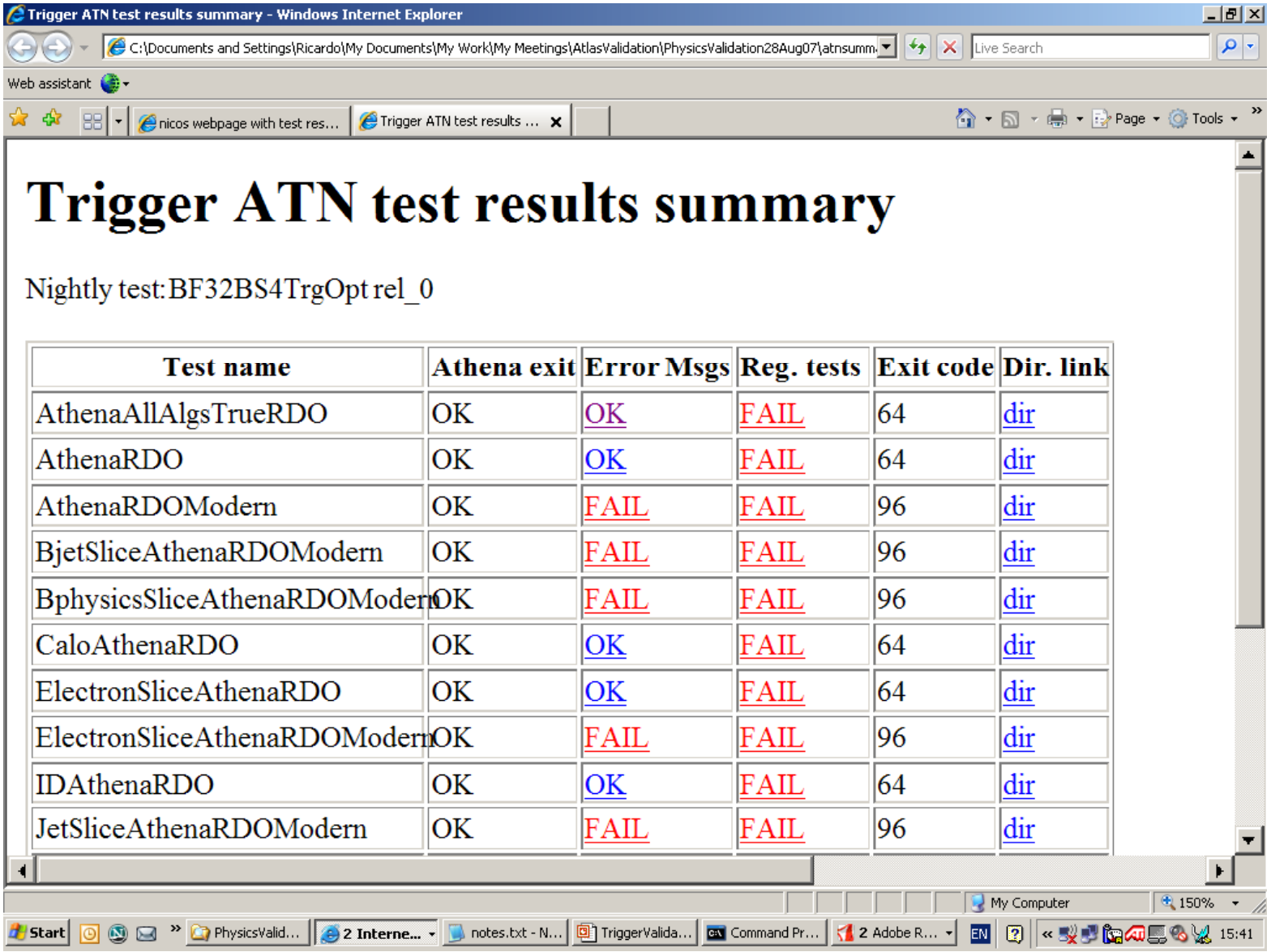
- Many histograms of algorithm execution time produced
- Numbers from RTT give only ball-park estimate (not being run on dedicated machine), but still useful
- Some need tuning



Viewing results

- There are many tests:
  - 9 slices
  - + 1 combined test
  - + 3 detector tests
  - + BS reading/writing
  - + AOD/ESD writing
  - + 2 job options types (standalone vs. RecExCommon)
  - x 2 python menu configurations
  - …
- Often, tests fail due bugs outside trigger
- Need “easy” way of assessing status of a nightly
  - **AID** + **DCube** running on **ATN tests**: **RTT** expected in September
  - **Athena output code** in NICOS page very useful (thanks to A.Undrus!)
  - **ATN summary** run as an extra test to build summary page

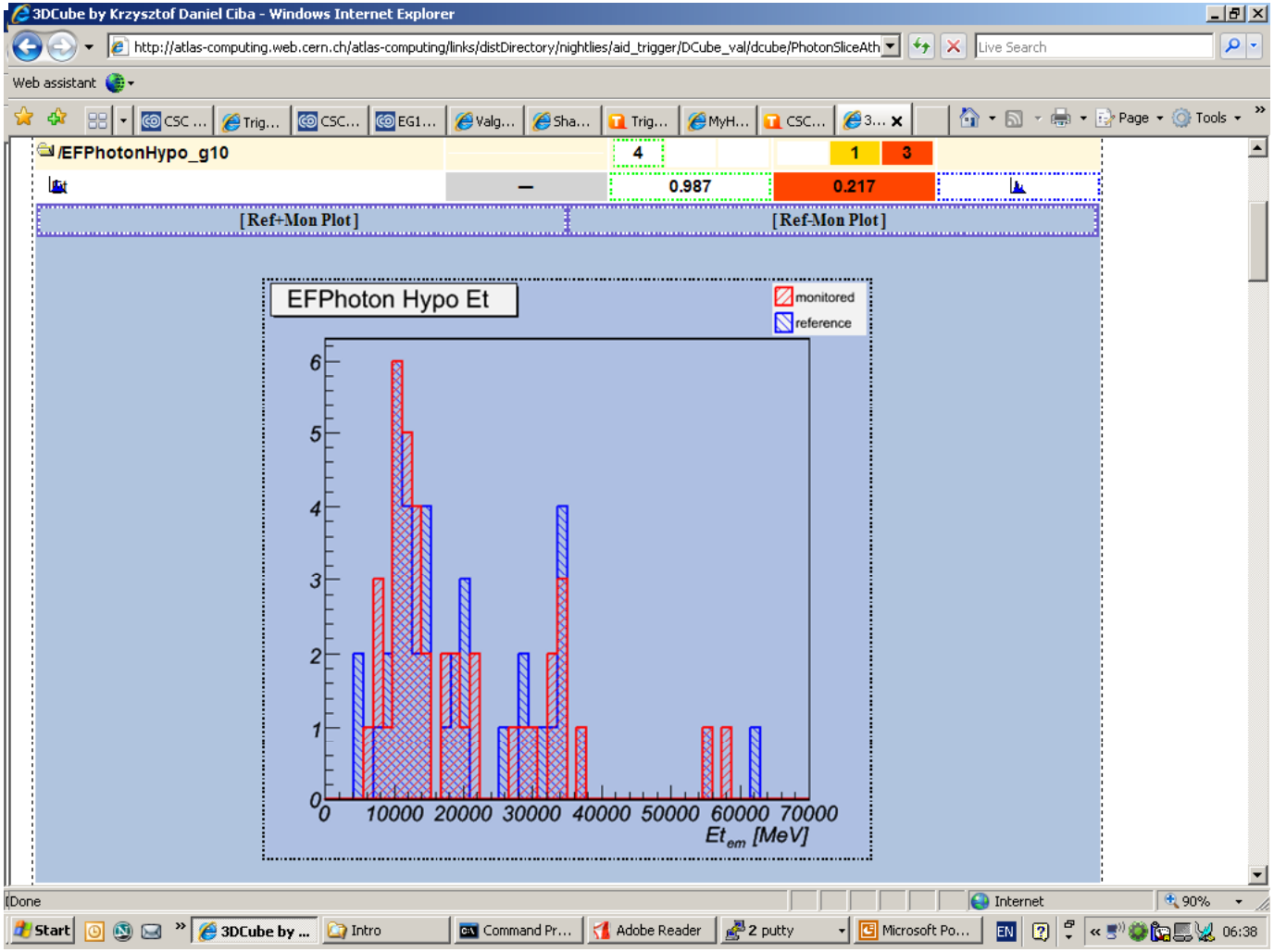

nicos webpage with test results - Windows Internet Explorer
http://atlas-computing.web.cern.ch/atlas-computing/links/distDirectory/nightlies/BFWebArea/nicos_web_areaBF32BS4TrgOpt/
Live Search
Web assistant
nicos webpage with test ...
Trigger ATN test results sum...
Page
Tools
ICOS (NIghtly COntrol System) test results
Project: AtlasTrigger
lease: rel_1 -- Built on: lxbuild075.cern.ch
other releases available: rel_0 rel_2 rel_3 rel_4 rel_5 rel_6
piler: gcc 3.4 ; option: opt ; CMT v1r20p20070720 (13.0.X, i686-slc4-gcc34-opt)
rementals: /build/atnight/localbuilds/nightlies/projects/AtlasTrigger/rel_0
pied to: /afs/cern.ch/atlas/software/builds/nightlies/bugfix/AtlasTrigger
ighlighted tests have problems, click on names to see logfiles
Last modified 08/27/2007 20:22:32
Integration+Unit tests results
16 + 3
failed:
41 + 1
ailable RTT test results and AID post-processing checks
sts exit codes are posted (for tests defined in XML files)
Test File#Name
Test Suite
Result, E.Code
Work Dir.
Manager(s)
103AthenaRDOtoBS
trigger
N/A
link
N/A
120CaloAthenaRDO
trigger
N/A
link
Denis.Damazio at cern.ch
121IDAthenaRDO
trigger
N/A
link
Denis.Damazio at cern.ch
122MuonAthenaRDO
trigger
N/A
link
N/A
TriggerTest_TestConfiguration#ElectronSliceAthenaRDO
tapm_val
64
link
N/A
TriggerTest_TestConfiguration#AthenaRDO
tapm_val
64
link
N/A
TriggerTest_TestConfiguration#IDAthenaRDO
tapm_val
64
link
N/A
151ElectronSliceAthenaRDO
trigger
N/A
link
Denis.Damazio at cern.ch
Teresa.Fonseca.Martin at cern.ch
152PhotonSliceAthenaRDO
trigger
N/A
link
Valeria.Perez.Reale at cern.ch
Internet
80%
Start
PhysicsValid...
2 Interne...
notes.txt - N...
TriggerValida...
Command Pr...
2 Adobe R...
EN
15:42


Trigger ATN test results summary - Windows Internet Explorer
C:\Documents and Settings\Ricardo\My Documents\My Work\My Meetings\AtlasValidation\PhysicsValidation28Aug07\atnsumm
Live Search
Web assistant
nicos webpage with test res...
Trigger ATN test results ...
Page
Tools
Trigger ATN test results summary
Nightly test:BF32BS4TrgOpt rel_0
Test name | Athena exit | Error Msgs | Reg. tests | Exit code | Dir. link
AthenaAllAlgsTrueRDO | OK | OK | FAIL | 64 | dir
AthenaRDO | OK | OK | FAIL | 64 | dir
AthenaRDOModern | OK | FAIL | FAIL | 96 | dir
BjetSliceAthenaRDOModern | OK | FAIL | FAIL | 96 | dir
BphysicsSliceAthenaRDOModern | OK | FAIL | FAIL | 96 | dir
CaloAthenaRDO | OK | OK | FAIL | 64 | dir
ElectronSliceAthenaRDO | OK | OK | FAIL | 64 | dir
ElectronSliceAthenaRDOModern | OK | FAIL | FAIL | 96 | dir
IDAthenaRDO | OK | OK | FAIL | 64 | dir
JetSliceAthenaRDOModern | OK | FAIL | FAIL | 96 | dir
My Computer
150%
Start
PhysicsValid...
2 Interne...
notes.txt - N...
TriggerValida...
Command Pr...
2 Adobe R...
EN
15:41

Viewing results: AID and DCube

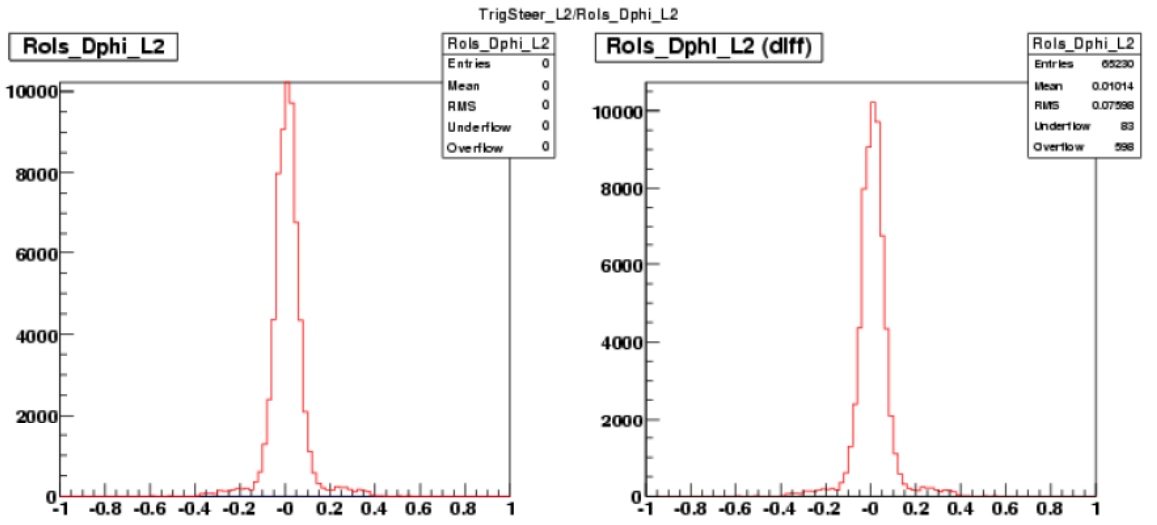
See Alex's and Krzysztof Ciba's talk in: http://indico.cern.ch/conferenceDisplay.py?confId=13869

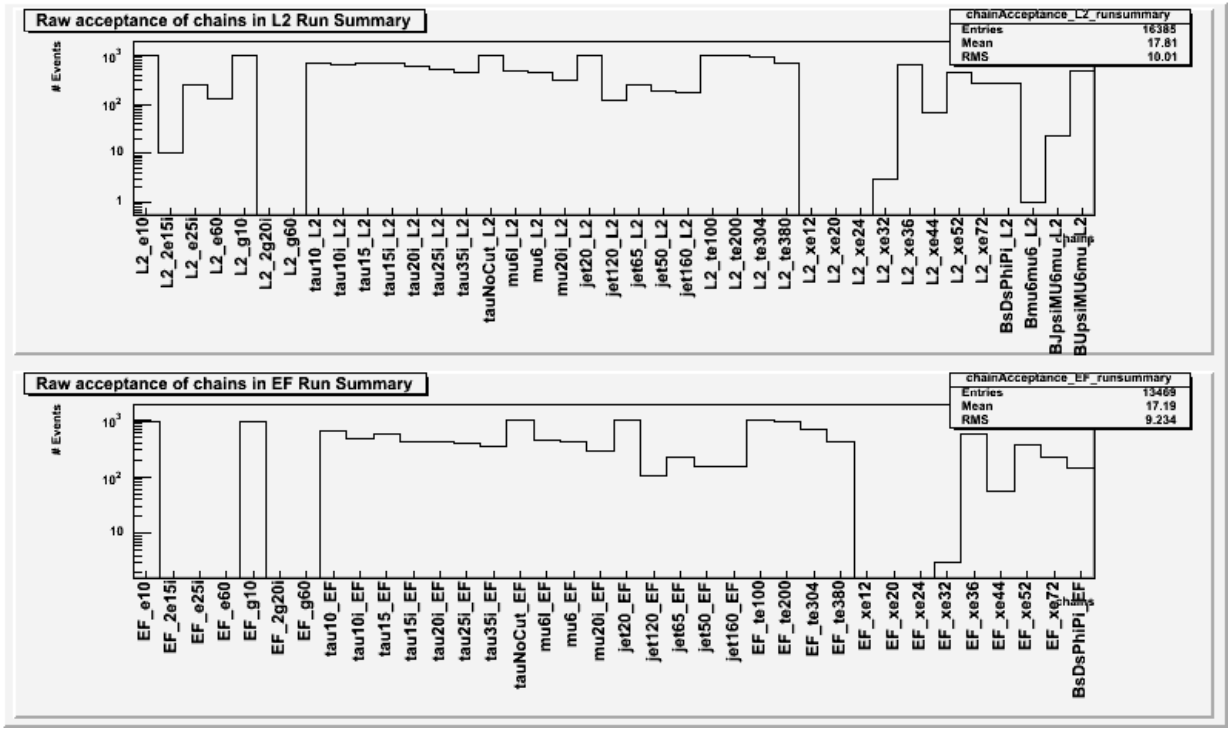
- Analysis Interpretation & Display (A.Undrus)
- Shows monitoring plots (algorithms, timers, steering)
- Shows statistical comparison with reference (DCube, K.Ciba)
- Linked from the NICOS nightlies pages
- ATN results for now, RTT to follow soon

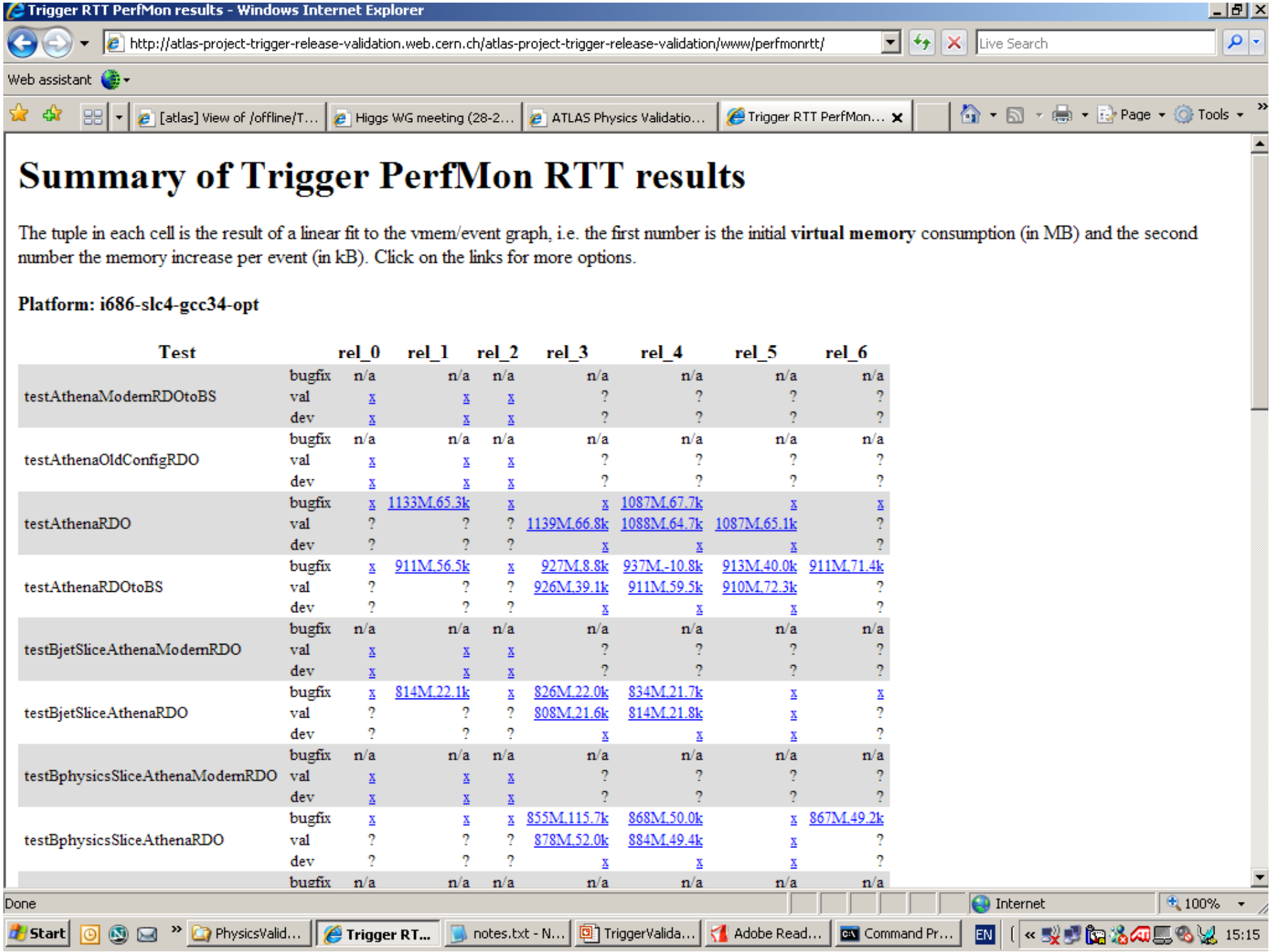


Standalone tools

- A suite of standalone tools exists in Trigger/TrigValTools to ease several tasks:
- Comparing ROOT files containing a (variable) set of histograms
- Publishing results of memory-leak tests
- Extracting and plotting TriggerDecision







Summary of Trigger PerfMon RTT results

The tuple in each cell is the result of a linear fit to the vmem/event graph, i.e. the first number is the initial **virtual memory** consumption (in MB) and the second number the memory increase per event (in kB). Click on the links for more options.

Platform: i686-slc4-gcc34-opt

Test		rel_0	rel_1	rel_2	rel_3	rel_4	rel_5	rel_6
testAthenaModernRDOtoBS	bugfix	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	val	x	x	x	?	?	?	?
	dev	x	x	x	?	?	?	?
testAthenaOldConfigRDO	bugfix	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	val	x	x	x	?	?	?	?
	dev	x	x	x	?	?	?	?
testAthenaRDO	bugfix	x	1133M,65.3k	x	x	1087M,67.7k	x	x
	val	?	?	?	1139M,66.8k	1088M,64.7k	1087M,65.1k	?
	dev	?	?	?	x	x	x	?
testAthenaRDOtoBS	bugfix	x	911M,56.5k	x	927M,8.8k	937M,-10.8k	913M,40.0k	911M,71.4k
	val	?	?	?	926M,39.1k	911M,59.5k	910M,72.3k	?
	dev	?	?	?	x	x	x	?
testBjetSliceAthenaModernRDO	bugfix	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	val	x	x	x	?	?	?	?
	dev	x	x	x	?	?	?	?
testBjetSliceAthenaRDO	bugfix	x	814M,22.1k	x	826M,22.0k	834M,21.7k	x	x
	val	?	?	?	808M,21.6k	814M,21.8k	x	?
	dev	?	?	?	x	x	x	?
testBphysicsSliceAthenaModernRDO	bugfix	n/a	n/a	n/a	n/a	n/a	n/a	n/a
	val	x	x	x	?	?	?	?
	dev	x	x	x	?	?	?	?
testBphysicsSliceAthenaRDO	bugfix	x	x	x	855M,115.7k	868M,50.0k	x	867M,49.2k
	val	?	?	?	878M,52.0k	884M,49.4k	x	?
	dev	?	?	?	x	x	x	?
	bugfix	n/a	n/a	n/a	n/a	n/a	n/a	n/a

(Wo)Manpower

- 1 contact per trigger slice doing routine checks and reporting every week
  - Overall – Olga Igonkina and Ricardo Goncalo
  - Muon – Giovanni Siragusa (Lecce as institute)
  - Electron – Denis Damazio (L2), Teresa Fonseca Martin (EF)
  - Photon – Valeria Perez-Reale
  - Tau – David Strom (Oregon as institute)
  - Jet – Chris Potter
  - MET – Allen Mincer
  - Calo – Denis Damazio (LVL2), Cibran Santamarina (EF)
  - IDet – Dmitry Emeliyanov (LVL2) and Paul Bell (EF, replacing Iwona Grabowska-Bold)
  - B-physics – Julie Kirk (primary contact); Sergey Sivoklokov (dimuon), Natalia Panikashvili (j/psi)
  - B-jet tagging – Andrea Coccaro
  - Cosmics – Jamie Boyd
  - L1 CTP – Wolfgang Ehrenfeld
  - L1 Calo – Peter Faulkner
  - L1 Muon – Chihiro Omachi
- Olya, Simon, John Baines, Dmitry Emeliyanov and myself on a week-by-week rota to check tests and overall status
- Simon George, Frank Winklmeier, Tomasz Bold, Olya and myself developing/maintaining tests

Release 13.0.30

- Needs to be thoroughly validated
  - To be used for FDR, detector paper results, etc
- More effort will be required from slices
  - But these are often already stretched…