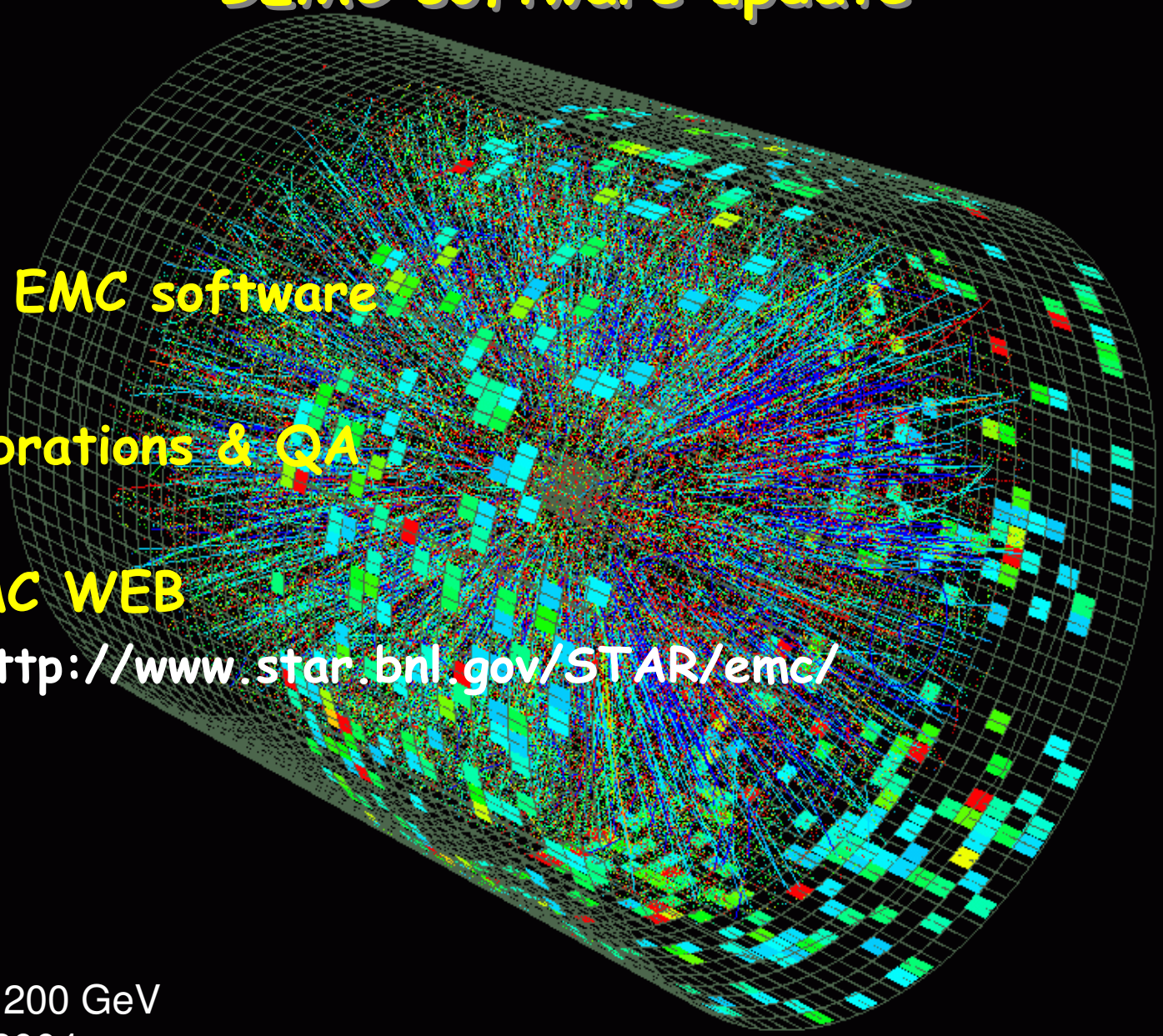


# BEMC software update

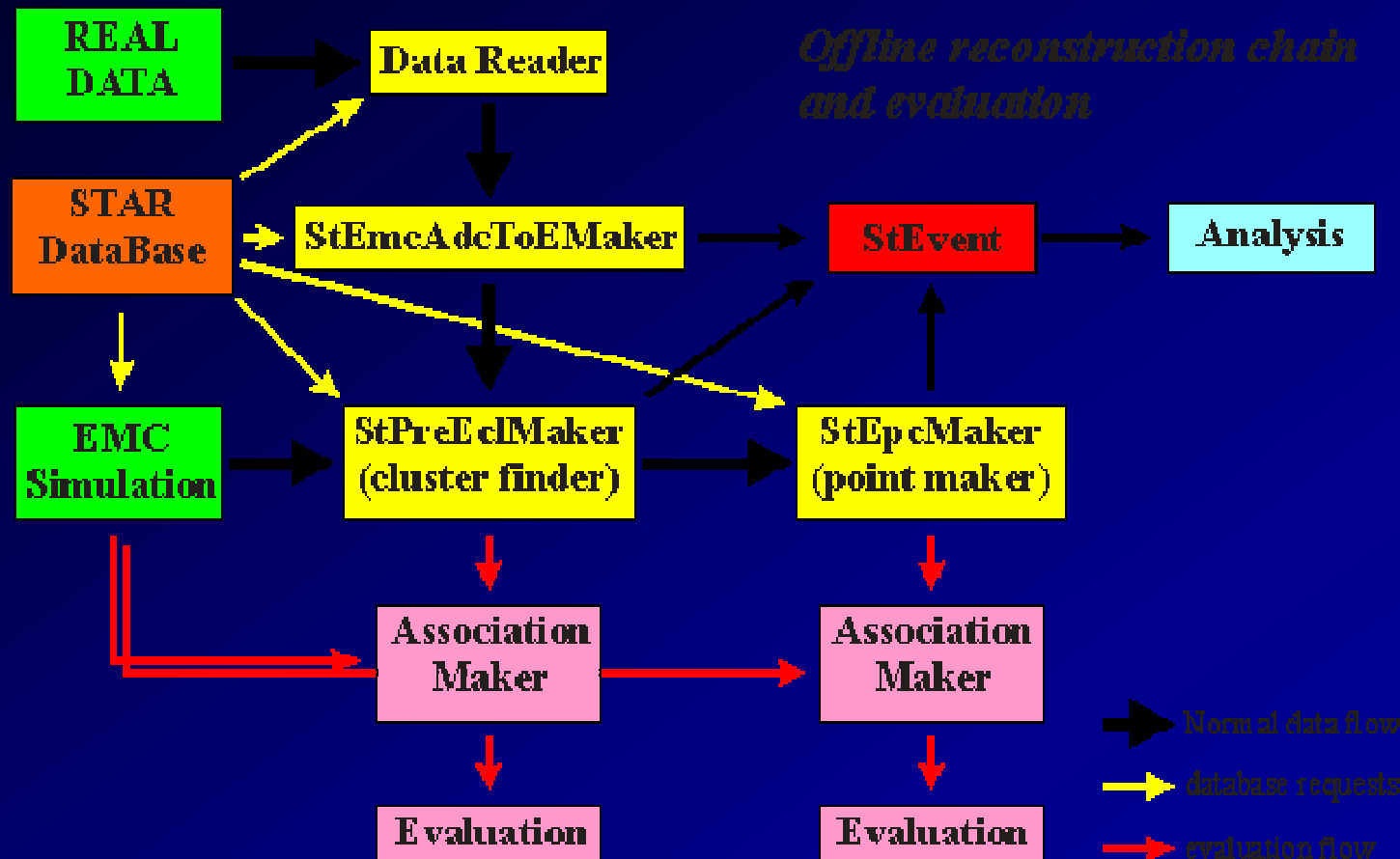
- The EMC software
- Calibrations & QA
- BEMC WEB
  - <http://www.star.bnl.gov/STAR/emc/>

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)



# Cluster finder and matching

- **Current cluster finder (StPreEclMaker) and point maker (StEpcMaker) are very naive**
  - **Cluster finder**
    - Do not cluster over sub-modules and modules
    - Do not take status into account
      - Splitting if dead strip in between
    - Do not use other detector information as seed
      - TPC for electrons or SMD-eta for SMD-phi clustering over sub-module
  - **Matching**
    - Plain matching - split tower energy based on SMD energies
- **Many improvements are necessary.**
  - Include status information
  - Clustering over sub-modules
  - Use other detector as seed, etc...



# BEMC database

- For each detector (BTOW, PRS, SMD-eta and phi)
  - Pedestal table
  - Calibration
  - Gain (time dependence of gain)
  - Status
- For the trigger
  - Trigger pedestals
  - Status (trigger masks)
    - Patch, high tower and single tower masks
  - LUT information
    - Do not save LUT (size) but save formula parameters
- **StBemcTables (StEmcUtil)**
  - Tool to interface with those tables in the database



# What is already saved in the DB?

- These tables can be accessed using `StBemcTables`

dataset	BTOW	PRS	SMD-eta	SMD-phi
dAu200 '03	S+C+P	NA	S+C+P	S+C+P
pp200 '03	S+C+P	NA	S+C+P	S+C+P
AuAu200 '04	C+P+T	P	C+P	C+P
AuAu62 '04	C+P+T	P	C+P	C+P
pp200 '04	C+P+T		C	C
CuCu200 '05	C+P+T	P	C+P	C+P

- Problem with `bemcTriggerStatus`. Solution found. Need to re-create old tables...

S = status table

C = calibration table

P = pedestal table

T = trigger tables (only BTOW)



# Calibration and status

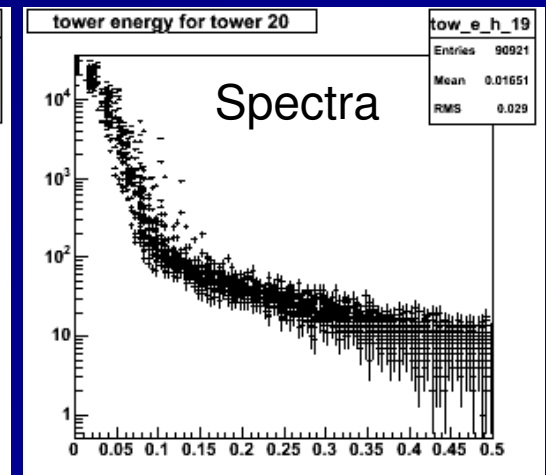
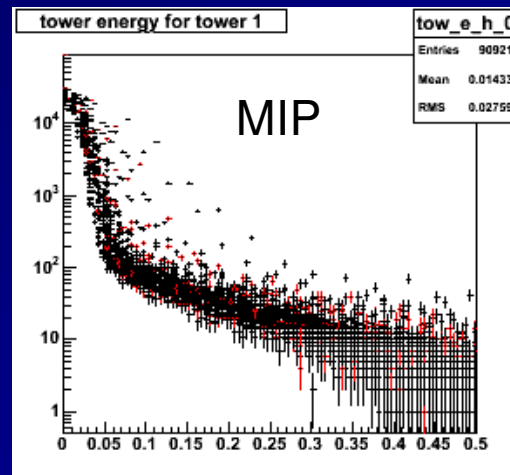
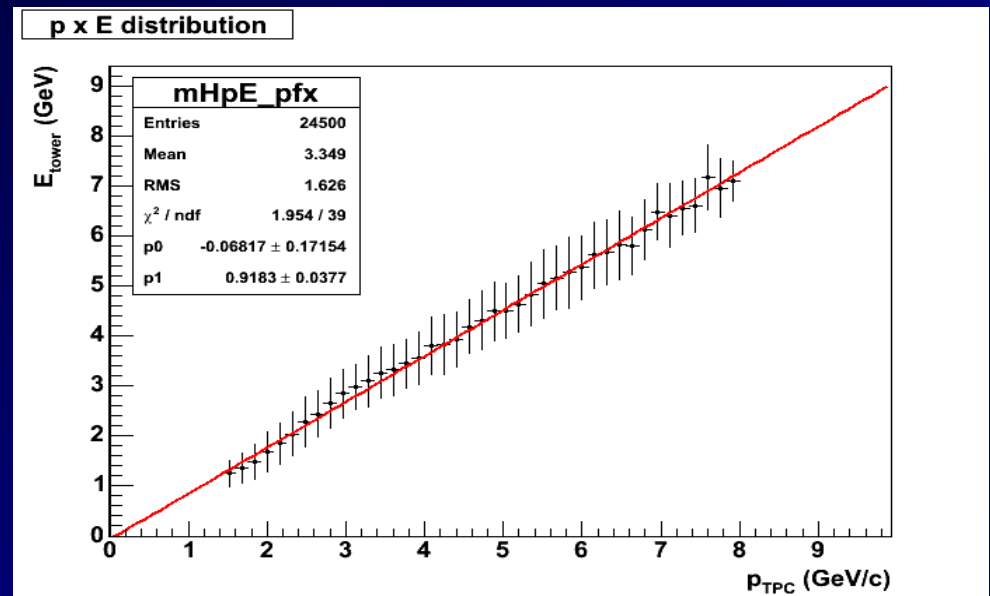
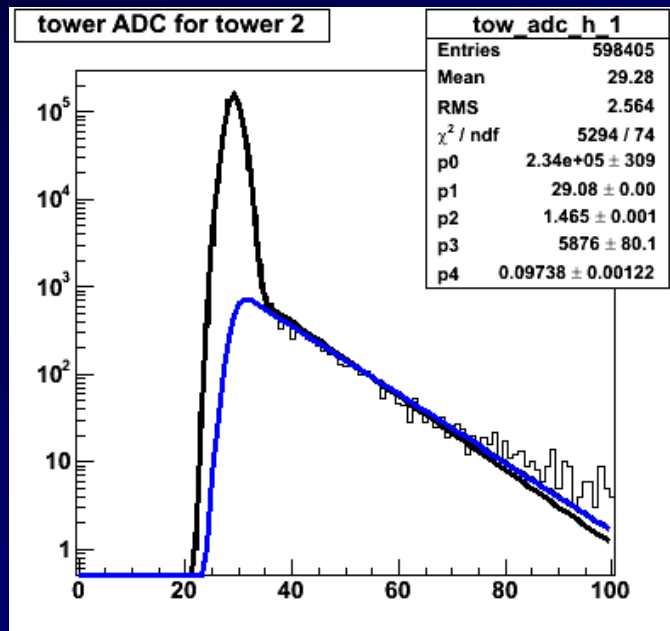
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- **Status of 2003, 2004 and 2005 runs**
  - QA of the data
  - Calibrations
  - Status



# 2003 dAu and pp data

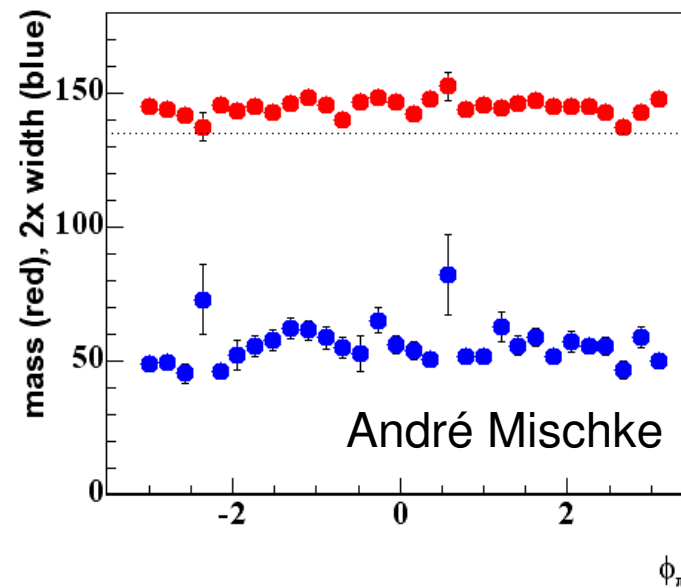
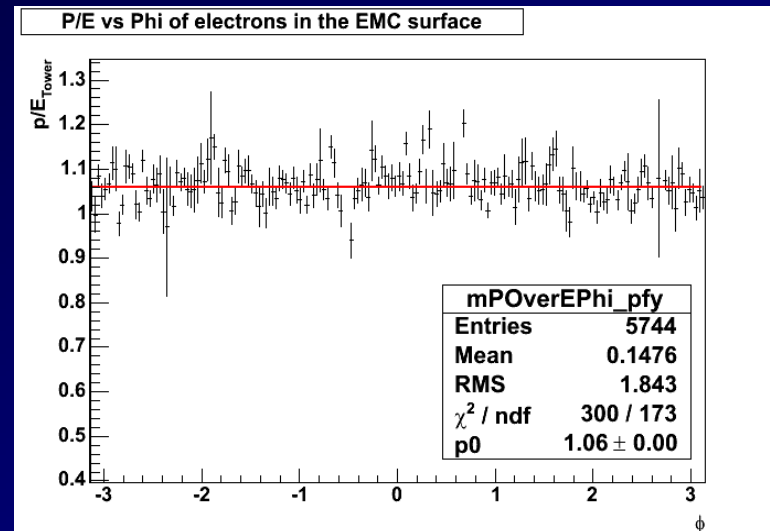
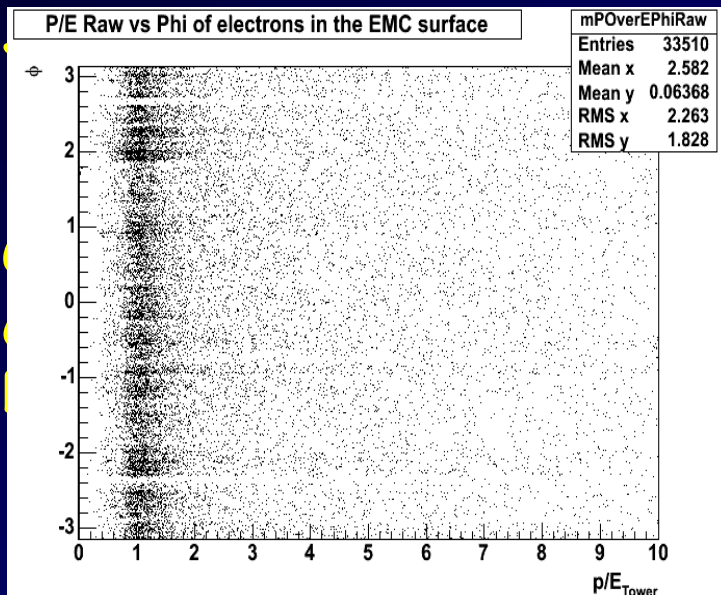
- Single tower MIP spectrum
- Electron peak for absolute normalization
- Calibration still improving
  - Spectra shape (Marco van Leeuwen)





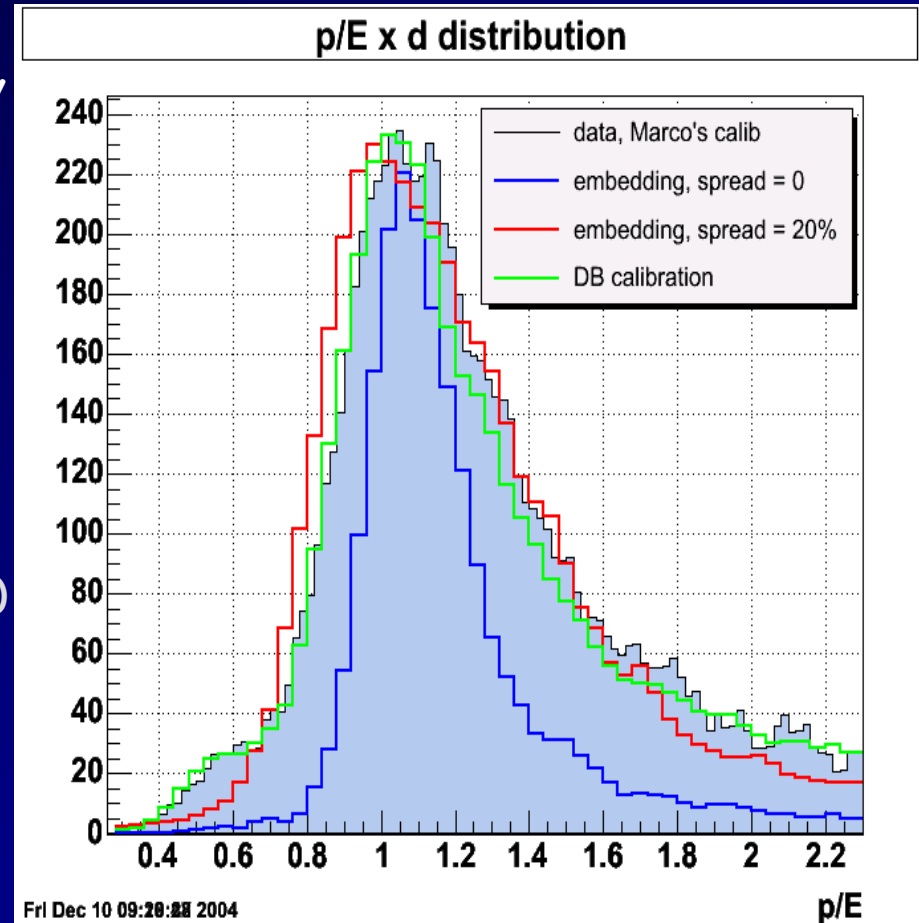
# Single tower electron and $\pi^0$ calibrations

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



# Single tower calibration "uncertainty" estimation

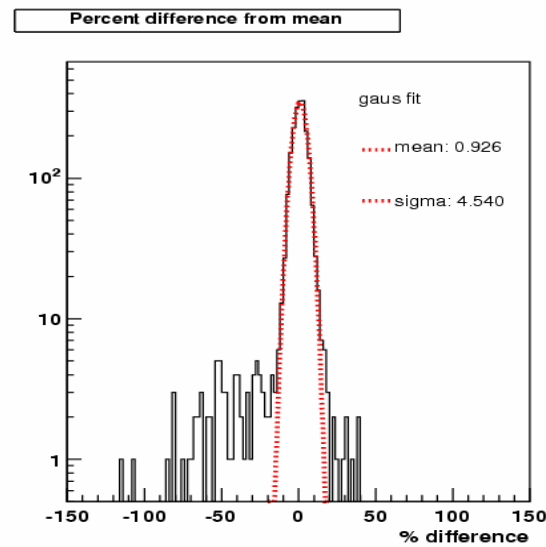
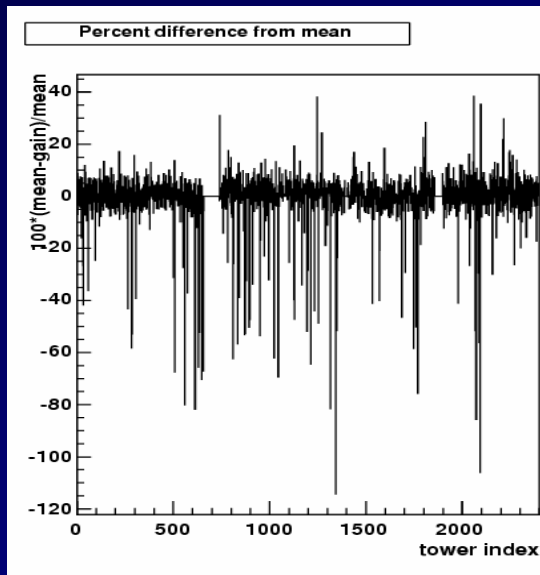
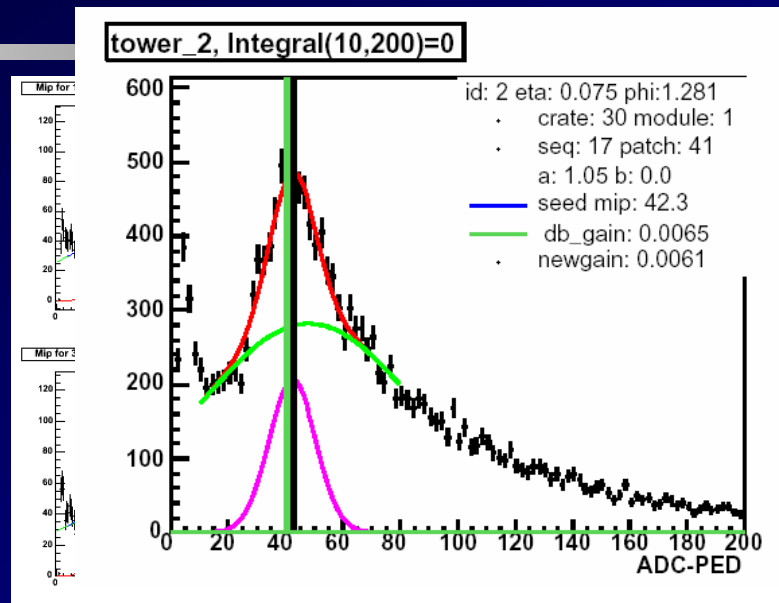
- **Current calibration is MIP based**
  - Electrons just shift overall gain
  - MIP calibration is at very low energy
    - 200-300 MeV
    - Large extrapolations to high-E
      - Large uncertainties
- **StEmcSimulator was updated to account for calibration uncertainties**
  - Systematic shift for 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 = 15 %
- **Comparing slopes and MIP method does not make improve the width of electron peak**
  - Is this the maximum we can get with MIP and slopes?
    - Need to improve high-pT calibrations
  - Or do we have effects that are not being taken into account during simulations?



# Calibration for Y2004 data

Mike Miller

- Calibration in DB is based on a eta-bin MIP calibration
  - Statistically limited
  - In database
- Single tower MIP calibration
  - Needs a lot of statistics
  - Take care of some outliers

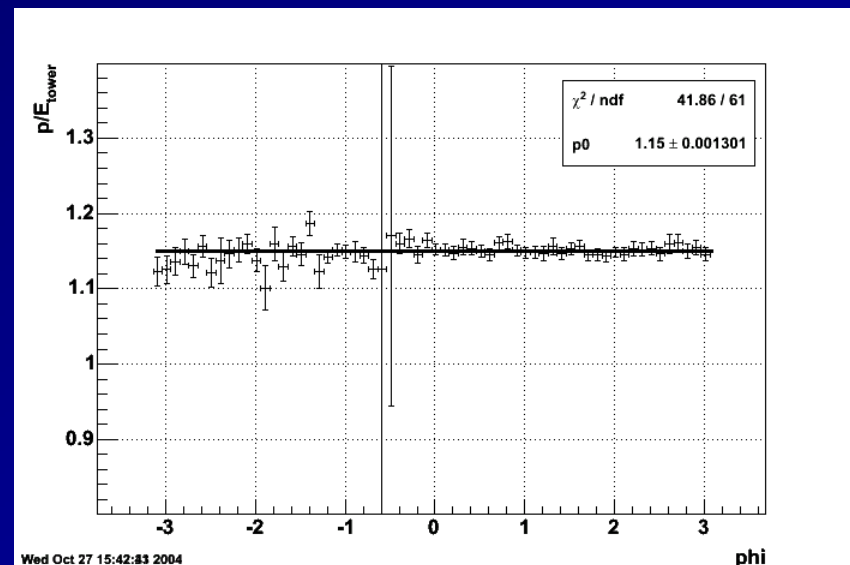
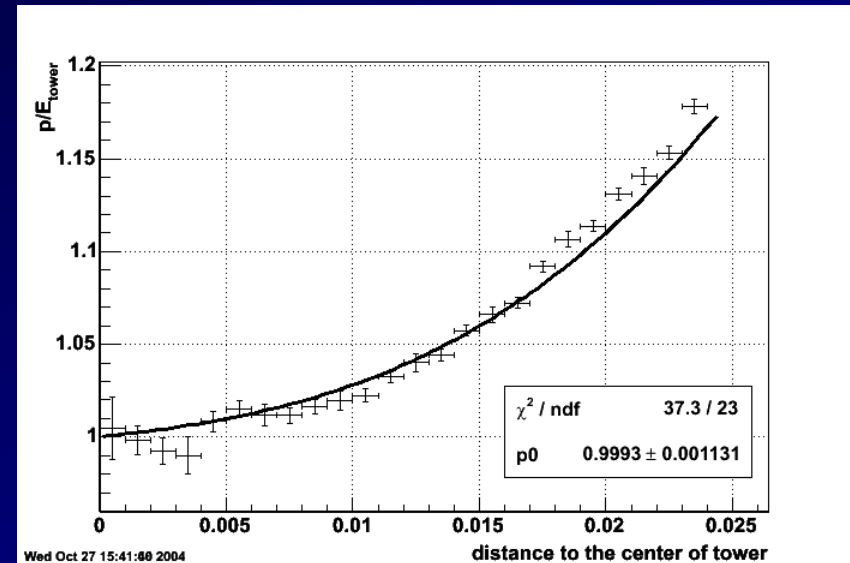


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University of Sao Paulo

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BNL, Feb 2005

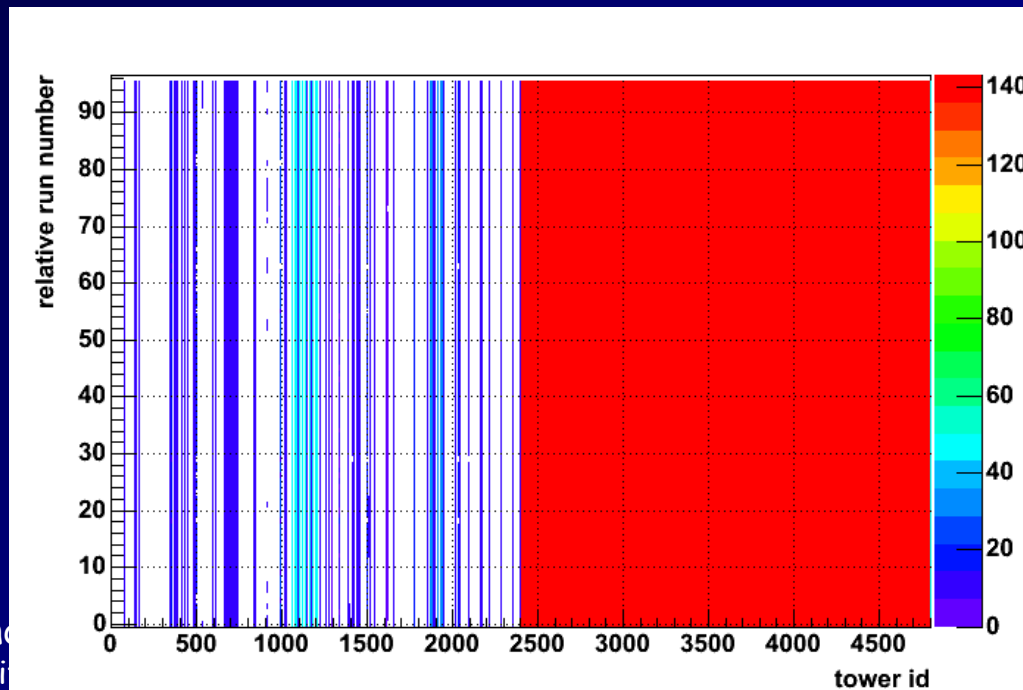
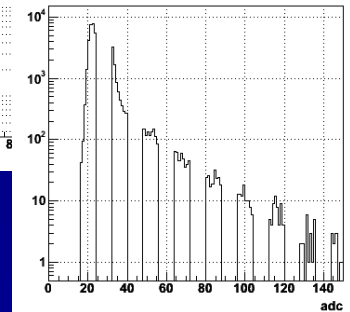
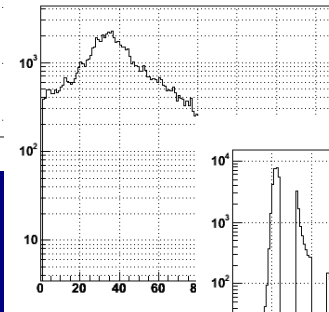
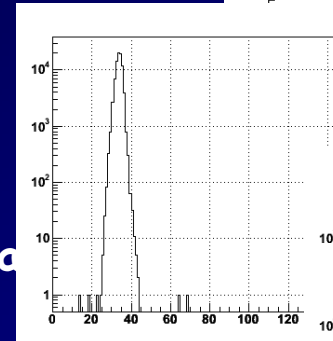
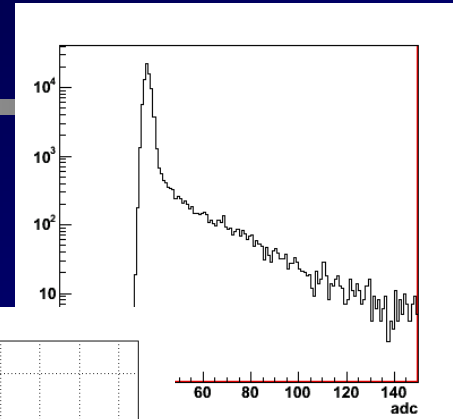
# Electron calibration. Preliminary...

- Electron peak after MIP ( $\eta$  bin) calibration
  - Offset of  $\sim 11\%$
  - Not uniform in  $\phi$  direction
- Use electron peak to correct gain
  - Using DB calibration as start point
  - Not enough statistics to do it tower by tower
    - Do it in  $\eta/\phi$  bins
      - Overall peak position ok
      - Azimuthal uniformity ok
- Need to redo with TbyT MIP



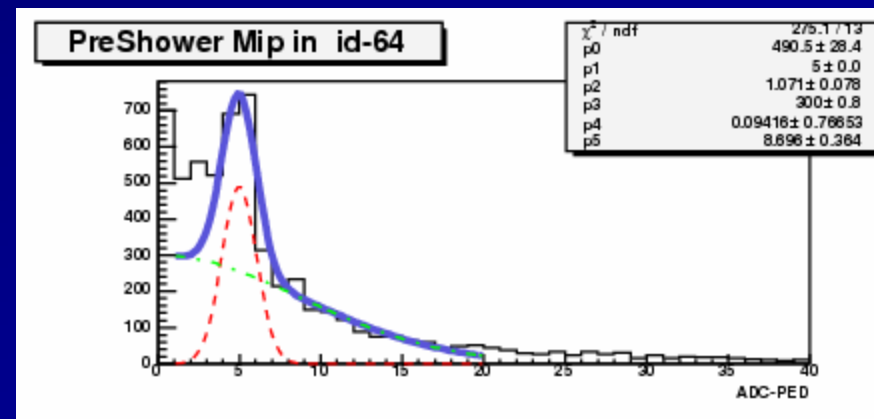
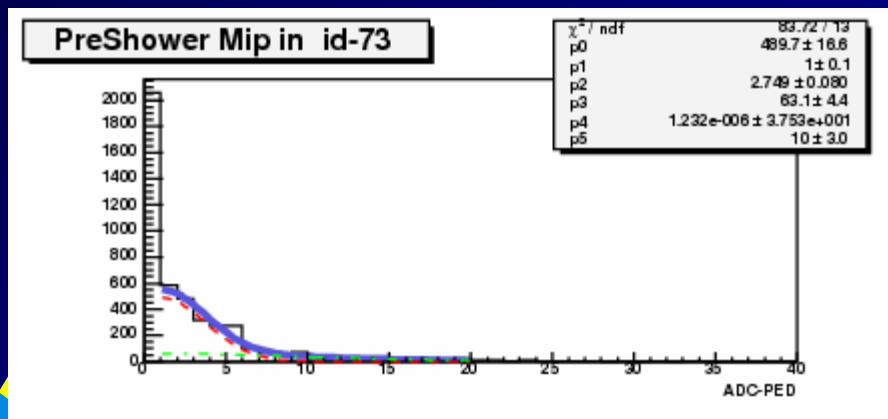
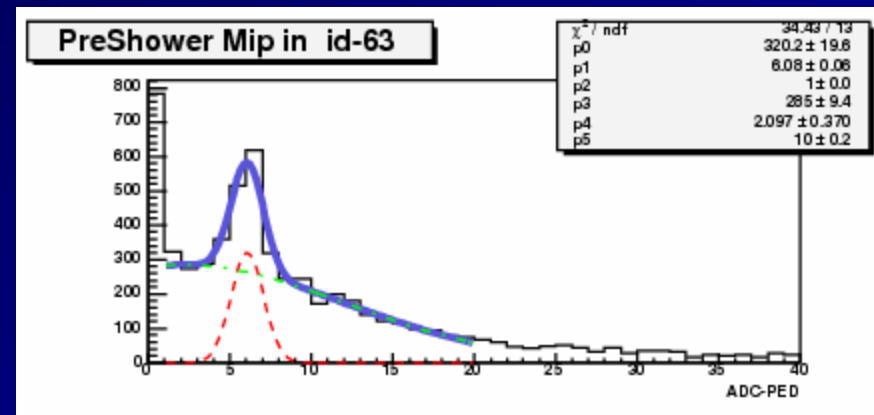
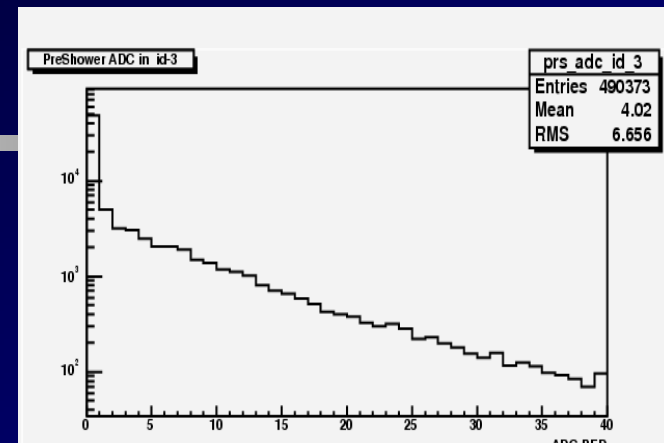
# BTOW status for the 2004 data

- **62 GeV AuAu (Thorsten)**
  - Based on single tower spectra
  - Basically no changes during the run
  - Not yet saved to DB
  - 8.5% of bad towers
- **pp (David)**
  - Basically the same method
  - Need to generate the tables in DB format
- **Expect those tables to be saved after the CM.**



# Pre-shower detector

- **Problem with PSD map**
  - Fixed after detailed review of documentation
- **First look at calibration (Jaro)**
  - MIP method (same as for towers)
  - Most of towers show a nice MIP peak
    - Some do not show
  - Hope to have first round available for tests soon



# Y2005 - calibration

- **High voltage uniformity**

- Calculated using the slopes method

- Dynamic range ~ 21 GeV

- West side only

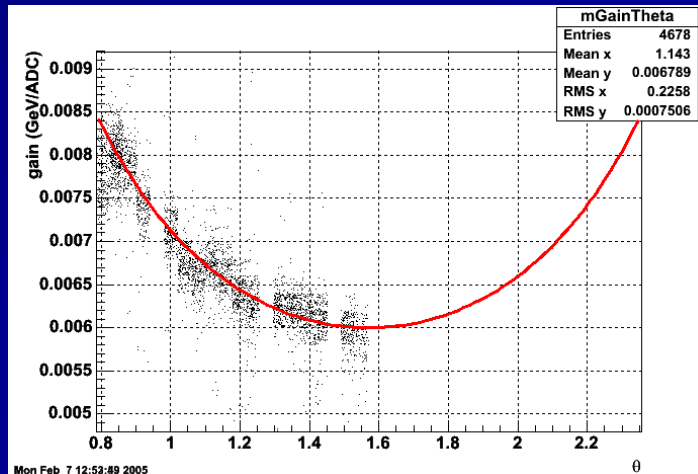
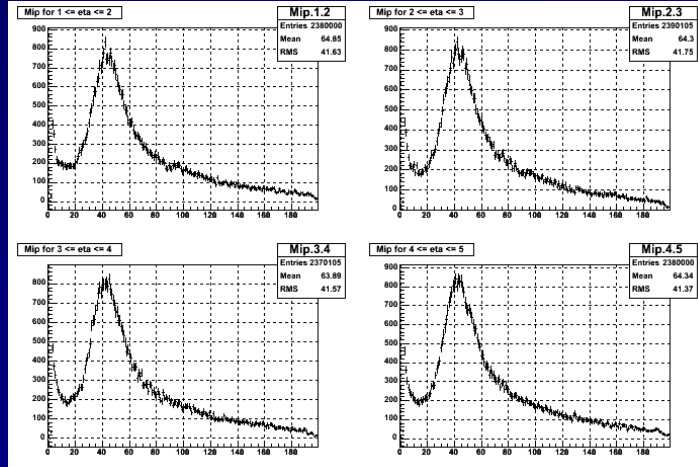
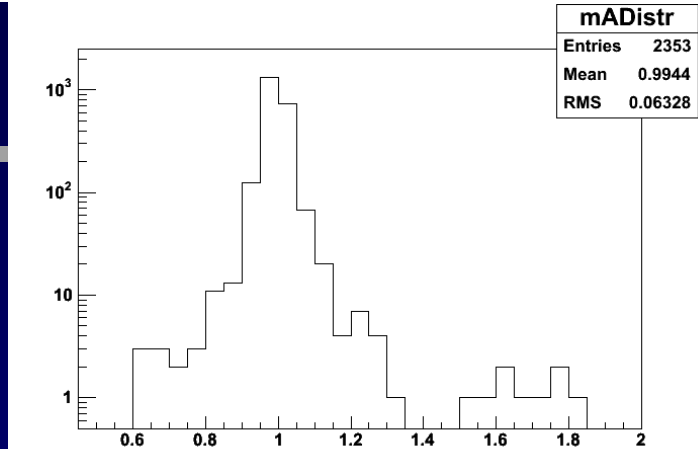
- Electronics in the east side are being installed

- Uniformity (from slopes) ~ 7%

- **MIP calibration**

- Fast offline production

- $ET \sim 0.006 \cdot (ADC - PED)$



# To do list in the next few months

- **Calibrations**
  - Improve 2003 calibration
    - Need to consider other possibilities at high-pT
  - 2004 calibration
    - Mike is being working on that. He has a TbyT MIP calibration in the market
  - SMD calibration
    - Need person to work on it
  - PSD
    - Jaro is working on that. Hope to have test calibration ready soon
- **Status tables and DB**
  - Most of the work has been done for the towers
    - Need to do the same for the SMD
  - Need pedestal tables for 2004 SMD run
- **Software development**
  - Need development in cluster finding and matching
  - Implement muDST in analysis tools (StMuEmcUtil?)





# Conclusion

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- **Software was deeply modified**
  - New ADCtoEMaker
  - Many tools for analysis and DB
- **Calibrations**
  - 2003 calibration needs improvement (high-pT signals)
  - 2004 calibration is improving and will be available for tests soon (Mike's single tower MIP)
  - 2005 pre-calibration in place - starting east side
- **QA of data**
  - All BEMC detectors are working as expected
    - MIP's, electrons, pi0, etc.
  - PSD seems to be working fine after MAP was fixed
- **All BEMC software information in the BEMC web**
  - Page is still growing.



# Where to look for information?

<http://www.star.bnl.gov/STAR/emc>

**Utilities**  
The STAR Barrel Electromagnetic Calorimeter

Home

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

**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 pT0 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 pedestal](#)
  - [Oleksandr Grebenyuk's AuAu pedestal](#)
  - [Marcia de Moura's SMD pedestal](#)
- [2003 d+Au and p+p data](#)
  - [MIP calibration](#)
  - [Electron calibration](#)

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

[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

[GET TIMESTAMP LIST!](#)



# EMC Database Browser

D. Arkhipkin, Y. Zoukarneeva

[http://www.star.bnl.gov/~dmitry/EMC\\_DB1.1/](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: 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
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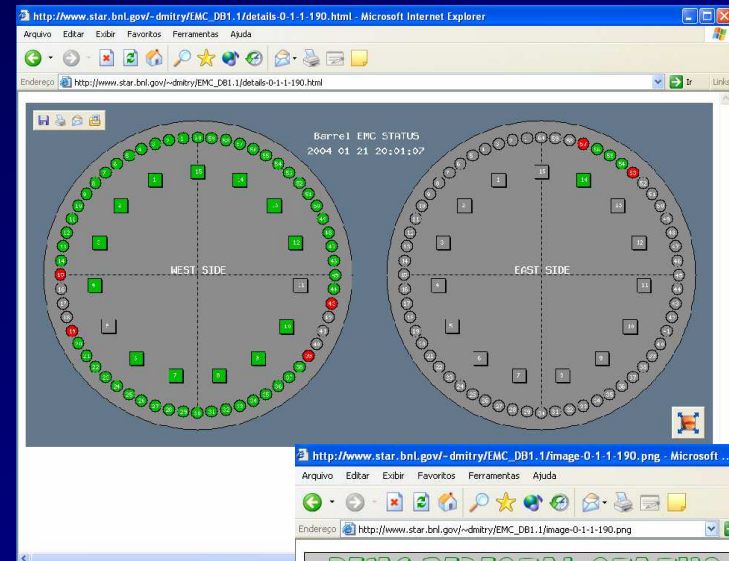
START Date

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

GET TIMESTAMP LIST!



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	

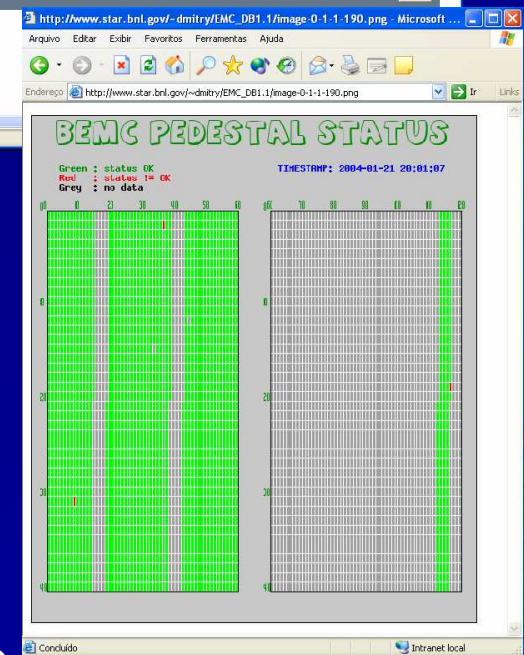
Information

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



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University of Sao Paulo

STAR Collaboration Meeting, Slide 19  
BNL, Feb 2005

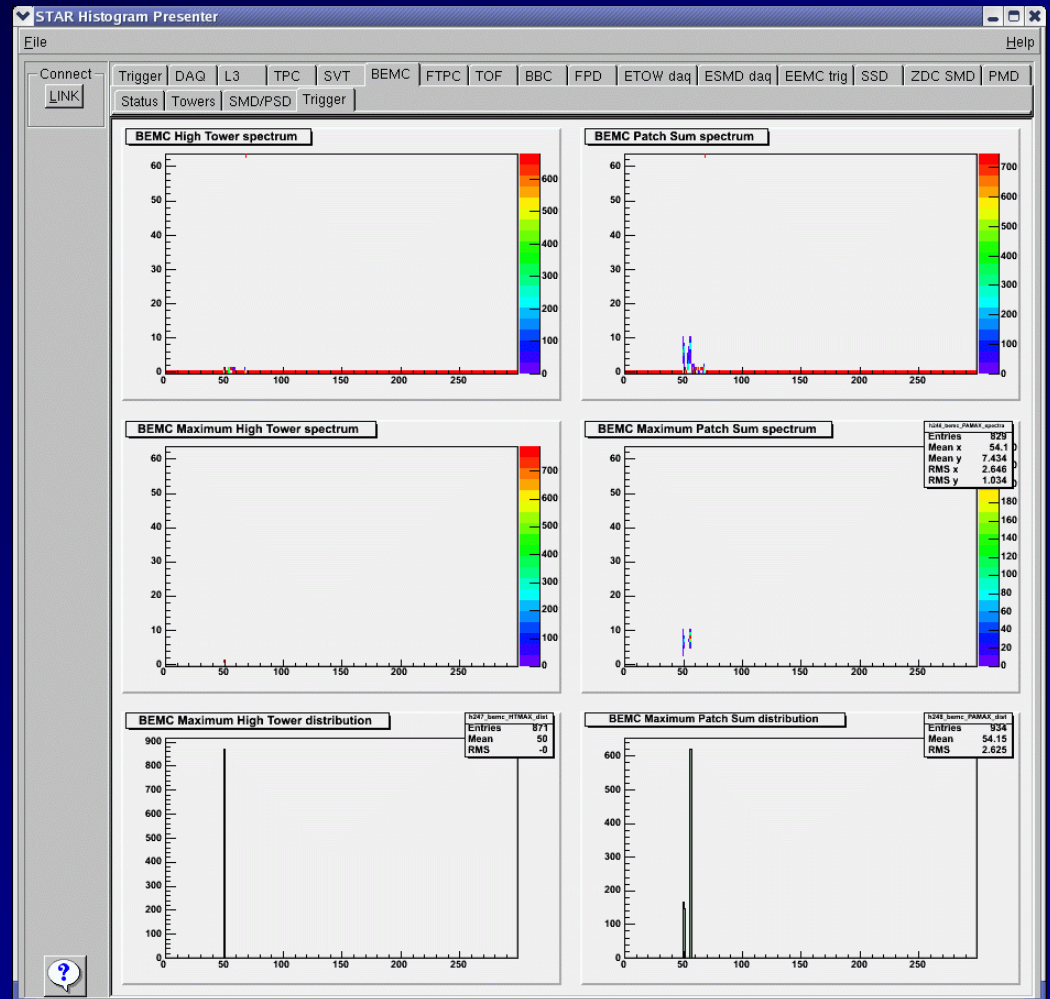
# BEMC Online

- **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

