HEC/FCAL/Combined Testbeam Meeting

Date: Tuesday, 28.1.2003

Place: 40 – SS-C01

Time: 13 : 30 – 17 : 30

A G E N D A

Current Status of HEC+EMEC Testbeam Software	Kanaya	15 m
EMEC/HEC Combined Run: Status of Signal Reconstruction and Calibration	Strizenec	15 m
EMEC and HEC Timing/Calibration in 2002 Testbeam	Menke	20 m
EMEC/HEC Combined Run: First Muon Results	Levitsky	15 m
HEC Xtalk: Comparison of CT-Results with Model	Kurchaninov	25 m

Nice results… ..but will skip..

Naoko: LArHEC+EMEC TestBeam Software

Current Status

- Freezing hectbmon CVS repository (~hectbmon/myCVSROOT) and moving to ATLAS CVS repository since 5.2.0.

Conditions Database for HEC+EMEC TestBeam

- Necessary constant data

Following constant data are required for signal reconstruction of the HEC+EMEC combined TestBeam data.

(1) Pedestal data
(2) Calibration coefficient (ADC to current)
(3) Digital filtering weight parameters
(4) Peaking time difference between cells
(5) Wrap around constant (correct time phase)

→ There might be many different (time-dependent) version, and user have to specify correct data by hand....

Conditions DB is helpful to load correct constant data triggered by run number or time stamp.

Naoko: LArHEC+EMEC TestBeam Software

Conditions Database

Fields contents

Make a common table for MC and any LAr TB data...

(1) Pedestal and rms (separated)

Field	*Type*	*Null*	*Default*
nsamp	*int(11)*		*0*
p1	*float(10,4)*		*0*
. . .			
p<nsamp>	*float(10,4)*		*0*

pi is pedestal or rms for i-th sample

(2) Calibration coefficients

Field	*Type*	*Null*	*Default*
n_ramp	*int(11)*		*0*
flag	*int(11)*		*0*
p1	*float*		*0*
. . .			
p<n_ramp>	*float*		*0*

(3) Digital filtering weight parameters

Field	*Type*	*Null*	*Default*
n_samp	*int(11)*		*0*
n_wpar	*int(11)*		*0*
name	*char(4)*		
p1	*float*		*0*
. . .			
p<X>	*float*		*0*

- **name might be *"amp"* or *"tim"* .**
- **How can we have global (header) information, like first sample no, global time offset ?**

→ **It is not fixed yet..**

Naoko: LArHEC+EMEC TestBeam Software

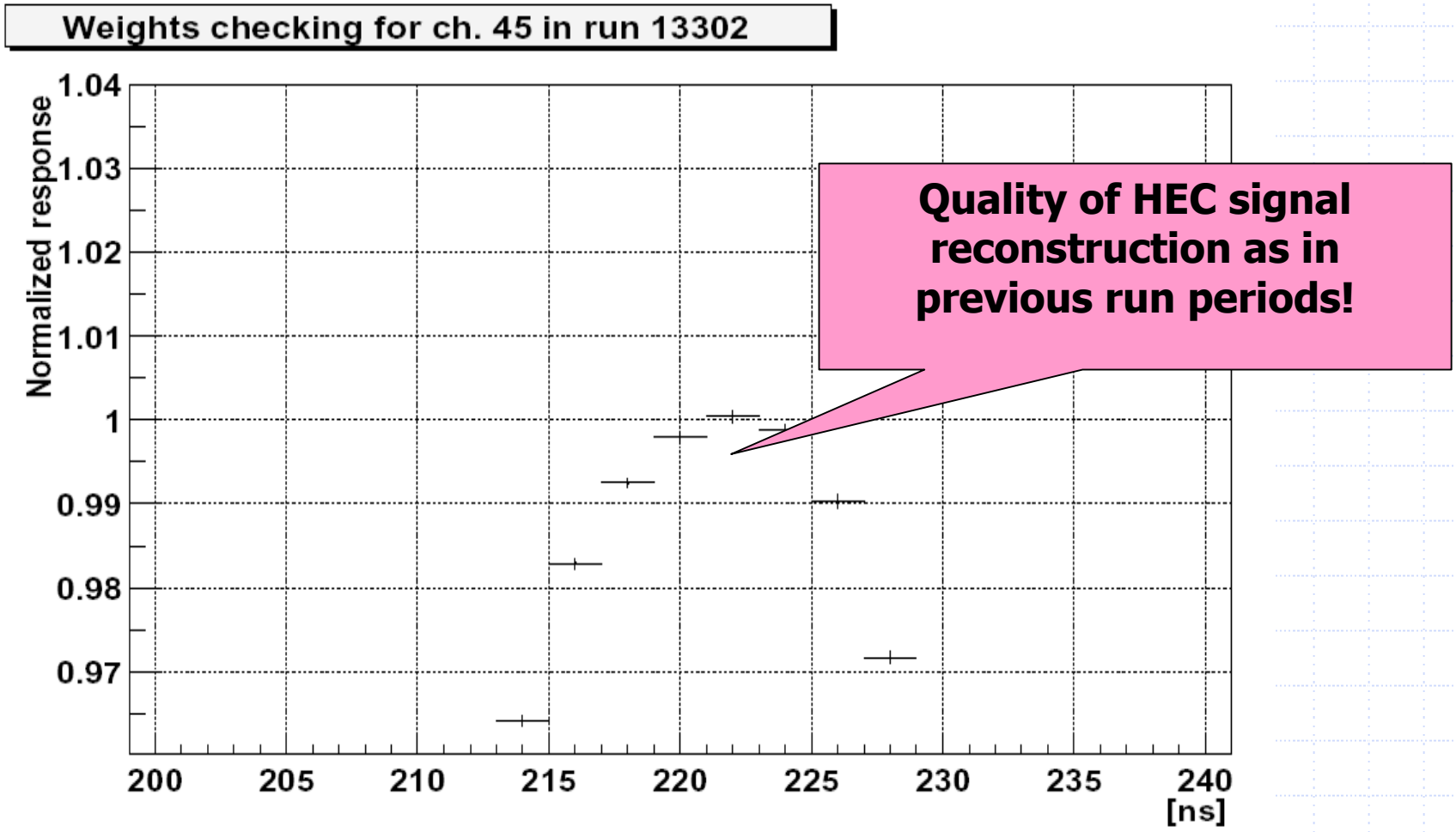
Status of Conditions Database

- Implementation of conditions DB is ongoing.

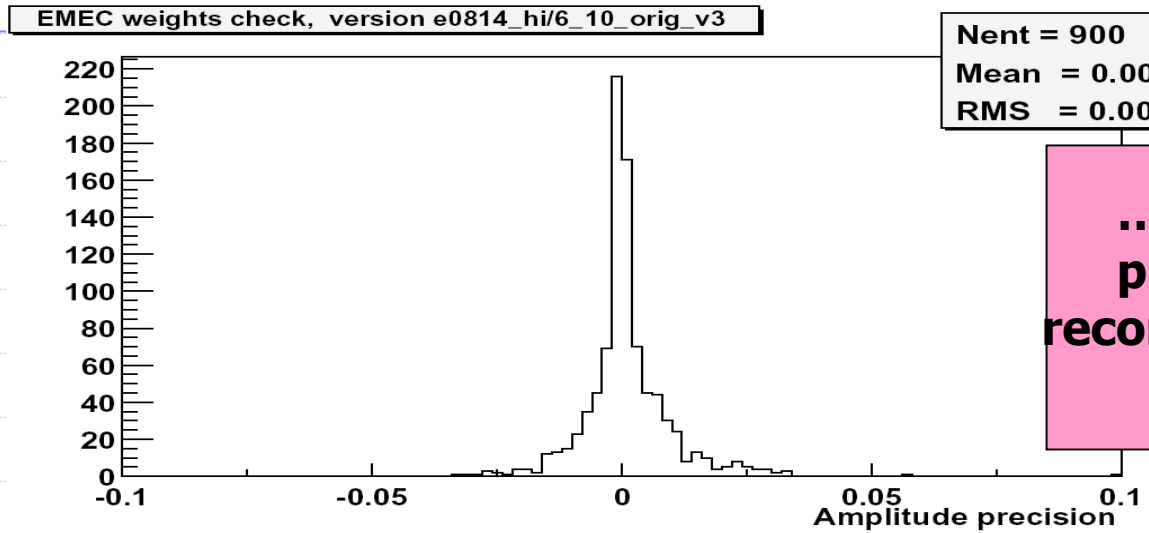
  Host : db1.usatlas.bnl.gov
  Database : atlas_tb_hec, atlas_tb_emec

- Things to do
  - Fix table structure.
  - Database production
    - Software to record data into a table is prepared. (MySQL base, not in Athena framework).
    - A few tables for pedestal were created as trial.
  - Implement usage of conditions DB in LArHECTBAna.
    - It was tested for only pedestal data. (i.e. LArPedestalSubtract sub-Algorithm).

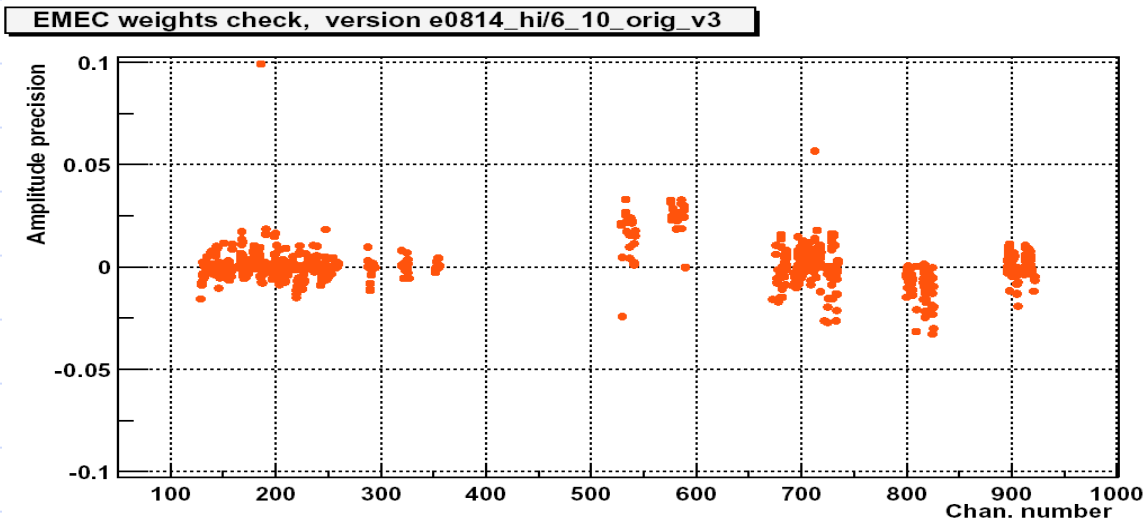
Pavol: Calibration, Signal Reconstruction…..



Pavol: Calibration, Signal Reconstruction…..

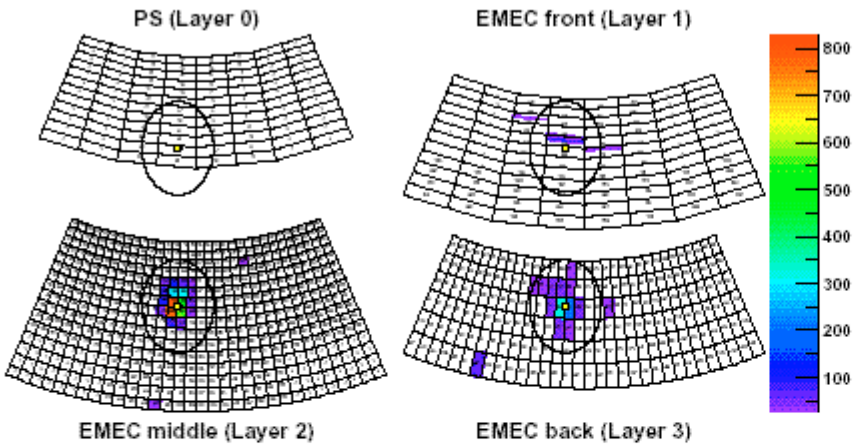


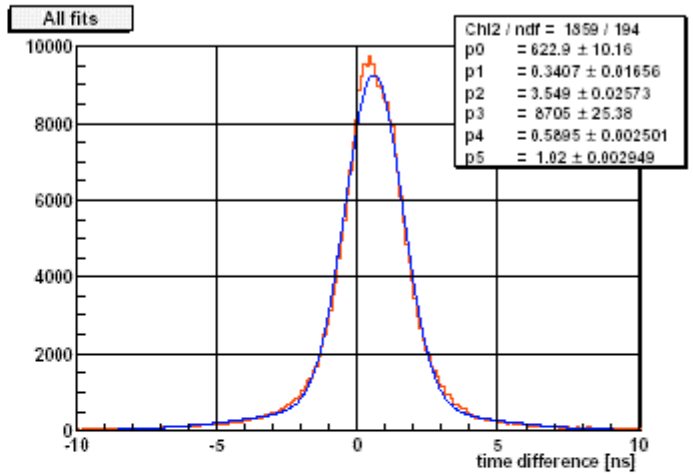
… first EMEC weights: precision of the signal reconstruction at the few % level!



Sven: Global Cubic Time Constants

- Example for used channels in a pion run in the EMEC





- Comparison of Global Cubic Time (excluding most energetic channel) with the Cubic Time of the most energetic channel

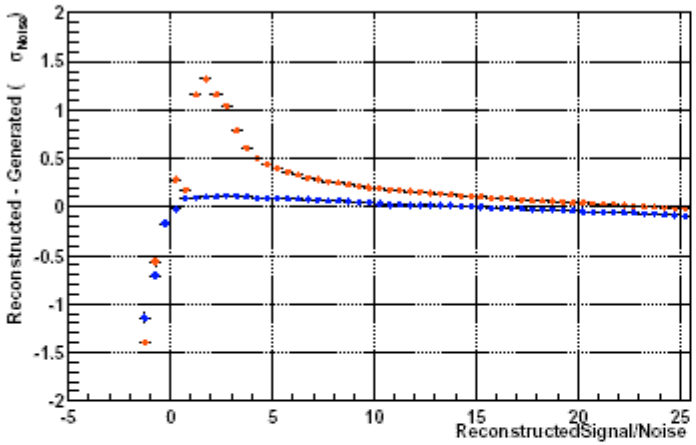
- overall performance of weighted global cubic time $\sim$ 1.5 ns

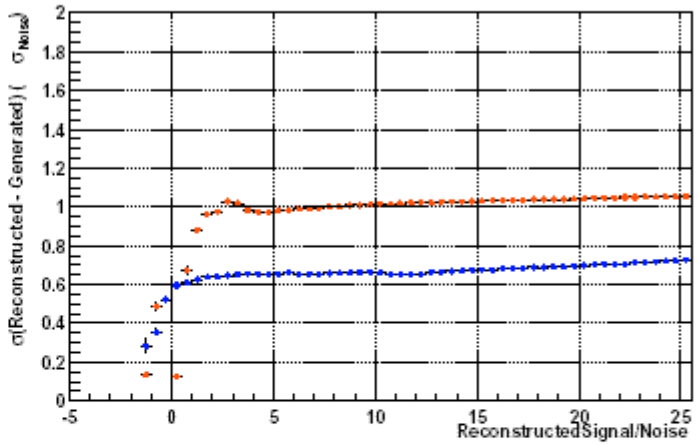
Sven: 'Poor Man's' Digital Filtering

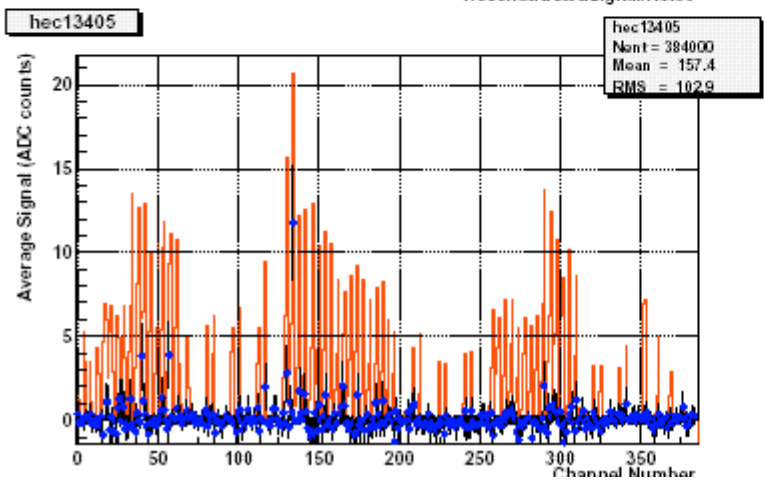
- SimplePolynomial gives (positively) biased results for small signal/noise ratios due to maximum search
- An alternative method should combine the robustness and independence from time information of SimplePolynomial with un-biased signal estimate
- 'Poor Man's' DF:
  - energy from sum of 5 samples with same weight $1/2.6$
  - EMEC and HEC ranges are fixed
  - time from 1st moment instead of 0th moment

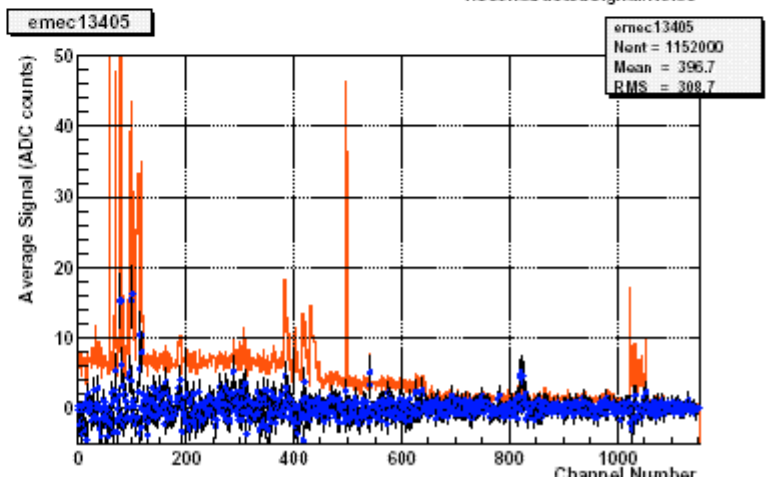
Sven: 'Poor Man's' Digital Filtering

- comparison plots for SimplePolynomial (red) and 'Poor Man's DF' (blue)



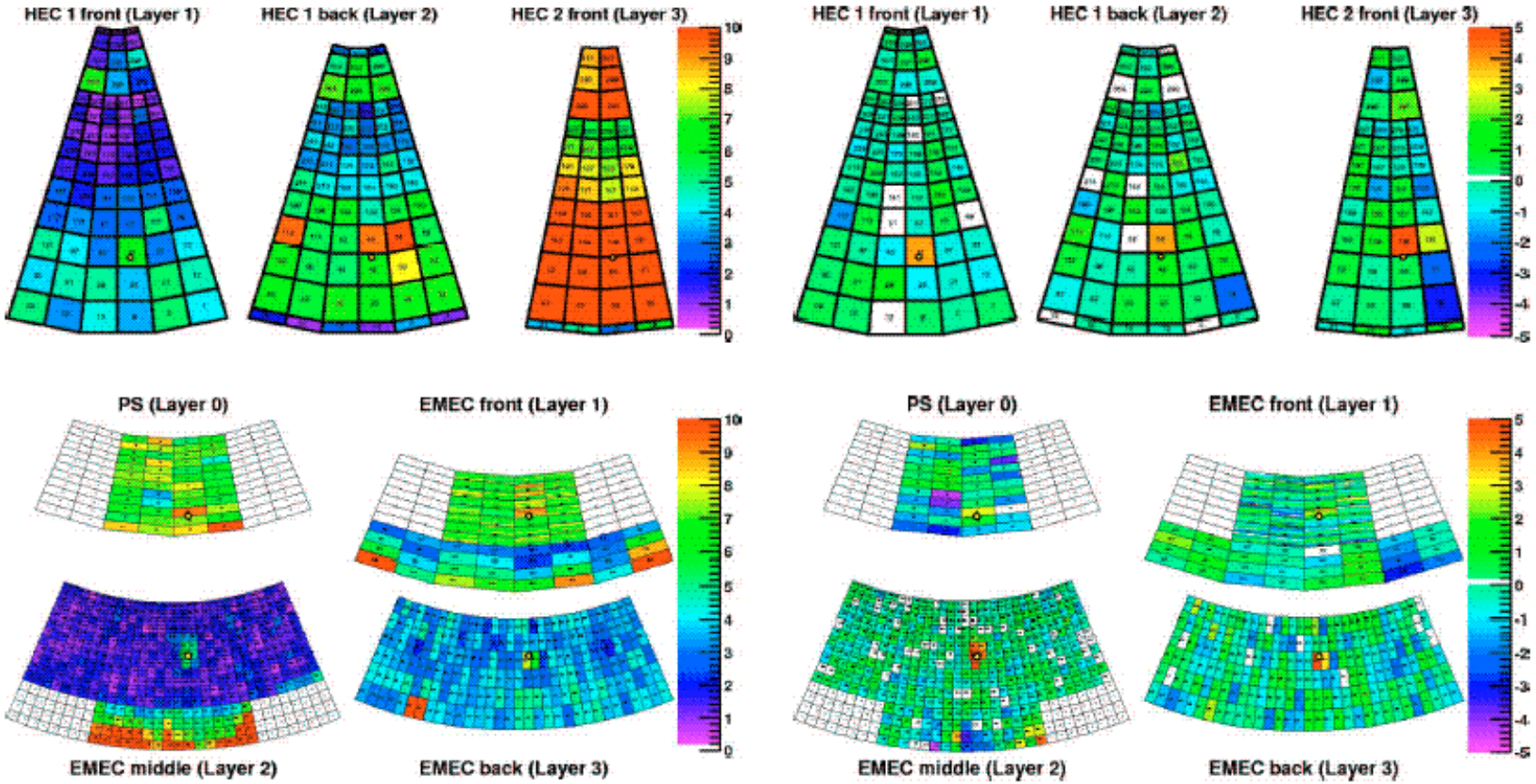






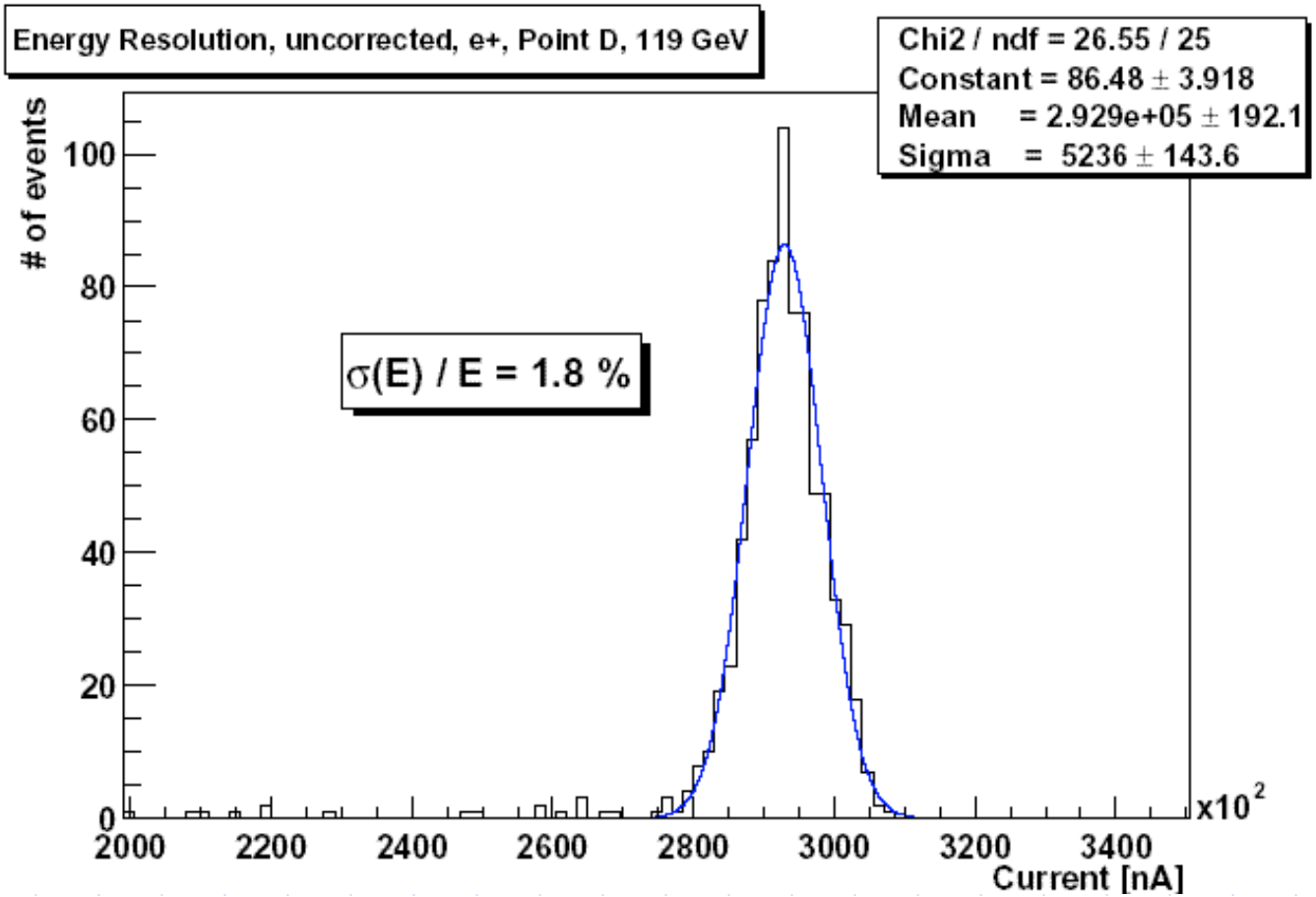
Sven: 'Poor Man's' Digital Filtering

- 2d example from a muon run; left: old; right: new



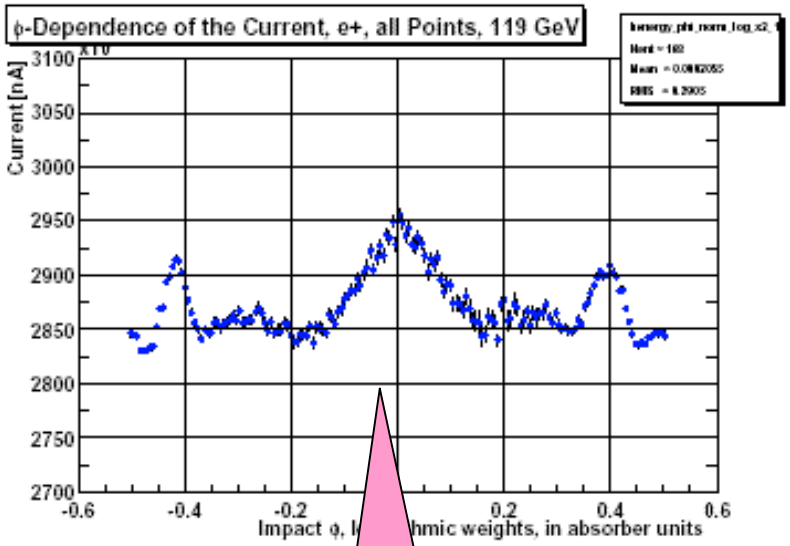
Sven: Performance: where are we, in particular EMEC ?

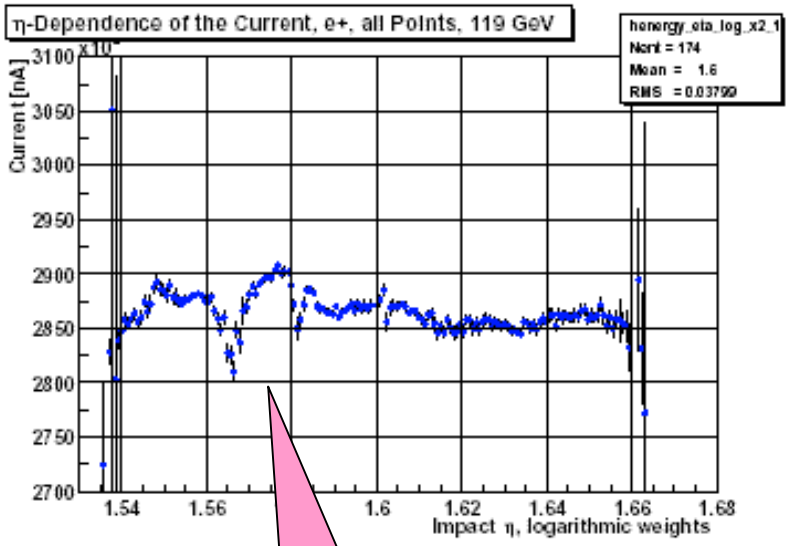
- look at EMEC with 119 GeV positrons
- with Global Cubic Time, T_0's, DF
- and calibration from Pavol



Sven: Performance: where are we, in particular EMEC ?

- plot total energy vs. ϕ or η



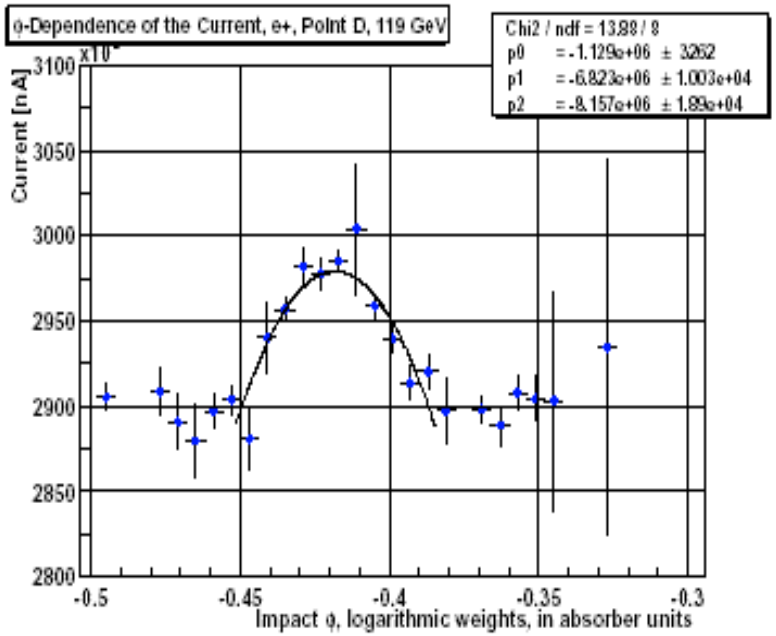


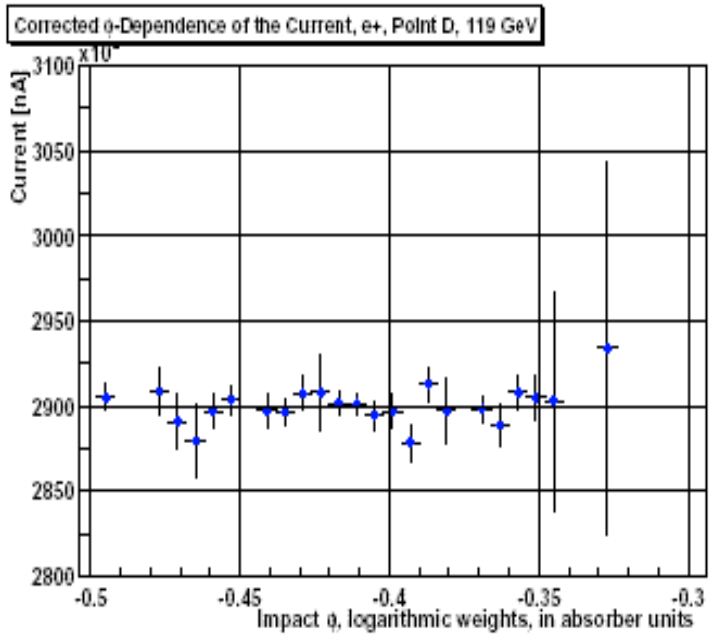
… well known…

… ??? …

Sven: Performance: where are we, in particular EMEC ?

- simple parabolic correction at point D for first estimate of improvement





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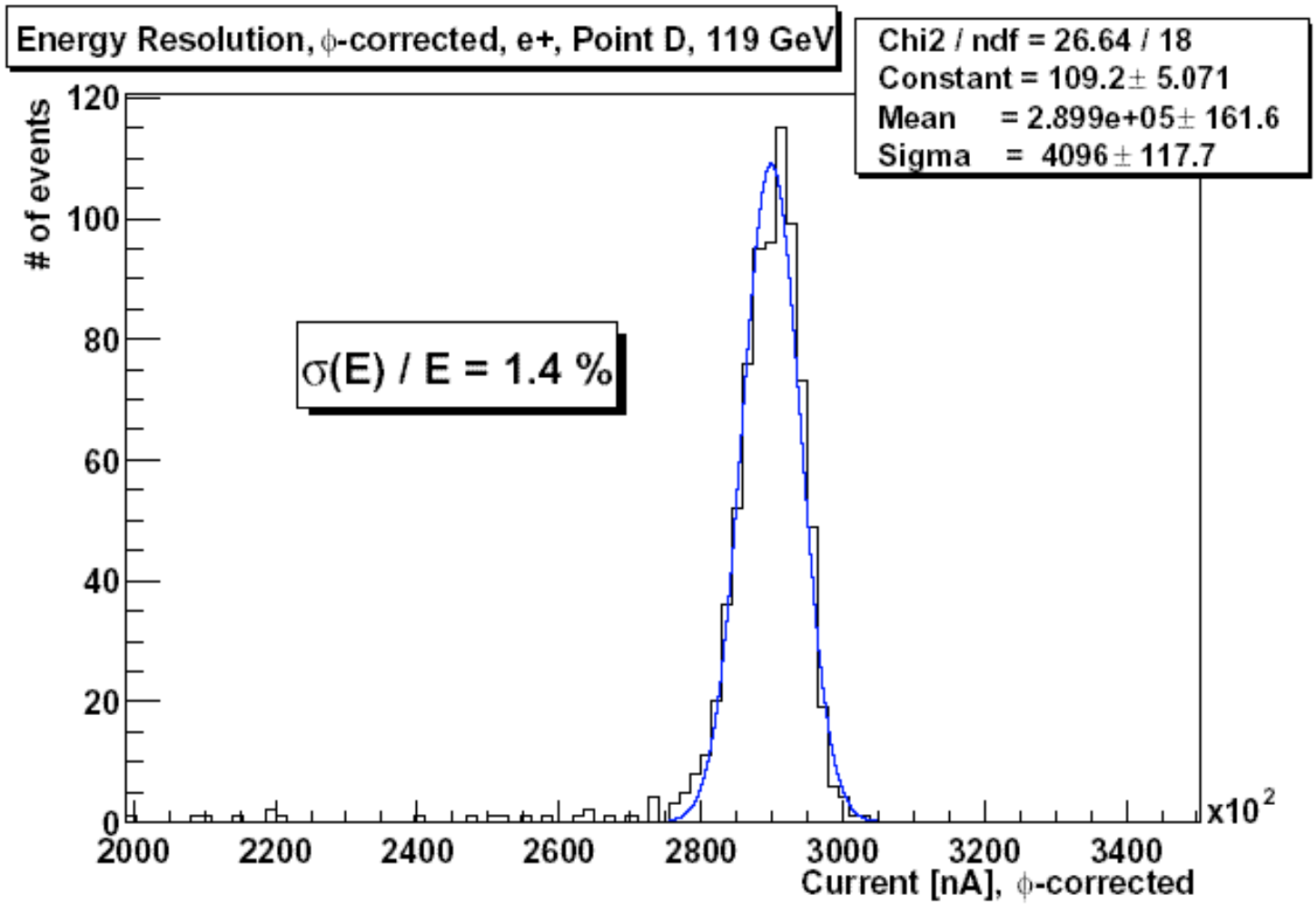
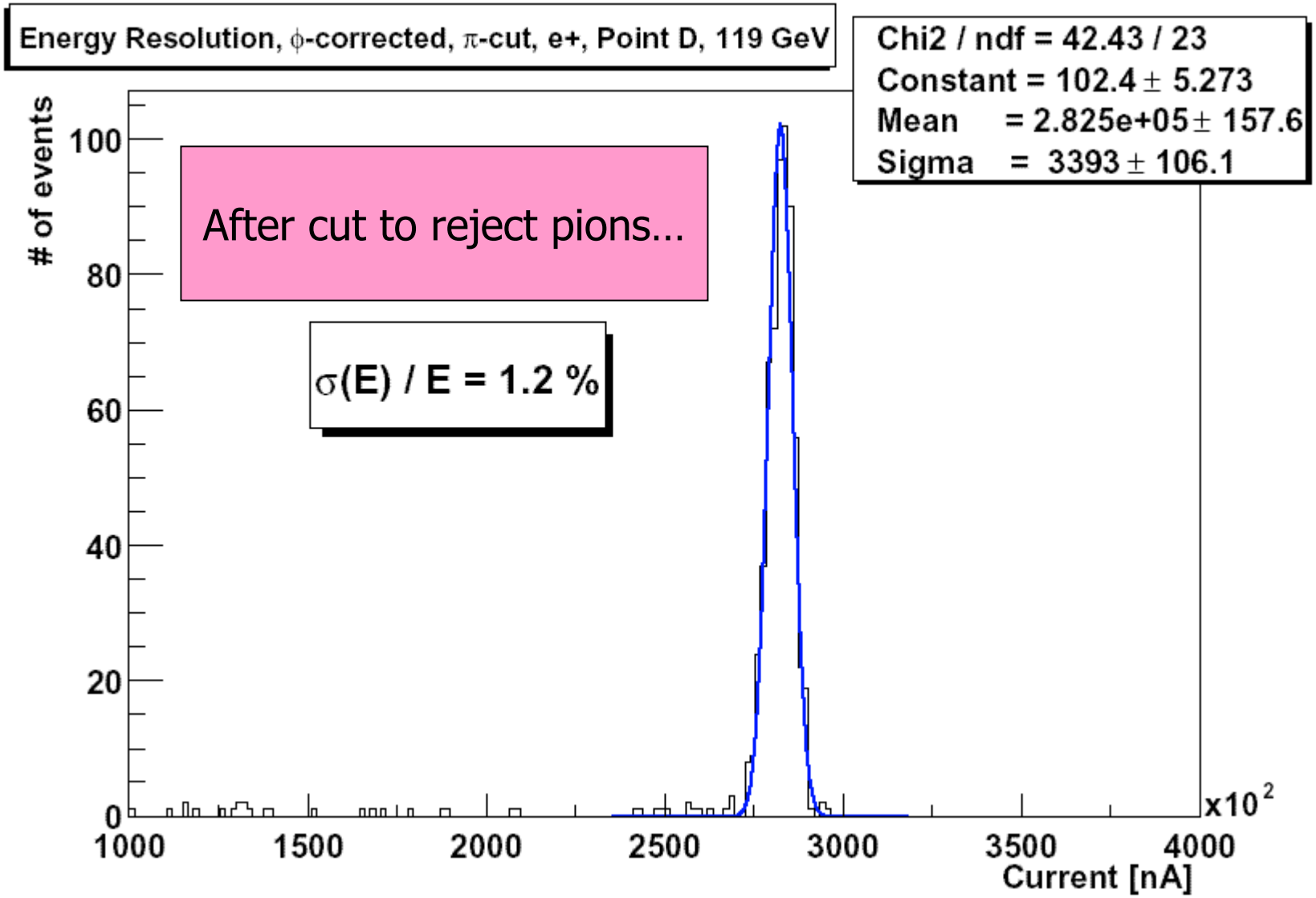


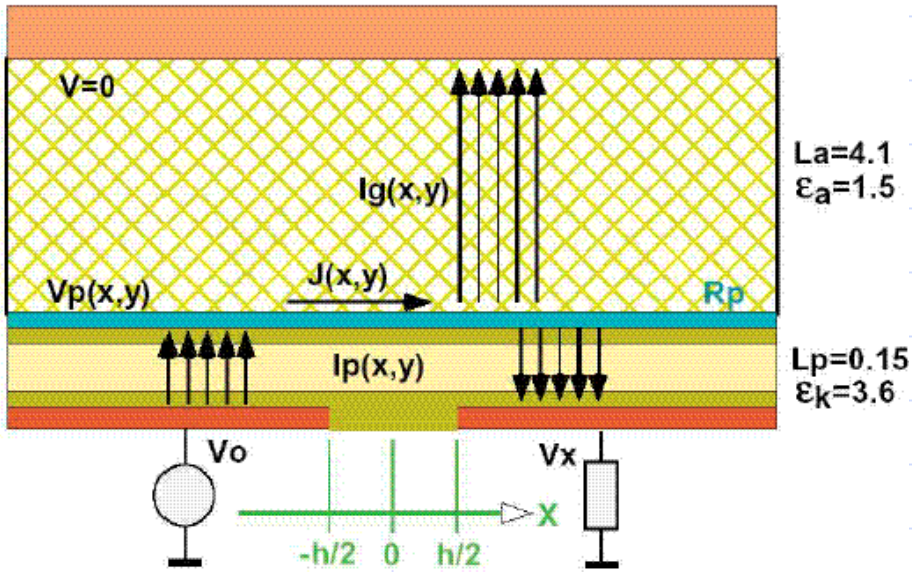
Sven: Performance: where are we, in particular EMEC ?

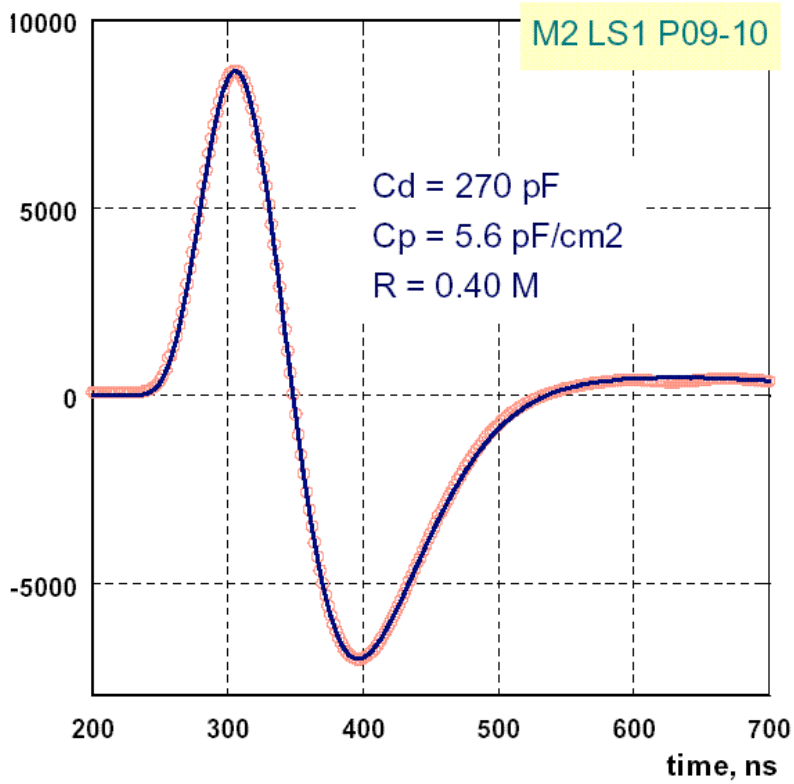


EMEC/HEC Combined run: where do we stand?

- Signal reconstruction for EMEC (and HEC) looks OK for a first round of data analysis
- Calibration and digital filtering constants available
- Timing is understood, various options (TDC, cubic fit..) available
- MWPC alignment: yet to be done (required for muon analysis)
- Understand effects related to cluster size, dead material corrections (presampler), background rejection……

Leonid: HEC Xtalk model – Cold test measurements….





Model OK, but strange parameters!

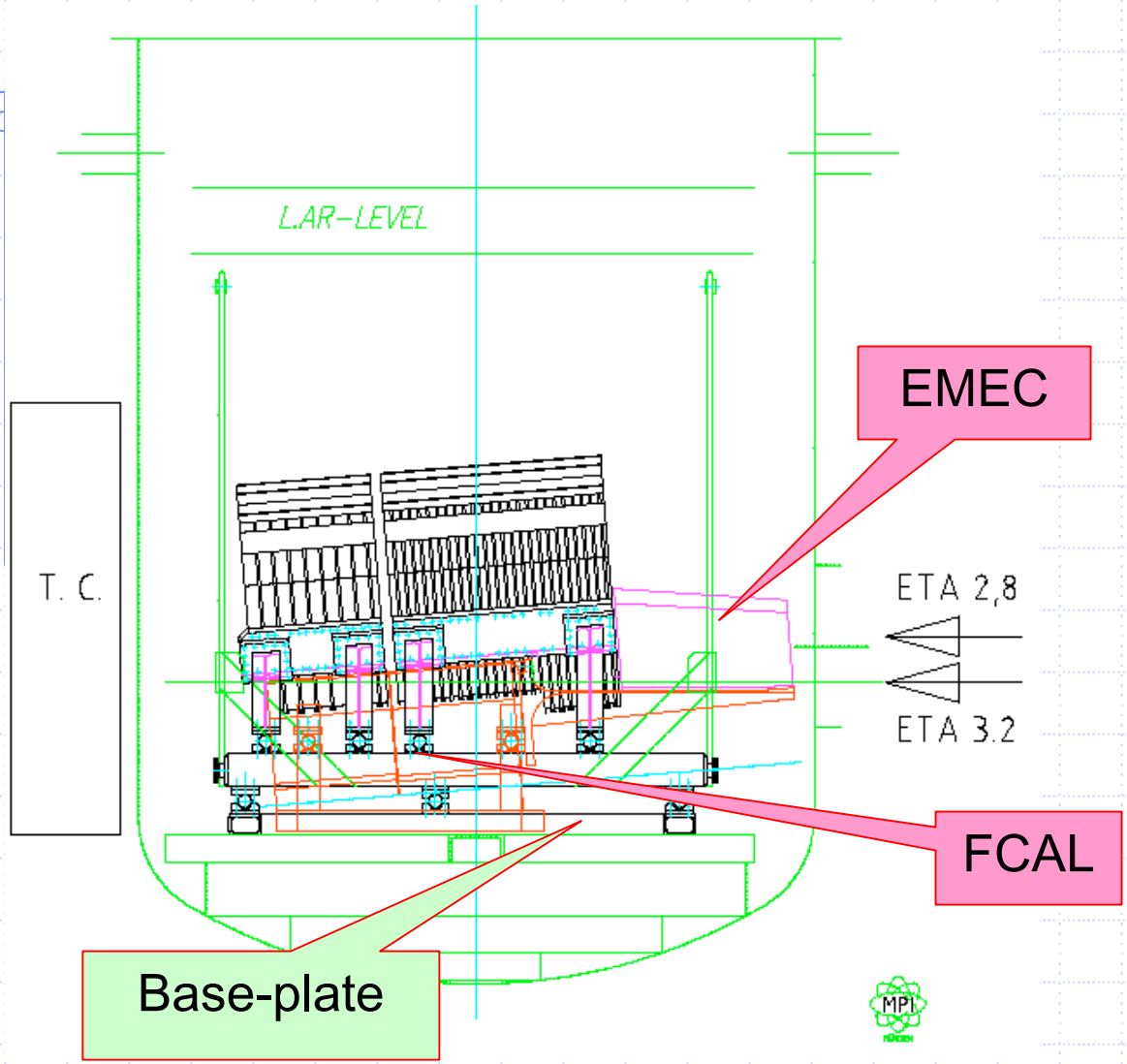
Cp should be smaller

Cd ~ 30% higher

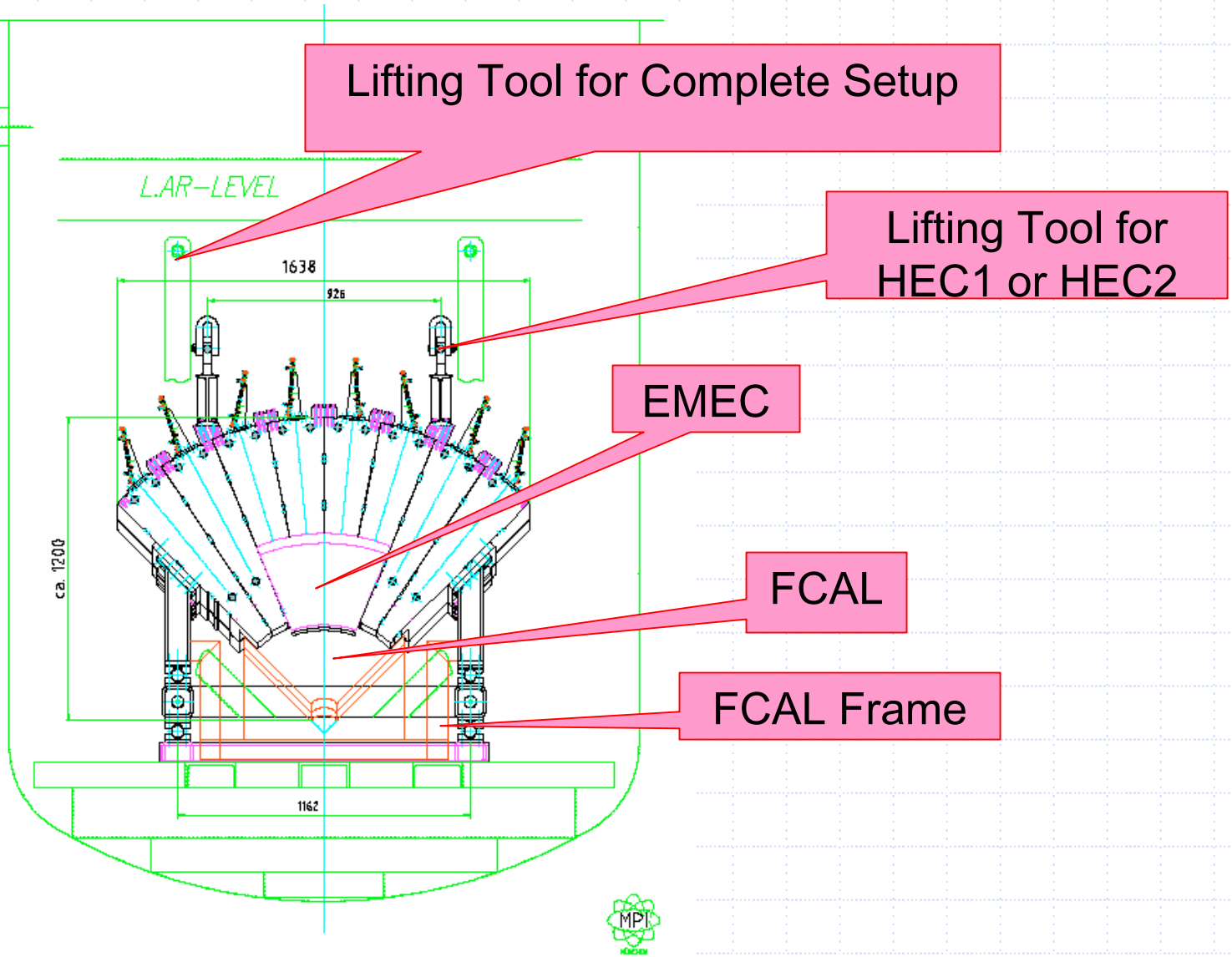
R is ~ twice reduced

$$X \equiv X1 \cdot X2 = Ic1 \cdot Ic2 \cdot \left(\frac{Zp1 \cdot Zp2}{Zp1 + Zp2 + Zx} \right)^2 \cdot H1(s) \cdot H2(s)$$

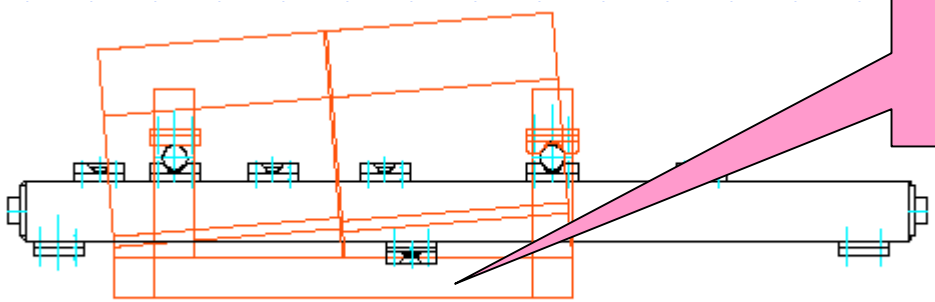
Setup for ?=3.2 Beam Test



Setup for ?=3.2 Beam Test

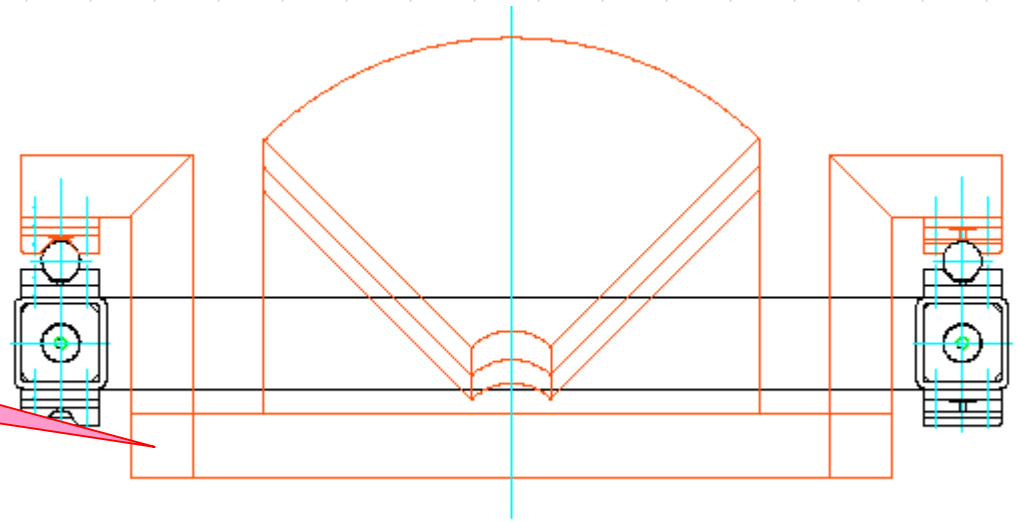


Setup for ?=3.2 Beam Test: **FCAL**



New Modification!
FCAL-support: will be tilted by 4.668° !!

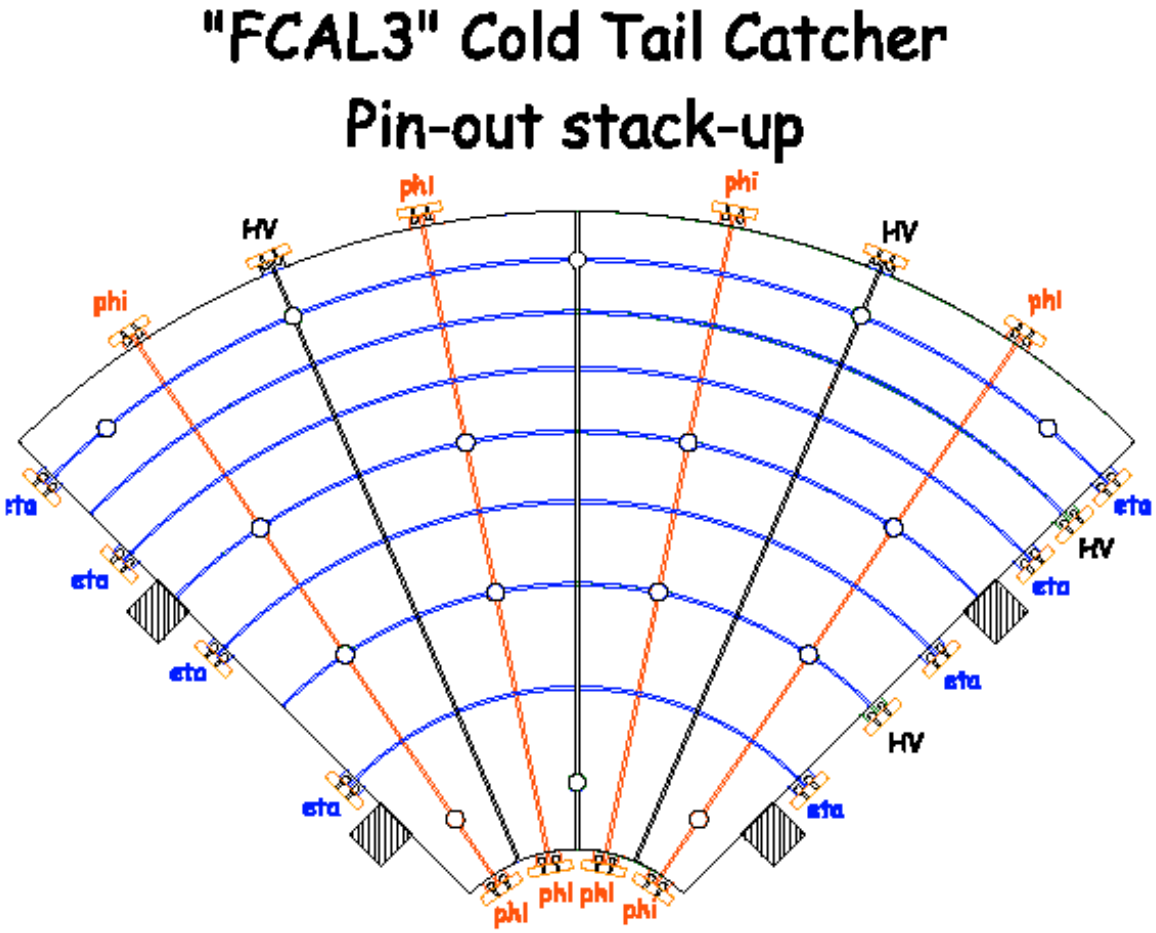
FCAL Frame

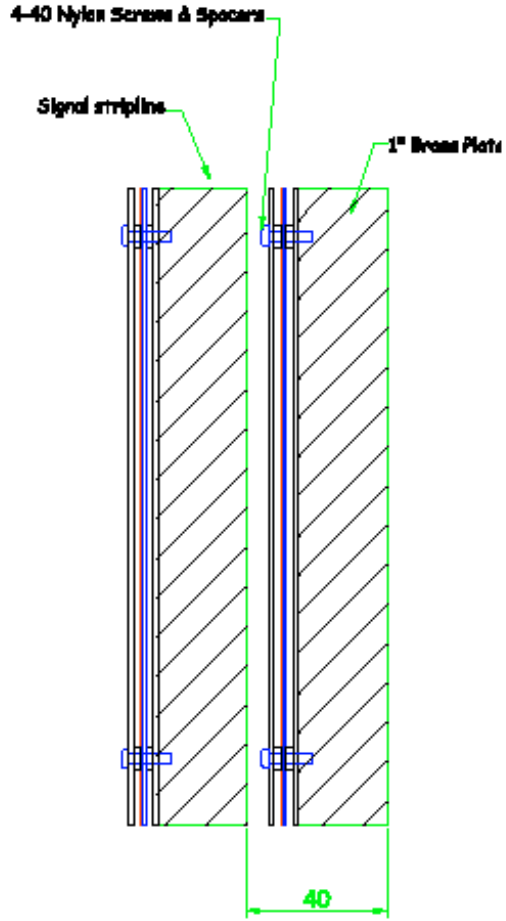


EMEC/HEC/FCAL Combined Run 2004: Cold TC - FCAL

- 'poor man's' FCAL3 ….. use simple, robust (and cheap) technology…
- Parallel plate geometry, 8 copper absorber plates (25 mm)
- G10 readout boards (signal and HV) , 'active gap' (2 mm) mounted onto absorber plate, 2 longitudinal segments, 16+16=32 channels, 4 HV lines

EMEC/HEC/FCAL Combined Run 2004: Cold TC - FCAL





EMEC/HEC/FCAL Combined Run 2004: Warm TC (Sergej Denisov - Protvino)

- size about 1.2 x 1.2 m², 4 layers of Fe absorber (10 cm)
- 6 layers of scintillator, x or y segmented (20 cm)
- Each scintillator read out by 2 PMT's, about 10% homogeneity of response
- Scintillator to be recovered from FCAL run (July 03) plus 1-2 layers from Protvino
- PMT's available in Protvino (e.g. 12+12+6+6+6+6=48)
- Engineering design, absorber structure, assembly in Protvino

EMEC/HEC FCAL Combined Run 2004 – Read-out and DAQ

- HEC: 4 FEB's ? 0.5 ROD MB
- FCAL: 320 channels + CTC (32) ? 3 FEB's ? 0.375 ROD MB
- EMEC: 112 channels (56 middle/56 back) ? 1 FEB ? 0.125 ROD MB
- Warm Tail catcher read-out: ADC system with 48 channels
- HV: HEC: 96 ? 48 channels
  EMEC: 8 channels (+ presampler…)
  FCAL: 20 + 4 (CTC) channels
  WTC: 48 channels
- LV: ? 24 PSB's ? 2 FEC-LV-boards, 2 LV-Control boards, 1 LV power board, warm cables+pigtails available (3 pigtails)

  FEC: ? new PS
- Cabling: FCAL is ordering 5 pigtails, HEC 2 additional pigtails