

D0TrigSim Status and p10 Certification

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Outline

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- d0trigsim and the Trigger Database
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Intro/News

- D0 Trigger Simulation is controlled by the d0trigsim cvs package (Serban and Dugan). L1/L2 default config is in by tsim_l1l2, L3 default config is in tsim_l3.
- d0trigsim-users@fnal.gov mailing list has recently been created. Forum for developers and users to discuss bugs, ask questions.
- d0trigsim webpage is linked from D0-at-work

<http://www-d0.fnal.gov/computing/trigsim/trigsim.html>

Has recently been rewritten....please visit.

- Overall documentation is still poor. No trigsim user's guide exists. However, webpage has links to known problems, practical info about each production release, sample macros, contact people, etc.

Intro/News

D0 Trigger Simulator Homepage

Report a bug in the trigger simulation

General Info <ul style="list-style-type: none">● Contacts● Meetings (ON weeks, Thurs. 3:30-5:30 in 9th circle)● Trigsim Docs	Release Status <ul style="list-style-type: none">● TEST p10.02.00● NEW p09.10.00● CURRENT p08.12.00● OLD p06.00.01
MC Samples <ul style="list-style-type: none">● General Recommendations● QCD files in SAM● Sample Ntuples	Tools <ul style="list-style-type: none">● Collected ROOT macros
Other Trigger Links <ul style="list-style-type: none">● D0 Trigger● TriggerMeister Home● Levan's Working Page● Trigger Database	Other Links <ul style="list-style-type: none">● D0 Simulation● Monte Carlo Challenge

Updated: oneil@fnal.gov

A New Way to TrigSim

- D0 Trigger Simulation used to be run using a script (Runme.sh) stored in the d0trigsim package. Now we have joined d0tools.
- Why?
 - Common environment to run reco, scriptrunner, trigsim and other executables
 - d0tools has many wonderful features (thanks Harry Melanson!) which can be used for any D0 executable. SAM, batch, debug, purify, etc.
- In current cvs head of d0tools package you will find a **runD0TrigSim** script. This is a trigsim wrapper for the general D0 executable run script. Features include:
 - sets up all necessary config files for trigger simulation
 - allows use of **xml trigger list** produced from trigger database, or default list from release or specified config files

A New Way to TrigSim

- Cookbook:

```
setup D0RunII p10.02.00 |
setup d0cvs | general stuff
cvs checkout d0tools |

setup python | general d0tools
setup sam | Should be in .login
setenv DOTOOLS_DIR $HOME/d0tools | or a script until
setenv DOTOOLS_BIN $DOTOOLS_DIR/bin | setup d0tools works
setenv DOTOOLS_DOC $DOTOOLS_DIR/doc |
setenv DOTOOLS_PY $DOTOOLS_DIR/python | replace $HOME with
setenv PATH $PATH:"$DOTOOLS_BIN | working dir
setenv PYTHONPATH $PYTHONPATH:"$DOTOOLS_PY |

cd d0tools/bin
./runD0trigsim -nocoorsim -filelist=myfiles.dat
```

- Other interesting examples:

```
./runD0trigsim -h
./runD0trigsim -nocoorsim -filelist=myfiles.dat -localbuild
./runD0trigsim -nocoorsim -filelist=myfiles.dat -num=10
./runD0trigsim -nocoorsim -filelist=myfiles.dat -batch -q=short
```

- Everything listed above is well tested. SAM datasets, XML triggerlist, etc. SHOULD also work but are not well tested.

D0TrigSim and the Trigger Database

- The design has always been that users grab a trigger list from the trigger database (or make a new one), hand that list to trigsim and wait for the results. How close are we?
- The trigger database is now in production. A 20 trigger list has been written for MC use and is available from the web.

http://www-d0.fnal.gov/trigger_meister/private/trigdb/tdb_front-gallas-prd.html

(not necessarily permanent location....)

- The new d0tools script will (in theory) allow users to take any XML file generated from the trigger database, and send it through coorsim.
- Coorsim creates configuration files which can be read by d0trigsim.
- D0trigsim runs, creates an ntuple, washes the dishes, does your taxes and returns.
- The chain is now in place! Needs more testing, but great progress has been made!

D0TrigSim and the Trigger Database

Trigger List Report					
TRIGGER LIST Name= X.test_xml , Version= 0.03 , Use_Status= unused , Current_Status= local Implementation in: primary DAQ system , Configuration Type = global , autopause= no , comics_runttype= data Description: A trigger list to test the xml generator Device Group Name/Version = allcrates / (version 1) , l3_type= regular , num_nodes= 0 created /modified by gallas / gallas on 29-Aug-2001 / 30-Aug-2001					
index	Trigger Name	Level 1	Level 2	Level 3	
0	SRtools	This trigger definition includes a SRDirective to useL1=yes and a set of tools required by Level 3 ScriptRunner (a run configuration and an error handling tool). Because it includes 'null' scripts at Level 1 and 2, it is not part of any specific trigger (a bit is not assigned), rather, it defines tools used by general programming instructions to Level 3 for this configuration to be listed before any trigger specific tools or filters in the element.		SRtools	
The following triggers belong to the same Exposure Group. They share Device Group = allcrates / (version 1) and Exposure related L1 And/Or Terms: [ALiveBX & ASkip0 &]					
1	EM_5C_ps_tg	Central (eta <1.5) electron with track (at L1) and preshower match (L2) with E_T>5 GeV	CER(1,C,5)TEL(L,3)	EM(9,0.,5.,EM(3,3,5.,0,1))	L3FEle(ELE_TGHT_G,1,5.,0.,1,5)
2	EM_10C_ls	Trigger on central (eta <1.5) EM candidates with loose selection criteria (no tracking or preshower match required).	CER(1,C,10)	EM(9,0.,10.,EM(3,3,5.,0,0))	L3FEle(ELE_LOOSE,1,10.,0.,1,5)
3	EM_10C_ps_ls	Central (eta <1.5) electron with preshower match (L2) with E_T>10 GeV	CER(1,C,10)	EM(9,0.,10.,EM(3,3,5.,0,1))	L3FEle(ELE_LOOSE,1,10.,0.,1,5)
4	EM_10_ls	Central (eta <3.0) electron with E_T>10 GeV meeting loose criteria	CEM(1,10)	EM(9,0.,10.,EM(3,3,5.,0,0))	L3FEle(ELE_LOOSE,1,10.,0.,3.)
5	2EM_1hC_ps_ls	A J/Psi --> di-EM trigger. Requires 2 low E_T central electrons meeting loose requirements (E_T>1.5 GeV, eta <1.5).	CER(2,C,1,5)	2EM(9,0.,1,5,EM(3,3,1,5,0,1))	L3FEle(ELE_LOOSE,2,1,5,0.,1,5)
6	2EM_1hC_ps_mass	A low mass (J/Psi) --> di-EM trigger. Requires 2 low E_T central electrons meeting loose requirements and E_T>1.5 GeV and eta <1.5). An electron pair must have a combined invariant mass between 1.5 and 15 GeV.	CER(2,C,1,5)	2EM(9,0.,1,5,EM(3,3,1,5,0,1))	L3InvMass(ele_1h_ls,ele_1h_ls,1,5,15.)
7	MU_11AT_local	requires one muon track with p_T>11 GeV within eta <1.5 satisfying tight requirements at Level 1. At least one segment is required at Level 3.	MUO(1,pt4,A,T,T,X)	none	L3FMuoLocal(MUO_LOCAL,1)
8	MU_11CL_local	requires one central muon track with p_T>11 GeV within eta <1.0 satisfying loose requirements at Level 1. At least one segment is required at Level 3.	MUO(1,pt4,C,L,L,X)	none	L3FMuoLocal(MUO_LOCAL,1)
9	MU_7CL_local	requires one central muon track with p_T>7 GeV within eta <1.0 satisfying loose requirements at Level 1. At least one segment is required at Level 3.	MUO(1,pt3,C,L,L,X)	none	L3FMuoLocal(MUO_LOCAL,1)
10	2MU_2CL_local	requires two central muon tracks with p_T>2 GeV within eta <1.0 satisfying loose requirements at Level 1. At least two segments are required at Level 3.	MUO(2,pt1,C,L,L,X)MUO(1,pt2,C,T,T,X)	none	L3FMuoLocal(MUO_LOCAL,2)
11	TAU_5C_ls	requires a tau candidate with E_T>5 GeV, eta <1.5	CEM(1,5)CJT(2,5)CJR(1,C,5)TIS(3)	2JET(5.,JET(5.,0.,10.,))_EM(9,0.,5.,EM(3,3,5.,0,0))	L3FTau(TAU_LOOSE,1,5.,0.,1,5)
12	MET20_2JT5	Requires missing E_T>20 GeV along with 2 kt jets with E_T>5 GeV	CME(20)CJT(2,5)	2JET(5.,JET(5.,0.,10.,))_MET(20.,MET)	met20_2ktjet5
13	MET35	Requires missing E_T>35 GeV	CME(35)	MET35	L3FMEt(CALMET,35.,2000.,0.)
14	3JT_10_kj	Requires 3 kt jets with E_T>10 GeV	CJT(3,5)CJT(1,7)	3JET(10.,JET(5.,0.,10.,))	L3FJet(KTJET_10,3,10.,0.,3.,0.,1.)
15	HT100_3JT10_kj	Requires a scalar H_T>100 GeV including 3 kt jets with E_T>10 GeV	CET(70)CJT(3,5)	HT100(JT5)	L3FJet(KTJET_10,3,10.,0.,3.,0.,1.)
16	JT30	requires at least one jet with E_T>30 GeV found using a simple cone algorithm	CJT(1,3)	JET(15.,JET(15.,0.,10.,))	L3FJet(SCJET_30,1,30.,0.,3.,0.,1.)
17	JT50	requires at least one jet with E_T>50 GeV found using a simple cone algorithm	CJT(1,10)	JET(30.,JET(15.,0.,10.,))	L3FJet(SCJET_50,1,50.,0.,3.,0.,1.)
18	JT85	requires at least one jet with E_T>85 GeV found using a simple cone algorithm	CJT(1,20)	JET(50.,JET(15.,0.,10.,))	L3FJet(SCJET_85,1,85.,0.,3.,0.,1.)
19	JT115	requires at least one jet with E_T>115 GeV found using a simple cone algorithm	CJT(1,30)	JET(70.,JET(15.,0.,10.,))	L3FJet(SCJET_115,1,115.,0.,3.,0.,1.)
20	gtrack5	requires a track found by the GlobalTracker tool with E_T>5 GeV	TTK(2,3)TIS(3)	EM(9,0.,5.,EM(3,3,5.,0,0))	L3FTrack(GlobalTracker,5.)

purple ==> current green ==> future (test) yellow ==> local pink ==> obsolete white ==> unknown

Combining d0trigsim and reco_analyze Ntuples

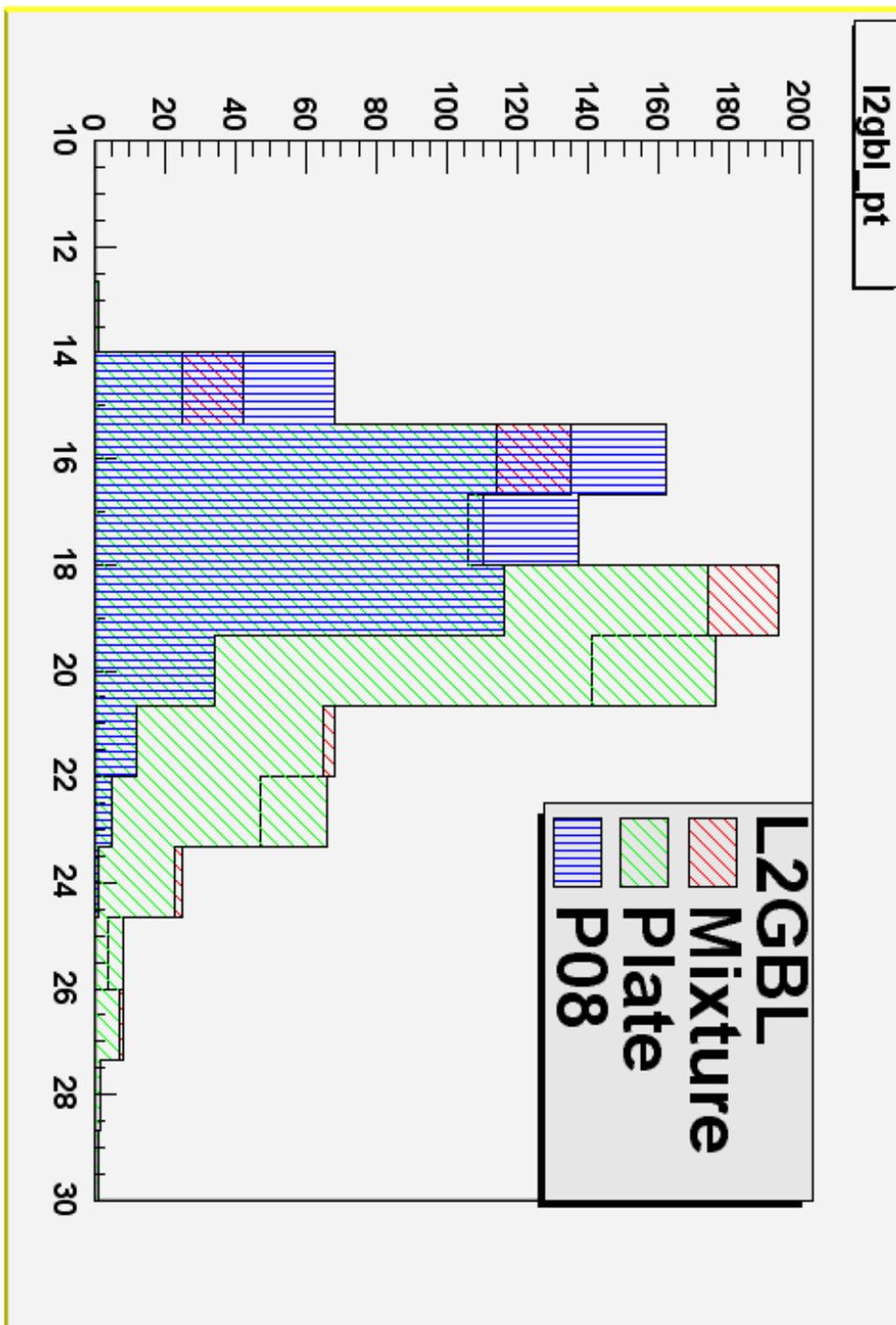
- Many people are interested in seeing MC info, reconstruction info and trigger info in the same global ntuple.
- This should be accomplished using the d0_analyze package. This requires creation of trigsim_analyze which can run independently of d0trigsim.
- L1 provides a couple of delays here. trigsim_analyze and d0_analyze exist in p10 but are not ready for general use.
- While you wait you can combine d0trigsim with individual reco packages if you want....add to the d0trigsim executable. Laurent Duflot has provided a set of scripts which do this automatically....tested in p09.08.00, samples on the web.

MC Samples for Trigger Studies

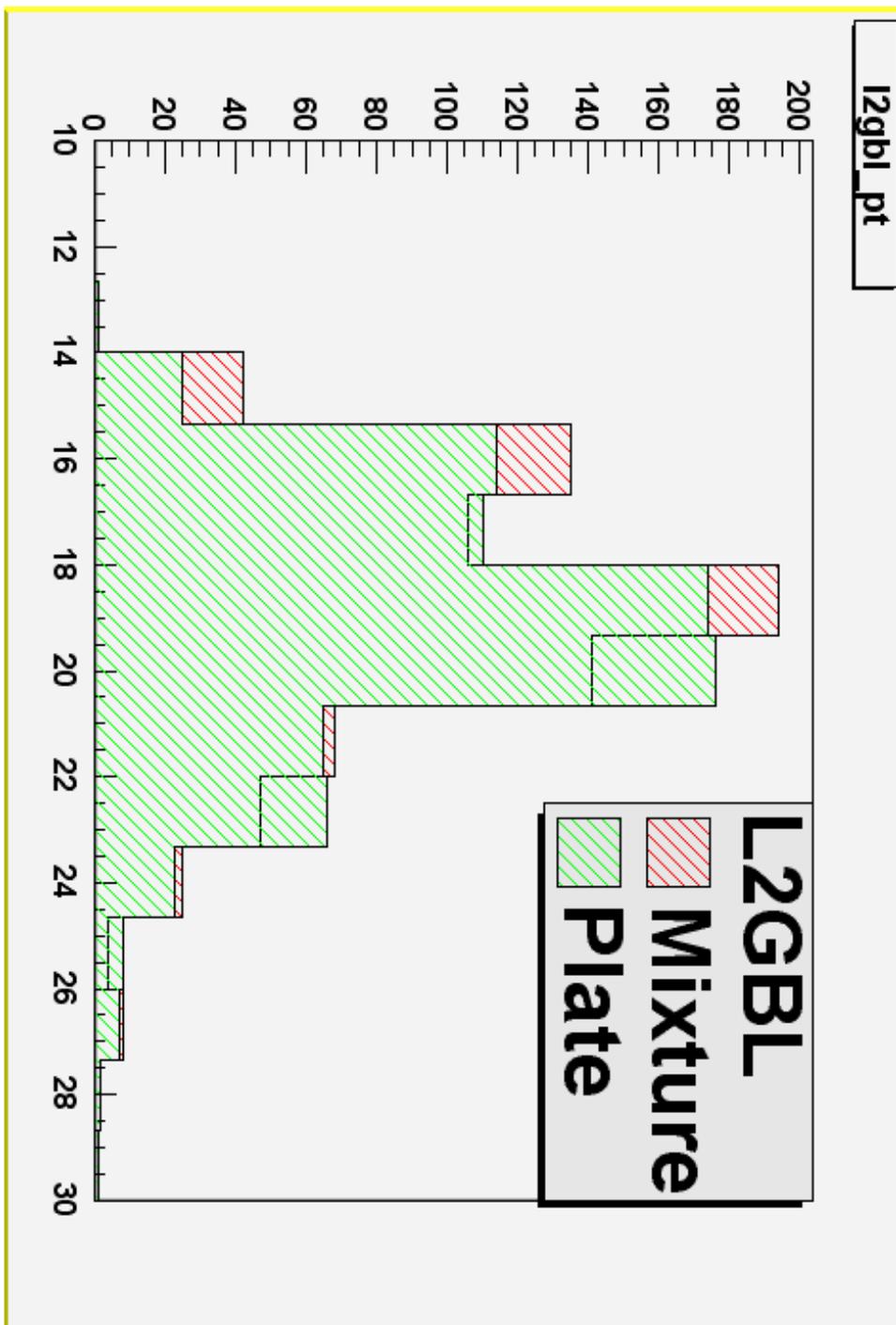
- Previous version of MC did not use cal trigger tower weights to reconstruct energy. p09.08.00 promises to fix this (improvements to calweights, calttmaker).
- We are also interested in the difference between plate and mixture geometry. Weights are optimized for plate geometry.
- Serban provided two files of single electrons produced in p09.08.00 ($P_t=20$ GeV). I had old files of single e from reco-cert p08.11 lying around. I looked at electrons from L2 global

Sample	Mean	RMS
p08	17.1	1.6
p09-mix	18.8	2.5
p09-plate	19.1	2.0

MC Samples for Trigger Studies



MC Samples for Trigger Studies



MC Samples for Trigger Studies

- Now we need large samples of QCD events with which to do trigger studies.
- Volker Buescher proposed a “fast-turnaround” mode of processing samples of MC events needed on a short timescale.
- This means getting MC farms to produce events with releases that are not yet fully certified. Also, for trigsim studies we need a farm-like body (garden?) to process the farm output with a recent version of trigsim.
- An effort is underway to produce 500k QCD events (various pt thresholds) on the farms and have the sample trigsimmed on d0mino by shifters.
- Should provide short-term relief for people who need to do rate studies with trigsim....

Release Status - Historical

- p06.00.01 - don't use this anymore...too old
- p08.12.00 - has run on Nx100k samples without crashing. Stable but getting old already.
- p09.10.00 - p09 has been plagued by fpes in last several versions. More fixes in p09.10.00....I haven't tried it yet.

p10 Certification

- p10 contains a lot of big changes for d0trigsim infrastructure. For example, L1/L2 changes to run on real data:
 - l1l2unpacker learns VRB format (interface change to l2iogen)
 - more analyze packages read directly from RDC (l1cal, l1muon, l2caljet, l2calmet, l2calem, l2cps, l2gbl)
 - tsim_l1ft completely rewrites L3 output classes to better emulate real data. New unpacker to be written for l1ft analyze package and examine.
- More functionality added to l2gbl (track match), L3 filters/tools, l2errorlogger integration, etc.
- So, we'd better test it....

p10 Certification

- p10.00.00 and p10.01.00 have some nasty bugs. p10.02.00 looks much better. The results I am showing are primarily for p10.01.00 + patches.....my private p10.02.00

- Run d0trigsim on p09.08.00 MC reco certification samples:

process	# events
$t\bar{t}$	1k
$wh - \tau\nu$	1k
single e	15k
single μ	10k
QCD ($P_t > 20$)	2k
z-bb	≈ 200

- Saw one crash in z-bb sample due to memory overwrite (?). Looking into it now. All other samples ran fine.

p10 Trigsim Performance

- Caveats:
 - L3 is running everything without the benefit of looking at L1/L2 trigger bits
 - This is a debug build, not maxopt
 - This uses offline framework -time option which does not work for dataflow controller. L1/L2 time is gotten by subtraction with no guide for overhead costs.

- Statistics for d0mino

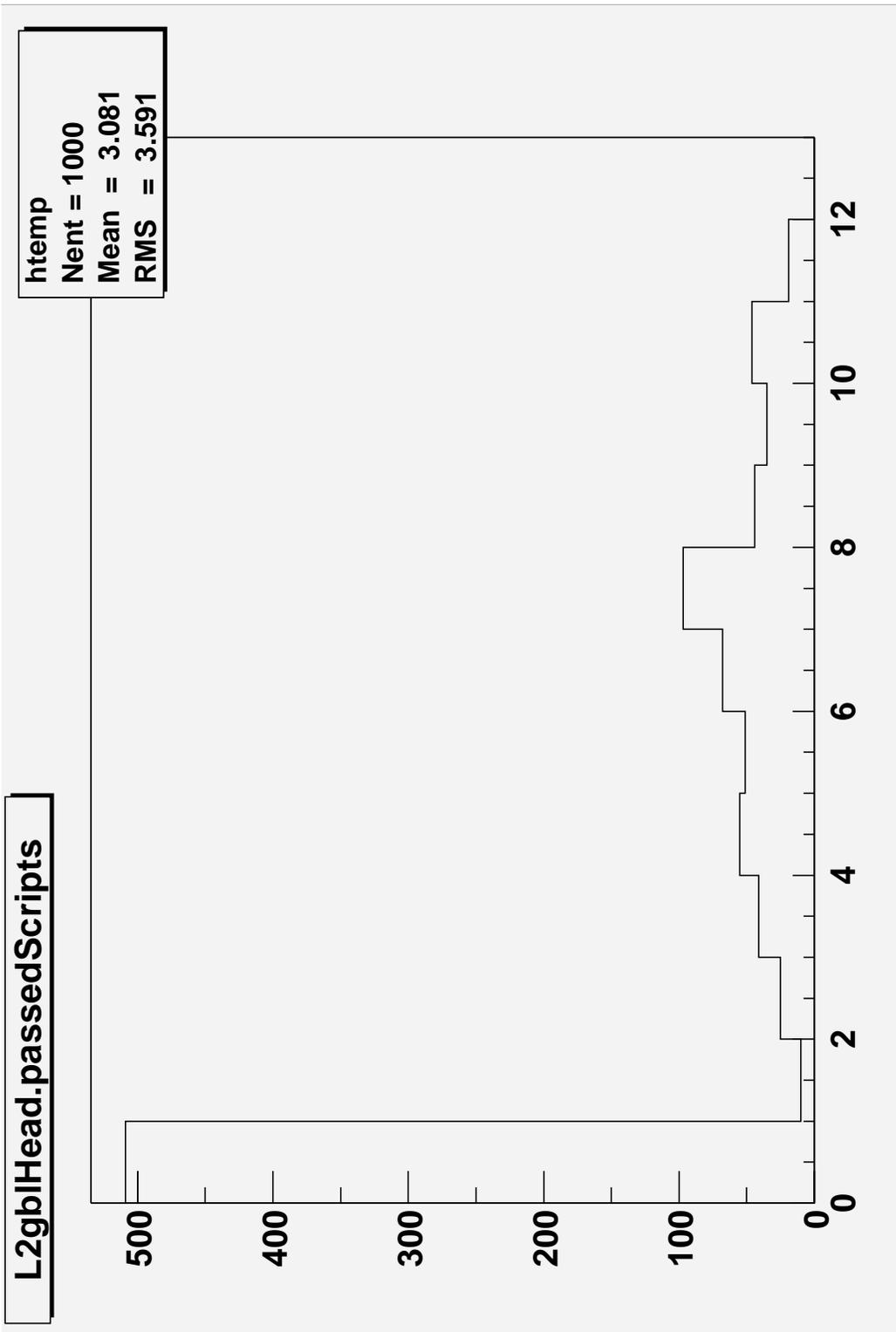
	$t\bar{t}$
Memory Max	125Mb
L1/L2 Time	2.1s/evt
L3 Time	23.7s/evt
Total Time	27.2 s/evt

	single μ
Memory Max	115Mb
L1/L2 Time	0.6s/evt
L3 Time	7.4 s/evt
Total Time	8.3 s/evt

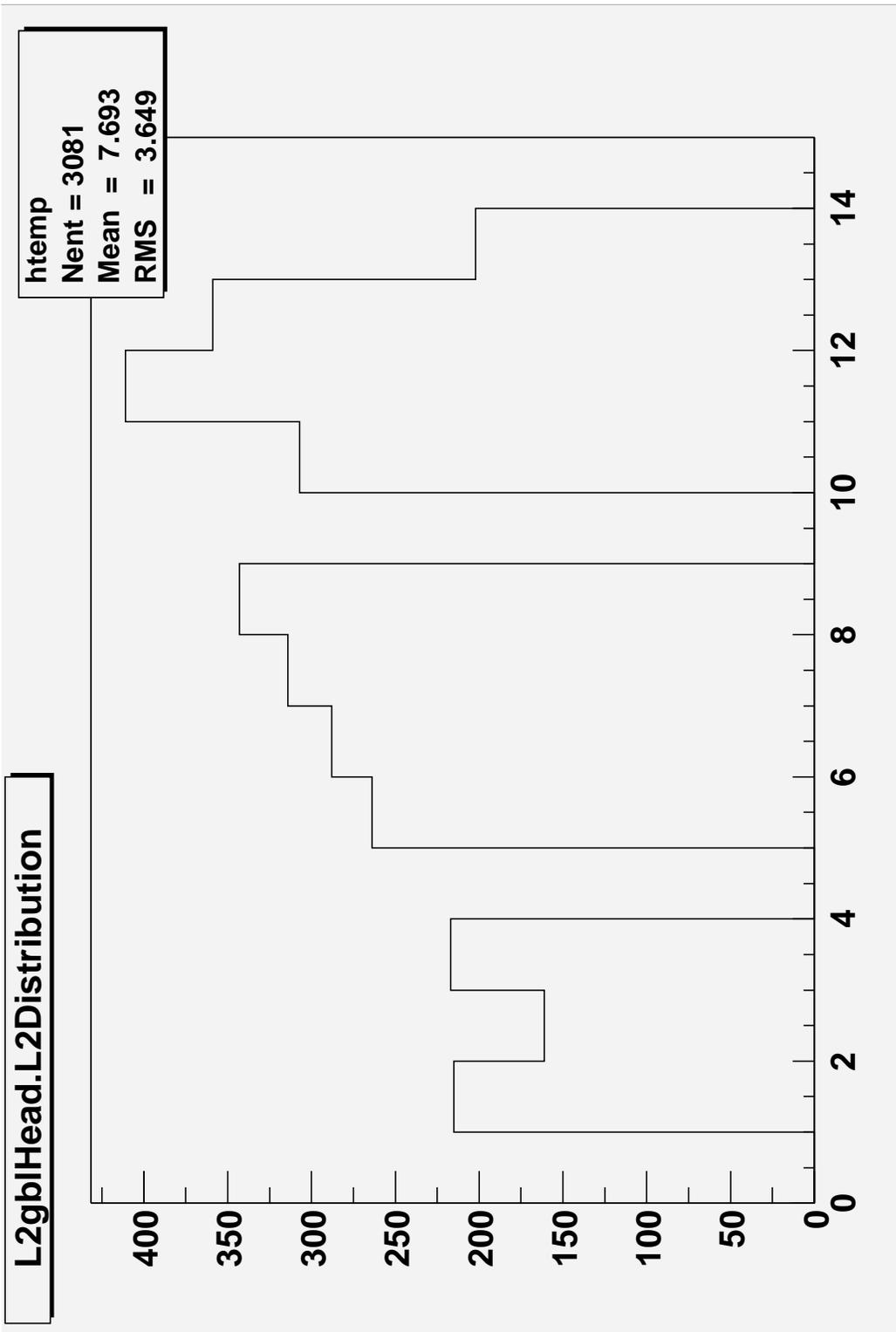
p10 Trigsim Results

- Known Problems:
 - number of entries in some ntuple variables is double number of events. This must be deeper than d0trigsim.
 - inefficiencies, phi problems in l2cps, l2cttcft
 - cal weights chosen incorrectly in default L3 trigger list...makes L3Cal look bad.
- L2GBL plots provided by Adam Yurkewicz
- L3 stuff

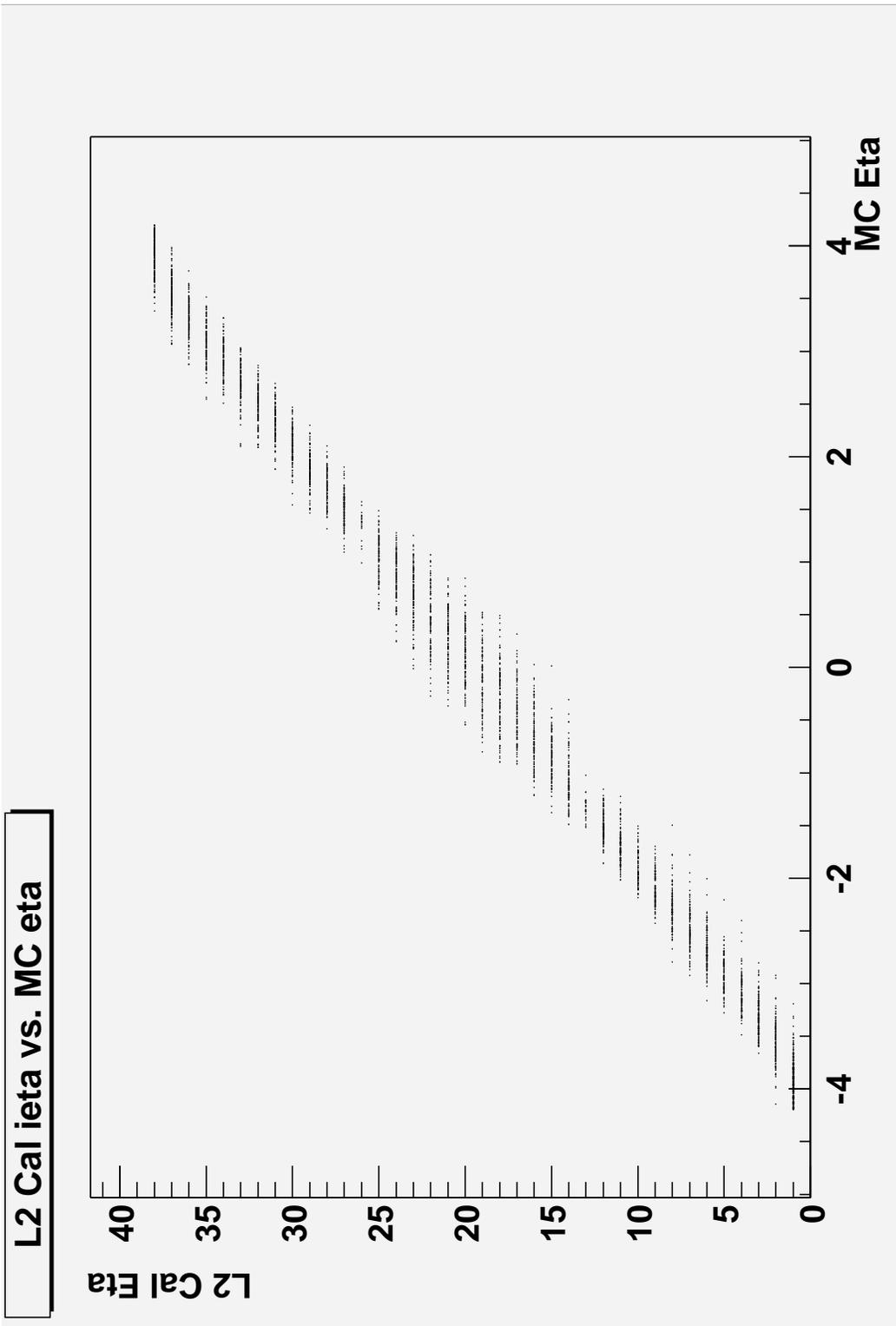
p10 Trigsim Results



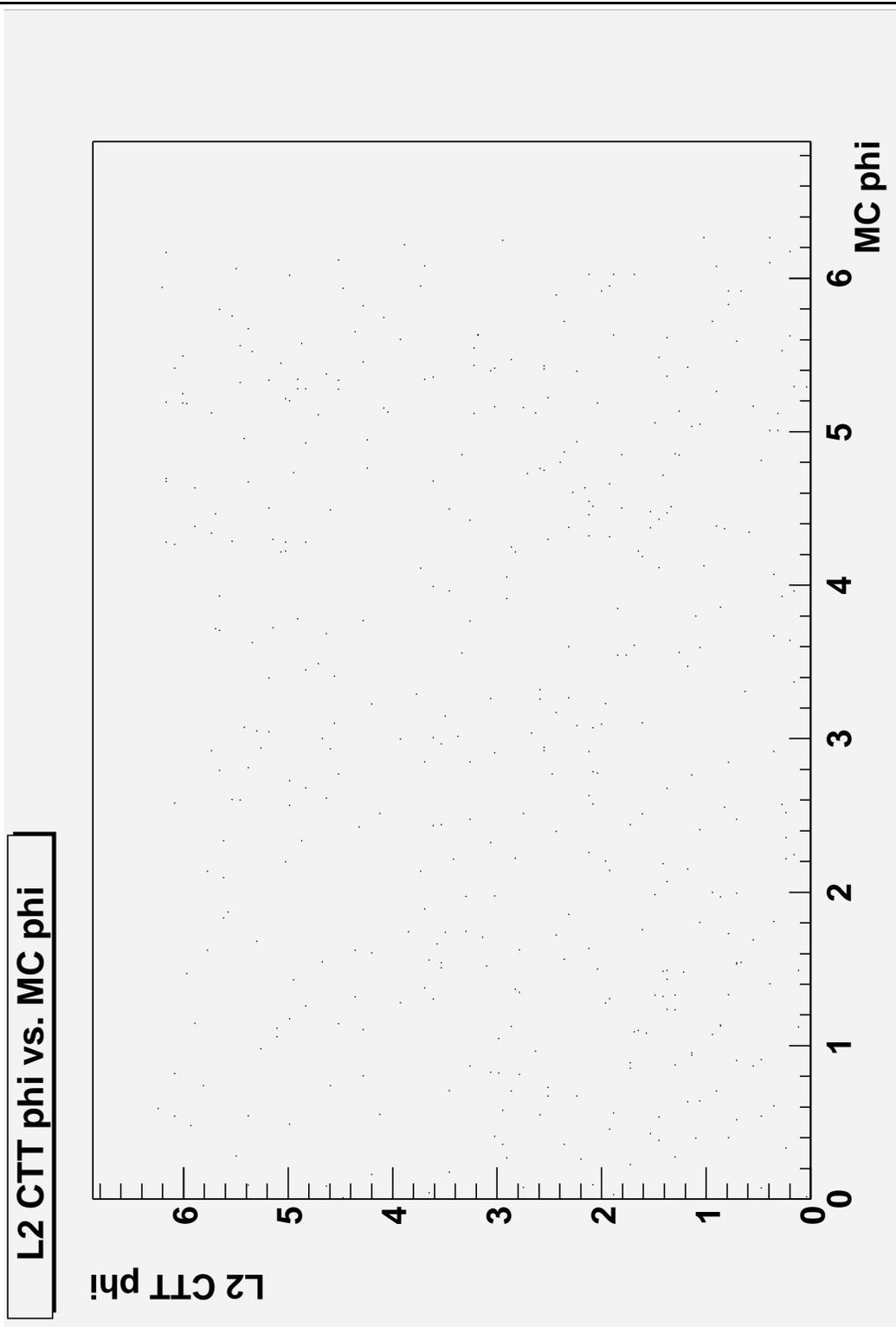
p10 Trigsim Results



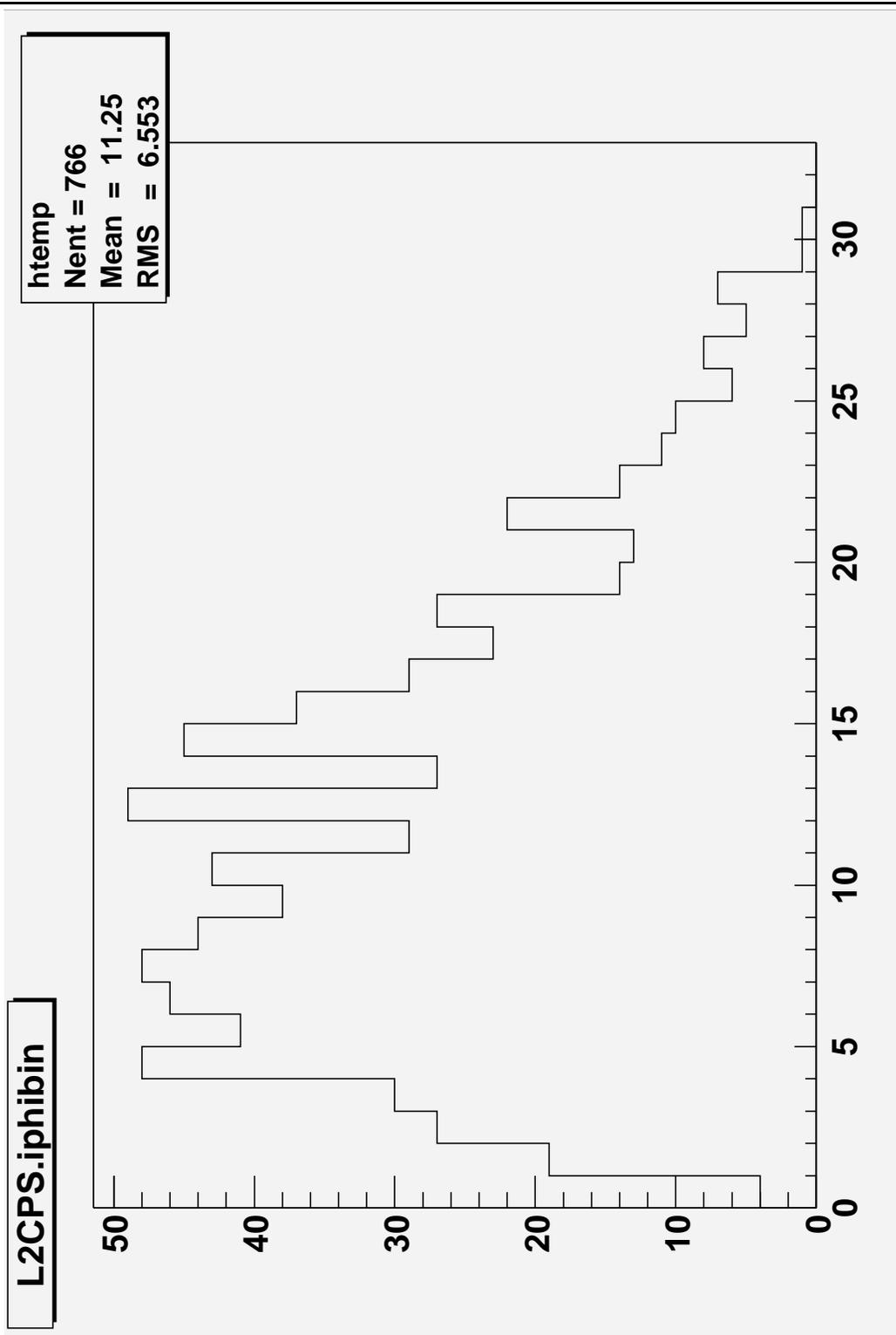
p10 Trigsim Results



p10 Trigsim Results



p10 Trigsim Results



Summary

- Many new features added to d0trigsim for p10.
- New d0tools script allows much more flexibility when running. Also SHOULD allow running of coorsim on xml file from trigger database.
- Trigger database now contains 20 trigger list for MC studies. Will become our default.
- D0trigsim can be run with reco packages to produce combined ntuple today. trigsim_analyze and d0_analyze provide better long-term solution.
- New MC samples are becoming available with much better cal TT weights. 500k new QCD events have been requested.
- p10 d0trigsim has run over 20k events, one crash seen on z-bb events. “Physics bugs” now being found and squashed.