D0 SIMULATION

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Q. Li

S. Protopopescu

- **Event Generators(MC...x)**
- **D0G* and C++ wrapper (d0gstar2.x)**
- **D0Sim: digitization,noise, pileup, and raw data (D0Sim_x)**
- **Trigger Simulation (D0TrigSim_x)**
- **Fast Monte Carlo (pmcs_x)**

SIMULATION Q. Li, S. Protopopescu	
Event generators	S. Protopopescu
D0G*	S. Kunori
D0Sim	Q. Li S. Protopopescu
L1 L2 Simulation	D. Oneil S. Protopopescu
L3 Simulation	A. Boehnlein J. Hays
PMCS	S. Eno, E. Nagy

Event Generators S. Protopopescu	
C++ containers **C++ General Interface**	**S. Protopopescu** **”**
Interface to ISAJET	**”**
Interface to PYTHIA	**G. Brooijmans**
Interface to HERWIG	**”**
Interface to SUSYGEN	**A. Besson**
Root tuple	**V. Jain**
Single Particle & Cosmic muons	**G. Graham**

Event Generators

Products:

- **mcpp General C++ containers and utilities**
- **mcpp_gen Interface to generators, fill C++ containers**
- **d0_mcpp D0 C++ containers**
- **d0_mcpp_gen packages to fill D0 C++ containers**

Interface programs:

- ISAJET, **executable MCisagen.x**
- PYTHIA, **executable MCpythia.x**
- HERWIG, **executable MCherwig.x**

All can be made to run with tauola.
qq available with PYTHIA.

Special generator programs:

- **MCbyHand.x: make events by hand.**
- **MCSingle_x: make events with single tracks.**
- **MCCosmic_x: make cosmic muon events.**

Convert to root tuple format:

- **MCAnalyze_x. Utility macros in mc_analyze/rootmacros**

All executables available in production releases p05.00.04 and p07.00.00

Documentation on C++ containers in mcpp/doc/

Documentation on running executables in d0_mcpp/doc/

Example on how to use a generator:

```
% setup n32
% setup D0RunII p07.00.00
% d0setwa
% ln -s /d0dist/dist/releases/p07.00.00 p07
% cp p07/d0_mcpp_gen/rcp/runMCisagen.rcp .
% ln -s your_isajet_command_file commands.isa
% MCisagen_x -rcp runMCisagen.rcp
```

Events are inMCevents.dat
Printout in isajet.out, must be deleted or renamed before rerunning.

Other generators require equally simple set of instructions.

Command files for various generators can be found in cvs library cardfiles.

First cardfiles release: t01.26.00

D0GStar S. Kunori	
CAL + ICD	A. Stone, M. Zielinski V. Zutshi
CFT	M. Hildreth
CPS	D. Coppage
FPS	S. Chopra, D. Shpakov
SMT	E. Shabalina
Muon	Y Gornushkin, C. Royon
FPD	A. Brandt
L0	R. Partridge

D0G* and simpp

Coordinator: S. Kunori

Production releases:

- **pmc03.00.00** Removed digitization.
- **pmc04.00.00** updated geometry (**CFT**, **SMT**, **ICD**).
- **p05.00.04**: identical to pmc04.00.00
- **p07.00.00**: Include FPD and L0.

Running d0gstar2.x

```
% setup n32
% setup D0RunII p07.00.00
% d0setwa
% ln -s /d0dist/dist/releases/p07.00.00 p07
% cp p07/simpp/rcp/sim_framework_mckine.rcp .
% cp p07/d0gstar_user/ex03/ttl.mckine .
% ln -s ttl.mckine fort.4
% setenv d0_ver $BFCURRENT
% setenv d0_path $BFDIST''/releases/''
% ln -s MCevents.dat dspack.input
% ln -s MCevents.d0g d0om-dspack.sim
% d0gstar2.x -rcp sim_framework_mckine.rcp
READ 4
STOP
```

Input file is MCevents.dat
output file MCevents.d0g.

To change d0gstar2.x defaults edit
ttl.mckine.

The command file
d0gstar_user/ex03/runt.test_mckine.csh
has all instructions needed to run
MCisagen.x + d0gstar2.x.

D0Sim **Q. Li, S, Protopopescu**	
pileup	**F. Touze**
CFT digitization	**M. Hildreth**
CPS digitization	**D. Coppage**
FPS digitization	**S. Chopra, D. Shpakov**
SMT digitization	**E. Shabalina,A. Solomin**
Cal. Weight	**L. Chan**
RawData **C. Leggett**	
CAL + ICD	**C. Leggett, V. Buescher**
CFT	**Kin Yip, L. Babukhadia, S. Chopra**
CPS	**D. Coppage**
FPS	**S. Chopra, D. Shpakov**
SMT	**M. Narain** **R. Illingworth**
Muon	**M. Fortner, P. Balm**
FPD	**A. Brandt**
Make RawDataChunk	**B. Thooris**

D0Sim Status

Coordinators: Q. Li, S. Protopopescu
Production releases:

psim01.00.01:
pileup + CalWeight + cps, fps, cft, smt digitization + muon hits + CalDataChunk + RawDataChunk(cal) + L1CalTTChunk

p05.00.04:
updated pileup, cps, cft digitization, and removed muon hits
RawDataChunk: cal+muo+smt+cps+cft

p07.00.00: updated smt noise
RawDataChunk: cal+muo+smt+cps+cft+fps

Only FPD and L0 still missing.

Running D0Sim_x:

```
% setup n32
% setup D0RunII p07.00.00
% d0setwa
% ln -s /d0dist/dist/releases/p07.00.00 p07
% cp p07/d0sim/rcp/runD0Sim.rcp .
% cp p07/d0sim/rcp/runD0Sim_RDConly.rcp .
% cp p07/rundata/d0sim/* .
% ln -s some_minbias_file minbias1
% ln -s another_minbias_file minbias2
% ln -s Zbb_isa.d0g inputfile
% ln -s Zbb_isa.d0sim outputfile

            (will not be needed in p07.00.01)
% cp p07/fps_unpdata/config/fps_map_inp.txt .
```

You have option to keep on output file of D0Sim all digi chunks +/or RawDataChunk+MCKineChunk+L1CalTTChunk.

```
% D0Sim_x -rcp runD0Sim.rcp
% D0Sim_x -rcp runD0Sim_RDConly.rcp
```

L1 L2 Simulation

D. Oneil, S. Protopopescu

Trigger Configuration Information	
Trigger config. data base	E. Gallas
L1, L2 trigger config. files	S. Snyder
Read trigger config. files	A. Boehnlein
L1 trigger config. file parser	P. Laurens + ...
L2 trigger config. file parser	R. Moore, D. Casey

L1 Trigger Data processing	
L1 calorimeter	J. Kalk
L1 muon	K. Johns, P. Johnson
L1 cft	Kin Yip, M. Martin V. Jain
L1 stt	S. Desai, W. Lee Brian Connolly
L1 preshower	L. Babukhadia Mrinroy Bhattacharjee
L1 trigger logic	J. Kalk C. Opazo-Castillo

L2 Trigger Data processing	
L2 central tracks	???D. Toback V. Jain(temp)
L2 calorimeter	R. Hirosky
L2 muon	A. Maciel
L2 stt	S. Repond
L2 preshower	M. Bhattacharjee
L2 Global	R. Moore, D. Casey
Add L1, L2 blocks to RawDataChunk	R. Moore
L1L2 framework	D. Oneil

D0TrigSim Status

Coordinators: D. Oneil, S. Protopopescu

p06.00.00 1st production release of D0TrigSim_x.

simulation of L1, L2 and L3.
L1 simulation emulates L1 trigger boards
L2 simulation runs the same code as L2 trigger boards
L3 simulation is the code that runs on L3 nodes

In addition D0TrigSim_x includes analysis packages to write root ntuple with L1, L2, L3 information.

At present L3 can be run independently of L1, L2:

- **tsim_l1l2 package runs L1, L2**
- **tsim_l3 package runs L3 ScriptRunner**

L3 ntuple information is rather limited.

D0TrigSim_x can run using either D0Sim_x (p05.00.04 or p07.00.00) or D0reco_x (p05.00.04) output files as input.
Present version still requires some digi chunks.

Only output from D0TrigSim_x p06.00.00 is root_L1L2L3global.ntpl.

One can turn on writing of output files by editing runD0TrigSim.rcp. The output files are the same as input files except:
RawDataChunk includes L1,L2 trigger block
L3Chunk L3 generated data

Running D0TrigSim_x:

```
% setup n32
% setup D0RunII p06.00.00
% d0setwa
% ln -s /d0dist/dist/releases/p06.00.00 p06
% cp p06/d0sim/bin/Runme.sh .
% ln -s Zbb_isa.d0sim inputfile
% Runme.sh
```

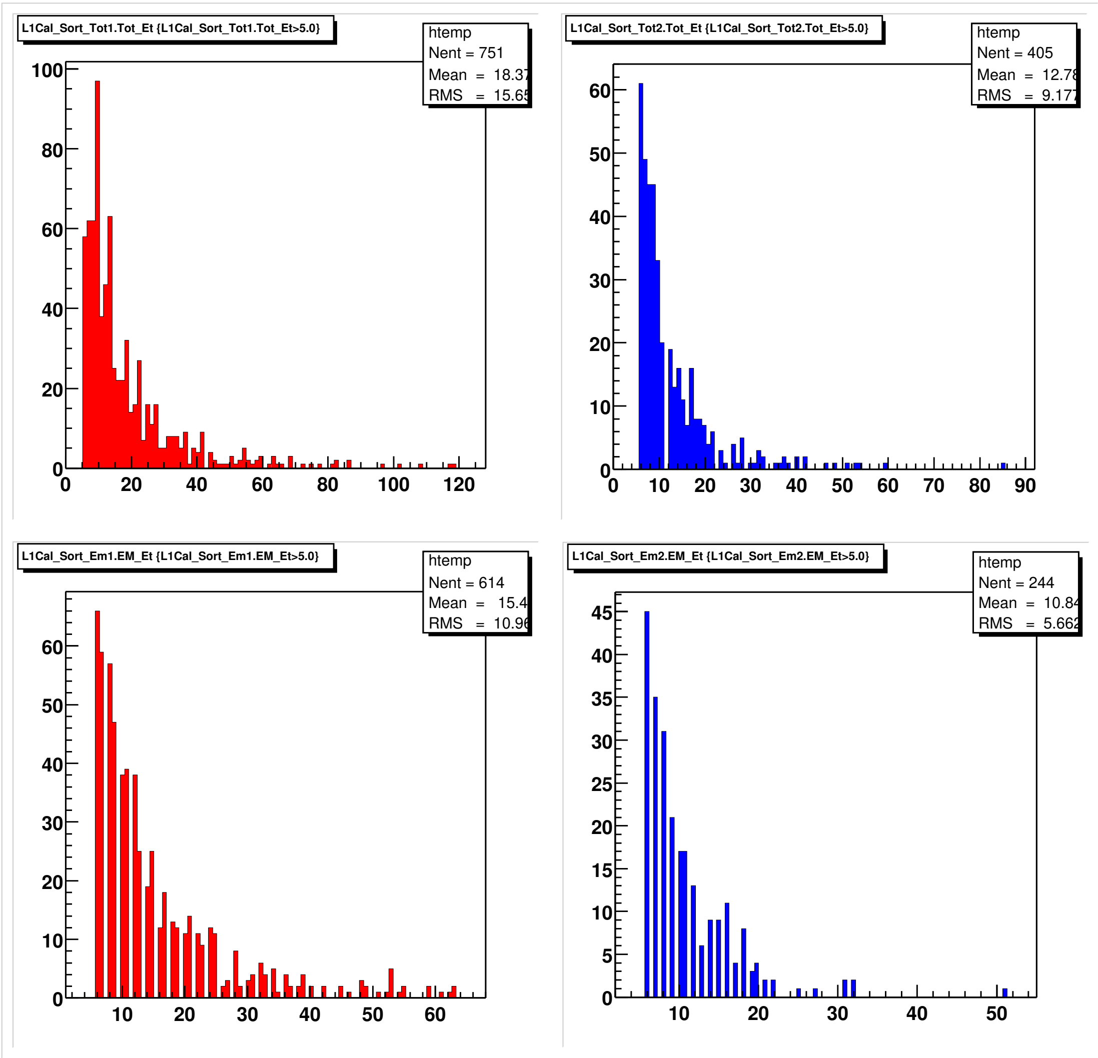
To write event output files

```
% ln -s Zbb_isa.d0trigsim outputfile
% cp p06/d0sim/rcp/runD0TrigSim.rcp .
% Runme.sh runD0TrigSim.rcp
```

runD0TrigSim.rcp needs to be edited to include write at the end of the list of packages.

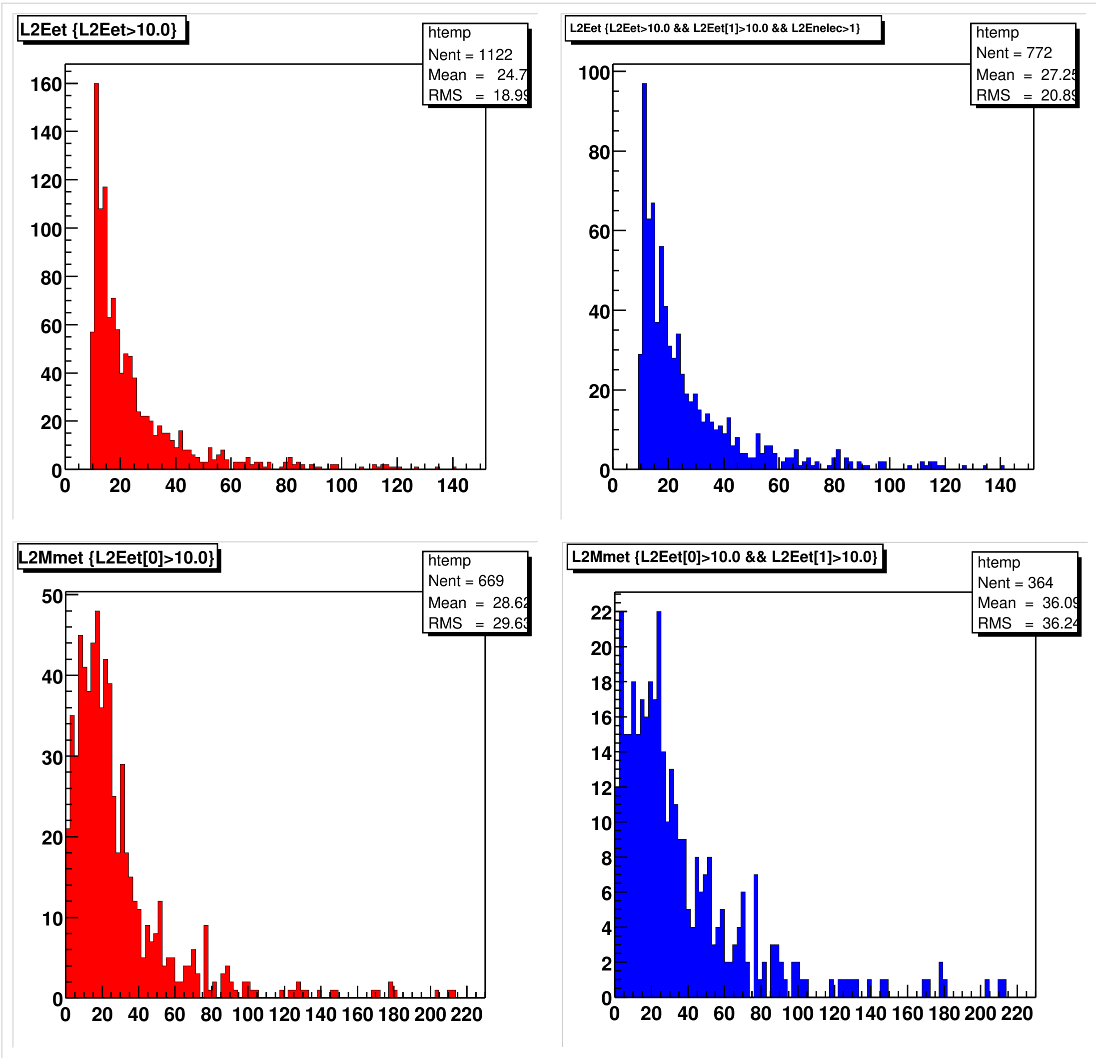
Before rerunning you must either delete or rename root_L1L2L3global.ntpl.

L1 Cal Et

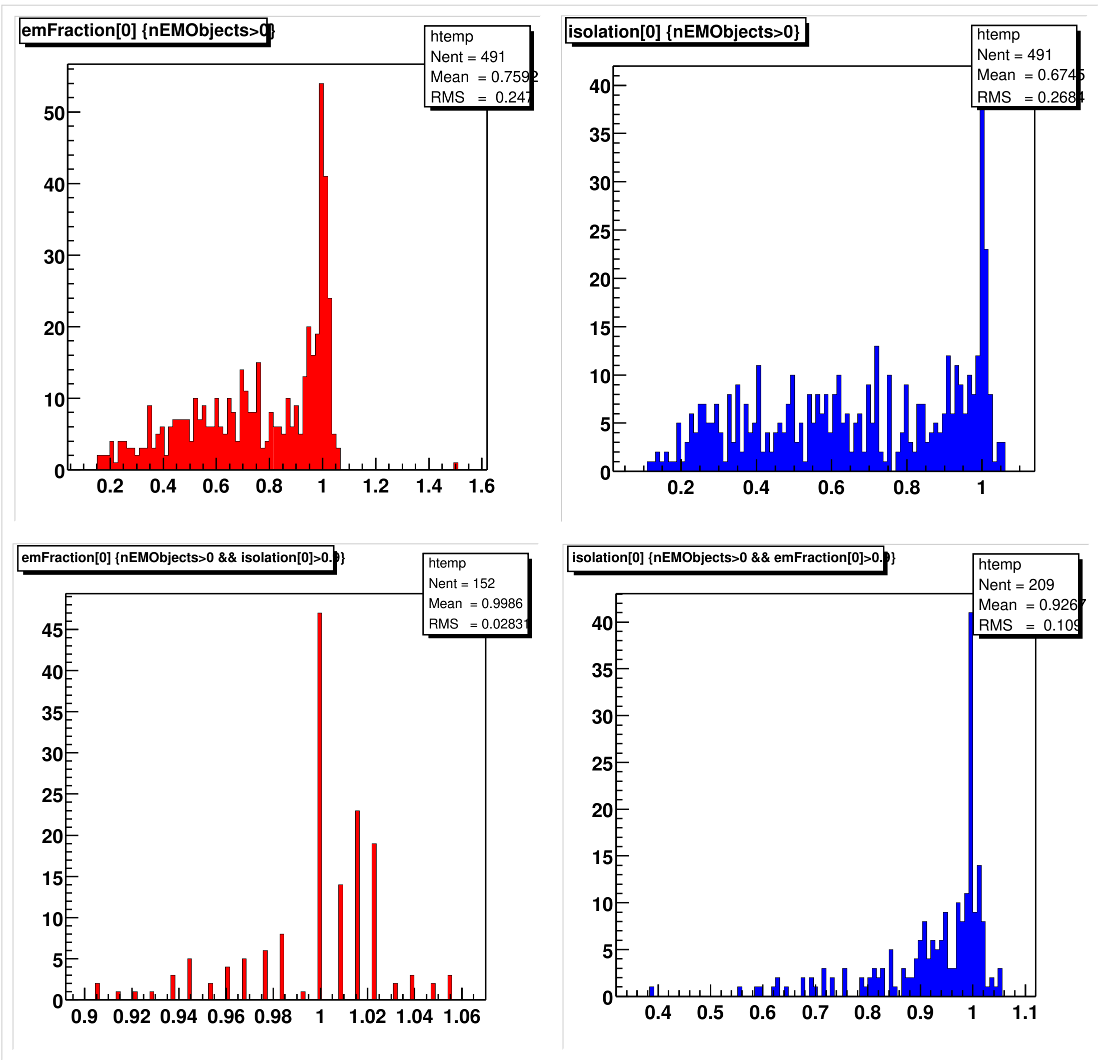


L1Cal_Sort_Tot1.Tot_Et {L1Cal_Sort_Tot1.Tot_Et>5.0}
htemp
Nent = 751
Mean = 18.37
RMS = 15.65
L1Cal_Sort_Tot2.Tot_Et {L1Cal_Sort_Tot2.Tot_Et>5.0}
htemp
Nent = 405
Mean = 12.78
RMS = 9.177
L1Cal_Sort_Em1.EM_Et {L1Cal_Sort_Em1.EM_Et>5.0}
htemp
Nent = 614
Mean = 15.4
RMS = 10.96
L1Cal_Sort_Em2.EM_Et {L1Cal_Sort_Em2.EM_Et>5.0}
htemp
Nent = 244
Mean = 10.84
RMS = 5.662

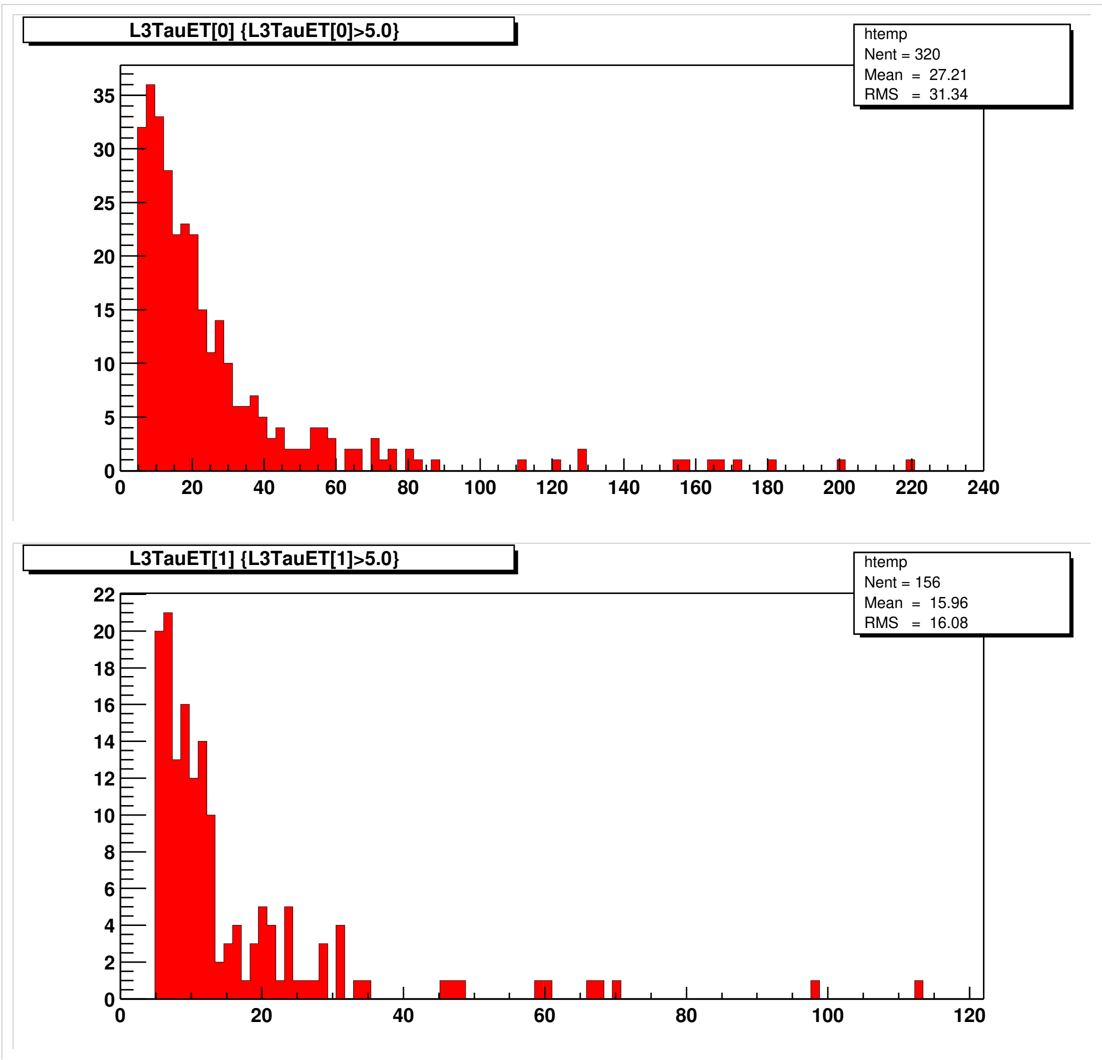
L2 Cal Et


L2Eet {L2Eet>10.0}
htemp
Nent = 1122
Mean = 24.7
RMS = 18.99
L2Eet {L2Eet>10.0 && L2Eet[1]>10.0 && L2Enelec>1}
htemp
Nent = 772
Mean = 27.25
RMS = 20.89
L2Mmet {L2Eet[0]>10.0}
htemp
Nent = 669
Mean = 28.62
RMS = 29.63
L2Mmet {L2Eet[0]>10.0 && L2Eet[1]>10.0}
htemp
Nent = 364
Mean = 36.09
RMS = 36.24

L2 em fraction & isolation



L3 Tau Et


L3TauET[0] {L3TauET[0]>5.0}
htemp
Nent = 320
Mean = 27.21
RMS = 31.34
L3TauET[1] {L3TauET[1]>5.0}
htemp
Nent = 156
Mean = 15.96
RMS = 16.08

PMCS S. Eno, E. Nagy	
Charged Particles	??? G. Graham
EM Particles	D. Cho, F. Canelli
Muon Particles	C. Royon
Jets	L. Duflot
Tau Particles	B. Smith
Missing ET	Z. Wang
Vertex	A. Schwartzman
GTrack	??? M. Roco
Toy Cal	S. Jain, S. Banerjee

Fast Monte Carlo (PMCS)

Coordinators: S. Eno, E. Nagy
G. Graham

- PMCS executable pmcs_x
- Object id packages: chpart, em, missing ET, jets. muon & tau not in yet
- conversion pmcsOutputChunk→D0PhysObjChunk's
- Vertex package
- GTrack package
- Cal package
- fast trigger simulation???

The executable available in production release p07.00.00.

Running pmcs_x:

```
% setup n32
% setup D0RunII p07.00.07
% d0setwa
% ln -s /d0dist/dist/releases/p07.00.00 p07
% cp p07/pmcs/rcp/frame_pmcs.rcp .
% ln -s Zbb_isa.dat test.dat
% pmcs_x -rcp frame_pmcs.rcp
```

This creates a ntuple file root_global.ntpl.

To write a d0om output file edit frame_pmcs.rcp to include io2 at the end of list of packages.

There is nice documentation on the pmcs Web page:

http://www-d0.fnal.gov/~sceno/pmcs_doc/pmcs.html