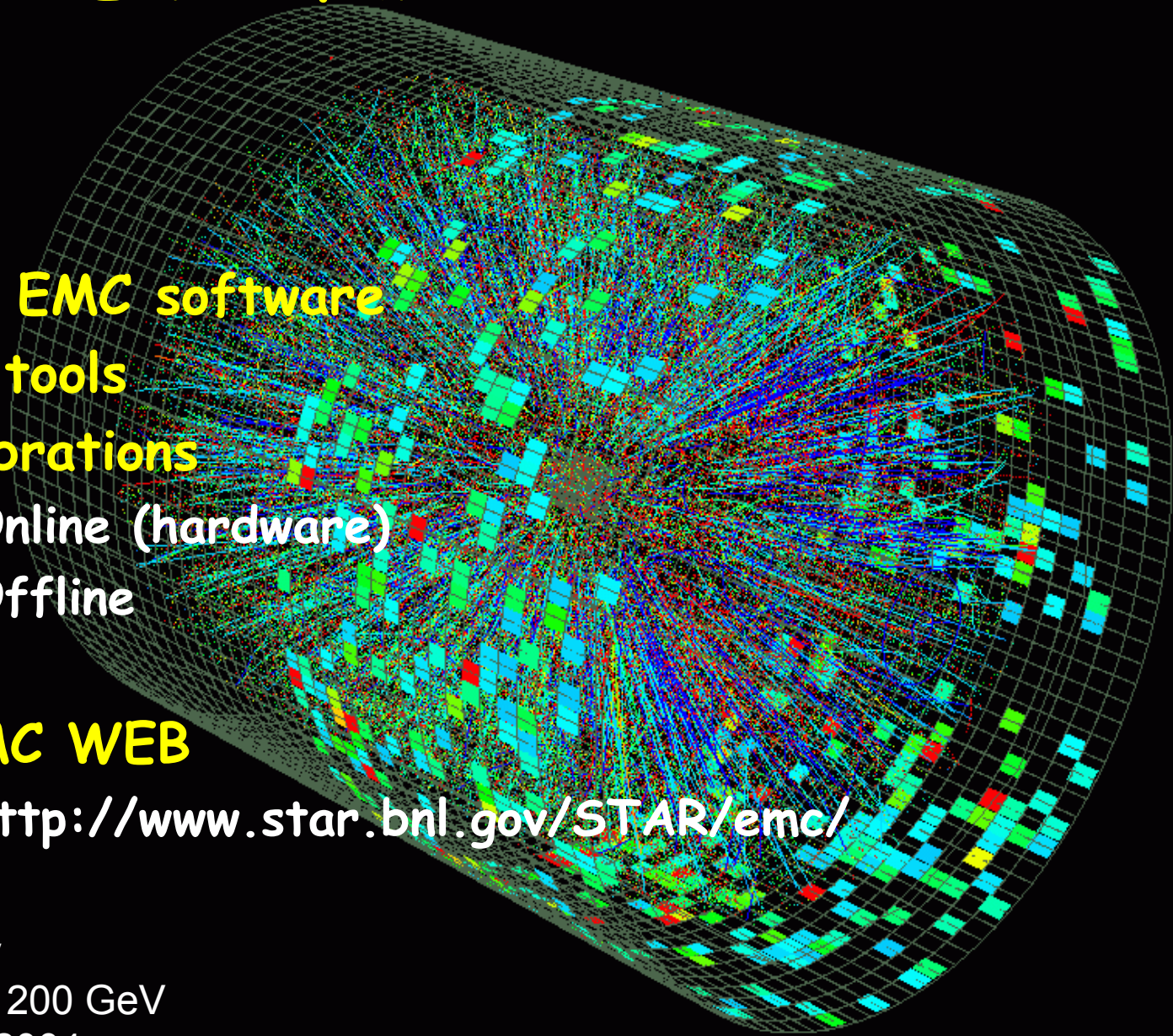


BEMC software and calibration

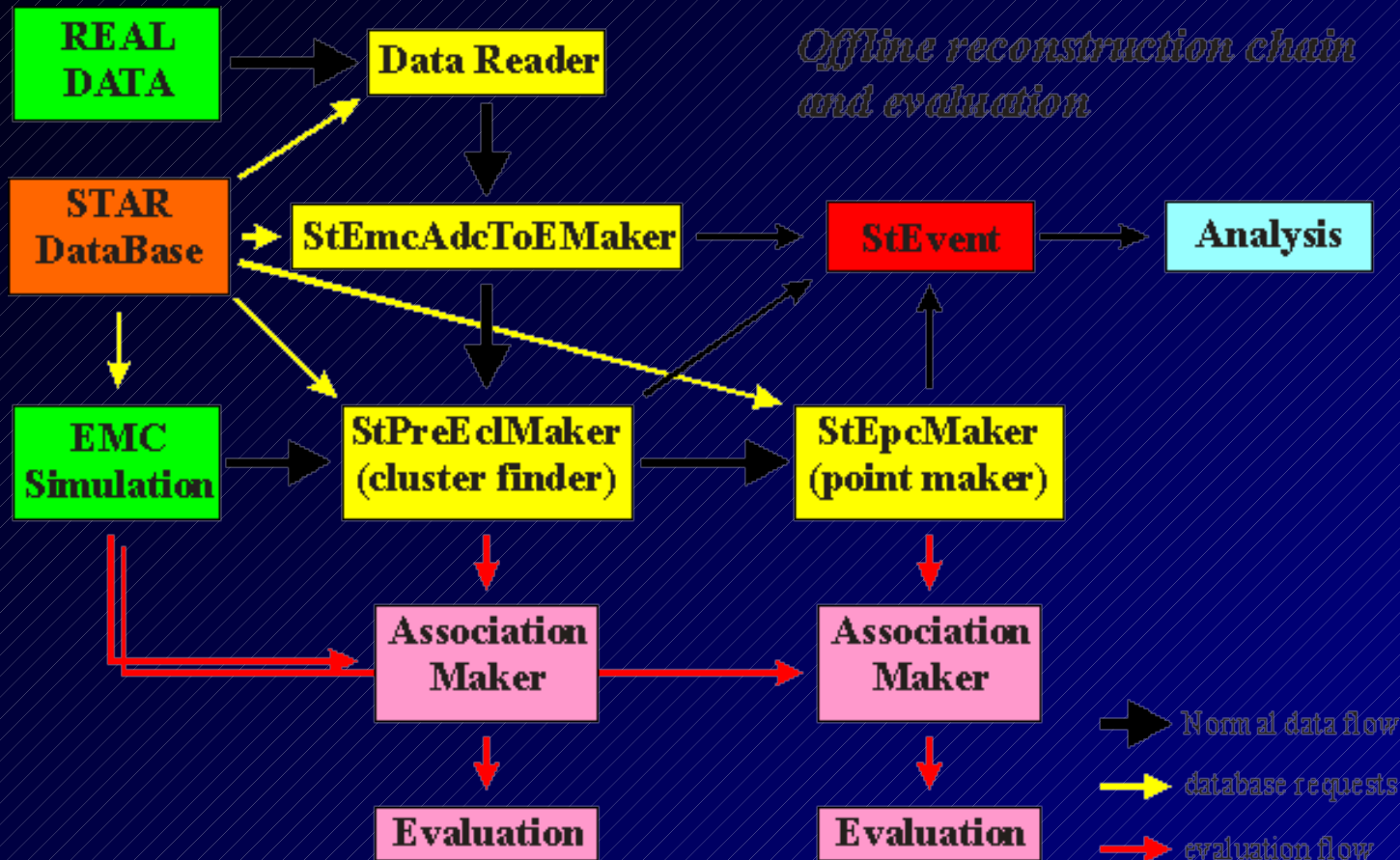
- **The EMC software**
- **QA tools**
- **Calibrations**
 - Online (hardware)
 - Offline
- **BEMC WEB**
 - <http://www.star.bnl.gov/STAR/emc/>

L3 display
Au+Au @ 200 GeV
February 2004



EMC Software reconstruction and analysis chains

- Offline reconstruction chain is fully implemented

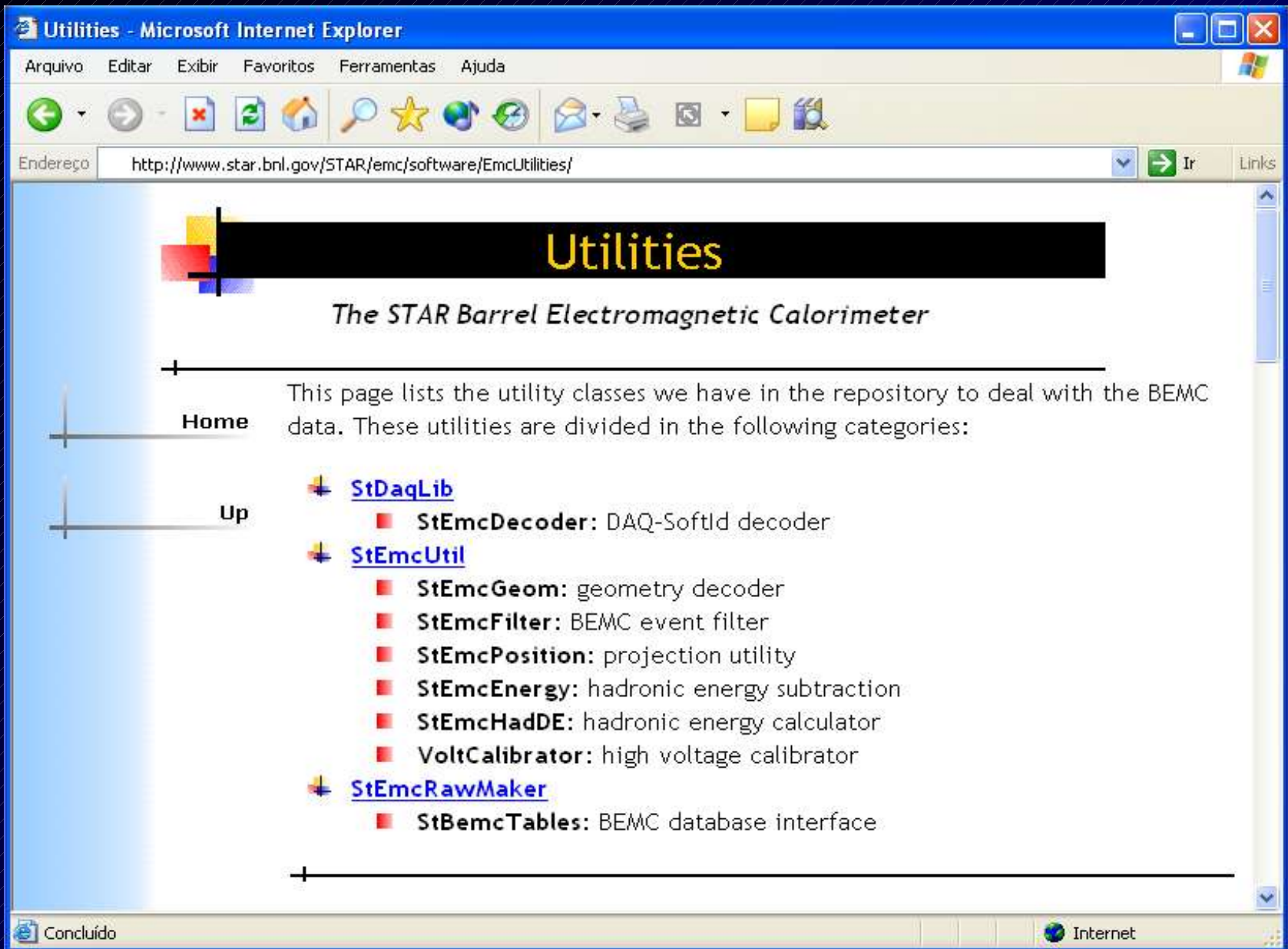


StEmcADCtoEMaker

- **Divided into two makers**
 - **StEmcRawMaker** - runs during reconstruction
 - Reads only RAW data format (DAQ or StEmcRawData)
 - Applies pedestal, calibration, copy daq structure to StEvent and Fill StEmcRawHits
 - **Fills crate status in StEvent (and muDST)**
 - **This information is available for the user!**
 - Also processes the Endcap data
 - **StEmcADCtoEMaker**
 - Runs only at analysis level
 - Does everything StEmcRawMaker does +
 - Reads StEmcRawHits from StEvent
 - Reads StMuEmcCollection (muDST)
 - Processes plain simulation files (need to set the correct flavor in database)



Offline tools for analysis



Utilities - Microsoft Internet Explorer

Arquivo Editar Exibir Favoritos Ferramentas Ajuda

Endereço <http://www.star.bnl.gov/STAR/emc/software/EmcUtilities/> Ir Links

Utilities

The STAR Barrel Electromagnetic Calorimeter

Home This page lists the utility classes we have in the repository to deal with the BEMC data. These utilities are divided in the following categories:

Up

- [StDaqLib](#)
 - **StEmcDecoder**: DAQ-SoftId decoder
- [StEmcUtil](#)
 - **StEmcGeom**: geometry decoder
 - **StEmcFilter**: BEMC event filter
 - **StEmcPosition**: projection utility
 - **StEmcEnergy**: hadronic energy subtraction
 - **StEmcHadDE**: hadronic energy calculator
 - **VoltCalibrator**: high voltage calibrator
- [StEmcRawMaker](#)
 - **StBemcTables**: BEMC database interface

Concluído Internet

EMC Analysis pages collection

BEMC Analysis page - Microsoft Internet Explorer

Arquivo Editar Exibir Favoritos Ferramentas Ajuda

Endereço <http://www.star.bnl.gov/protected/emc/analysis/> Ir Links

BEMC Analysis page

This page is a link to all the BEMC analysis being done by STAR. These are the current analysis and QA being done with EMC data:

- Home
- QM2004
- Tasks 2003
- Tasks 2004

- [The pi0 analysis working group webpage](#)
- [How to get trigger prescales from database \(Alex Stolpovsky\)](#)
- 2004 Au+Au data
 - [Status tables for the 62 GeV data \(Thorsten\)](#)
 - [QA of the 62 GeV Au+Au data](#)
 - [Dmitry and Julia SMD correlation for the 200 GeV AuAu data \(fastoffline\)](#)
 - [MIP calibration](#)
 - [Jaroslav Bielcik's page about the PSD studies](#)
 - [Subhasis studies about PSD pedestals](#)
 - [Oleksandr Grebenyuk's AuAu tower pedestal check](#)
 - [Marcia de Moura's SMD pedestal check](#)
- 2003 d+Au and p+p data
 - [MIP calibration](#)
 - [Electron calibration](#)

Internet

http://www.star.bnl.gov/~dmitry/EMC_DB1.1/

STAR Barrel EMC DB browser version 1.2
created and maintained by Dmitry Arkhipkin and Julia Zoukarneeva, WSU-JINR 2003/2004

Navigation tabs: Pedestal tables, Pedestal runs, Summary tables + runs, Bad tables check, Help/FAQ

[HOW-TO] If you know the time/date of suspicious run, you can select start/end date near that time to see what tables can be used in EMC pedestal subtraction or calibration procedures. This browser decodes all information, so be prepared for *very* long lists (e.g. 18000(!) pedestal entries for each SMD timestamp).

Service Information

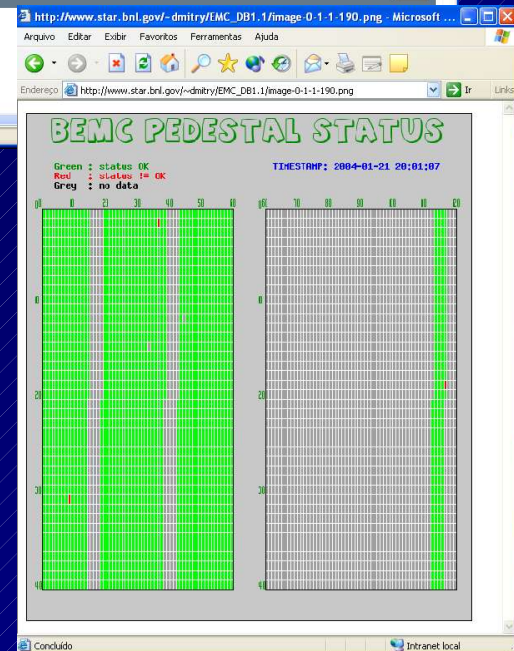
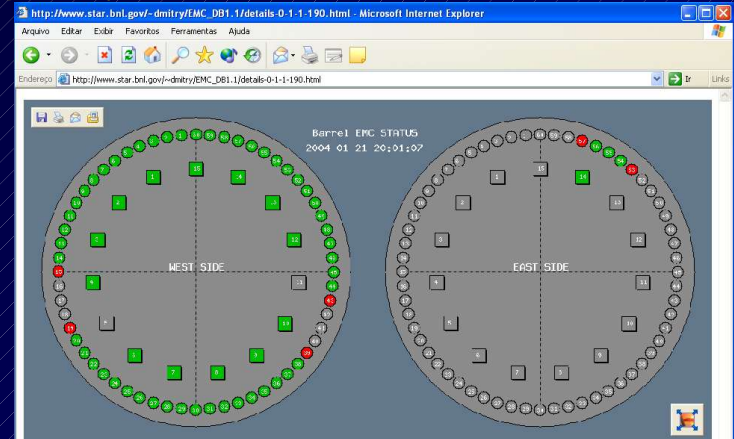
Detector Type	Data Type	DB server	Active/Deactive
BEMC	PEDESTAL	dbx.star.bnl.gov	Active only

START Date

Month	Day	Year	Hour	Minutes	Seconds
January	01	2004	00	00	00

END Date

Month	Day	Year	Hour	Minutes	Seconds
January	01	2010	00	00	00



STAR Barrel EMC DB browser version 1.2
created and maintained by Dmitry Arkhipkin and Julia Zoukarneeva, WSU-JINR 2003/2004

Navigation tabs: Pedestal tables, Pedestal runs, Summary tables + runs, Bad tables check, Help/FAQ

Request statistics
Detector : BEMC
Data type : PEDESTAL
FROM 2004-01-01 00:00:00
TO 2010-01-01 00:00:00
Total 76 items
DB server : dbx.star.bnl.gov

DataID	Begin time	Day	Entry time	Deactive	Flavor	Control
190	2004-01-21 20:01:07	21	2004-01-22 23:31:00	0	off	
191	2004-01-22 23:42:13	22	2004-01-23 00:07:27	0	off	
192	2004-01-26 00:26:56	26	2004-01-26 01:30:11	0	off	
194	2004-01-29 04:48:04	29	2004-01-29 05:40:51	0	off	
195	2004-01-30 22:19:18	30	2004-01-31 01:20:49	0	off	
196	2004-01-31	31	2004-01-31	0	off	

Information

If you click on you will get PEDESTAL table.

If you click on - detailed graphical overview will be shown

If you click on - closest pedestal run will be shown.

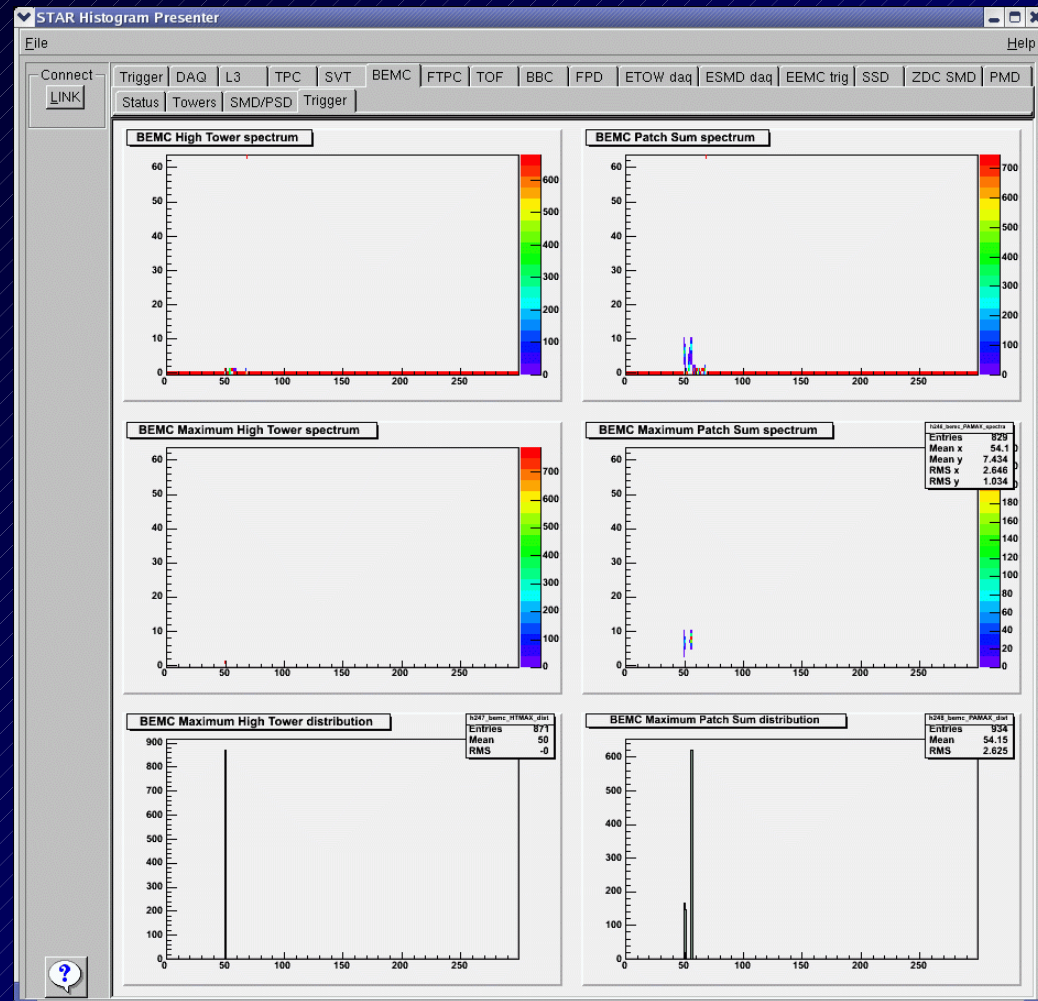
If you click on - simple graphical representation of BEMC modules state will be



- **Panitikin's plots**
 - Fast QA for the shift crew
 - This is the only tool the shift crew is trained to QA the data
 - Needs to be very simple and compact
 - Also Panitikin.LE in the emc01.starp and emc02.starp
 - Same interface with ONLY BEMC histograms
 - » Processes more events/second and much faster.
- **Expert QA (also runs offline)**
 - Event display
 - emcOnline
 - Hundreds of histograms for raw data and trigger QA
 - Option to run full BEMC reco (cluster finder, points, etc)
 - Online pedestal
 - Calculates pedestals every 24 hours and save them automatically to DB
 - With new offline status maker we will be able to check these pedestals values very fast

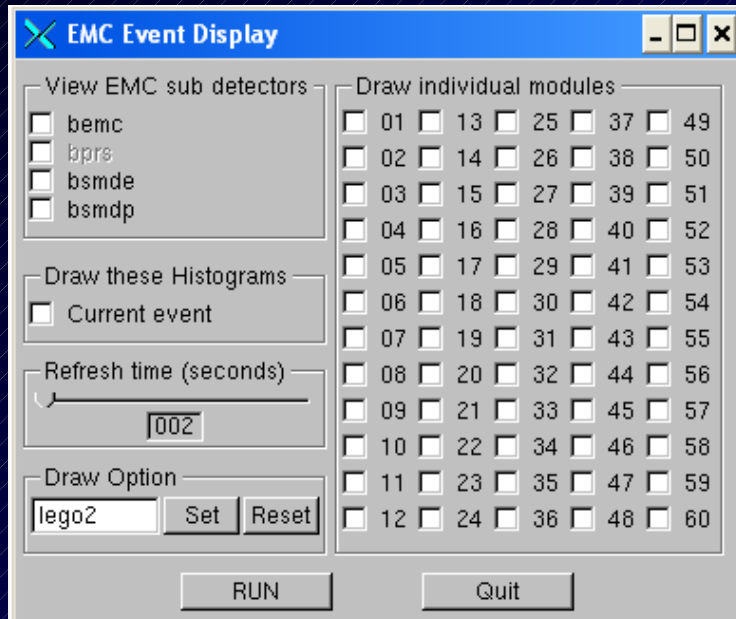
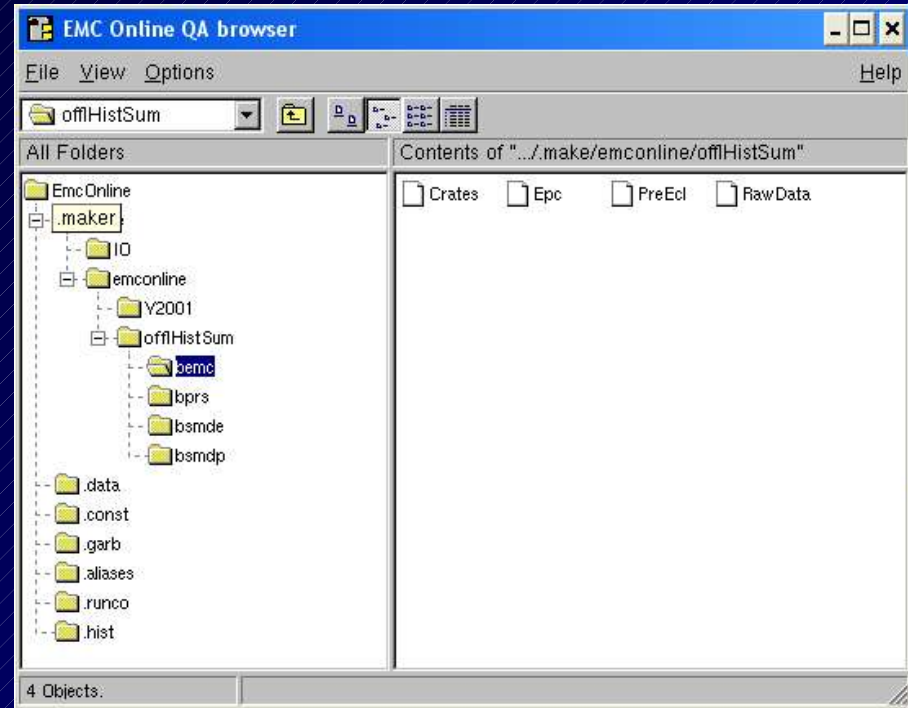
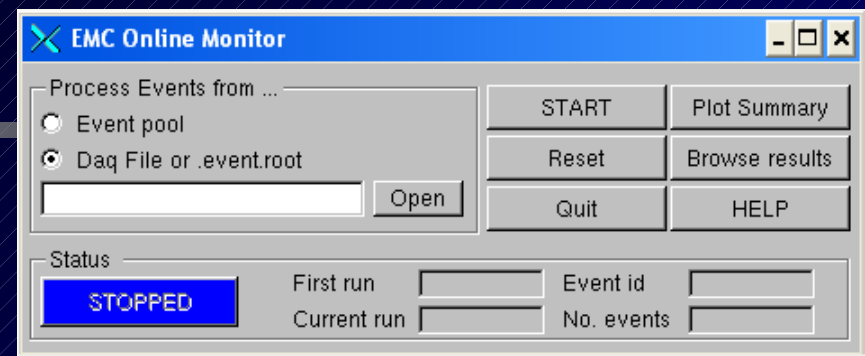
Panitikin's histograms (4 tabs)

- **Status tab (3 histograms)**
 - Status of TDC event for each TDC channel (total, ok corrupted, not installed)
 - Global status of BTOW event (total, ok, corrupted)
 - Status of BSMD/BPRS data (fiber is present/not present)
- **Towers (3 histograms)**
 - Show 2D plot with spectra for each single tower. The plot is organized by TDC channel
- **BSMD/BPRS (6 histograms)**
 - Show ADC sum for each fiber and capacitor distribution
- **Trigger (6 histograms)**
 - High tower and Patch trigger information
 - 2D spectra for HT and PA
 - 2D highest HT and PA spectra (identify noisy towers)
 - 1D distribution of trigger tower id for HT and PA



EMC event display and online monitor

- Display EMC events in real time
- Graphical user interface for easy operation
- QA of data in real time
 - Raw data
 - EMC trigger
- Possible to run offline



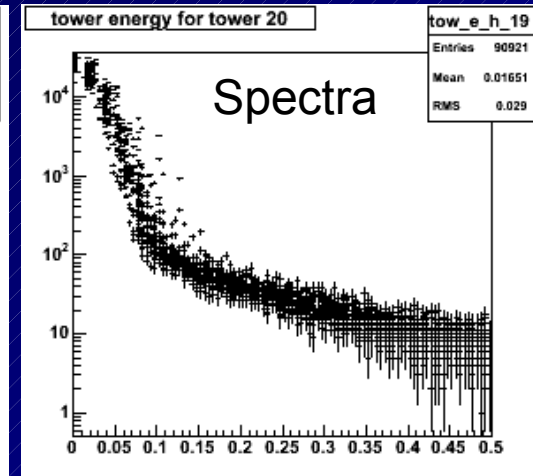
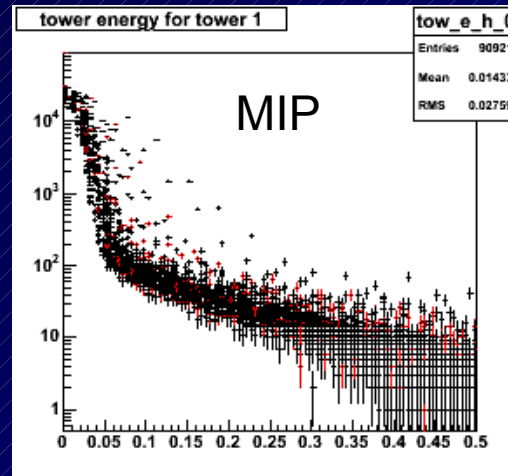
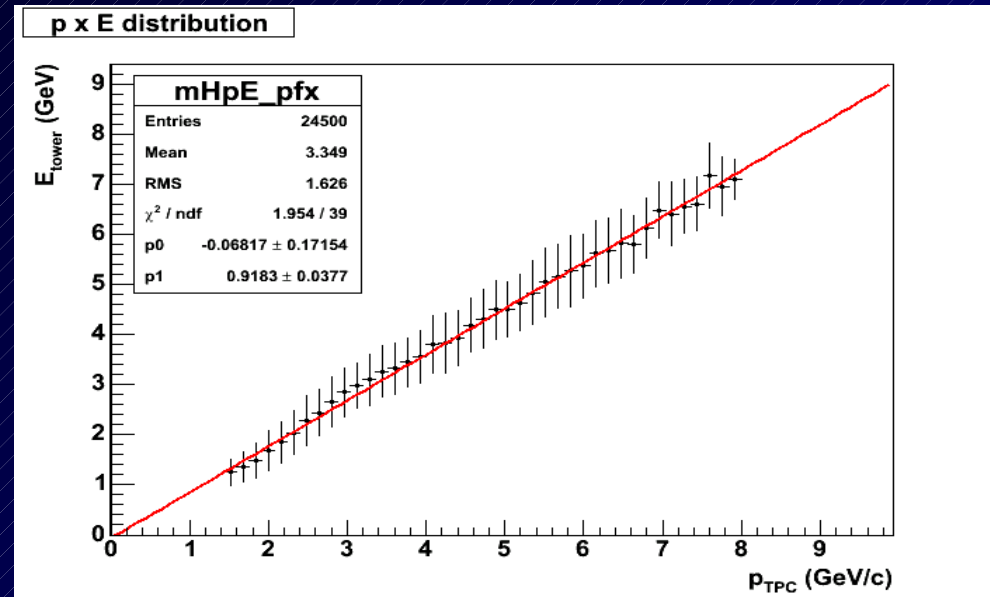
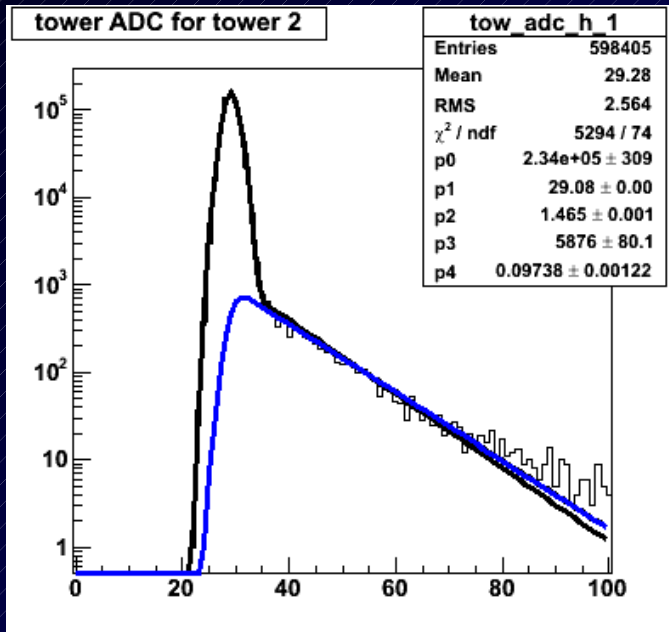
Calibration

- **Status of 2003 and 2004 runs**
- **Calibration for upcoming run**
 - Hardware calibration
 - Offline



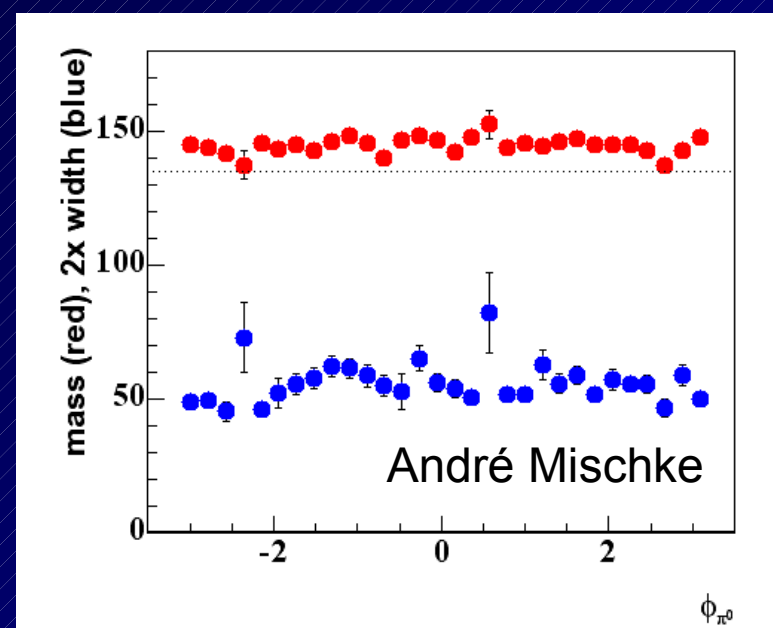
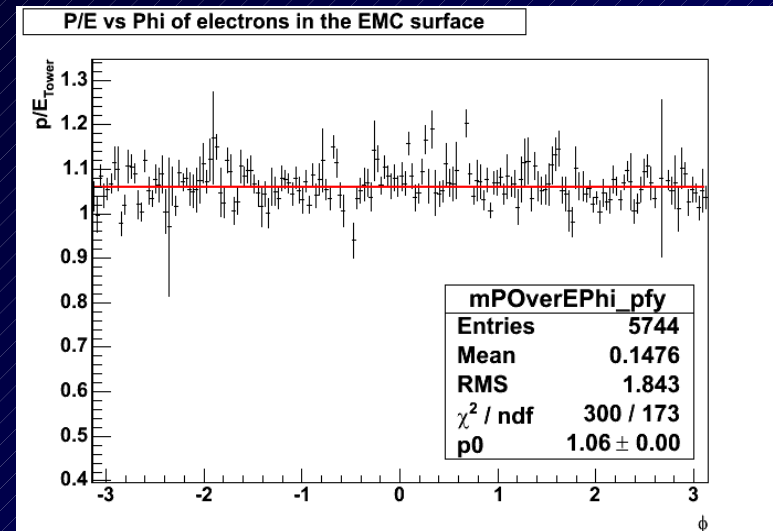
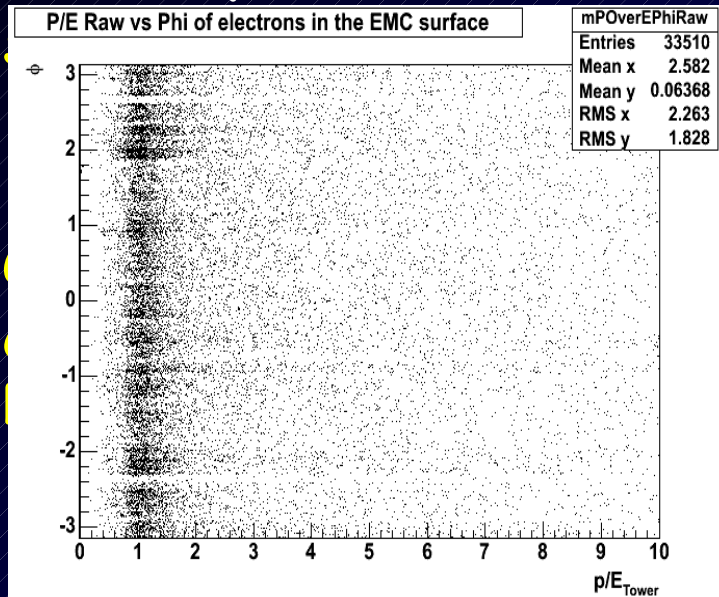
2003 dAu and pp data

- Single tower MIP spectrum
- Electron peak for absolute normalization
- Calibration still improving
 - Spectra shape (Marco van Leeuwen)



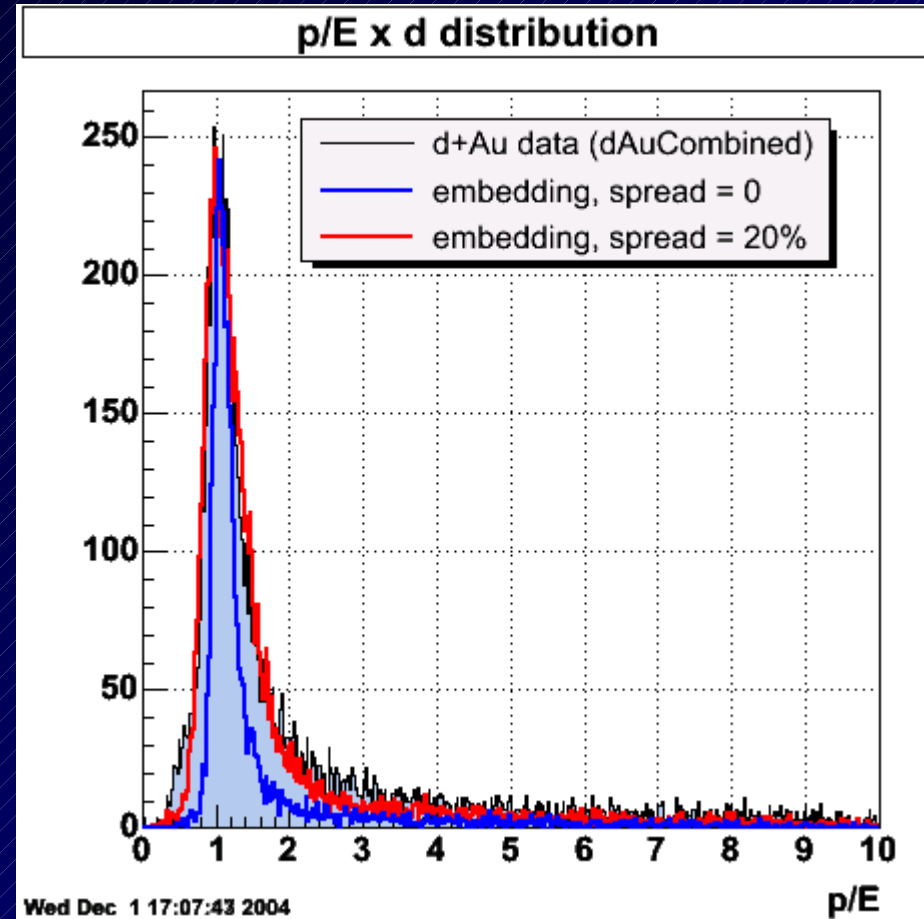
Single tower electron and π^0 calibrations

- Test detector uniformity
- Gain corrections
- Single tower electron
 - Peak position

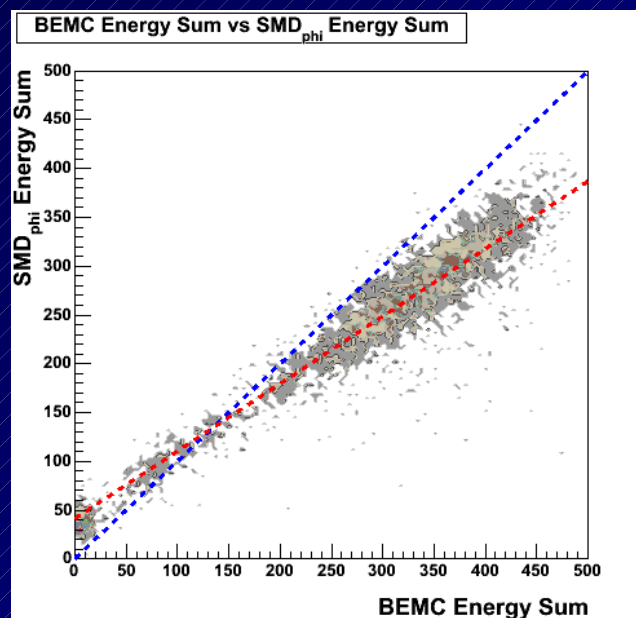
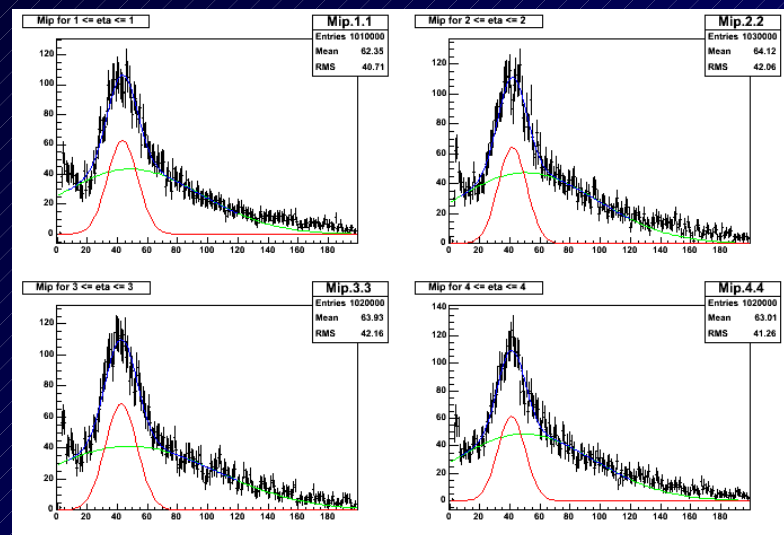


Single tower calibration "uncertainty" estimation

- **Current calibration is MIP based**
 - Electrons just shift overall gain
 - MIP calibration is at very low energy
 - 200-300 MeV
 - Large extrapolations to high-E
 - Large uncertainties
- **StEmcSimulator was updated to account for calibration uncertainties**
 - Systematic shift for all towers
 - Gaussian shaped gain error
 - Default is no shift and no error
 - The best settings to reproduce the electron data is
 - Shift = 1 (overall gain seems correct)
 - Single tower gain uncertainty = 20 %



- **Hardware calibration**
 - Online spectra slope method
 - Adjust high voltages to get better uniformity
 - Special runs during data taking
 - Very important for trigger uniformity
- **MIP Calibration**
 - Absolute calibration
- **SMD calibration**
 - Global gain correction with respect to towers

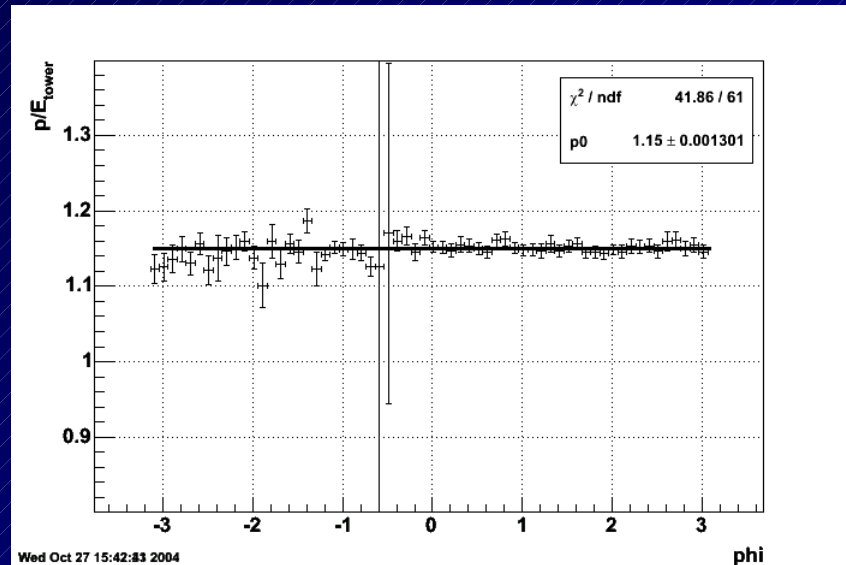
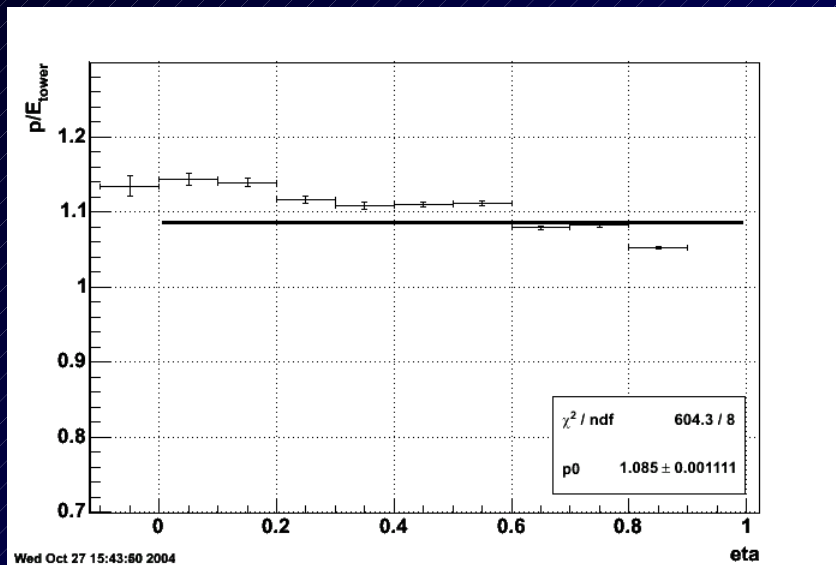
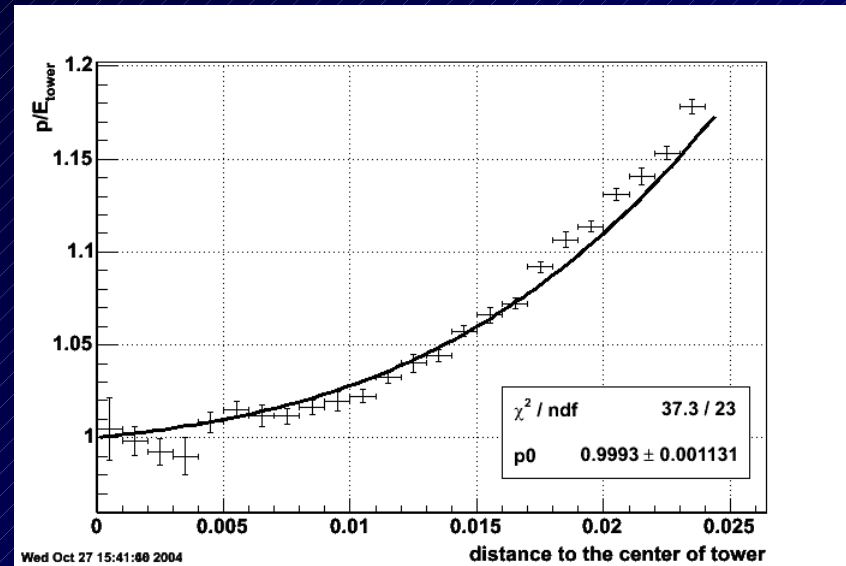


Electron calibration. Preliminary...

- **Electron peak position to correct gain calibration**

Not enough statistics to do it

- Offset by tower %
- Not uniform in η direction
 - Overall peak position ok
 - Azimuthal uniformity ok
- η dependence
 - Still investigating
 - » Towers are large at $\eta=1$
 - » Less leakage, small p/E ???

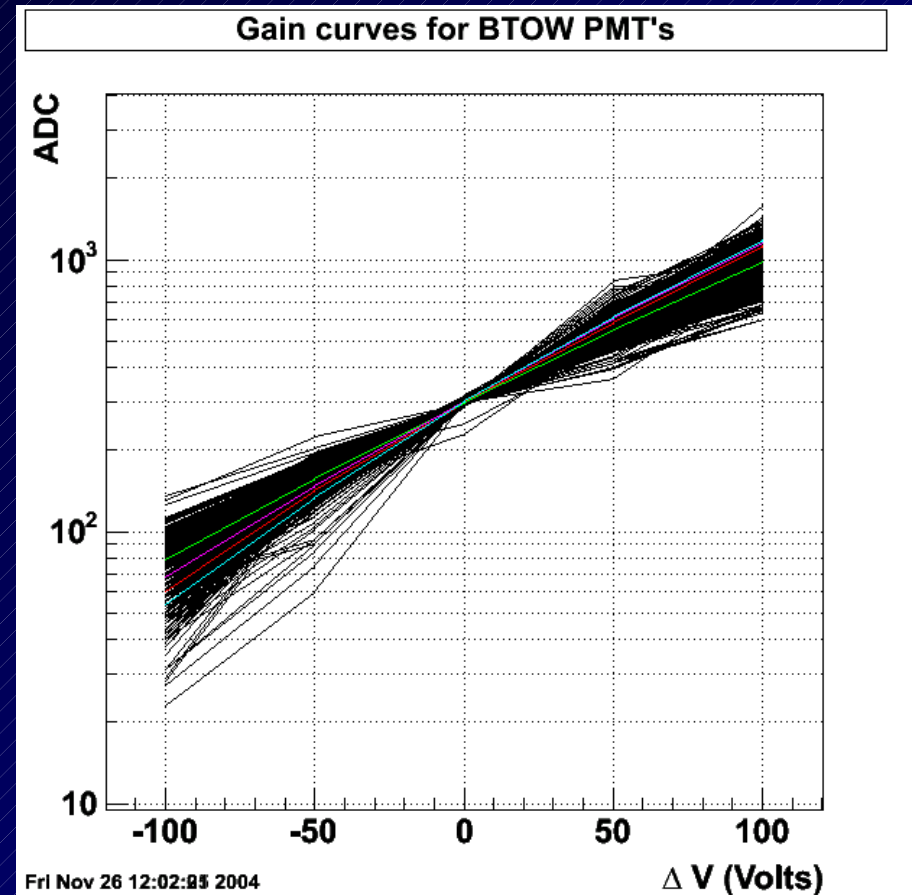


Calibration task list

- **2003 dataset**
 - **What is in DB?**
 - Single tower MIP + electron gain correction
 - Ideal SMD calibration
 - Need to compare calibration fro π^0 and electrons better.
 - Need better single tower absolute calibration!
 - Very important for π^0
 - Need SMD calibration (global gain correction?)
- **2004 dataset**
 - **What is in DB?**
 - Eta-bin MIPS
 - Ideal SMD calibration
 - Need to finish eta/phi electron calibration
 - Available as root file for private DB after analysis meeting.
 - Need π^0 calibration
 - Need PSD and SMD calibration
 - PSD has other issues (Subhasis, Jaro, Marcia and Ahmed)

Calibration task list (cont.)

- **Redo High Voltages settings**
 - 2004 data has gain twice the designed one
 - Make BEMC only runs (about 500 k minimum bias event per run)
 - Calculate single tower spectrum slope (fit)
 - Calculate gain correction
 - Compare to gain \times voltage curves for every PMT
 - Redo this process about 3-4 times until converge
- **Make 500k minimum bias run with BEMC+TPC (L3 would be great)**
 - Do MIP calibration.



Conclusion

- **Software was deeply modified**
 - New ADCtoEMaker
 - New web page
 - Many tools for analysis
- **QA of data is reshaped**
 - Hope that shift crew can identify problems easily
 - Expert QA also available
- **Calibrations**
 - 2003 calibration needs improvement
 - 2004 calibration is improving and will be available for tests soon
 - 2005 scheme in place. Turn around time is a few days after start taking data
- **All BEMC software information in the BEMC web**
 - Page is still growing.

