

Backward Calorimeter Update

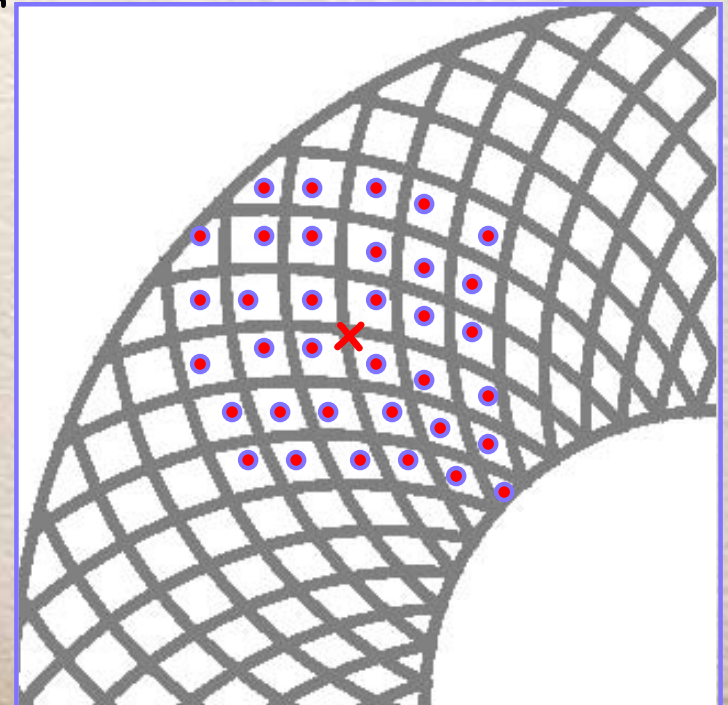
G. Eigen, U. Bergen

SuperB meeting, Frascati 04-04, 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
- It is sufficient read out 6 strips per layer since strip sizes are larger (4.1-9.8 cm) than one Molière radius (3.8 cm) → total of 144 readout channels
- Each scintillator strip is read out with a WLS Y11 fiber positioned in a groove in the center of the strip and coupled to an MPPC at the outer rim



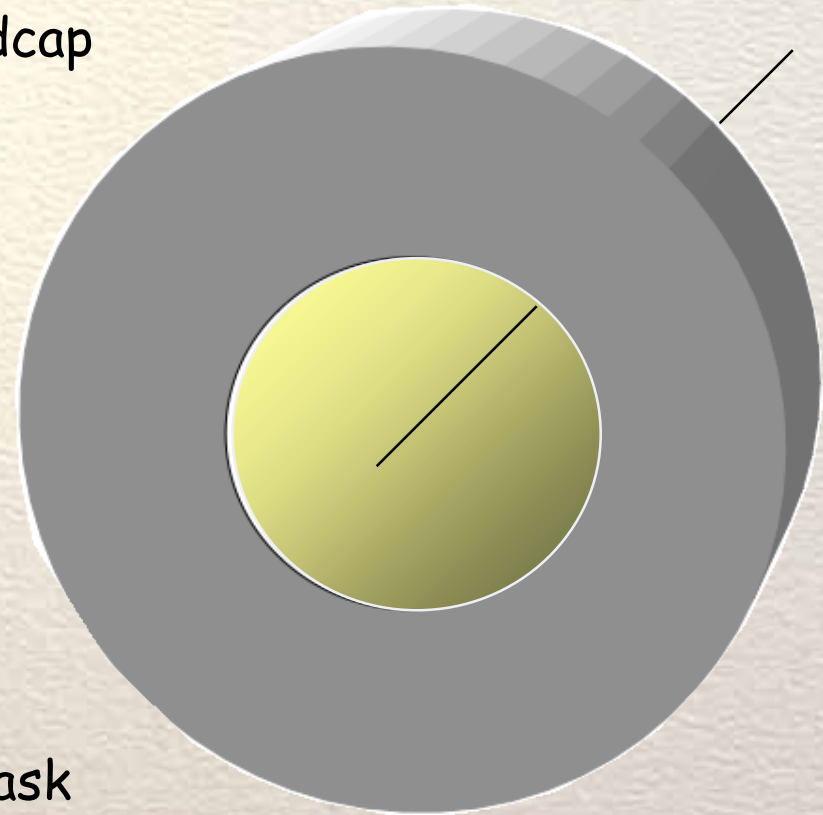
Status of Prototype Preparations

- I am still waiting for the first spiral strip to be cut by our workshop in Bergen
 - ➔ before June I need to ship the scintillator plates out of Norway to avoid duty plus taxes (sending them to DESY would solve the problem)
- The 24 hardened Pb plates from JL Goslar machined to the correct segment shapes are in Bergen
- Gigi Cibinetto sent me 50 m of Kuraray Y11 fiber (paid €30 in taxes)
 - For remaining 30 m I have asked Felix Sefkow,
 - ➔ if they do not have the correct size left, I need to find 6 volunteers to ask for 5 m samples from Kuraray
- Missing components:
 - Diffuse reflector sheets and paint
 - Temperature sensors
 - Get 3 more SPIROC boards from LAL
 - Get calibration board and clear fibers from Prague



Review of the Backward Endcap EMC

- At the SuperB workshop at Caltech in December 2010 the backward endcap EMC was reviewed by the backward task force (Bill)
- I have not seen a report yet, but I heard from Bill that the design is generally fine
- Main issue is manpower
→ find collaborators
- Before the approval of SuperB the manpower issue was a difficult task





Norwegian Research Council Review

- 10 days ago we had our annual 2-day review with the Norwegian Research Council and committee (John Ellis, Vera Luth, Barbara Jacak)
- The main issue was the program and funding requests for 2012-2017
- In my 20 min presentation, I spend about half the time on the backward EC EMC
- The backward EC EMC is part of the instrumentation project we had for the last 6 years → our hope is to secure sufficient funding that Bergen can contribute to the construction of the backward EC EMC
- Vera asked about occupancy in the strips from machine backgrounds → this is an issues that needs to be studied in simulation using a realistic machine background model
- Man power issues were addressed by John
- From Steinar Stapnes coordinator of the Norwegian HEP program I heard that the review went well



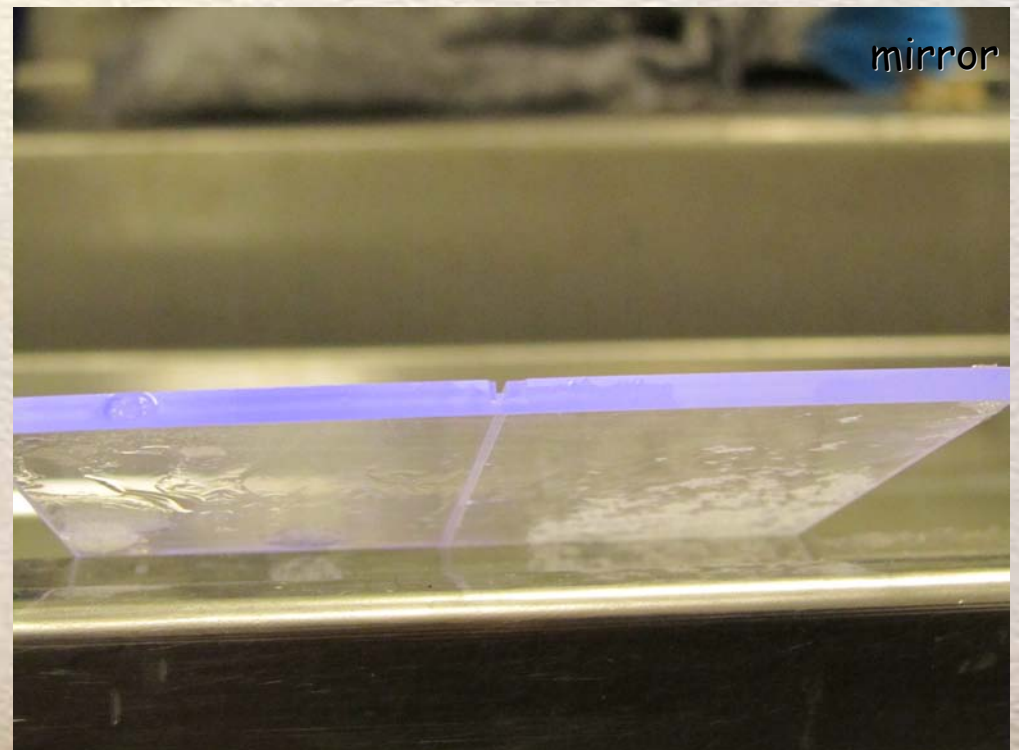
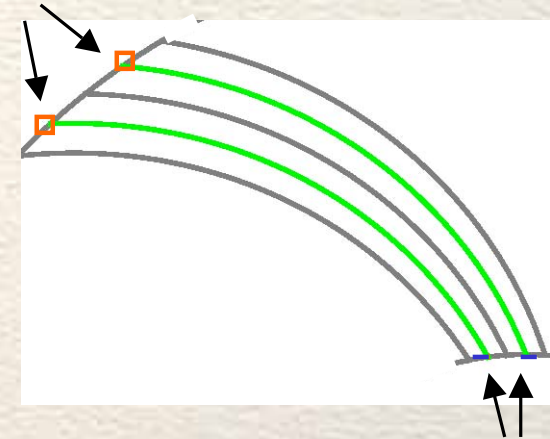
Manpower Issues

- Through the EU project AIDA I will be able to hire a postdoc in Bergen this summer who will work 50% on the backward EC EMC prototype
- One of my ATLAS master students is interested in gaining hardware experience → he will help with strip testing and prototype construction
- A reorganization at the department will pour more technical students into the HEP group → may get a new student in the fall
- At the AIDA kickoff meeting at CERN early February, I spoke with Felix Sefkow, spokesman of the CALICE collaboration, trying to get him and his group interested in SuperB
- Felix said that he was interested in the EMC and the muon system but that the research director (Joachim Mnich) was somewhat hesitant
- Despite the issue if DESY will join or not, Felix said that he may be able to help me with the prototype (cutting of strips) through their prototype R&D funding, in particular if the DESY test beam is used → he needs to talk to his engineer to find out if machining of plastic scintillators still can be done at DESY

Scintillator Strip Cutting

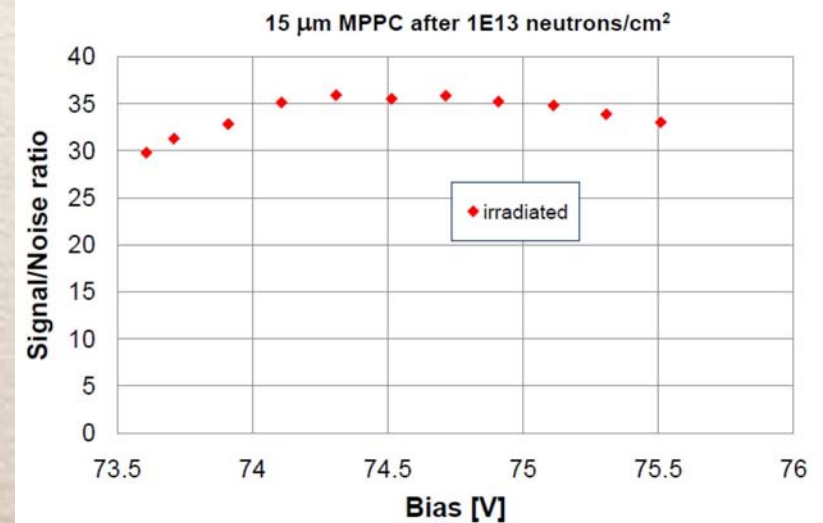
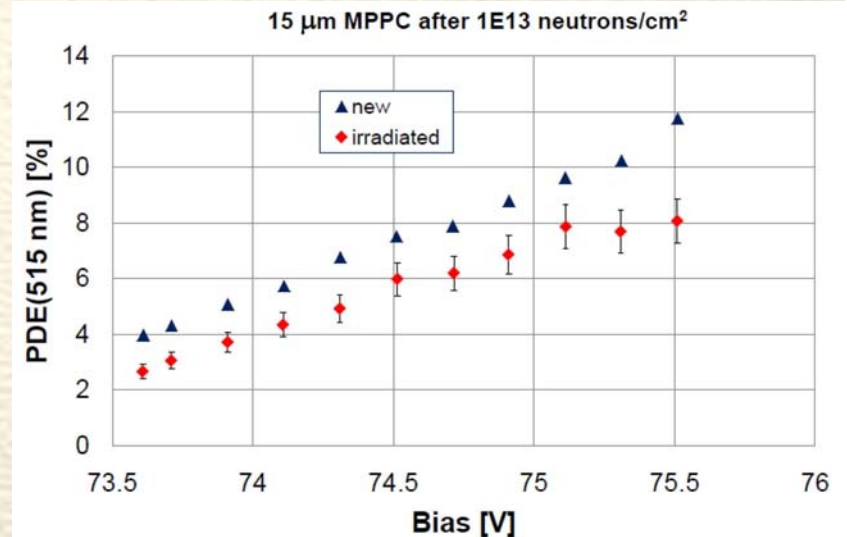
- We need 96 logarithmic spiral strips and 48 radial sector strips
- It takes about 1h to cut the strip shape from the sheet → 144 hours
- It takes about 20 min to cut the fiber groove and 10 min to mill the MPPC groove → 72 hours
- Thus, the production of all 144 strips should take about 29 days → 6 weeks
- So the strips could be ready for stacking earliest middle of June

SiPM



MPPC Choice

- We presently use the 25 μm pixel MPPCs to read out the Y11 fiber
- According to Eugenio's study the backward EC EMC will see 10^9 n/mm² after 10 years
- If the n radiation level turns out to be too high in the backward EC EMC we can switch to 20 μm or 15 μm pixel detectors that work fine after 10^{11} n/mm²
- Saturation curve is not effected by irradiation, response is reduced by 40%



Particle Identification: dE/dx

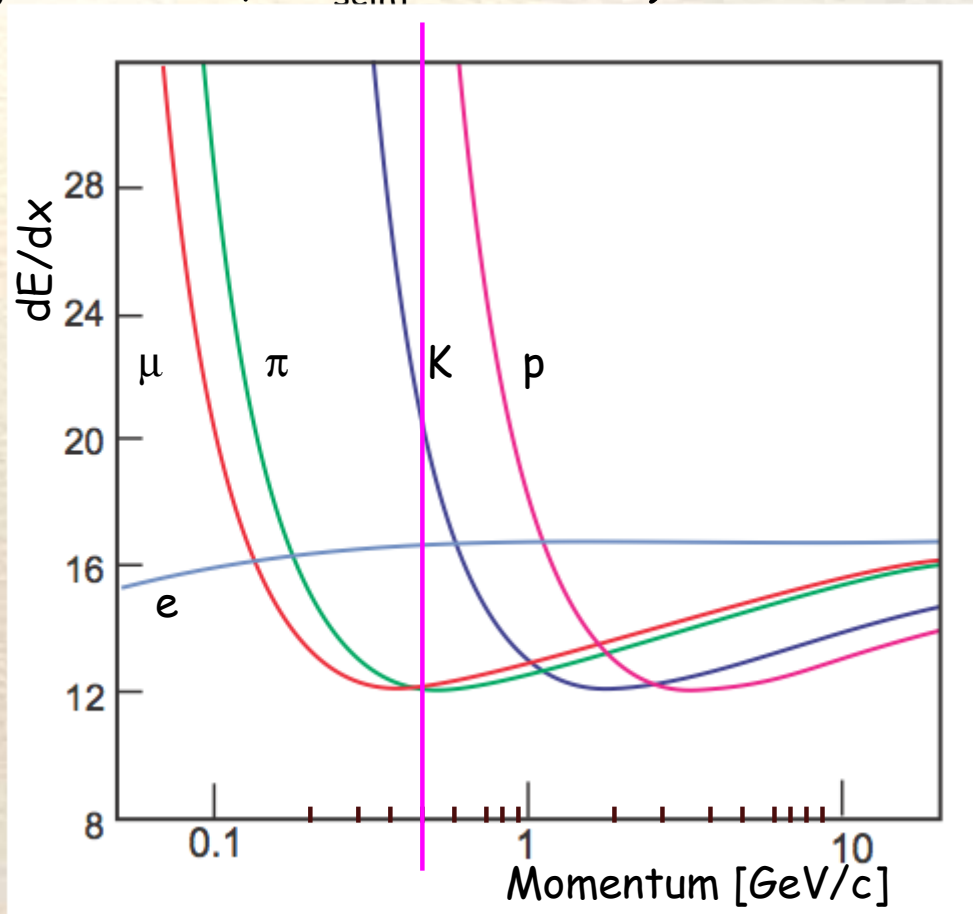
- Do dE/dx pattern recognition for hadrons → for MIP-like particles energy losses are ($dE_{pb}=4.3$ MeV, $dE_{scint}=0.6$ MeV)

- A 0.5 GeV π is at the minimum while a 0.5 GeV K is below the minimum

- For MIPs, $\Delta E=100$ MeV in 24 layers

- For particles below minimum dE/dx increases with depth ($1/\beta^2$)

→ look at dE/dx pattern and combine it dE/dx information from SVT and DCH → improve K/ π separation (3σ) up to 0.6-0.7 GeV





Summary and Next Steps

- We have all major components in Bergen and have the resources to purchase the few missing items
- The strip production is and has been the bottleneck over several months → hopefully DESY will help out
- The manpower situation will improve with hiring a postdoc
- Measure light yield and uniformity of radial sector strip in April
- Decide on reflector sheets and order them (tend towards Tyvec)
- Measure properties of 2 strip segments connected via one Y11 fiber
- I am pushing hard to have one spiral strip produced by the Bergen machine shop before Easter to study its light yield performance
- I am still aiming for test beam at DESY in the fall of 2011 and at Frascati in 2012?