

The background features several large, overlapping, curved shapes in shades of purple, green, and blue. Interspersed among these are numerous small, yellow, triangular shapes pointing in various directions, creating a dynamic and colorful abstract pattern.

DØ Global Monitoring and Ideas for LHC/CMS remote monitoring

**Pushpa Bhat
Fermilab**

Remote International Monitoring for the DØ Experiment

DØ Goes Global

Detector Monitoring data sent in real time over the internet

9 am

NIKHEF
Amsterdam

2 am

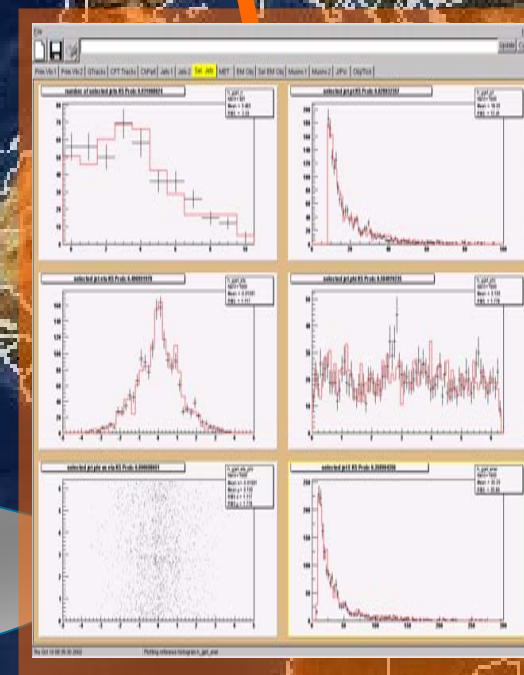
Fermilab

DØ physicists in Europe use the internet and monitoring programs to examine collider data in real time and to evaluate detector performance and data quality.

They use web tools to report this information back to their colleagues at Fermilab.



DØ detector





The online monitoring project has been developed by DØ physicists and is coordinated by Dr. Pushpa Bhat from Fermilab. Jason Webb, a DeVry University, Chicago, undergraduate student is helping develop and maintain the interactive tools for the remote physicists.

DØ Global Monitoring

- “global data monitoring”
 - Reconstruct and examine event data at a global level, i.e., trigger and physics objects built using info from a variety of sub-detectors
- Turned into remote monitoring from
“Around the Globe”
- See “Dzero Goes Global”
FermiNews, January 31, 2003
“DZero has seen the future!”



DØ Global Monitoring

- Goals for monitoring
 - Monitor physics/trigger data in real-time
 - Spot detector/trigger problems if any
 - Communicate with other shifters and experts as needed
 - Take corrective actions
 - Provide online data quality evaluation
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DØ Global Monitoring

- Motivation for remote monitoring:
 - Get remote collaborators involved
 - Provide opportunity to engage in experiment's operations
 - More shift help at all times (especially at odd hours)
 - Great PR for remote institutions
 - Use detector/trigger/physics experts from all over the world more readily and effectively



Remote Shifters

- Overwhelming interest and enthusiastic response
- Shifters from
 - The Netherlands, Germany, France, U.K., Switzerland (CERN)
 - India, Korea, Vietnam
 - South America
 - Within the U.S.
- Has been used for ~4 years
- Successful remote monitoring



Tools

- Main GM_GUI (python)
 - for controlling processes
 - for display of vital run information
- “Examine” software
- Browsers (root-based)
 - Standard set of histograms
 - Configurable
 - Comparison with reference plots
- Web tools
- Electronic log book
- GM Chat tool

Communication is the key

- Remote shifters sign on with the shift captain and electronic logbook and keep in close touch with other shifters through the GM chat tool
- Can send audio messages (urgent pleas for help) to the control room
- Was trying video links (when I moved on ..)
- Browsers and displays automatically started on Dzero GM display monitors when processes are started remotely
- Log book entries, checklists and run certifications are performed by the shifter

Run Info

The screenshot shows a software window titled "Global Monitoring" with a menu bar containing "File". Below the menu bar are several tabs: "Main", "Run Information" (which is selected), "Physics Examine", "Trigger Examine", "Run Certification", and "Run Checklist".

Under the "Run Information" tab, there is a section titled "Runs currently in progress:" with two buttons: "Save Selection" and "Refresh". Below this, a yellow box highlights the text "165776 physics".

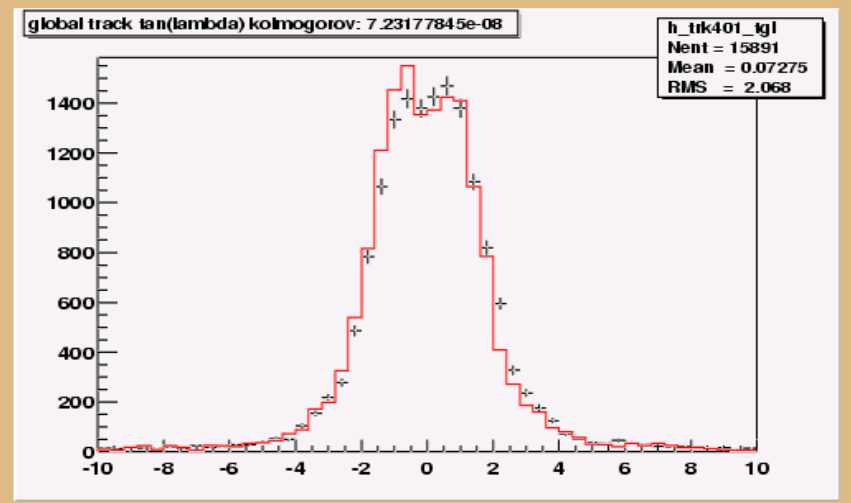
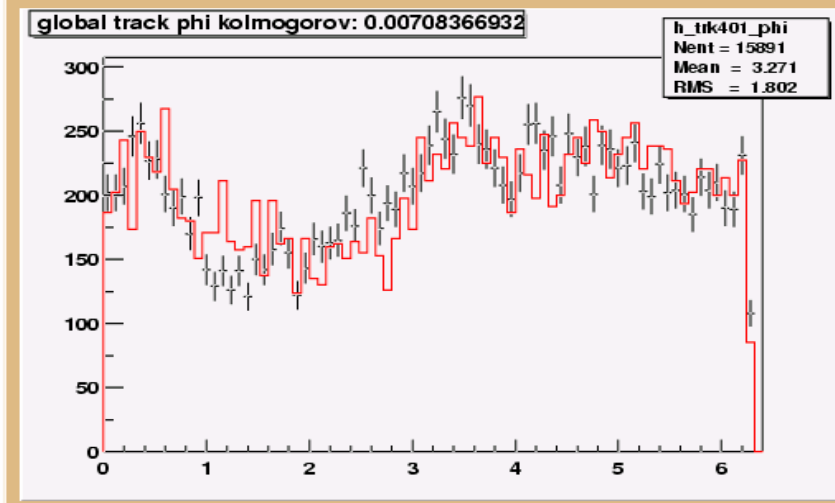
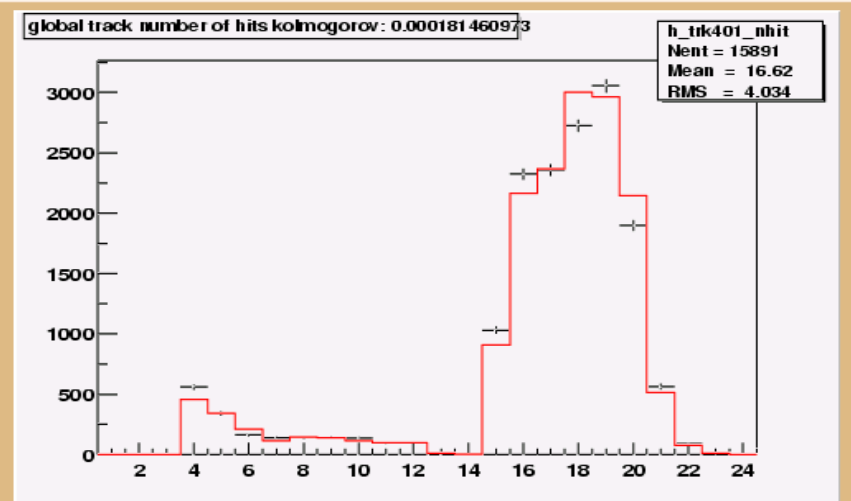
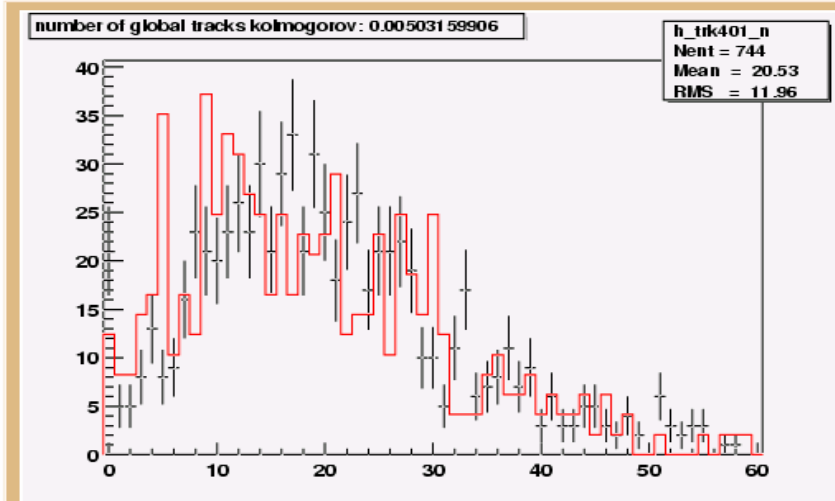
Further down, there are three columns of information:

- Trigger Config:** 8.40official/global_CMTphysics
- Streams:** all
- Triggers:** This section has three sub-tabs: "Level 1 Bits" (selected), "Level 2 Bits", and "Level 3 Bits". Under "Level 1 Bits", there is a list of triggers with checkboxes:
 - Afastz
 - ALiveBX
 - CEM(2,2.5eta1.6)
 - CEM(3,2.5eta1.6)
 - CEM(1,5)
 - CEM(1,5)CJT(2,5)
 - CEM(2,5)
 - CEM(2,5)^2
 - CEM(1,10)

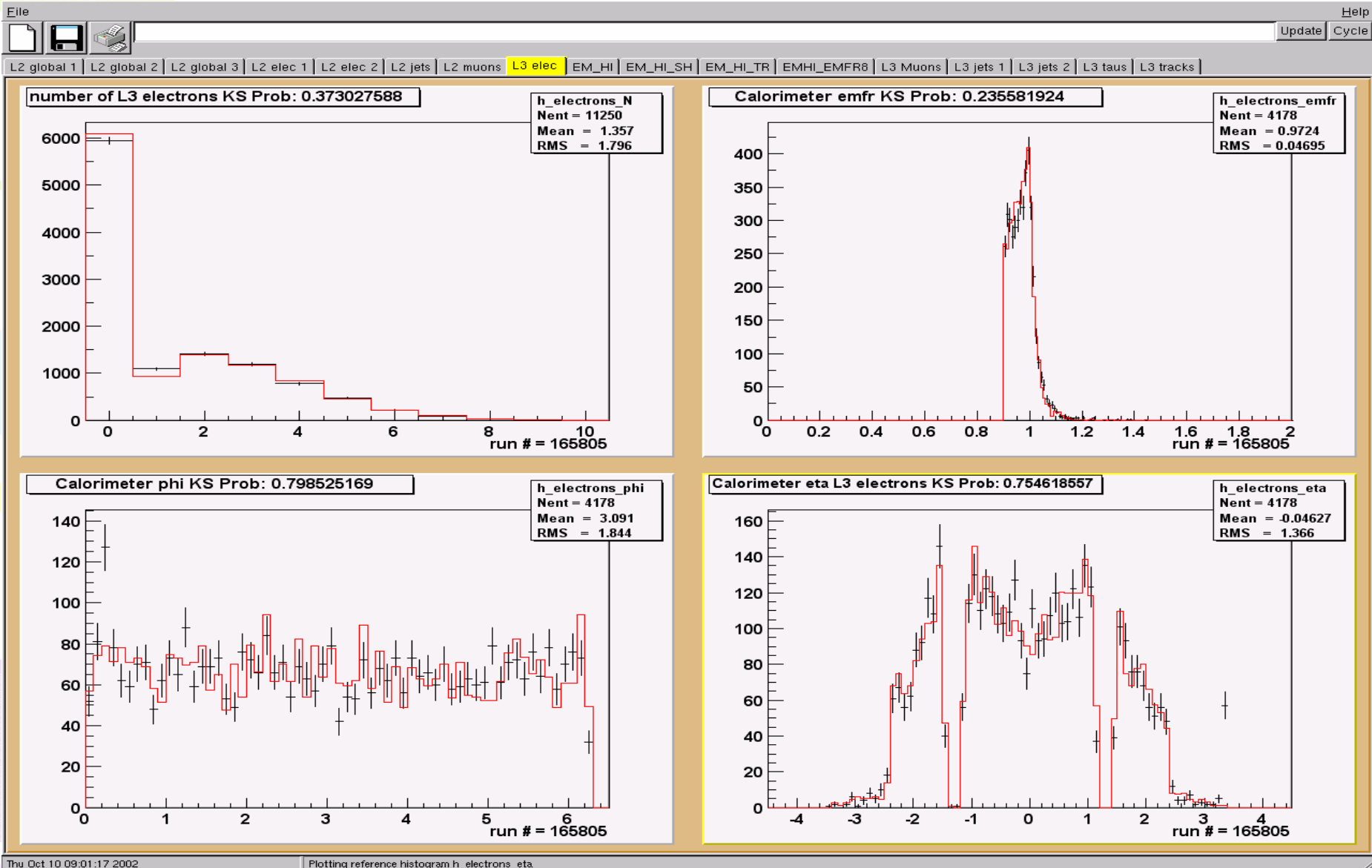
Below the trigger list are two buttons: "Deselect All" and "Select All".

At the bottom of the window, there is a status bar with two fields: "Tue Oct 8 17:21:39 2002" and "Problems/Comments please email pushpa@fnal.gov and jgwebb@fnal.gov".

PhysEx Global Tracks



TrigEx: L3 Electrons





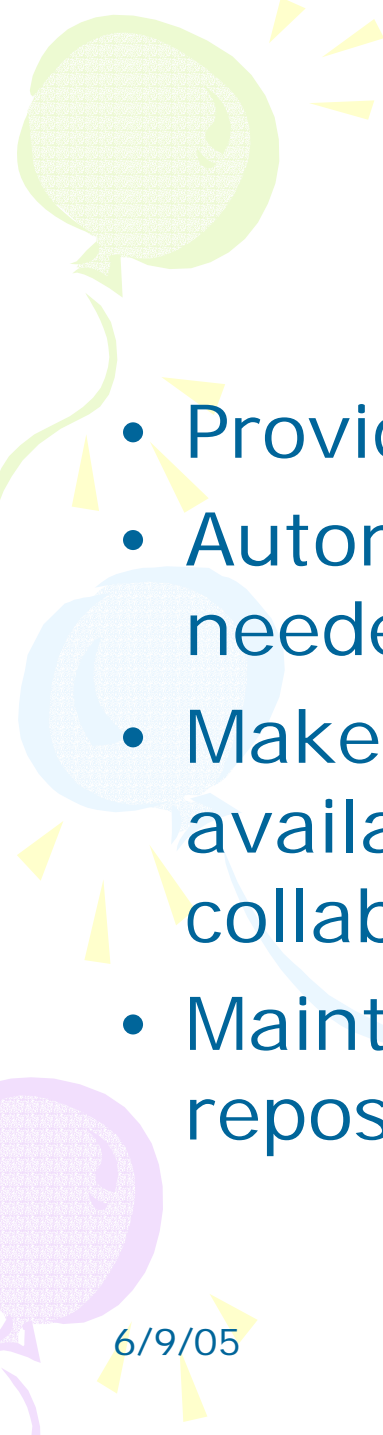
LHC/CMS Remote Operations

- Crucial in order to lure physicists from the U.S. institutions to spend time at Fermilab
 - “better than being there?” ← Should be at least “almost as good as being there”
- LPC alone is not enough
- More collaborators can be involved
- Experts used more efficiently
- Save money



Some Essentials

- Mirror the CERN CMS control room so all information is available
 - All screens to be replicated
 - Set up video links between main CMS control room at CERN and Fermilab remote operations center → “Tele-presence”
 - Continuous communication, quick feedback
 - Significant fraction of the real shifters should be here (say, a third)
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- Provide fully functional electronic log book
 - Automate monitoring programs to run as needed
 - Make real time Standard plots/info available via the web to all interested collaborators
 - Maintain searchable problem/solution repository



Remote Functions

- Monitor data, identify problems if any, investigate and help correct
- Control/Monitor cameras in the detector hall and electronics
- Some detector controls? Robotics?
- Generate helpful info/maps
- Calibration runs, special runs



Start Now

- Remote monitoring for test runs and commissioning of detector sub-systems