

Electron-Muon Ranger (EMR)

Progress Report

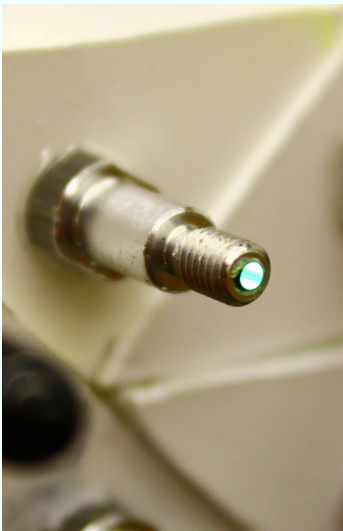
Ruslan Asfandiyarov
On Behalf of the EMR Group

MICE Collaboration Meeting 34
October 17-19, 2012

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 - Photon Simulation (by Matt)

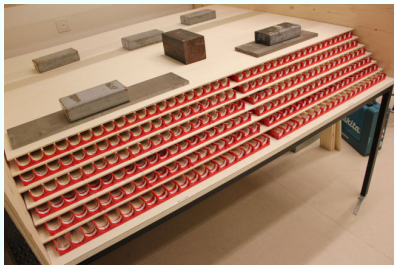
Production Status



- 100% of bars glued (~ 3300)
- 50% polished

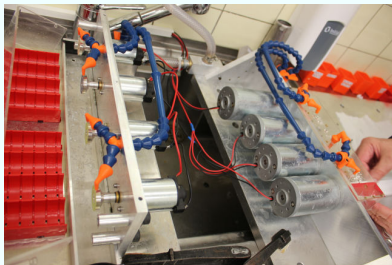


Clear Fiber Assembly Line



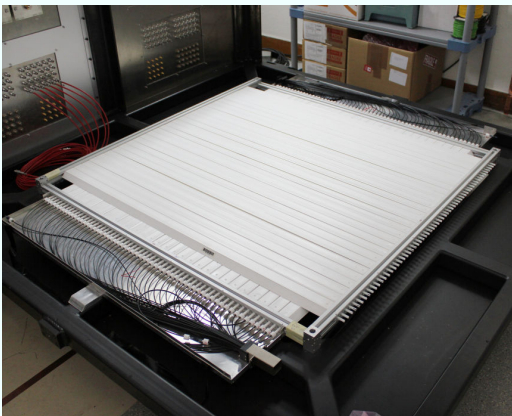
- each clear fiber has individual length in order to reduce stress due to bending
- special storage for clear fiber was made (left)

Clear Fiber Assembly Line



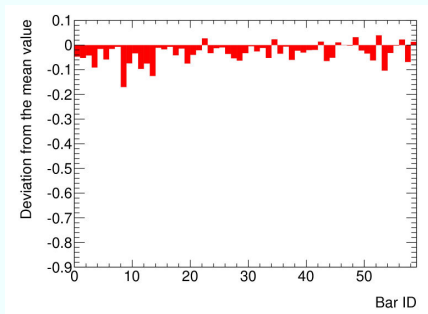
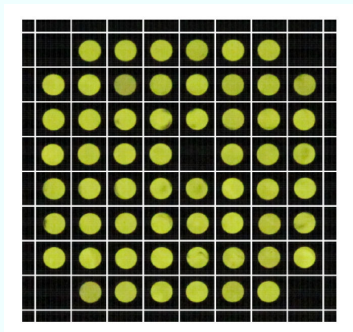
- small fiber connector is glued at one end of each clear fiber
- ... and polished

Final Module Assembly



- one plane was assembled in its final configuration
- ... and tested with digital camera

Final Module Optical Test



- light output of all the channels is within acceptable limits

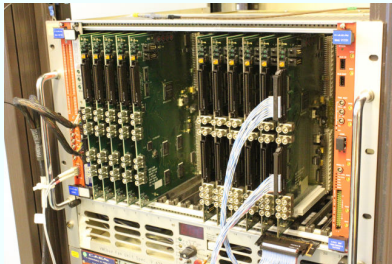
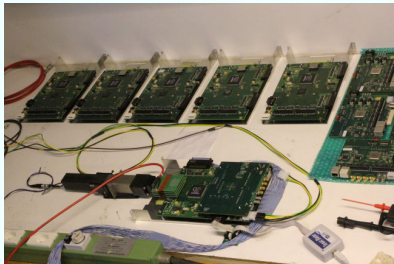
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Front-End-Boards and Firmware



- next two months will be dedicated to the firmware revision and finalization

Single-anode PMT tests



- PHILIPS XP2972
- 217 PMT tested with LED/Cosmics
- ~60 selected
- performance compared to HAMAMATSU R6427 (signal 4 times higher); this may be the future upgrade of the EMR

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Current State

Simulation

- MAUS software workshop this week was extremely useful
- EMR geometry refined in MAUS
- geometry details can be controlled via configuration files
- EMR development branch is compatible with the latest MAUS release

Digitization

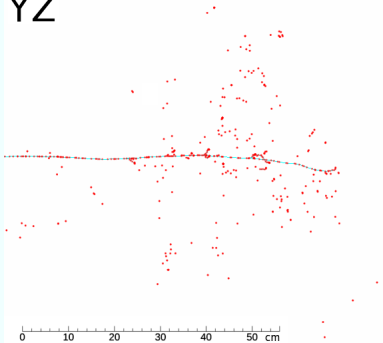
- Matt implemented EMR digitization framework in MAUS and developed simulation of photons inside scintillators

Reconstruction

- still in the pipeline

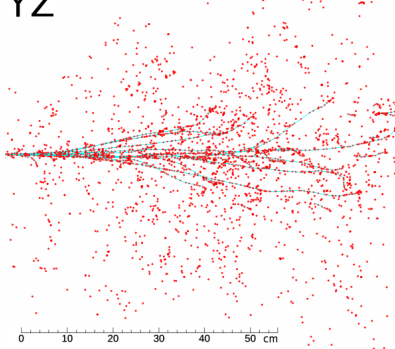
Geant4 Simulation

electron
YZ

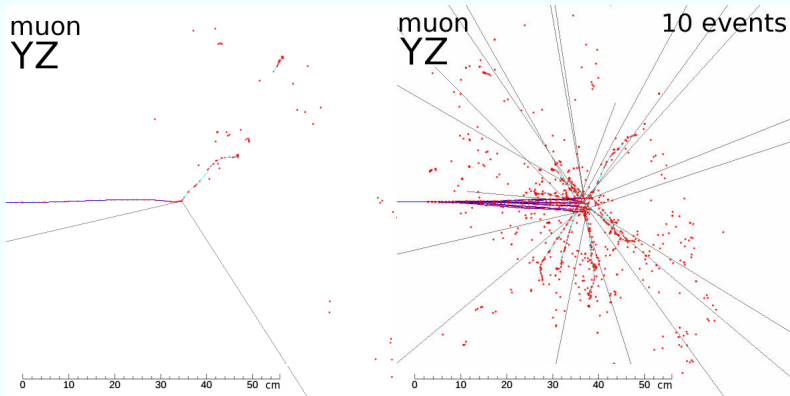


electron
YZ

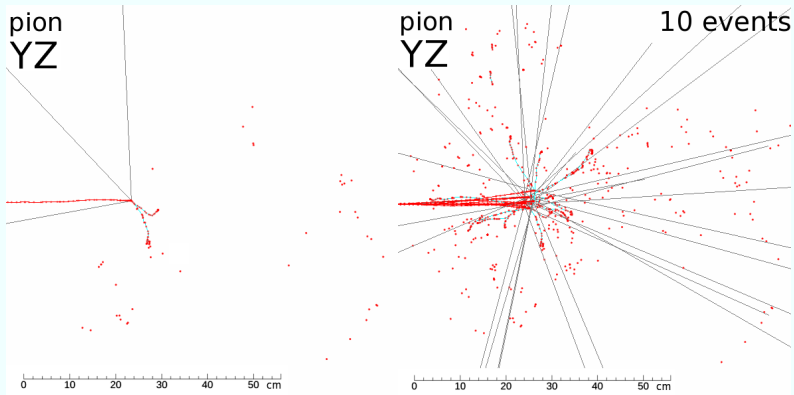
10 events



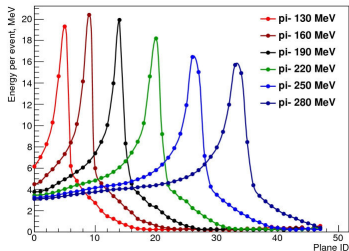
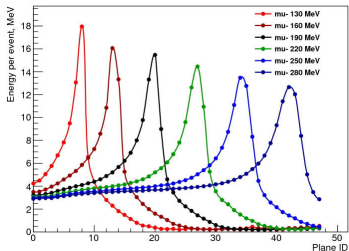
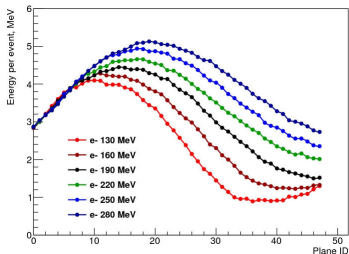
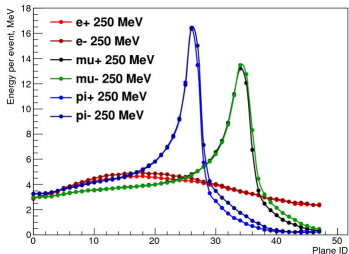
Geant4 Simulation



Geant4 Simulation



Geant4 Simulation



Photon Simulation (by Matt)

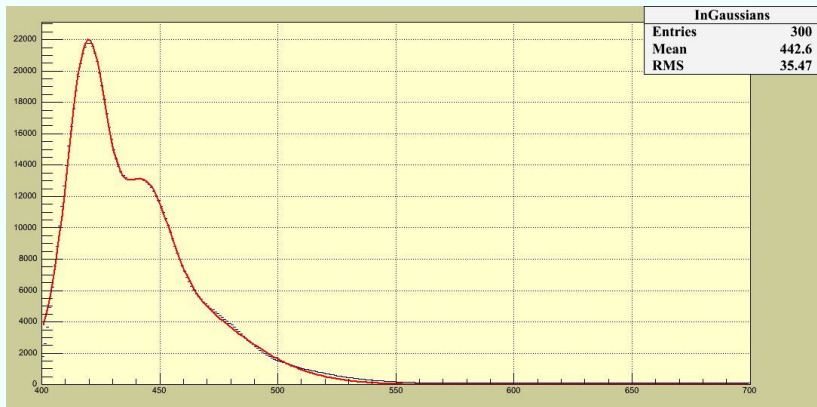
The screenshot shows the Geant4 EMR simulation interface. On the left is a menu with options like 'ps', 'Portrait', 'Landscape', 'eps', 'Preview', 'pdf', 'svg', 'gif', 'xpm', 'png', 'jpg', 'tiff', 'SumOfRuns', 'Detectors', 'RunDependent', 'Next Spectrum', 'Next Fit', 'Grey | Color', 'Pad1AndPad2', 'Lin | Log', and 'Exit'. The main window displays a 3D model of a scintillating bar (a long red cylinder) with a PMT (a blue cylindrical component) at one end. A yellow line indicates the radiation path. The right panel, titled 'Simple Setup of the Scintillating EMR Bar', contains a 'GlobStat' window with the following statistics:

GlobStat	
Nb. of photons generated	: 897695
Lost for abnormal reasons	: 15
Lost because abs. length 0	: 307
Eff. nb. of gen. photons	: 897373
Nb. of photons seen	: 5635
Efficiency	: 0.00627944
error	: +/-8.33885e-05
Lost for any reason	: 891753
Lost in materials	: 480603
Lost before wrapping	: 374791
Lost in wrapping	: 80
Lost leaving setup	: 0
Lost because too late	: 5384
Lost b. too few e- in APD	: 0
Lost b. acceptance angle	: 0
Lost b. quantum efficiency	: 30880

At the bottom of the interface, the text 'F.X. Genit DAPNIA/SPP CEA Saclay genit@hep.saclay.cea.fr' and 'Simple Setup of EMR Scintillating Bar' are visible.

- SLitrani photon simulation was used to model emission spectra of the scintillator
- The simulation models a scintillating bar being radiated by muons with a PMT at one end

Photon Simulation (by Matt)



- the emission spectra was experimentally measured (black)
- experimental data well described by the simulation (red)

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4 Summary

Summary

Construction

- should be finished within next three months
- polishing is the most time consuming activity

Hardware

- firmware revision and final development before the end of the year

Software

- significant progress in EMR implementation in MAUS
- reconstruction is still missing

Thank you for your attention!