

Backward EC EMC Update



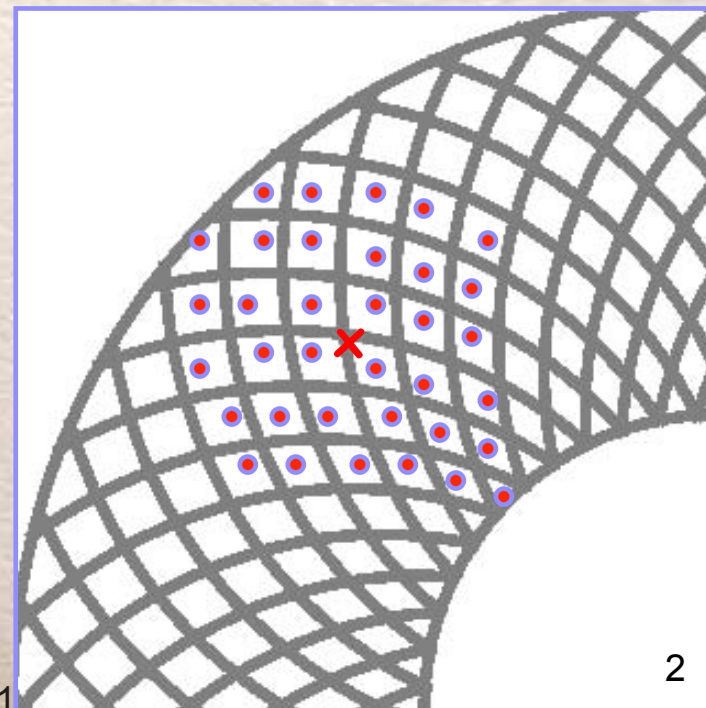
G. Eigen, Bergen

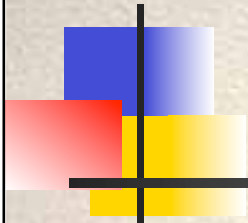
SuperB meeting, London 13-09 2011

Introduction



- The backward endcap EMC prototype consists of 24-layers of Pb plates and scintillator strips → full depth is $12 X_0$
- Pb plates are 2.8 mm thick ring segments
- Scintillator strips are 3 mm thick left-handed spirals, right-handed spirals radial segments that alternate eight times
- 6 strips per layer will be read out
strip sizes vary from 4.1 cm at the inner rim to 9.8 cm at the outer rim
→ total of 144 readout channels
- Each scintillator strip is read out with a Y11 WLS fiber positioned in a groove in the center of the strip and coupled to an MPPC at the outer rim





Status of Prototype Preparations

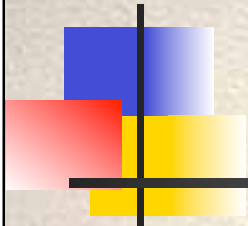


- 32 out of 48 sector strips have been completed in our workshop with the old milling machine



- The remaining 16 strip have been cut sides need to be polished, grooves need to be cut
- All sector strips were supposed to be finished by end of July
- This will take several weeks





Status of Prototype Preparations



- Yesterday, I spoke with Felix Sefkow about help with the production of the 96 spiral strips
 - ➔ he told me that the DESY plastic laboratory is working and that their engineer is looking for tasks to keep his lab busy
 - ➔ send drawings & details of the job to Felix after the meeting
 - ➔ for ~2 hours per strip this job should take about 5 weeks
- I will also ask the Felix to produce the 48 plastic pieces needed to hold the strips at a fixed position in each layer
- After our workshop has finished the remaining sector strips, I will ask the to machine the parts for the mechanical support structure
- In ~2 weeks I will order the missing components (have 70k NOK left)
 - 3 mm thick plastic filler material
 - 30m Y11 fiber (need help from collaborators)
 - Tyvek sheets and white reflector paint
 - Temperature sensors



Manpower Issues



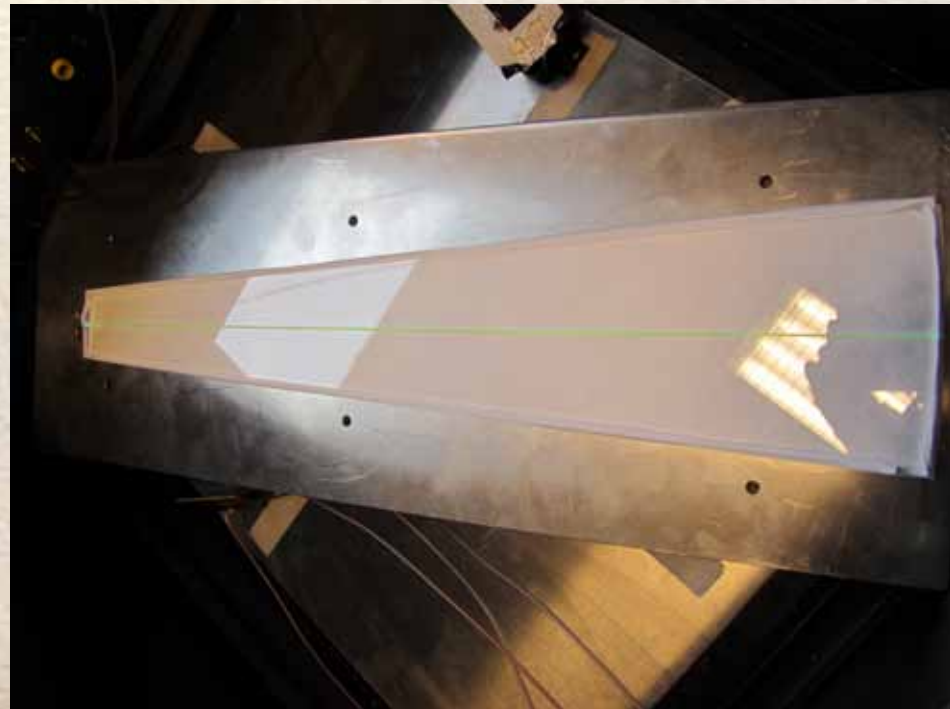
- A Chinese master student, Zhou Zhuo, started middle of August
- My student Justas needs to focus on ATLAS analysis, but he promises to help Zhou with electronics issues and will participate in the test beam
- The other 3 master students have not decided yet
- Though I have 65k€ from the EU project AIDA for hiring a postdoc, the department is causing problems, since we are in a transition period to a new 4+4 year contract with NFR (application deadline is Oct 16th, approval in December)
 - ➔ I am hoping to send out an add for a 3-year postdoc position soon (without a guarantee of money from NFR they are hesitant)
 - ➔ If the add is placed before October I still won't get anyone before December/January
- Though DESY will help with producing the strips they probably will not join SuperB, since they have involvements in Belle II
 - ➔ I will see Joachim Mnich early October (ECFA meeting) & discuss this



Hire technical PhD student jointly with CERN (Justas is candidate) ₅

Test Station

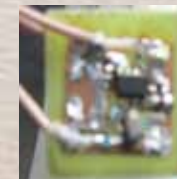
- We have a test station that allows us to quickly
 - measure the light yield in MIPS,
 - determine the non-linearity curve of the photodetector
 - measure the non-uniformity of the strips
 - test black dot patterns to make strips uniform
- We couple the MPPC directly to a custom-made preamp at the outer edge of the strip
- Signal is sent to a 14 bit ADC housed in a VMS crate
- Data taking and processing is done with Labview
- One of Zhou's first task is to learn doing these measurements



Preamplifier Design

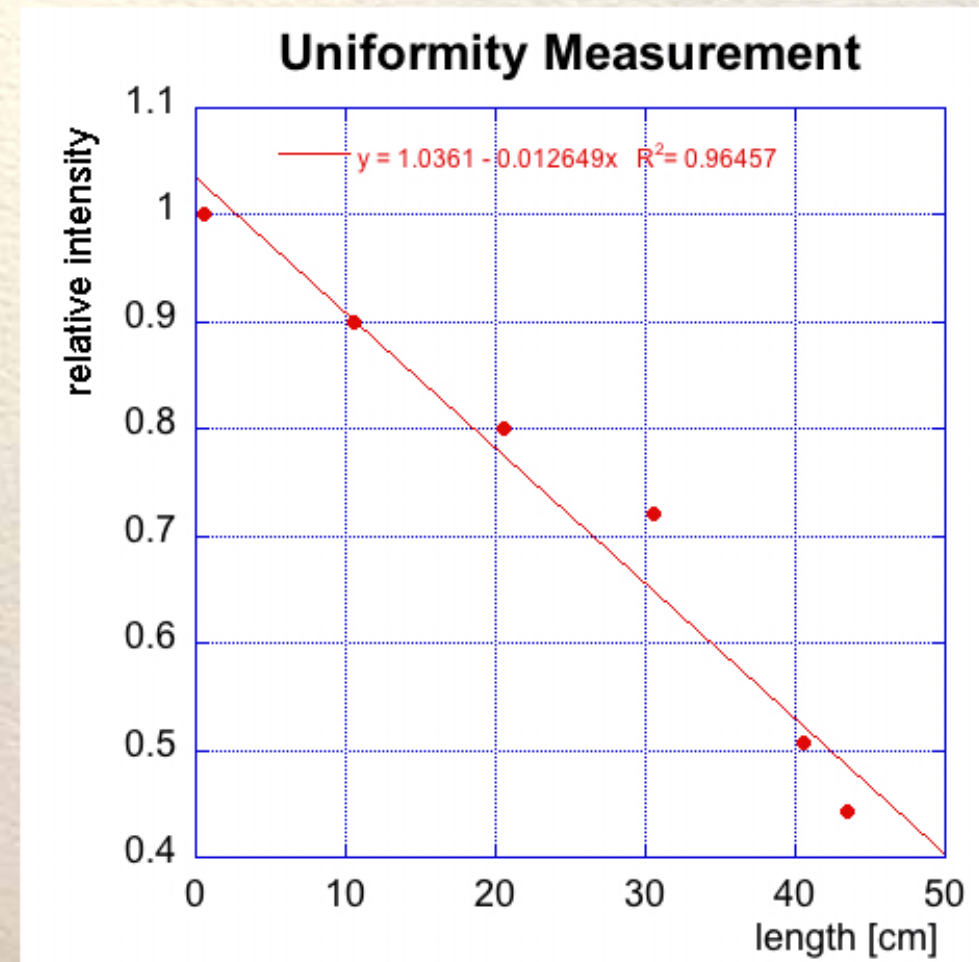


- To avoid pickup noise it is useful to place a preamplifier directly onto the MPPC
- The amplified signal will be sent to the SPIROC chip
- We have a laboratory and the tools to quickly produce preamplifiers
→ this will be one of the first tasks for Zhou, who needs to learn basic electronics and how to solder
- The present layout, however, is too bulky to place onto the prototype layers
- Since the fibers in three alternating strips reach the outer edge in different places, we have space of 9 cm in ϕ and 1.71 cm in z
→ dimensions of 1.2 cm \times 2.5 cm should be suitable
- Once a mask is designed it is very fast to produce boards and solder components

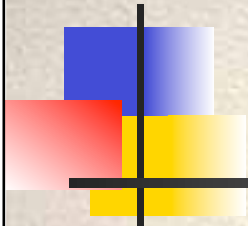


Non-Uniformity Corrections

- The non-uniformity of the sector strips is consistent with the ratio of the inner side to outer side (0.41)
- This is far too large to leave uncorrected
- To produce a uniform light response, we print a pattern of black dots onto the Tyvek
- The dot pattern is designed using a simulation for the light response in the strip
- Expect the number of dots to increase linearly with radius



The sides of the strip will be painted white



Conclusions



- 32 radial sector strips are completed, 16 remaining sector strips are cut out
- DESY will help out with production of logarithmic spiral strips, since strip production is still the bottleneck
- Ask DESY to cut also the 48 plastic positioning pieces
- The manpower situation is improving slowly
 - one new master student, maybe more
 - postdoc student hiring is delayed due to funding situation
 - plan to hire a technical PhD student jointly with CERN
- Urgently need new collaborators



Immediate Next Steps

- Mount MPPCs and test performance of the sector strips
- Measure absolute light yield with trigger counter underneath the strip
- Build 144 custom-made preamplifiers
- Design pattern of black dots to compensate for non-uniformity
- Need to investigate backgrounds to decide if strips need to be split into 2 pieces to deal with occupancy due to backgrounds
- Measure properties of 2 strip segments connected via one Y11 fiber
- Measure non-linear response of MPPC in strip arrangement