Global Monitoring

Pushpa Bhat
Fermilab

Shifter Tutorial Feb. 3, 2003

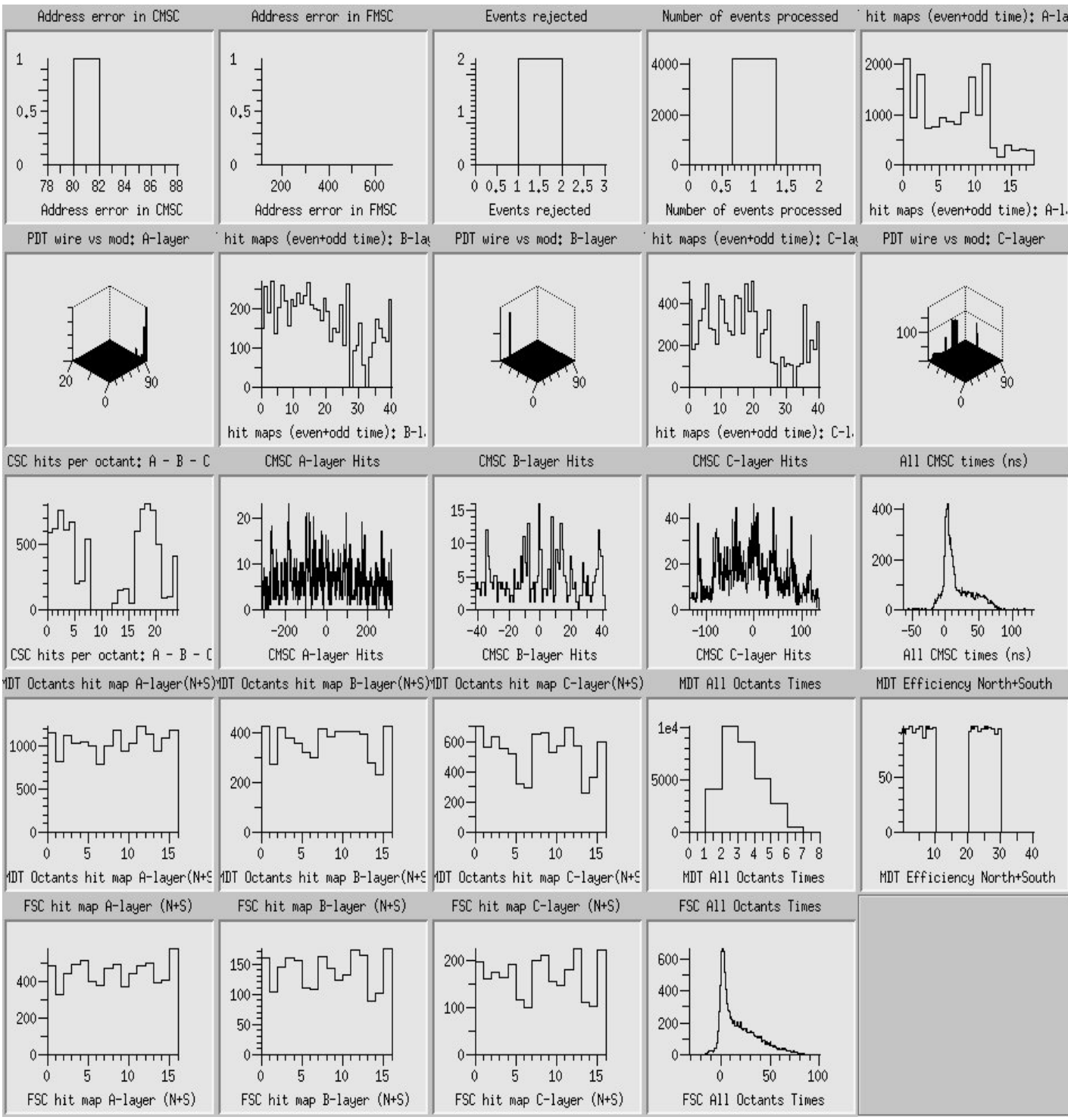
Global Monitoring

- **Goals:**
  - Monitor detector, trigger and physics information in real time, in a random sampling of data, to look for any detector/trigger problems
  - Monitor trigger rates
  - Spot problems if any and investigate causes
  - Provide baseline data quality evaluation
- Global Examines
  - Physics, Trigger
- Trigger Rates
  - LmTrigger
- There are other examines run by detector shifters:
  - Detector Examines: CAL, SMT, MUO, CFT, CPS, FPS
  - Trigger Examines: L1CAL, L1CTT
- http://www-d0.fnal.gov/~pushpa/GM/

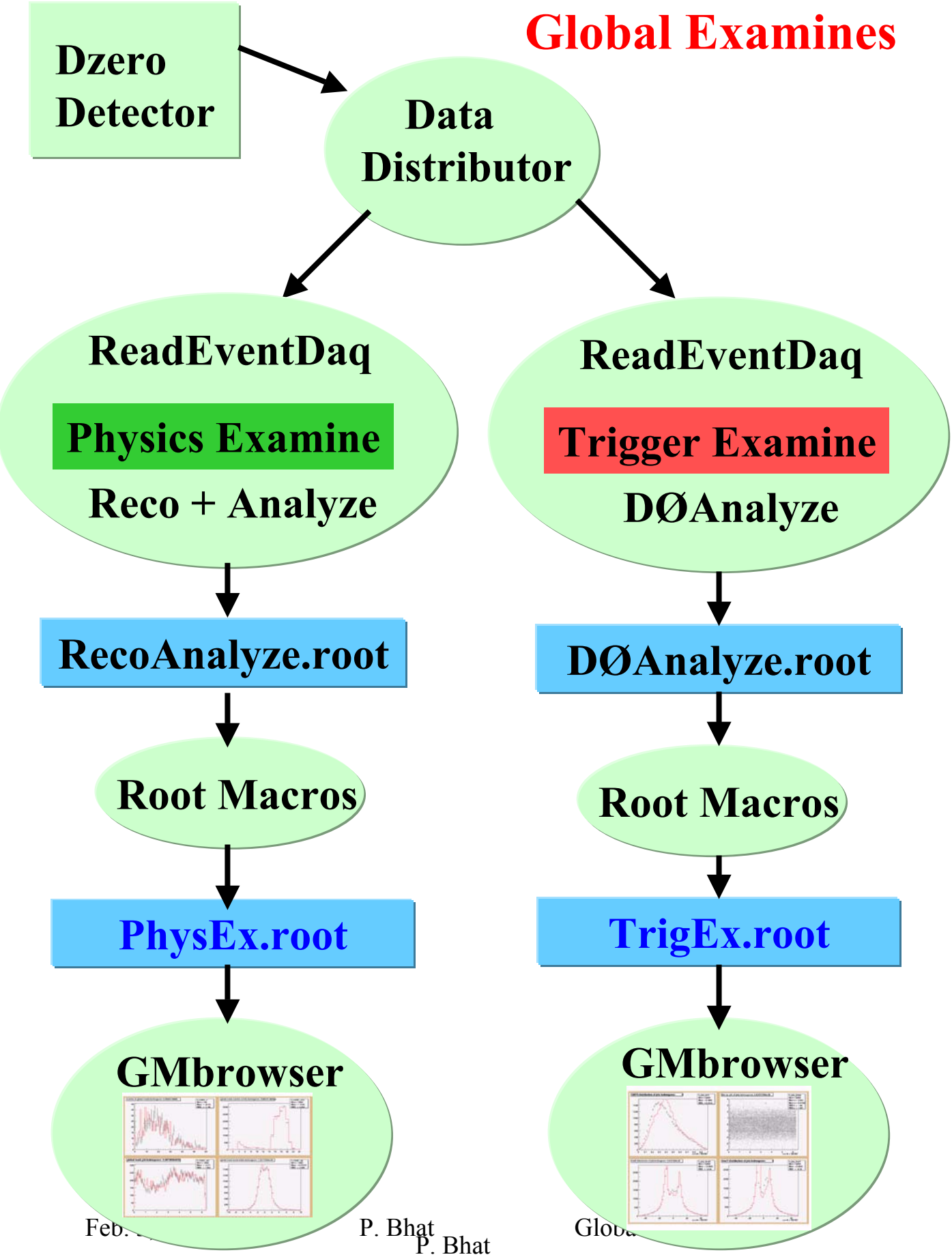
Detector Examines (not part of GM)

- Basic raw data information
- Muon
  - Hit maps, Times, Address errors
- Calorimeter
  - EM, Hadronic energies, ET distributions, occupancies
    - Vs Eta,phi
- SMT
  - Barrel, fdisk, hdisk cluster charges
- CFT
  - Maps of fired fibres, occupancies in layers, hit multiplicities in layers & sectors

MuoExamine


Address error in CMSC
Address error in FMSC
Events rejected
Number of events processed
hit maps (even+odd time): A-la
PDT wire vs mod: A-layer
hit maps (even+odd time): B-la
PDT wire vs mod: B-layer
hit maps (even+odd time): C-la
PDT wire vs mod: C-layer
CSC hits per octant: A - B - C
CMSC A-layer Hits
CMSC B-layer Hits
CMSC C-layer Hits
All CMSC times (ns)
MDT Octants hit map A-layer(N+S)
MDT Octants hit map B-layer(N+S)
MDT Octants hit map C-layer(N+S)
MDT All Octants Times
MDT Efficiency North+South
FSC hit map A-layer (N+S)
FSC hit map B-layer (N+S)
FSC hit map C-layer (N+S)
FSC All Octants Times

Global Examines



Global Monitoring Tools

- Physics Examine
  - Reco+RecoAnalyze+macros
    - M. Sanders, (PB)
- Trigger Examine
  - D0Analyze +macros
    - E. Cheu, J. Steele, M. Sanders
- GMGui
  - Python GUI that integrates all GM tasks
    - J. Webb, PB
- GMbrowser
  - Customized root browser
    - H. Prosper, PB
- LmTrigger Gui
  - Trigger rates
    - Han Do, (J. Park)

GM Tools (contd.)

- Web Monitoring of PhysEx and TrigEx histograms
  - DØ at work → RunIIa operations & Commissioning → DØ Live: Physics Examine and Trigger Examine
  - http://www-d0.fnal.gov/~pushpa/GM/
  - Used for remote shifts
    - J. Webb, PB
- Run Info, Certification & Checklists
    - J. Webb, PB
- GM Messenger/Communicator
  - GM Chat tool + web message board + archival
    - J. Webb, PB

GM Home Page

http://www-d0.fnal.gov/~pushpa/GM/ - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites History

Address http://www-d0.fnal.gov/~pushpa/GM/ Go Links

GLOBAL MONITORING

Go back to Online Monitoring & Examines Page

Contact: Pushpa Bhat (pushpa@fnal.gov, x8302)

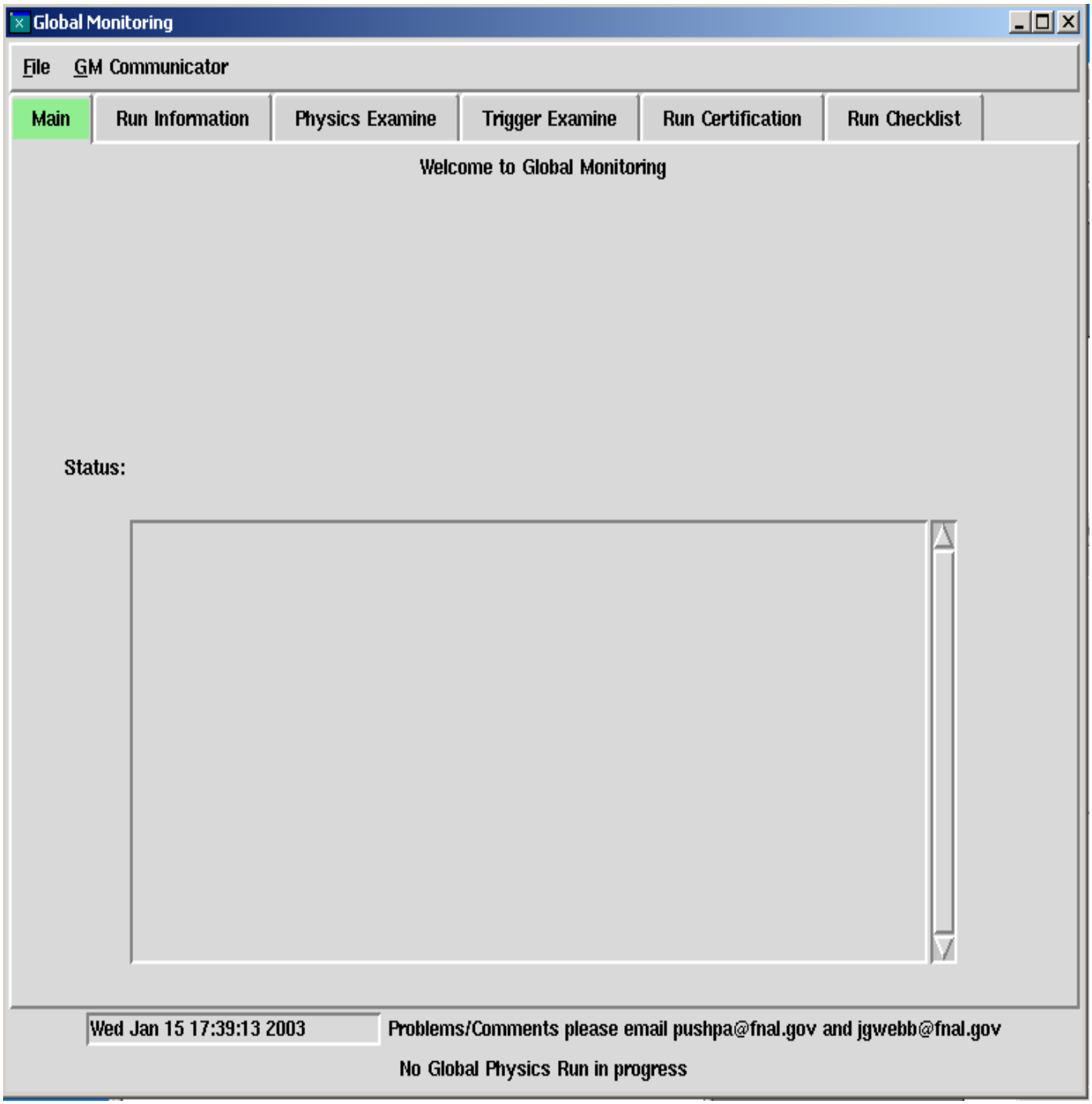
- GM Shift Schedule
- Captain Shift Schedule
- D0 Full Shift Schedule
- Beams Status
- GM Shift Instructions
- GM Remote Shift Instructions
- GM Web Message Board
- GM Log Book Entry Web Form
- Log book Links from DAQ page
- D0 Run II Operations Page
- Live Monitoring Plots: Physics Examine Trigger Examine Trigger Rates Ratio

  Java-based Live Plots (reliable for updating) Physics Examine Trigger Examine
- Description of Plots: Physics Examine Trigger Examine
- Captain Instructions for remote GM shifts

Internet

Start \\D... \\D... DA... Exc... C:\... xterm Micr... htt... 10:38 AM

GMgui


Global Monitoring
File
GM Communicator
Main
Run Information
Physics Examine
Trigger Examine
Run Certification
Run Checklist
Welcome to Global Monitoring
Status:
Wed Jan 15 17:39:13 2003
Problems/Comments please email pushpa@fnal.gov and jgwebb@fnal.gov
No Global Physics Run in progress

GMGui - RunInfo

Global Monitoring

File GM Communicator

Main | Run Information | Physics Examine | Trigger Examine | Run Certification | Run Checklist

Runs currently in progress: Save Selection Refresh

170496 test | 170493 test

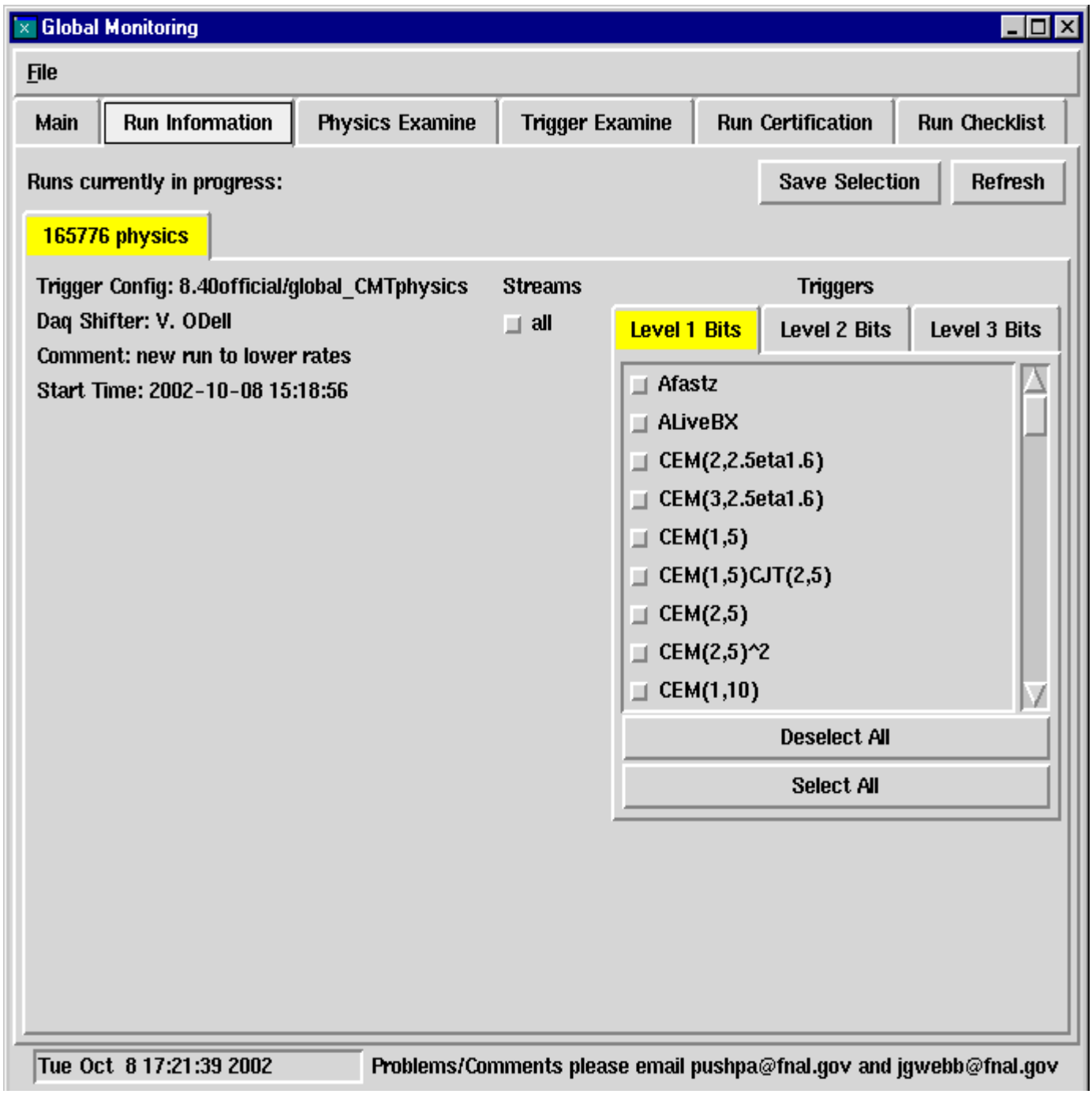
Trigger Config: 1.00official/zero_bias_3L1L2L3_1outtest
Daq Shifter: Tulika Bose
Comment: remove x50, x52
Start Time: 2003-01-15 16:56:23
Prescale: Unknown

Streams
zero_bias

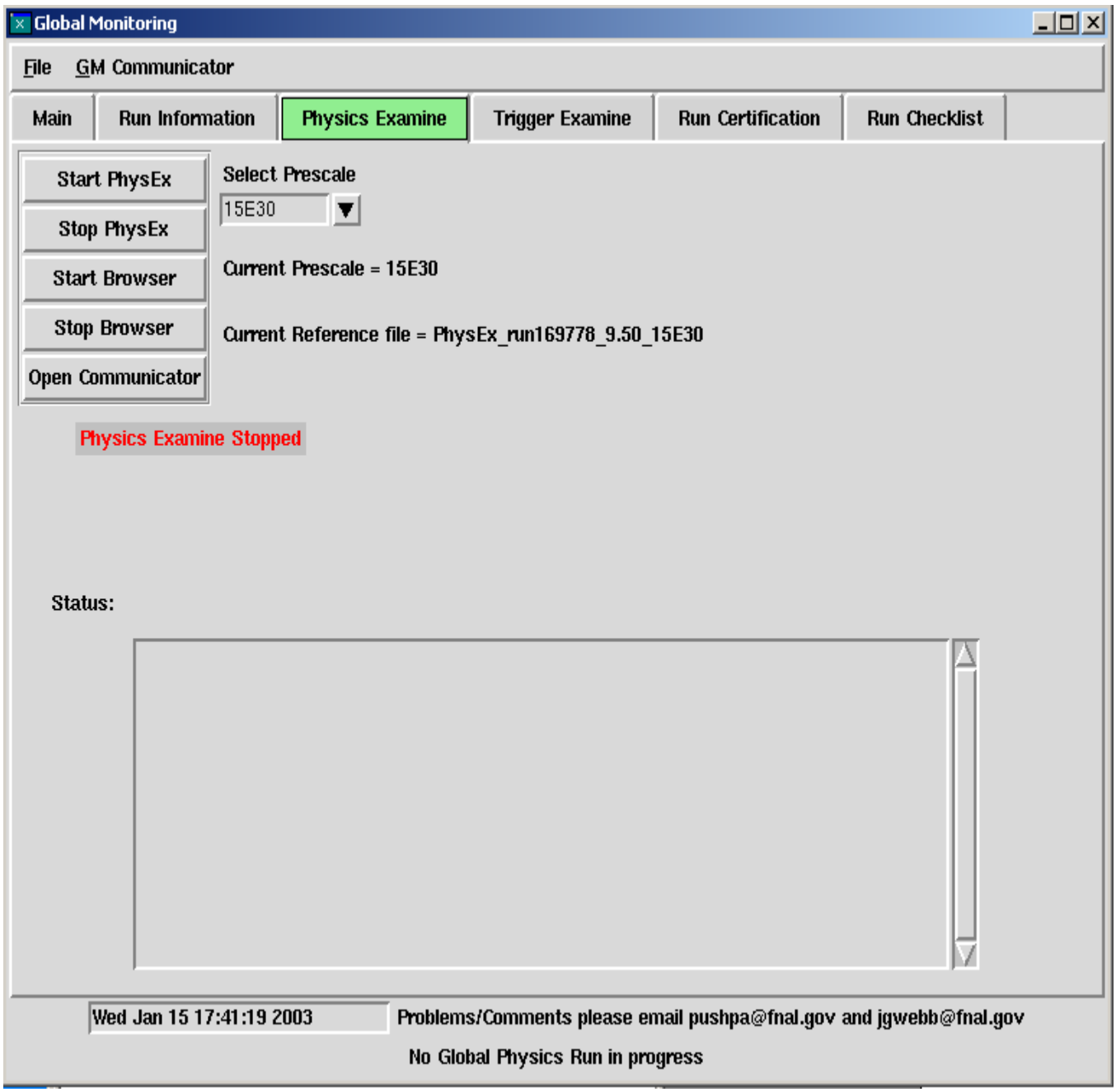
Triggers
Level 1 Bits | Level 2 Bits | Level 3 Bits
ALiveBX
ALiveBX^2
ALiveBX^3
Deselect All
Select All

Wed Jan 15 17:40:33 2003
Problems/Comments please email pushpa@fnal.gov and jgwebb@fnal.gov
No Global Physics Run in progress

Gmgui - Run Info



GMgui – Physics Examine



GMgui – Physics Examine (Upgrade)

Global Monitoring

File GM Communicator

Main | Run Information | Physics Examine | Trigger Examine | Run Certificatio | Run Checklist

Start PhysEx
Stop PhysEx
Start Browser
Stop Browser
Open Communicator

Select Prescale
15E30

Current Prescale = 15E30

Current Reference file = PhysEx_run169778_9.50_15E30

Physics Examine Stopped

Select Processes
PhysExAll
PhysExElec
PhysExMuon
PhysExJets

Status:

Wed Jan 15 17:41:19 2003

Problems/Comments please email pushpa@fnal.gov and jgwebb@fnal.gov

No Global Physics Run in progress

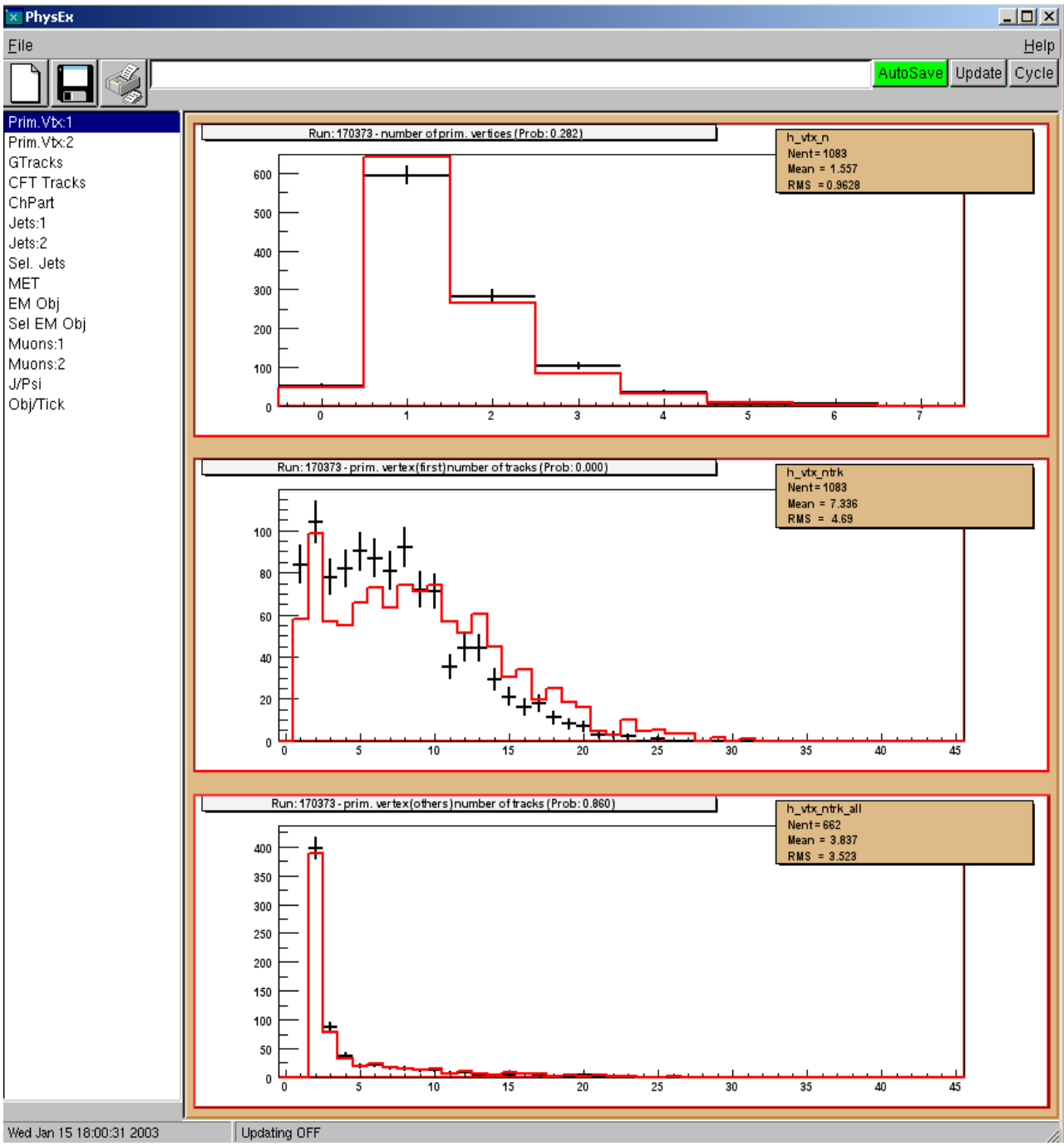
Physics Examine Plots

- Primary Vertex Info
- Gtracks
- CFT tracks
- Jets
- Selected jets
- Electrons
- Muons
- J/Psi
- More to come:
  - W, Z

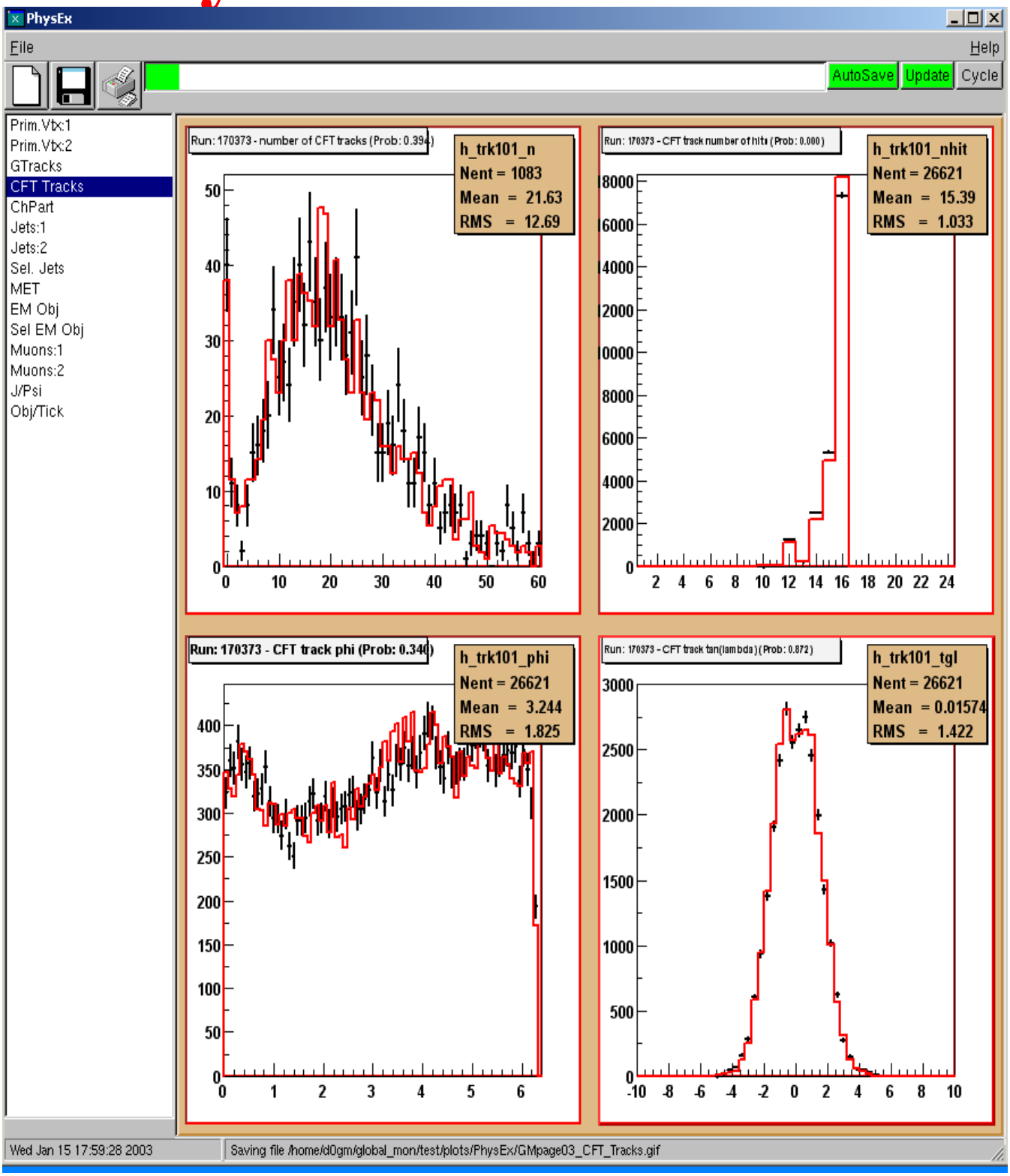
Trigger Examine Plots

- L1 Muon triggers
- L2 Global jets
- L2 CAL jets
- L2 electrons
- L2 muons
- L3 tracks
- L3 jets
- L3 electrons
- L3 taus
- L3 EM_HI_xx
- …

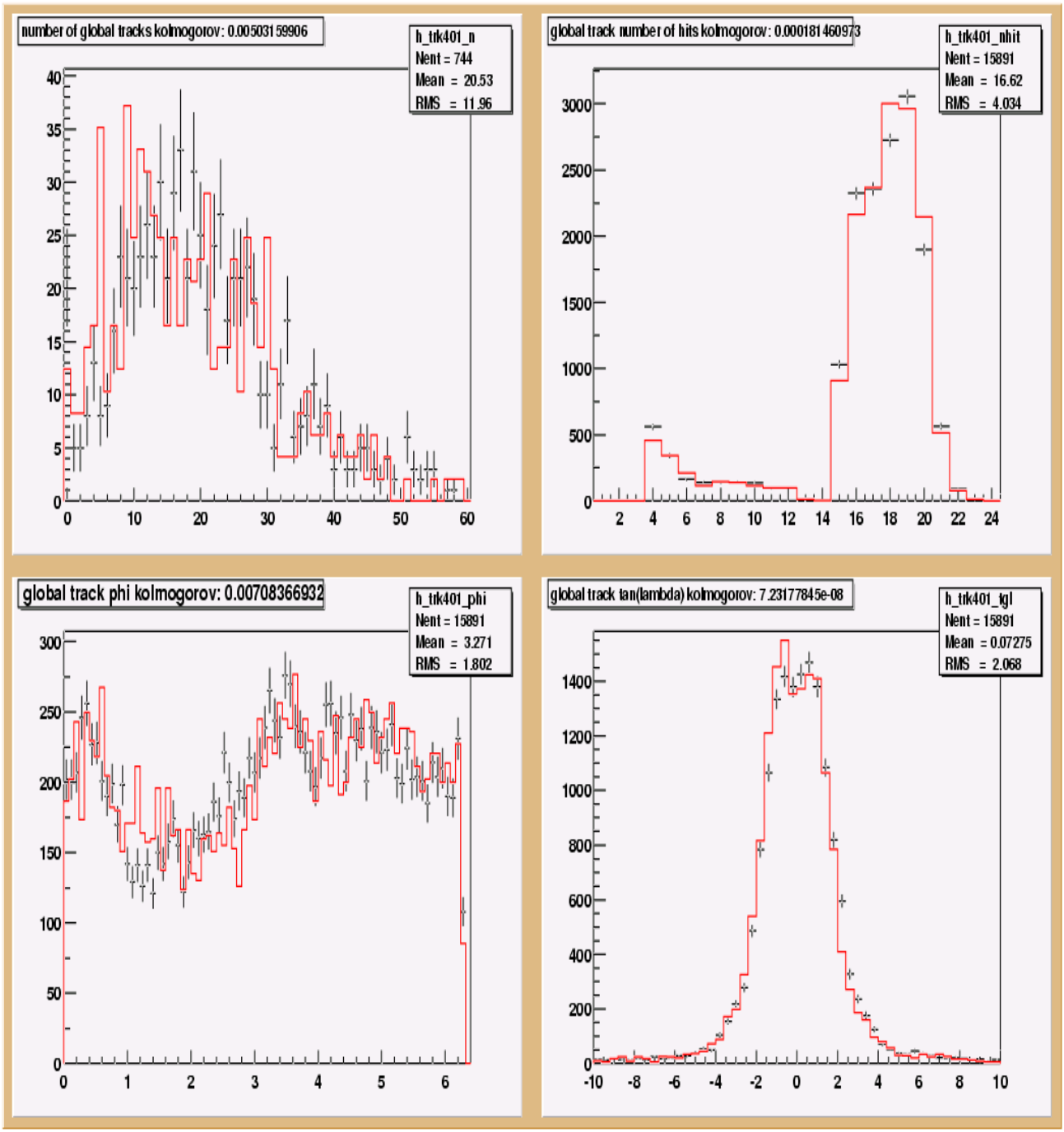
GMBrowser


PhysEx
File
Help
AutoSave
Update
Cycle
Prim.Vtx:1
Prim.Vtx:2
GTracks
CFT Tracks
ChPart
Jets:1
Jets:2
Sel. Jets
MET
EM Obj
Sel EM Obj
Muons:1
Muons:2
J/Psi
Obj/Tick
Run: 170373 - number of prim. vertices (Prob: 0.282)
h_vtx_n
Nent = 1083
Mean = 1.557
RMS = 0.9628
Run: 170373 - prim. vertex(first) number of tracks (Prob: 0.000)
h_vtx_ntrk
Nent = 1083
Mean = 7.336
RMS = 4.69
Run: 170373 - prim. vertex(others) number of tracks (Prob: 0.860)
h_vtx_ntrk_all
Nent = 662
Mean = 3.837
RMS = 3.523
Wed Jan 15 18:00:31 2003
Updating OFF

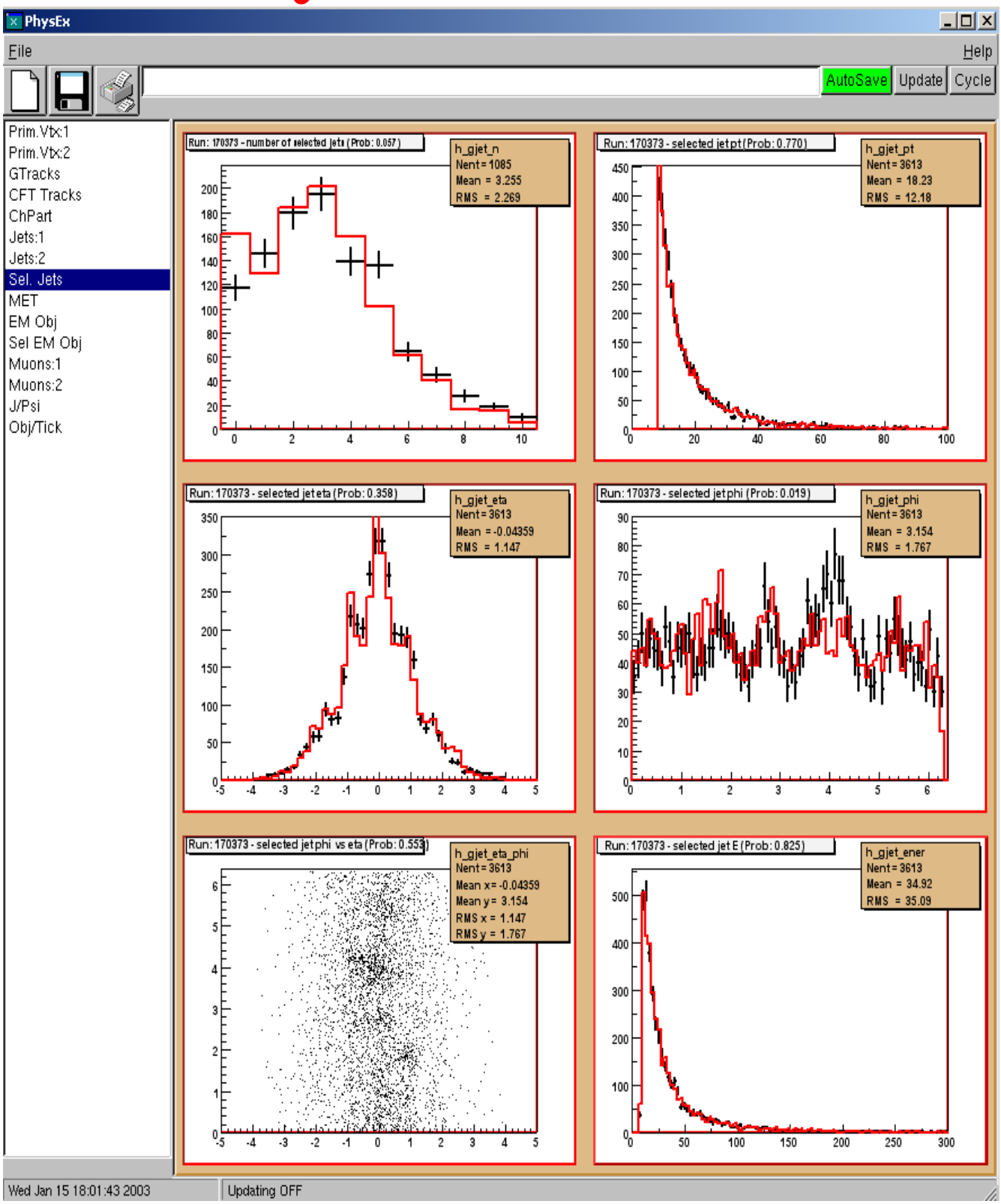
PhysEx: CFT Tracks



PhysEx
Global Tracks



PhysEx: Sel. Jets



Click on a title to show page Turn Cycling on

Prim.Vtx:1

Prim.Vtx:2

GTracks

CFT_Trcks

ChPart

Jets:1

Jets:2

Sel._Jets

MET

EM_Obj

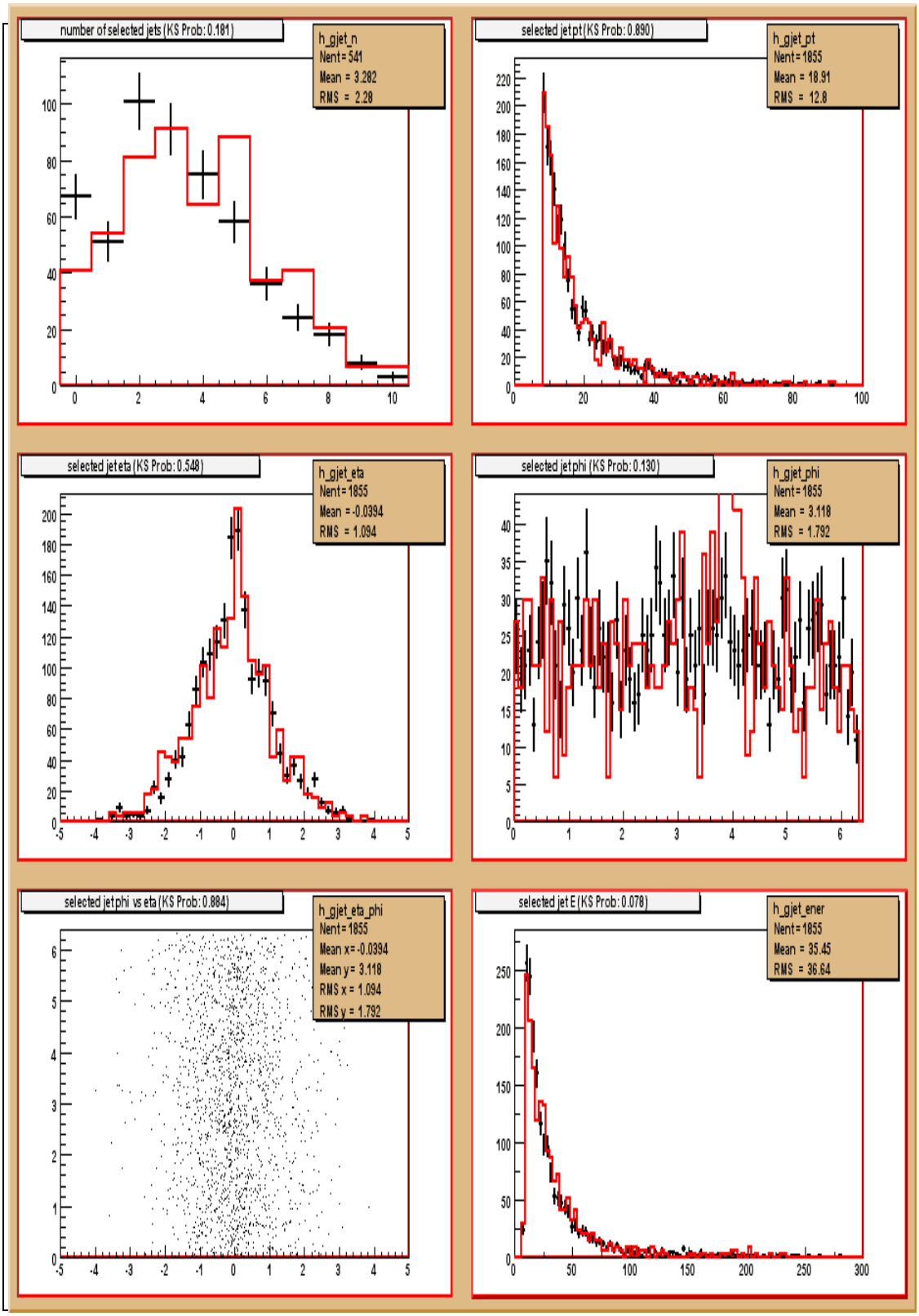
Sel_EM_Obj

Muons:1

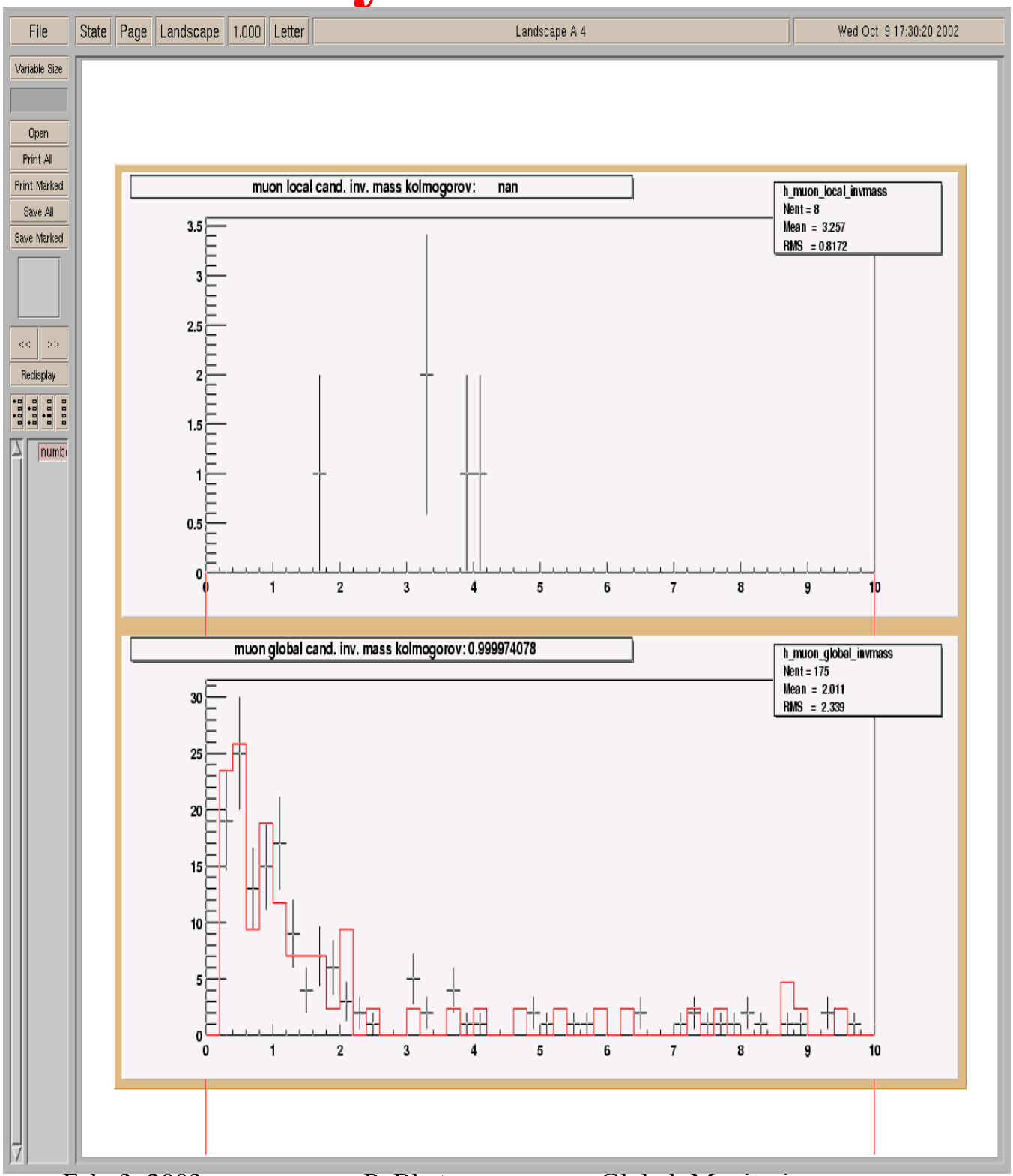
Muons:2

J_Psi

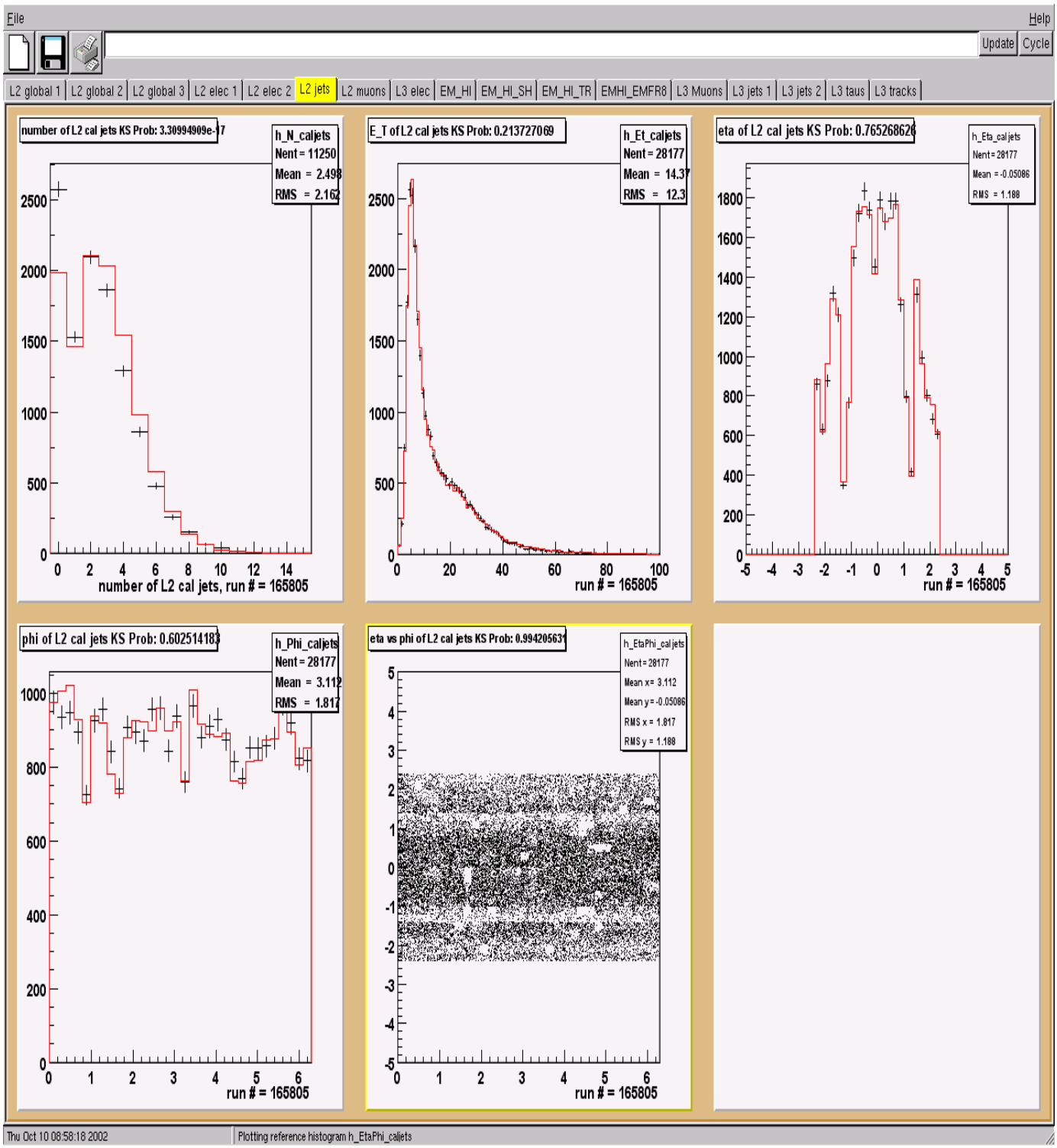
Obj_Tick



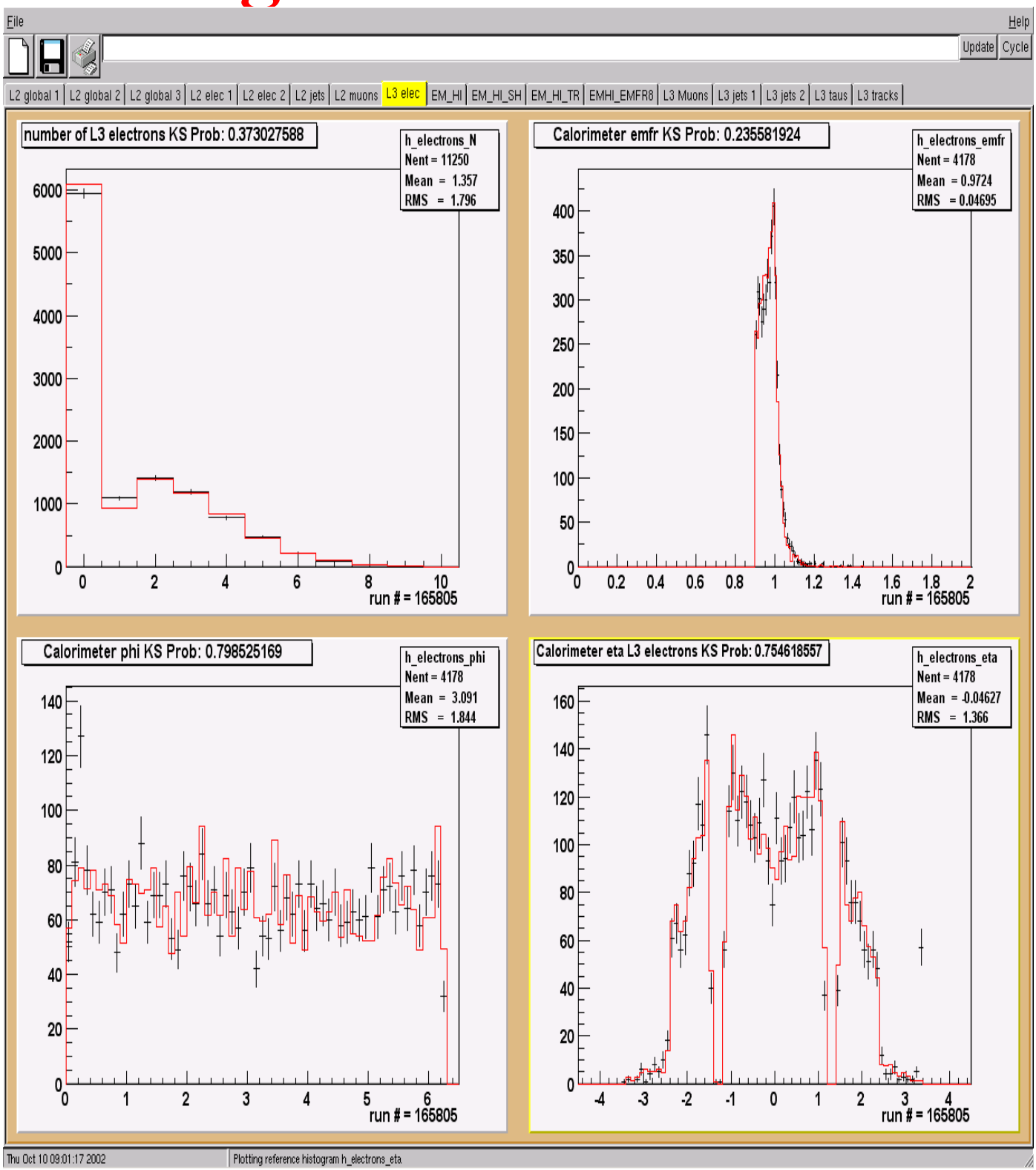
PhysEx: J/Psi


File
State
Page
Landscape
1.000
Letter
Landscape A 4
Wed Oct 9 17:30:20 2002
Variable Size
Open
Print All
Print Marked
Save All
Save Marked
Redisplay
muon local cand. inv. mass kolmogorov: nan
h_muon_local_invmass
Nent = 8
Mean = 3.257
RMS = 0.8172
muon global cand. inv. mass kolmogorov: 0.999974078
h_muon_global_invmass
Nent = 175
Mean = 2.011
RMS = 2.339

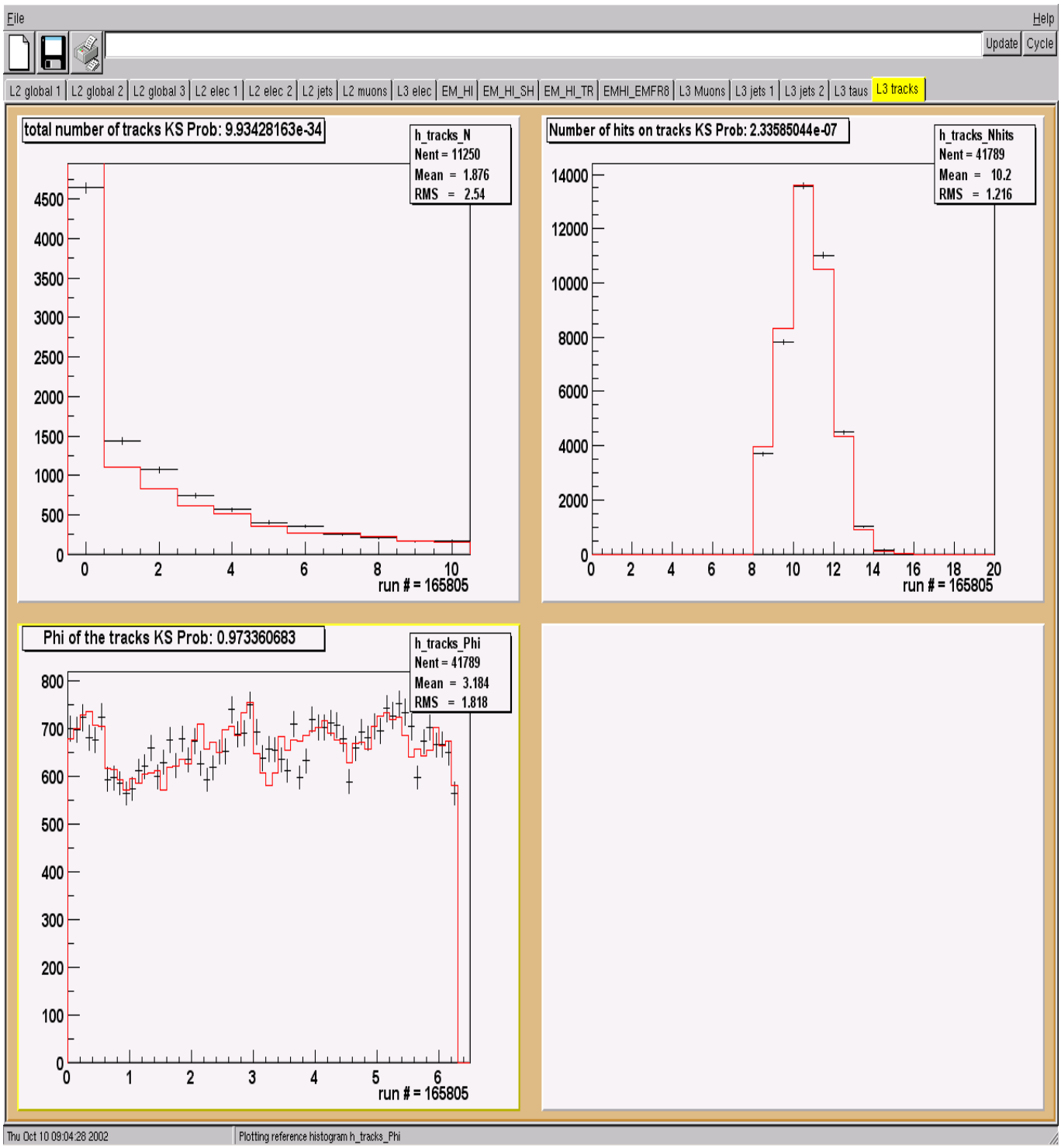
TrigEx: L2 CALJets



TrigEx: L3 Electrons



TrigEx: L3 tracks



Description of Plots

Physics Examine Plots Descriptions - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites History

Address http://www-d0online.fnal.gov/groups/gm/PhysExPlotsDescription.html Go Links

Favorites

Add... Organiz

- Links
- Media
- Fermilab at Work
- GM web page
- MSN.com
- Radio Station Guide

Physics Examine Plots in GMBrowser

Pushpa Bhat

Nov. 2002

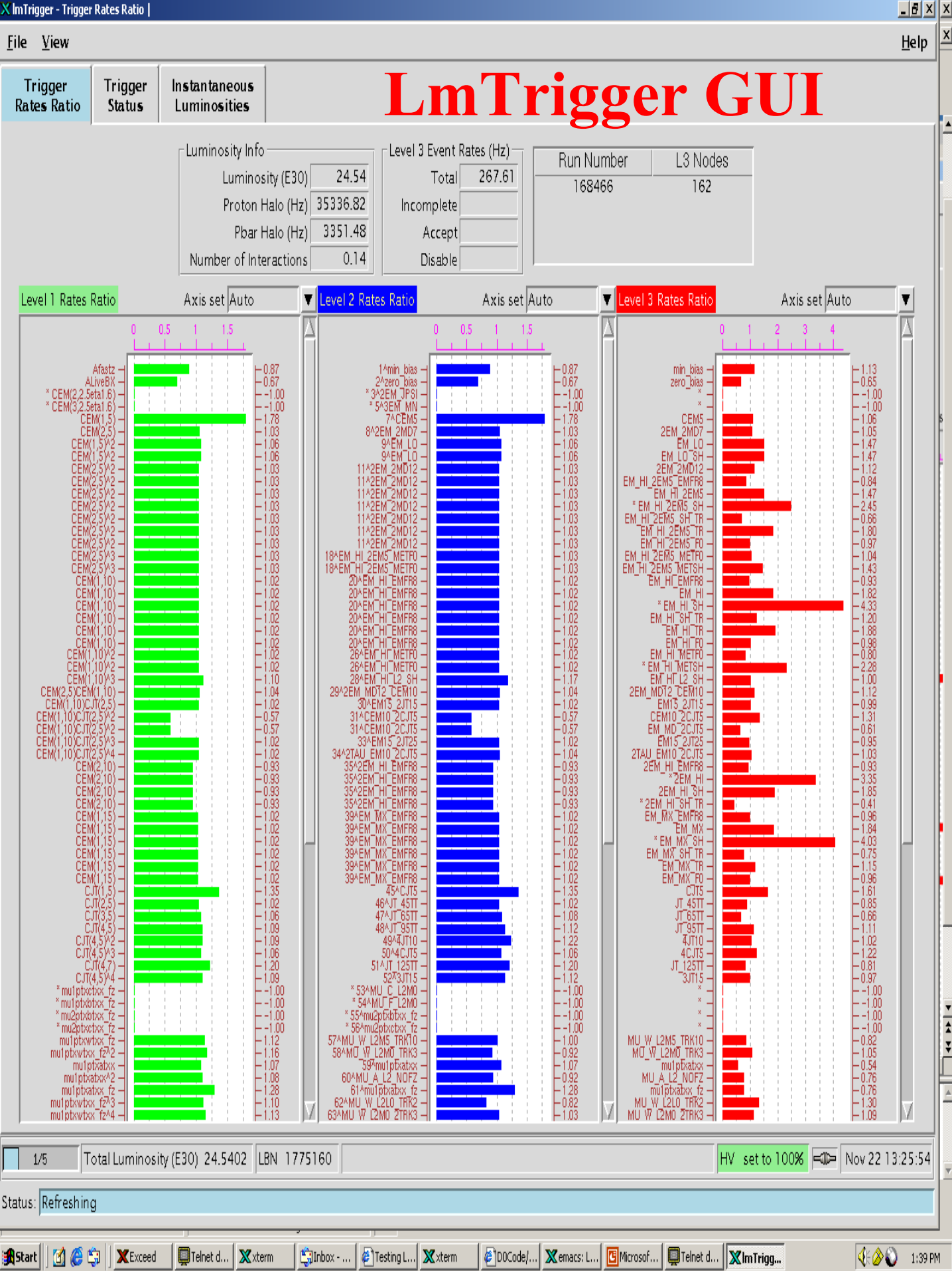
Prim. Vtx:1 Prim. Vtx:2 GTracks CFT Tracks
ChPart Jets:1 Jets:2 Sel. Jets
MET EM Obj Sel. EM Obj Muons:1
Muons:2 J/Psi Obj/Tick

```
Prim. Vtx:1
-----------

* Number of primary vertices in the events (from PVSEL)
* Number of tracks associated with the first/best primary vertex in each event
* Number of tracks associated with other primary vertices found in the event

Prim. Vtx:2
-----------

* Primary Vertex x, y and z positions and y vs x, x vs z, y vs z

GTracks
-------

* Distributions of number of ID=401 Tracks (SMT+CFT tracks fitted outside to
```

Internet

Start 11:54 AM

LmTrigger GUI



Run Certification

Global Monitoring

File

Main | Run Information | Physics Examine | Trigger Examine | Run Certification | Run Checklist

Submit | Reset Form | Runs to be Certified

Run Number: | GM Shifter:

Comments:

SMT: Unknown

CFT: Unknown

CAL: Unknown

MUO: Unknown

Level 1: Unknown

Level 2: Unknown

Level 3: Unknown

Trigger Examine: Unknown

Physics Examine: Unknown

Tue Oct 8 17:23:36 2002 | Problems/Comments please email pushpa@fnal.gov and jgwebb@fnal.gov

GM Shifter Tasks

- Run Physics & Trigger Examines
- Run LmTrigger (trigger rates GUI)
- Run Browsers (will automatically start)
- Monitor Plots
- If there are problems try to find the cause; communicate with detector shifters, detector experts, shift captain.
- Make entries in the log book and include relevant images
- Complete Run Checklist and Run Certification for each run.
- Print out and look at run summary
- If there are operational problems, contact GM expert on-call.
- Complete shift summary in the log book
  - Sent out to the d0_examines email list

GM Experts On-call

- We are adding GM experts on-call to help with operational problems:
  - Pushpa Bhat
  - Michiel Sanders
  - Joe Steele
  - Elliott Cheu
  - Jason Webb (Gmgui, GM Messenger)

- Expert Duties:
  - Respond to page and help with shift operational problems, NOT help resolve detector/trigger problems seen. The latter is to be taken care of by the GM shifter and detector/trigger experts.
  - Read log book and shift summaries
  - Report at the D0 Operations meeting

GM Remote Shifts

- So far, NIKHEF, Saclay, University of Munich, Aachen, Tata Institute have participated.
  - Mainly owl shifts from abroad
    - Day or afternoon shifts for them
- Would like to extend it to other places in Europe

GM Remote Shifts

- How do they work?
  - Remote shifter logs onto one of the fnal machines and then does ssh to d0ol33 (d0gm account)
  - Sends a message through the GM web messenger tool to the shift Captain; messages appear on
    - http://www-d0.fnal.gov/~pushpa/GM/
- Remote shifter uns the Gmgui locally; Starts all the global examine processes from the GUI which pop up windows on the control room GM console
  - Needs “xhost +d0ol33”

GM Remote Shifts (contd.)

- Remote shifter monitors plots of PhysEx and TrigEx on the web
  - Linked on the GM web page and RunII operations page
- Communicates problems to the shift captain using gm web messenger.
- Makes text entries in the log book using web entry form
- Image entries via web will be possible soon.

GM Messenger

GM Web Communicator: Signed in as pushpa

Welcome to the GM Web Communicator

Previous Messages

Users currently online

pushpa
user1
user2

pushpa(Feb 3 11:31:06): Testing if the new version of the GM meesenger wor
ks.
user1(Feb 3 11:31:48): Also, test if multiple users can all recieve messag
es.
user2(Feb 3 11:32:24): It remains to be tested as to how many users can ha
ve the tool open at one time.
pushpa(Feb 3 11:33:06): Looks fine for all users' chat boxes. What about
the web message board?
pushpa(Feb 3 11:33:50): The message board looks fine too.

Enter your message:

Type your message here and hit send.

Send

Exit

GM Web Message Board (1)

http://www-d0online.fnal.gov/groups/gm/comm.html - Microsoft Internet

File Edit View Favorites Tools Help

Back Search Favorites History

Address http://www-d0online.fnal.gov/groups/gm/comm.html Go Links

Favorites

Add... Organiz

- Links
- Media
- Fermilab at Work
- GM web page
- MSN.com
- Radio Station Guide

GM Remote Communication Interface
User(US Central Time): Message

Logfiles

pushpa(Feb 3 11:31:06): Testing if the new version of the GM meesenger works.
user1(Feb 3 11:31:48): Also, test if multiple users can all recieve messages.
user2(Feb 3 11:32:24): It remains to be tested as to how many users can have the tool open at one time.
pushpa(Feb 3 11:33:06): Looks fine for all users' chat boxes. What about the web message board?
pushpa(Feb 3 11:33:50): The message board looks fine too.

Done Internet

Start 11:39 AM

GM Web Message Board (2)

http://www-d0online.fnal.gov/groups/gm/commlogs/Jan_9.html - Microso

File Edit View Favorites Tools Help

Back Search Favorites History

Address http://www-d0online.fnal.gov/groups/gm/commlogs/Jan_9.html Go Links

GM Remote Communication Log for Jan_9
User(US Central Time): Message

Stefan(Jan 9 00:01:08): Pushpa: physics run underway. No problems starting examines and browsers from gmui.
Thomas(Jan 9 00:01:33): Thomas Nunnemann on remote shift from Munich...
Stefan(Jan 9 00:03:09): Hi Thomas. Everything should be ready for you. Halos are a bit high but examines look ok so far. See my end of shift summary in elog for discription of earlier troubles. Have a good shift!
Thomas(Jan 9 00:06:27): Thanks Stefan and have a good night...
Mike Tuts(Jan 9 00:52:42): Hi Thomas, I'm captain - just checking to see if/how this works
Mike Tuts(Jan 9 00:52:50): Hi Thomas, I'm captain - just checking to see if/how this works
Thomas(Jan 9 00:57:41): Hi Mike - things are up and running here in Munich. I am checking the webboard regularly, but if you need my immediate attention try e-mail (nunne@fnal.gov) or phone (01149-89-28914156 and 01149-179-3254556)
Mike Tuts(Jan 9 01:04:44): ok - thanks one question for my education -- doi you have the same setup at Munich (4 screens) or something different?
Thomas(Jan 9 01:08:35): No. It's just my office desktop here. Some applications are running via remote X (which is very slow...) some are web based.
Thomas(Jan 9 01:32:29): Mike, I see some bad histograms in the physics examine. Could ypu please relate the following problems to the tracking and calorimeter shifters Significant deviation from reference histograms: - Pr. Vertex y shifted by ~+0.025cm - Hits per global track -2 - CFT track number of hits: ratio 16/15 lower - charged particle DCA much broader - too many jets, hot region around phi=4 - MET: missing E_y shifted by -5GeV - L3 elec; excess seen for phi ~2.5. No excess in L2 (e.g. no hot cell)
Mike Tuts(Jan 9 02:31:10): will do -- sorry to be so deyaed in responding. Window is open on the GM console and I didn't pay close enough attention

Done Internet

Start \\D... \\D... DA... Exc... C:\... xterm Micr... htt... 10:42 AM

GM Web Message Board (3)

http://www-d0online.fnal.gov/groups/gm/commlogs/Jan_12.html - Micros

File Edit View Favorites Tools Help

Back Search Favorites History

Address http://www-d0online.fnal.gov/groups/gm/commlogs/Jan_12.html Go Links

GM Remote Communication Log for Jan_12
User(US Central Time): Message

thooris(Jan 12 00:03:42): shift captain can you read me ?
thooris(Jan 12 00:09:15): bonjour Ursula, es-tu le shift captain ? tout semble ok pour moi...
thooris(Jan 12 00:12:04): rectificatif : pas mal de problemes sur les histos de physics examine
bassler(Jan 12 00:19:24): bonjour Bruno, nous y voila! A priori tout tourne ici et il n'y as pas de problem mentione par les sous-detecteur.
thooris(Jan 12 00:28:55): ok, bon finalement , ils ne sont pas si moches que ca ces histos ... on dit que c'est bon
Pushpa(Jan 12 01:35:16): OK, I have no idea what you guys are saying. I shall assume everything is going just great!
thooris(Jan 12 01:43:03): all is ok for me;
Pushpa(Jan 12 01:45:18): Bruno, you can now run LmTrigger. It should pop up the display on your window. I also have a link on the GM web page.
Pushpa(Jan 12 01:48:03): I'm going to sleep. Bye! This is the last owl shift before shutdown. Have a good one!
thooris(Jan 12 01:48:41): hi, I already have a display of LmTrigger on my screen ! all the tools are running very well ! for the time being :-)
thooris(Jan 12 01:49:48): have a good night pushpa! the sun is rising on Paris !
bassler(Jan 12 02:44:49): on va arreter le run et commencer un nouveau
thooris(Jan 12 02:46:14): ok, je vais arreter les examines des la fin du run
thooris(Jan 12 02:56:29): starting run 170373 : T & P examines started you should see the new browsers in control room all seems ok for me
bassler(Jan 12 03:36:47): oui, tout va bien
bassler(Jan 12 06:34:19): on va arrete et recommener le run

Done Internet

Start \\D... \\D... DA... Exc... C:\... xterm Micr... htt... 10:40 AM

How can we improve?

- Enhancements to the GUI
  - Run start/end alerts
    - Already in place in GMgui
- Run multiple instances of PhysEx, some on specific triggers
- Better training of shifters
- More automation
- Experienced shifters

How can we improve Data Quality Monitoring?

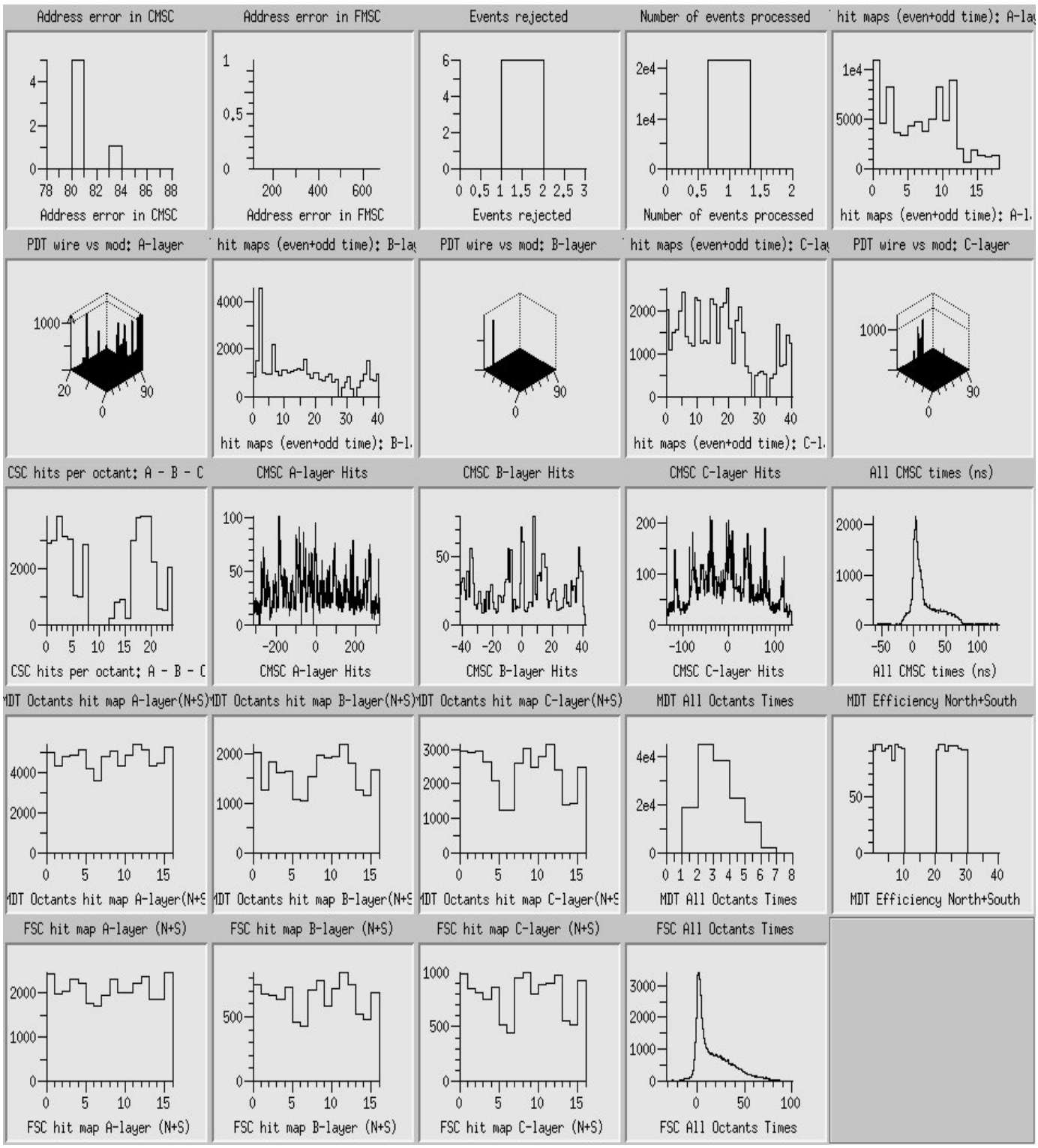
- Make the monitoring info available to experts in real time:
  - Root files or plots on the web?
  - Plots already available in real time
- Use a pool of detector/ID experts to provide supplemental monitoring
  - They can be anywhere in the world
- More detailed monitoring with some latency
  - Possibly run examines/reco on a slightly larger sample; run a suite of macros to diagnose specific problems
- Online-Offline Feed-back Loop:
  - What problems have been uncovered in data in offline analyses? How can the knowledge be incorporated into online monitoring?

Future Plans

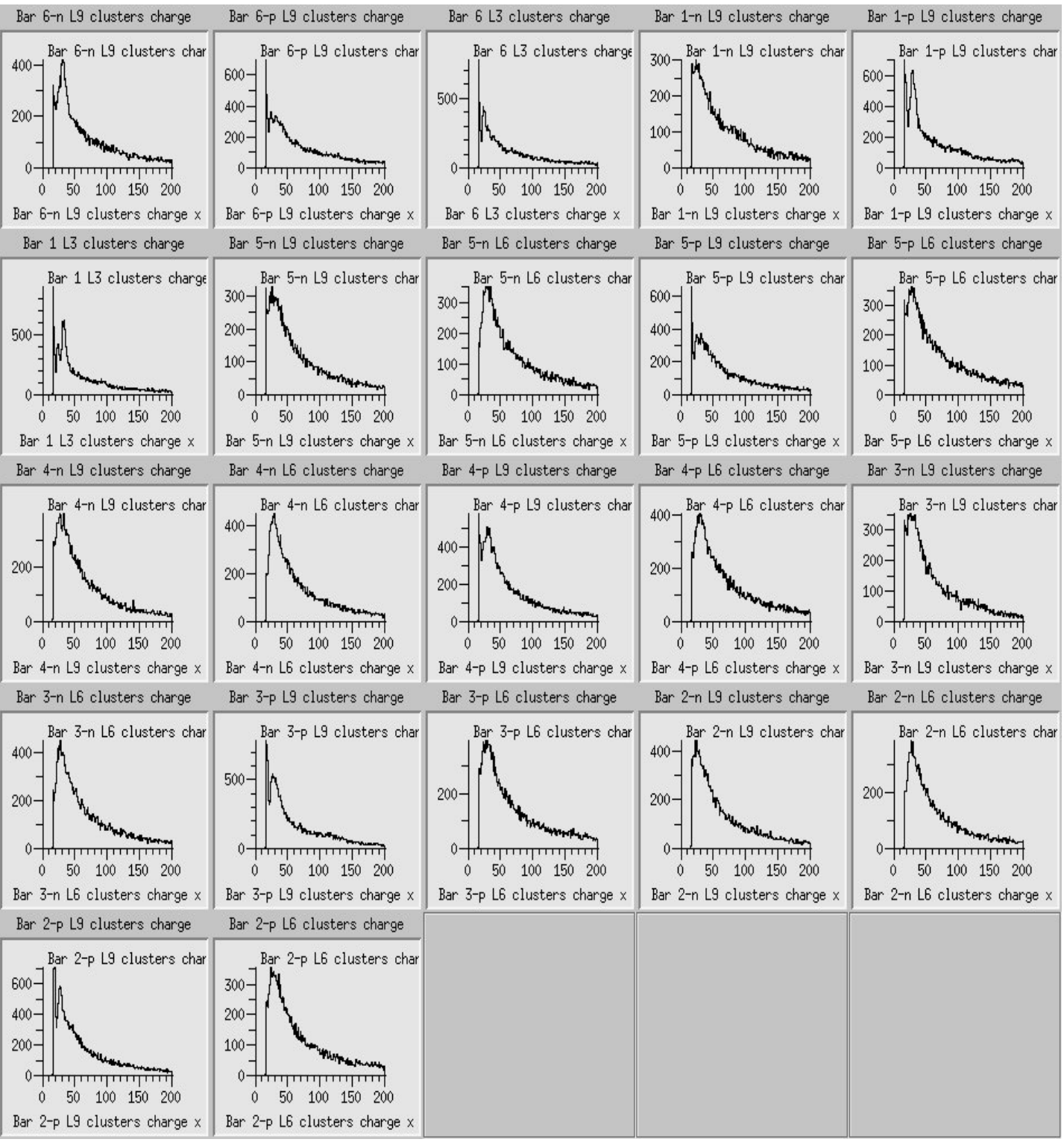
- Detector/trigger/ID/physics groups to designate someone
  - To think about what problems might arise and how they might manifest in the data and how we may find them.
  - To look at what exists and send me info as to what else is useful to monitor (and send necessary code wherever possible)
- Developing a knowledge-based GMExpert system
  - An expert writes down what they know and make that knowledge available electronically; updates as needed
  - A database of problems, explanations, actions to be taken, or just a well organized web page, for now!
  - Alarms

Summary

- Global Monitoring has proven to be useful in the control room
  - Cal hot cells, muon hot cells, CFT problems, trigger problems etc. are uncovered but we can do better
- Basic tools exist
- We need more shifters, particularly physicists experienced in data analysis
- Expert help in developing a knowledge-based Expert System is needed.
  - inputs and participation from Detector, ID and Physics groups
- Feedback loop from Offline Data Quality group to improve online monitoring


Address error in CMSC
Address error in FMSC
Events rejected
Number of events processed
hit maps (even+odd time): A-lay
PDT wire vs mod: A-layer
hit maps (even+odd time): B-lay
PDT wire vs mod: B-layer
hit maps (even+odd time): C-lay
PDT wire vs mod: C-layer
CSC hits per octant: A - B - C
CMSC A-layer Hits
CMSC B-layer Hits
CMSC C-layer Hits
All CMSC times (ns)
MDT Octants hit map A-layer(N+S)
MDT Octants hit map B-layer(N+S)
MDT Octants hit map C-layer(N+S)
MDT All Octants Times
MDT Efficiency North+South
FSC hit map A-layer (N+S)
FSC hit map B-layer (N+S)
FSC hit map C-layer (N+S)
FSC All Octants Times

SMT Examine


Bar 6-n L9 clusters charge
Bar 6-p L9 clusters charge
Bar 6 L3 clusters charge
Bar 1-n L9 clusters charge
Bar 1-p L9 clusters charge
Bar 1 L3 clusters charge
Bar 5-n L9 clusters charge
Bar 5-n L6 clusters charge
Bar 5-p L9 clusters charge
Bar 5-p L6 clusters charge
Bar 4-n L9 clusters charge
Bar 4-n L6 clusters charge
Bar 4-p L9 clusters charge
Bar 4-p L6 clusters charge
Bar 3-n L9 clusters charge
Bar 3-n L6 clusters charge
Bar 3-p L9 clusters charge
Bar 3-p L6 clusters charge
Bar 2-n L9 clusters charge
Bar 2-n L6 clusters charge
Bar 2-p L9 clusters charge
Bar 2-p L6 clusters charge