SHMS Calorimeter Status

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EXPLORING THE NATURE OF MATTER

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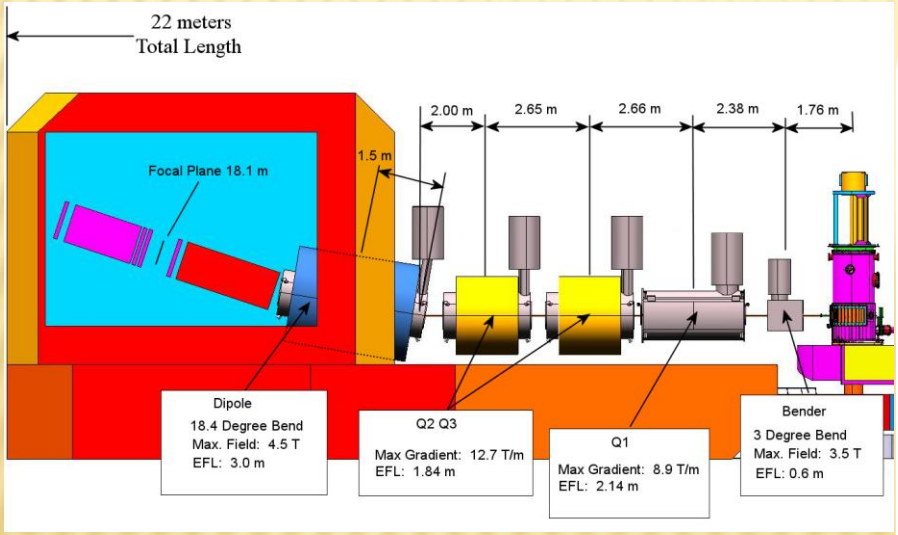
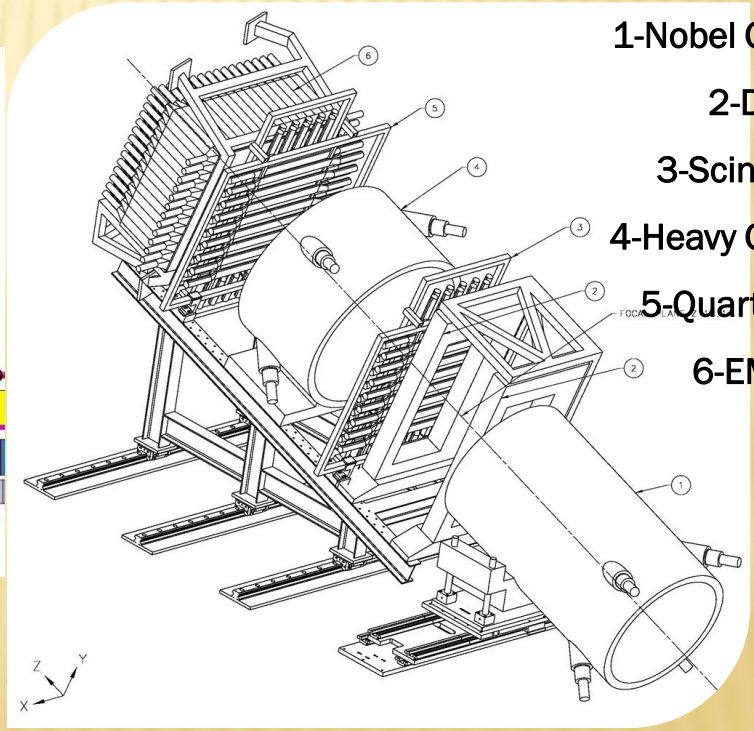
SHMS spectrometer overview

SHMS Spectrometer will operate at small angles and high energies.

Central momentum: 2-11GeV/C
Momentum Acceptance: -10%, +22%
Scattering Angle: 5.5-40 °
Solid Angle: 4.0msr





1-Nobel Gas Cerenkov

2-Drift Chamber

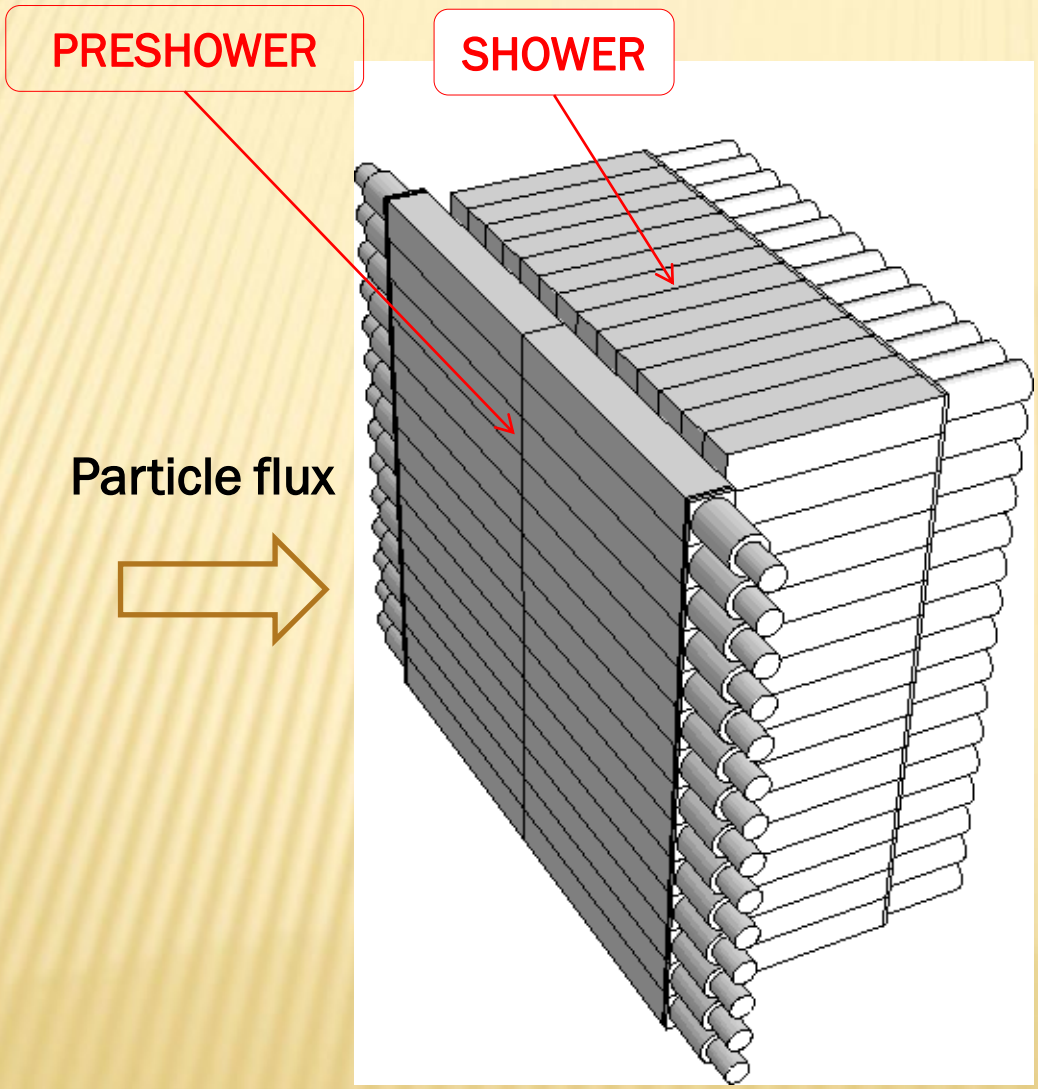
3-Scint. Hodoscope

4-Heavy Gas Cerenkov

5-Quartz Hodoscope

6-EM calorimeter

Design construction of SHMS calorimeter



CALORIMETER:

Number of channels	252
Effective Area (cm^2)	116×134
Thickness (Rad.L.)	21.6

PRESHOWER:

Number of blocks	28
Blocks & PMTs from	SOS
Block size (cm^3)	10×10×70
Lead Glass type	TF-1
Thickness (Rad.L.)	3.6

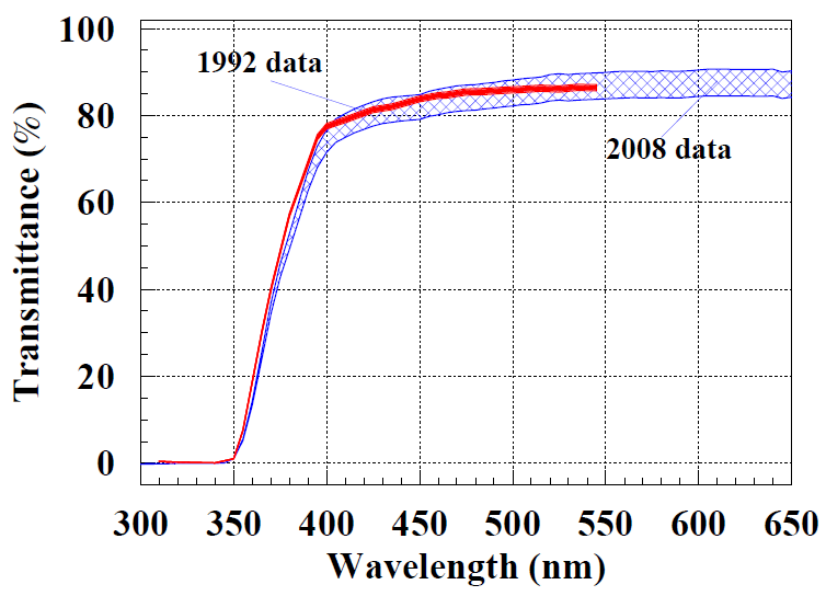
SHOWER:

Number of blocks	224
Modules from	HERMES
Block size (cm^3)	9×9×50
Lead Glass type	F-101
Thickness (Rad.L.)	18.0

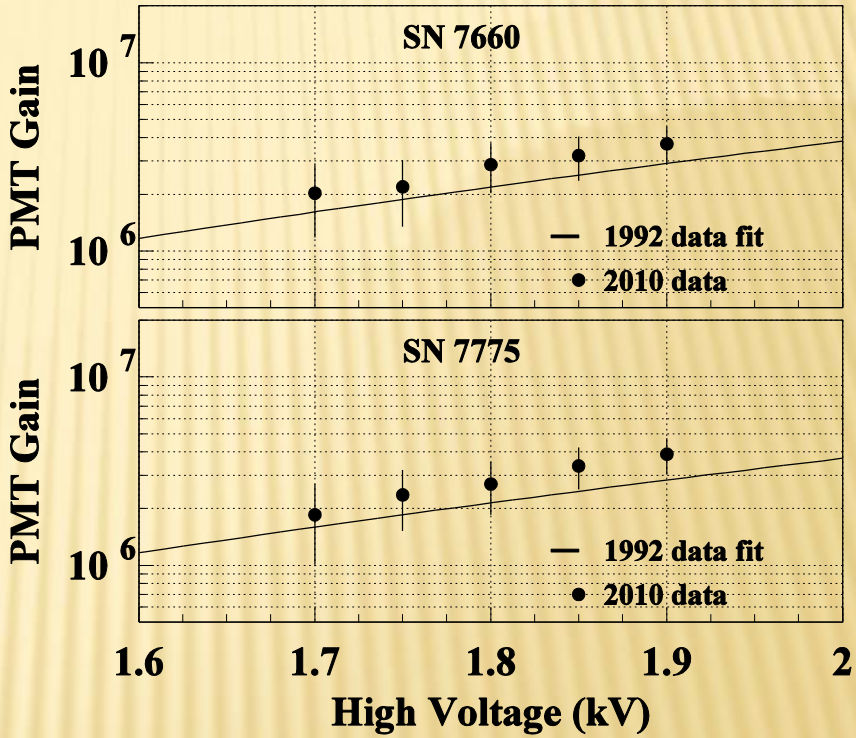
Radiators:

TF-1 Rad.L.(cm)	2.74
F-101 Rad.L.(cm)	2.78
Density (g/cm^3)	3.86
Refractive Index	1.65

Pre-assembly studies of PRESHOWER

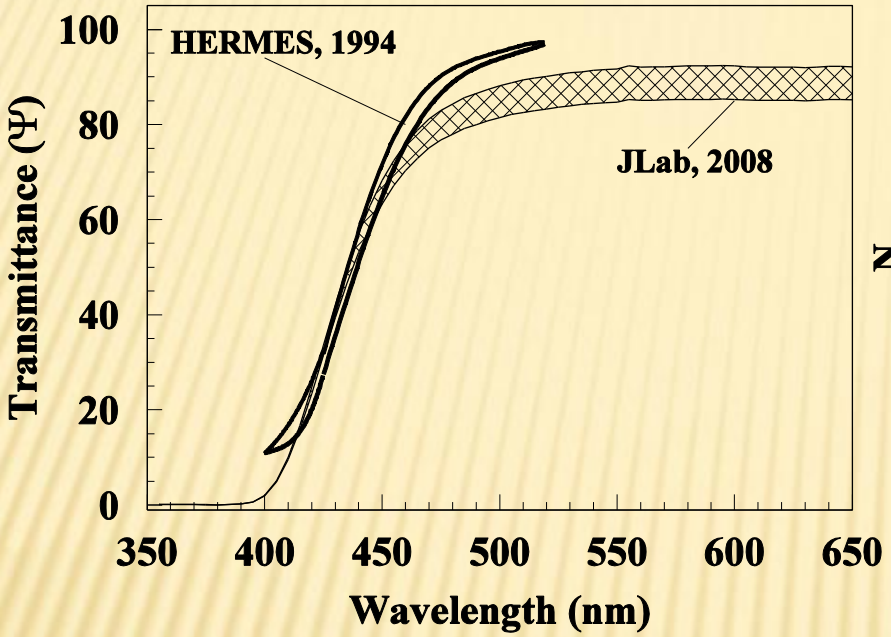


Light transmittance of TF-1 lead glass blocks, before and after use in SOS calorimeter. Signs of marginal degradation from radiation.

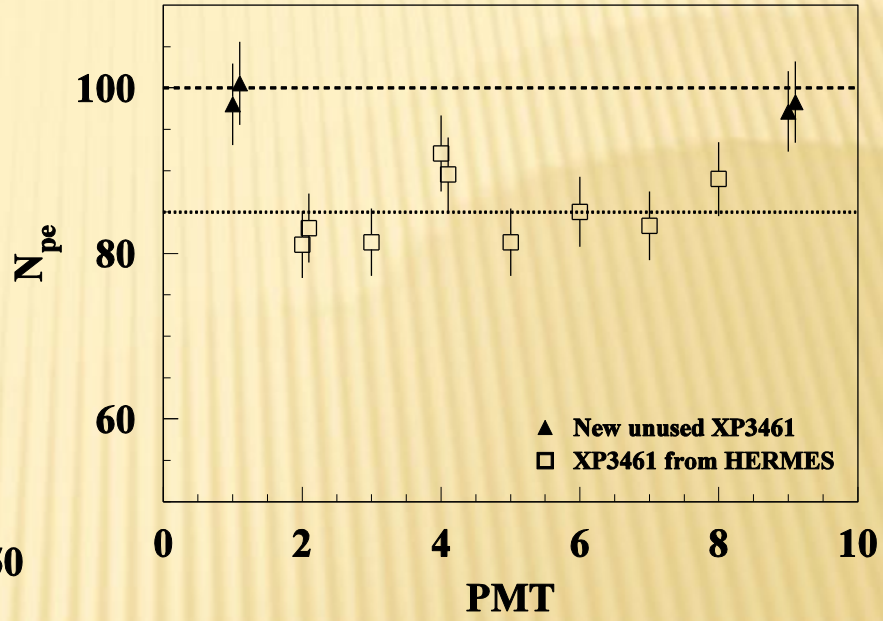


Gain measurement of XP3462B PMTS, before and after use in SOS calorimeter. No deterioration was detected.

Pre-assembly studies of SHOWER

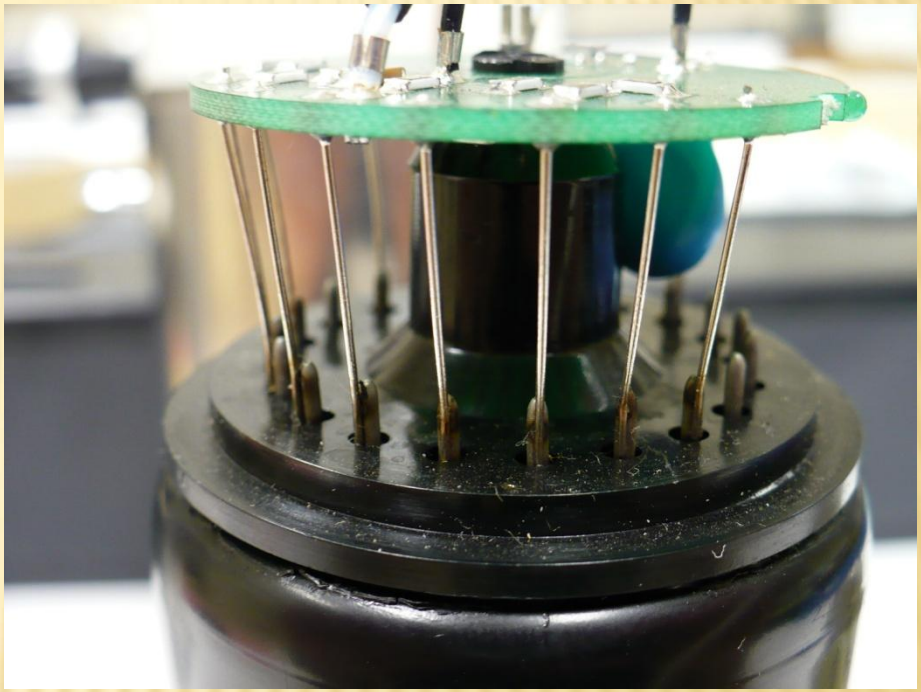


Light transmittance test for HERMES F-101 lead glass blocks. The difference between 1994 and 2008 is due to different measuring setup.



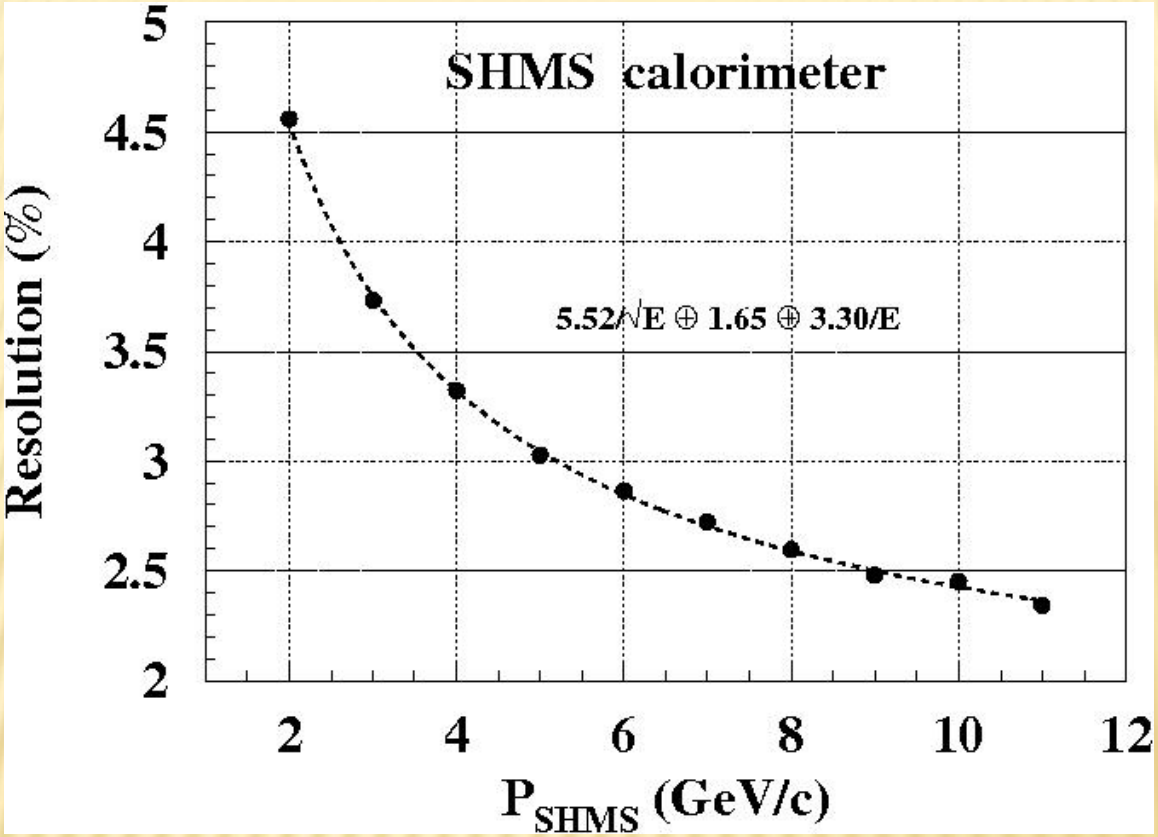
Relative quantum efficiency tests of XP3461 PMTs from HEREMES. A 15% (marginal) degradation was detected.

Pre-assembly studies of SHOWER



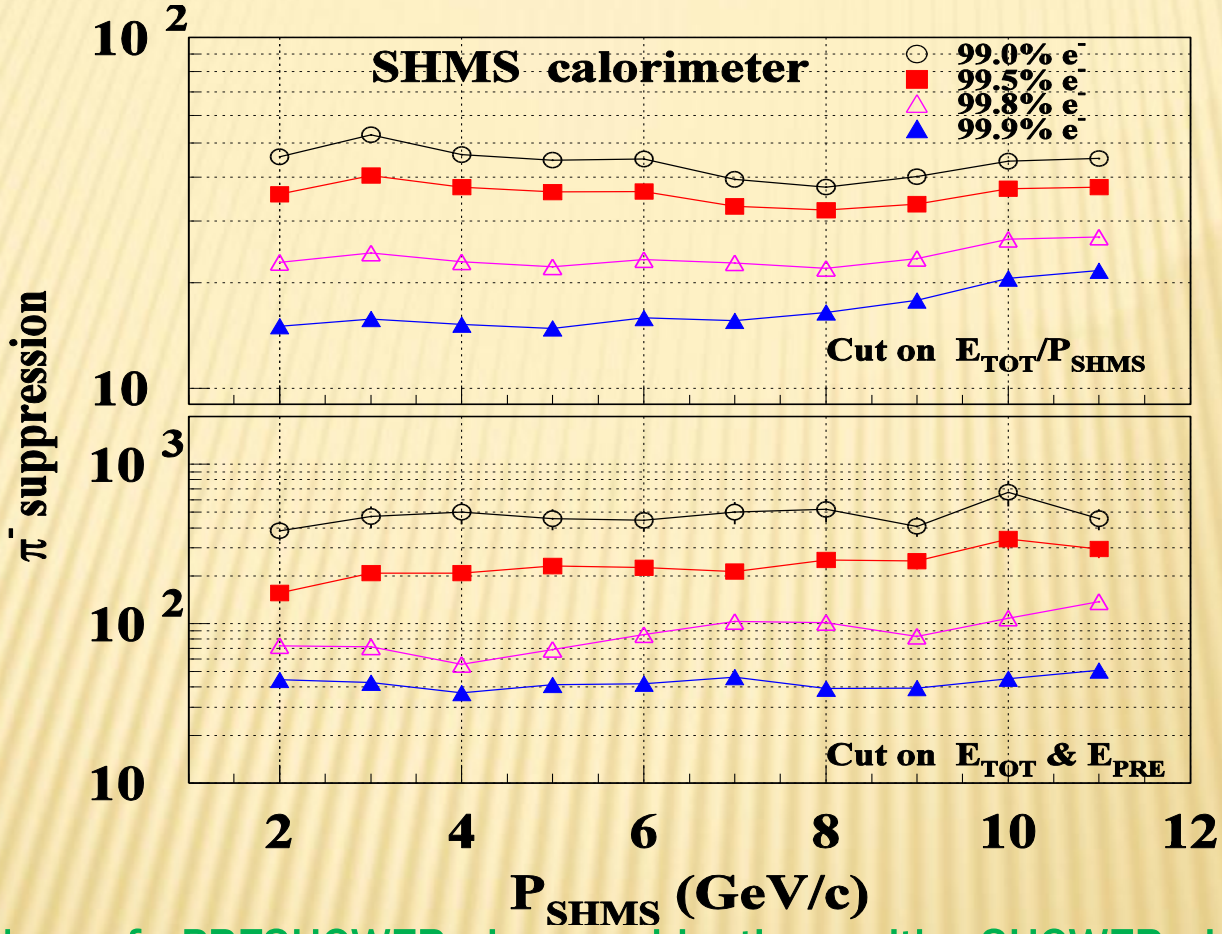
The pre-assembley studies showed all PMTs are glued to lead blocks, and HV dividers are soldered directly to PMT's. This makes technically impossible to change the PMT or HV base, in case of problem in the course of running experiment.

MC Studies: Resolution of SHMS calorimeter



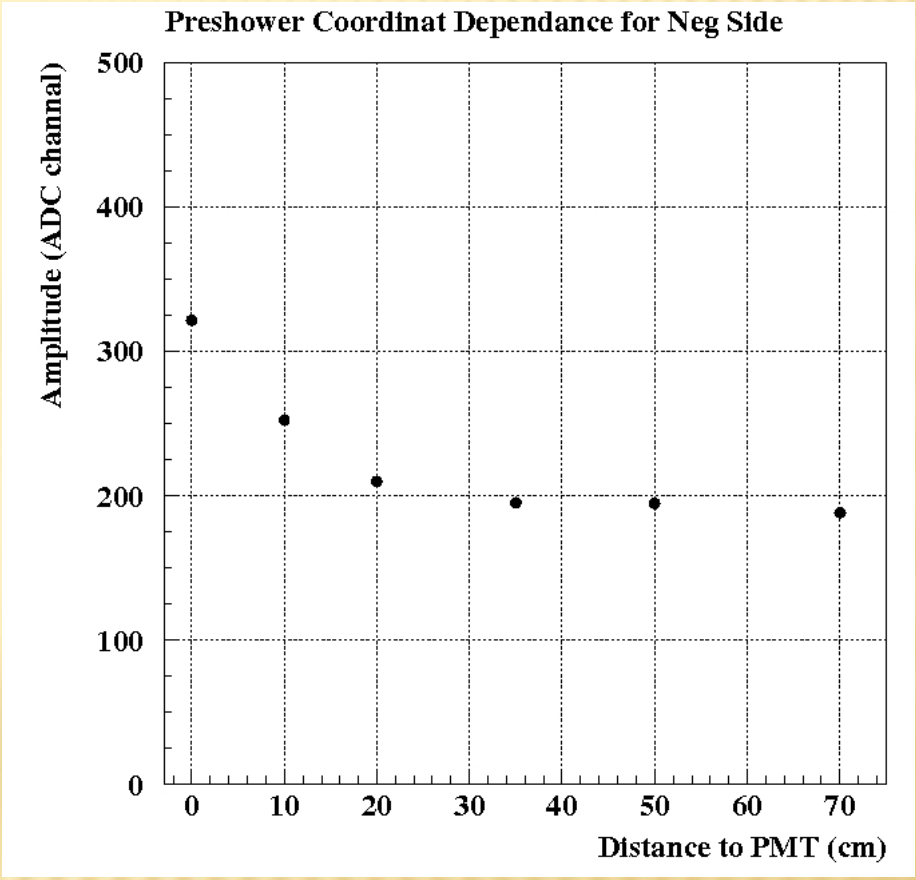
- Based on MC studies the EM calorimeter resolution is similar to other lead glass calorimeters
- The energy resolution is expected to be ~6% or higher

MC STUDIES: PION SUPPRESSION IN SHMS CALORIMETER



- Use of PRESHOWER in combination with SHOWER improves pion suppression.
- With Preshower and Shower combination π/e rejection is expected to be ~200:1 at 99.5% e efficiency

PRESHOWER COSMIC TESTS IN EEL-126



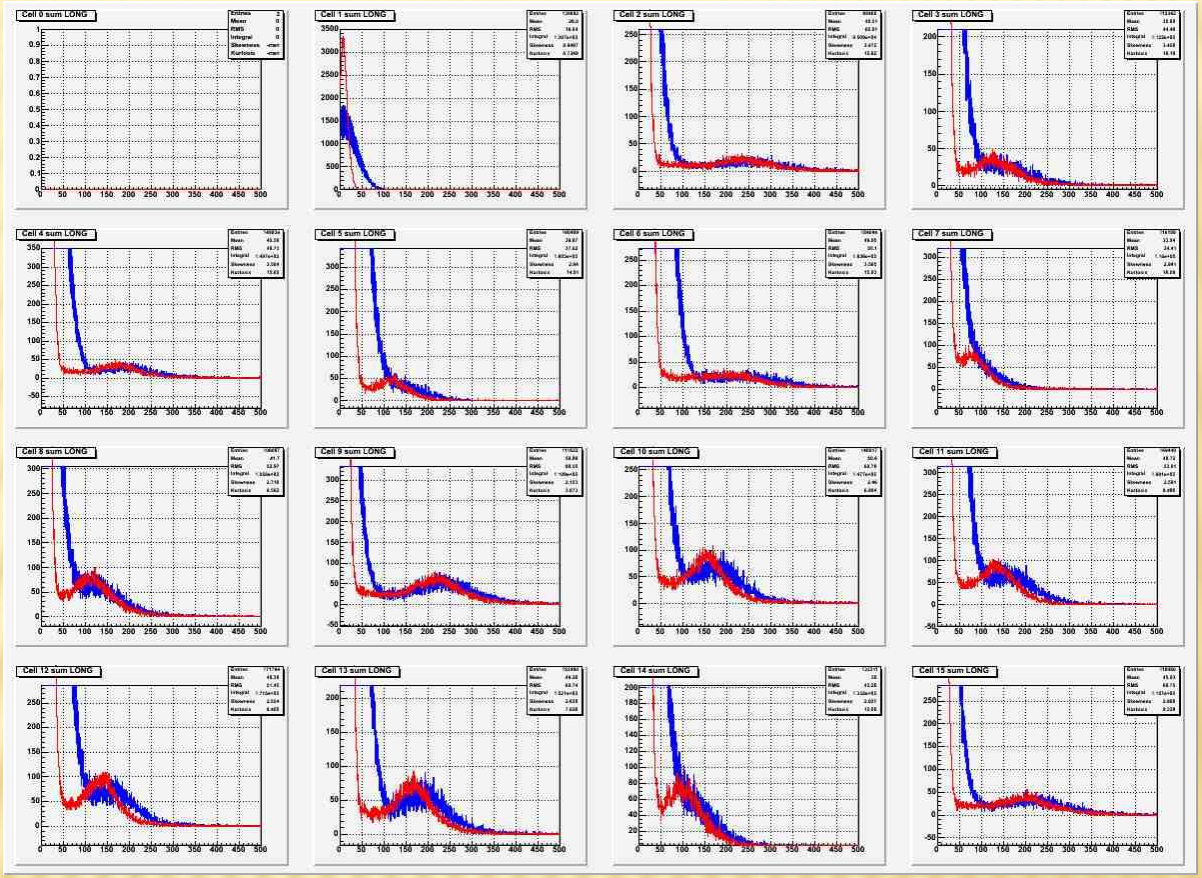
•Left: Preshower and electronics in EEL-126

•Right: Response of a Preshower module to cosmic rays passing at different distances to the PMT. A scintillator paddles have been used to trigger signal output.

MOVING AND INSTALLING SHMS BLOCKS IN TO THE SHMS DETECTOR HUT

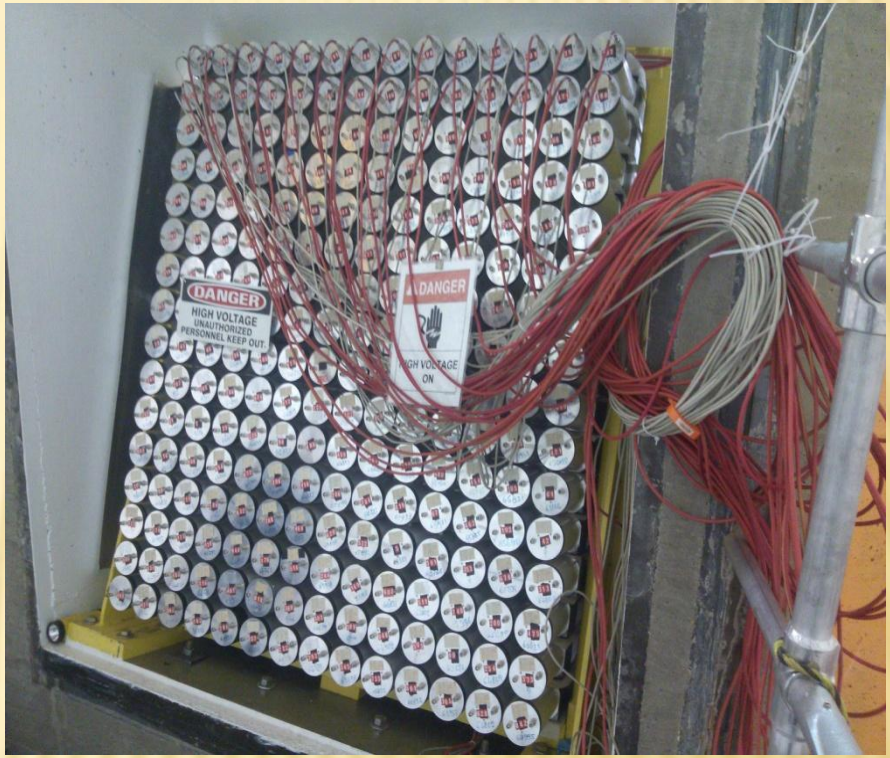
- Before moving blocks to Hall-C, all blocks have been carefully checked for light tightness,
- And all PMTs were checked for sparking by applying 1900V, which is 300-400V higher than nominal HVs for this type of PMTs
- After installation of each 2 layers the assemby was checked with cosmic rays.

SHMS Calorimeter installation and Readout electronics



- fADC-250 are used for signal readout for Shower
- The cosmic test was done by applying 1500V on all Shower blocks

SHMS CALORIMETER INSTALLATION



•Preshower is installed in SHMS Spectrometer in beginning of November

• Just before Christmas shutdown we have finished installation of the Shower in the SHMS Spectrometer.

SUMMARY AND FUTURE WORK TO BE DONE ON THE SHMS CALORIMETER

- Design construction of the SHMS calorimeter was chosen, based on Monte Carlo simulations
- TF-1 type lead glass blocks and PMTs from SOS calorimeter are used in the PRESHOWER, while modules with F-101 type lead glass from HERMES calorimeter are used in the Shower
- Pre-assembly studies indicate little degradation of the lead glass blocks and PMTs for both PRESHOWER and SHOWER
- A simulation code, based on GEANT4 package and QGSP-BERT physics model, was developed and used for evaluation of the performance of the calorimeter
- Expected resolution is similar to the other lead glass calorimeters
- With Preshower and Shower combination π/e rejection is expected to be 200:1 at 99.5% e efficiency
- Preliminary cosmic test of both Preshower and Shower was done
- The Calorimeter is now installed in the SHMS Spectrometer.
- Future work need to be done: make signal and HV cables
- Test EC with cosmics

THANKS