Backward Calorimeter Update

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The Backward Endcap EMC Prototype

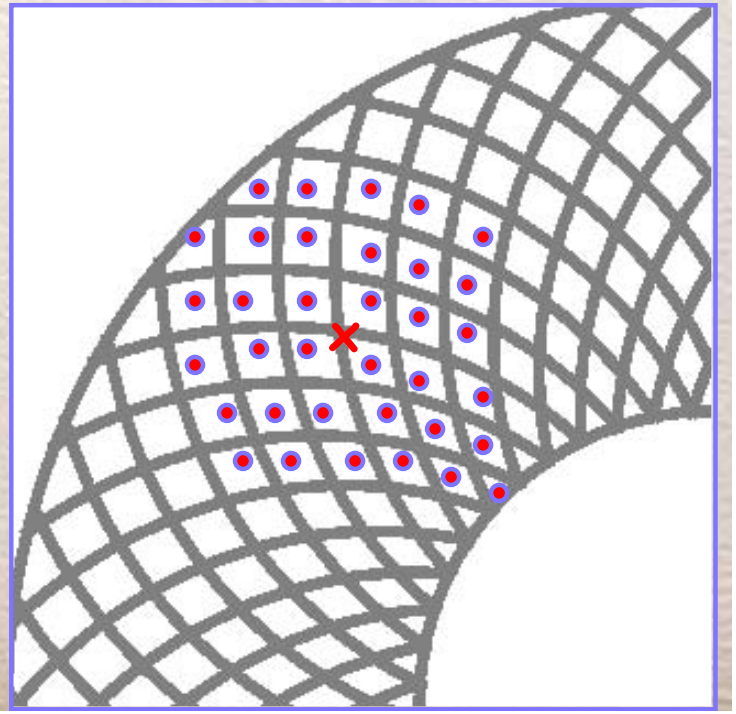
- The backward endcap calorimeter prototype consists of 24-layers of Pb plates and scintillator strips (full length of 12 X_0)

- It is built in a quadrant structure
  - ➔ 2.8 mm thick Pb plates have ring segments with r_i=31 cm & r_a=75 cm
  - ➔ 3 mm thick scintillator plates are segmented into left-handed spiral strips, right-handed spiral strips and radial strips (alternating)

- We will cut individual strips with a diamond tool (polished edge) and instrument 6 strips per layer

- Each scintillator strip has a WLS Y11 fiber positioned in its center coupled to an MPPC ➔ use for timing: reduce backgrounds, PID? (τ_{sc}=2.2 ns, τ_{fiber}=2.3 ns, τ_{MPPC}~0.1 ns)

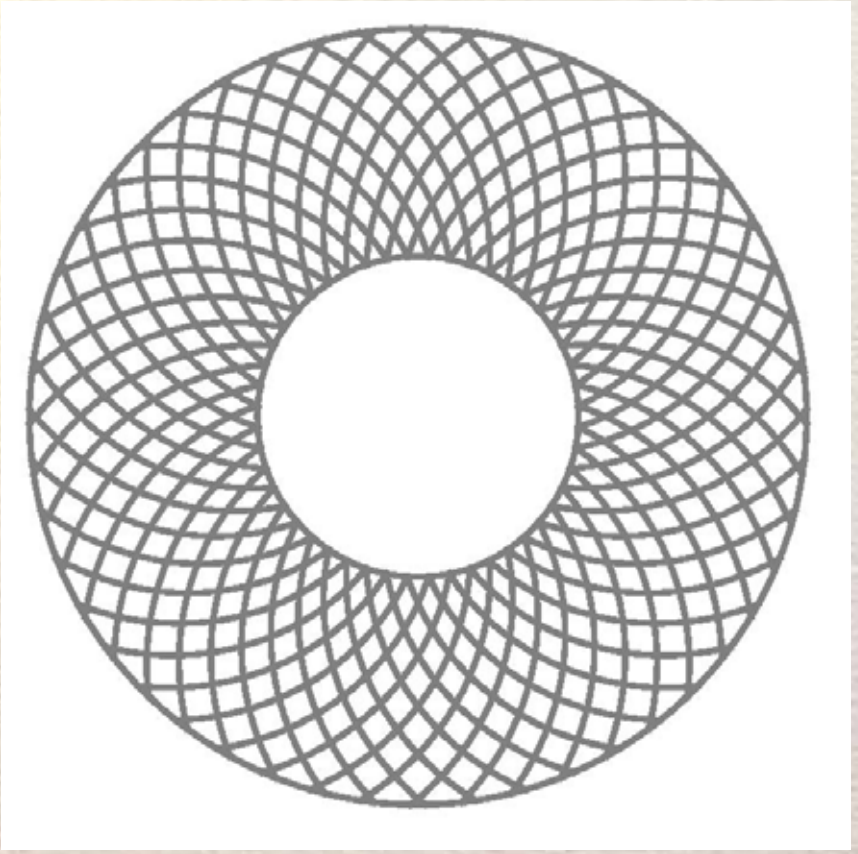
- Each strips is equipped with a thermocouple to record temperature
  - ➔ a clear fiber coupled to an LED provides calibration and monitoring



Discussion of Spiral Shapes

- The left-handed logarithmic spirals are defined by

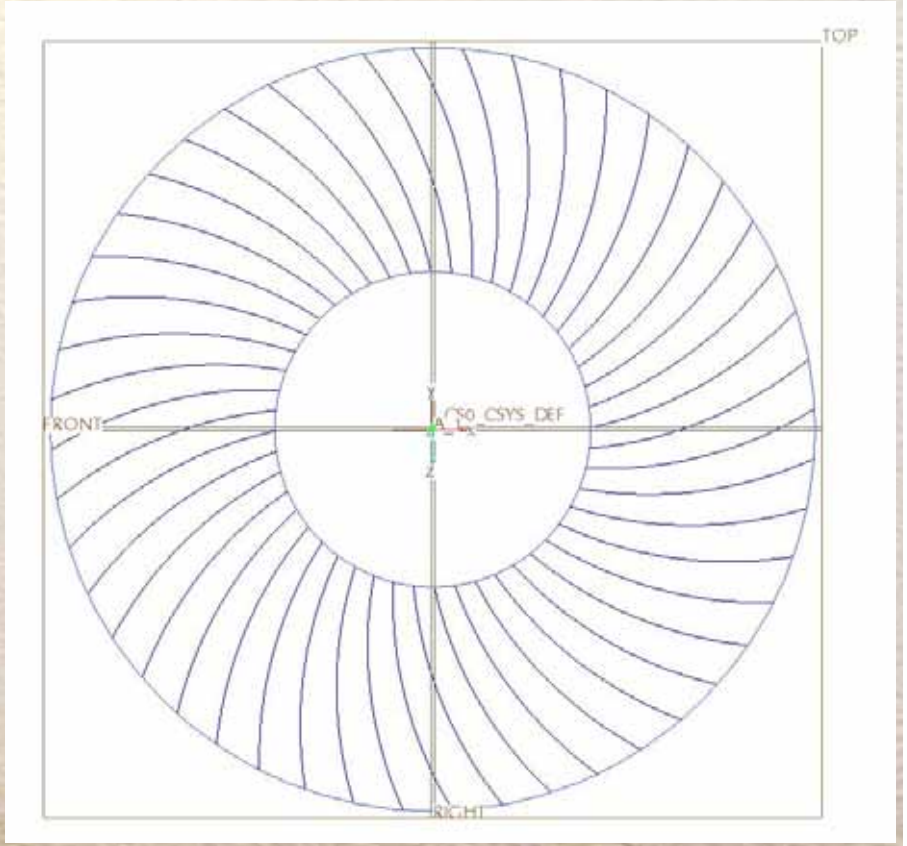
$$x(t) = r\ \mathrm{Exp}[b * t]\ \mathrm{Cos}[t] - r$$
$$y(t) = r\ \mathrm{Exp}[b * t]\ \mathrm{Sin}[t]$$



- For r=37.5 cm, b=0.2 yield 8 complete tiles and 2 fractions of a tile
- By modifying r and b get complete half tiles in outer ring
- Tile sizes are larger than 1 Molière radius ➔ for smaller size need to increase # strips/layer (60, 90) ➔ too many readout channel?
- Obtain diamond shape in inner region ➔ rectangular shape in outer region

Status of Prototype Preparations

- We have the scintillator sheets (75 cm x 75 cm x 0.3 cm) in Bergen
  25 BC 404 sheets from St Gobain
- The machine shop in Bergen has a computer-controlled milling machine, they started with the training to operate it
- The first spiral strip will be cut with the old machine, since I want one strip for testing asap
- Dominik Fehlker, our electronics engineer has programmed 48 left-handed spirals and 48 right-handed spirals in Pro Engineer
- Dominik is working on the drawing of one spiral in Pro Engineer
  ➔ this can be read into the old milling machine



Status of Prototype Preparations

- So I hope to get the first spiral in a week or two
- The 24 hardened Pb plates from JL Goslar machined to the correct segment shapes are at CERN
- We are working on a tax-free transfer to Bergen
  ➔ takes about 2 weeks
- We have 160 MPPCs in Bergen, 16 more than we need for the prototype
- We have our own PC with Labview which needs to be interfaced to the SPIROC chip and the CALICE CMB
- Gigi Cibinetto promised to send me 80 m of Kuraray Y11 fiber, once they finished cutting fibers for their prototype, but I have not heard back from him after the summer

Missing Components for Stacking

- 48 cut left-handed spiral strips, 48 cut right-handed spiral strips, and 48 cut radial strips, each with a groove in the center.
- Diffuse reflector sheets that cover the top and bottom faces of the scintillator strips
  ➔ master student wanted to perform tests (he disappeared since June)
- Diffuse white reflector paint to cover sides of the scintillator strips
  ➔ reach conclusion after tests
- Aluminized mylar sheet to cut out 144 mirrors with Ø=1 mm
- 144 temperature sensors positioned near each MPPC
- Clear fibers and CALICE CMB that I will borrow from Prague
  ➔ I need to confirm that both are available in 2011 for a testbeam operation at Frascati

Manpower Issues

- Good news: due to the approval of AIDA I will be able to hire a postdoc for 2-3 years who will work on SuperB more than half the time

  Bad news: EU funding is only available after April 2011, it pays at most 7 months, rest will come from NFR, which is available in 2012
  ➔ probably, I cannot hire the postdoc before June 2011

  ➔ The master student working on R&D disappeared in June

  ↳ I have been advertising at the institute without success so far (there may be a candidate)

- Our machine shop is undermanned due to a retirement, vacant position not been filled yet and training on the computer-controlled milling machine is not finished

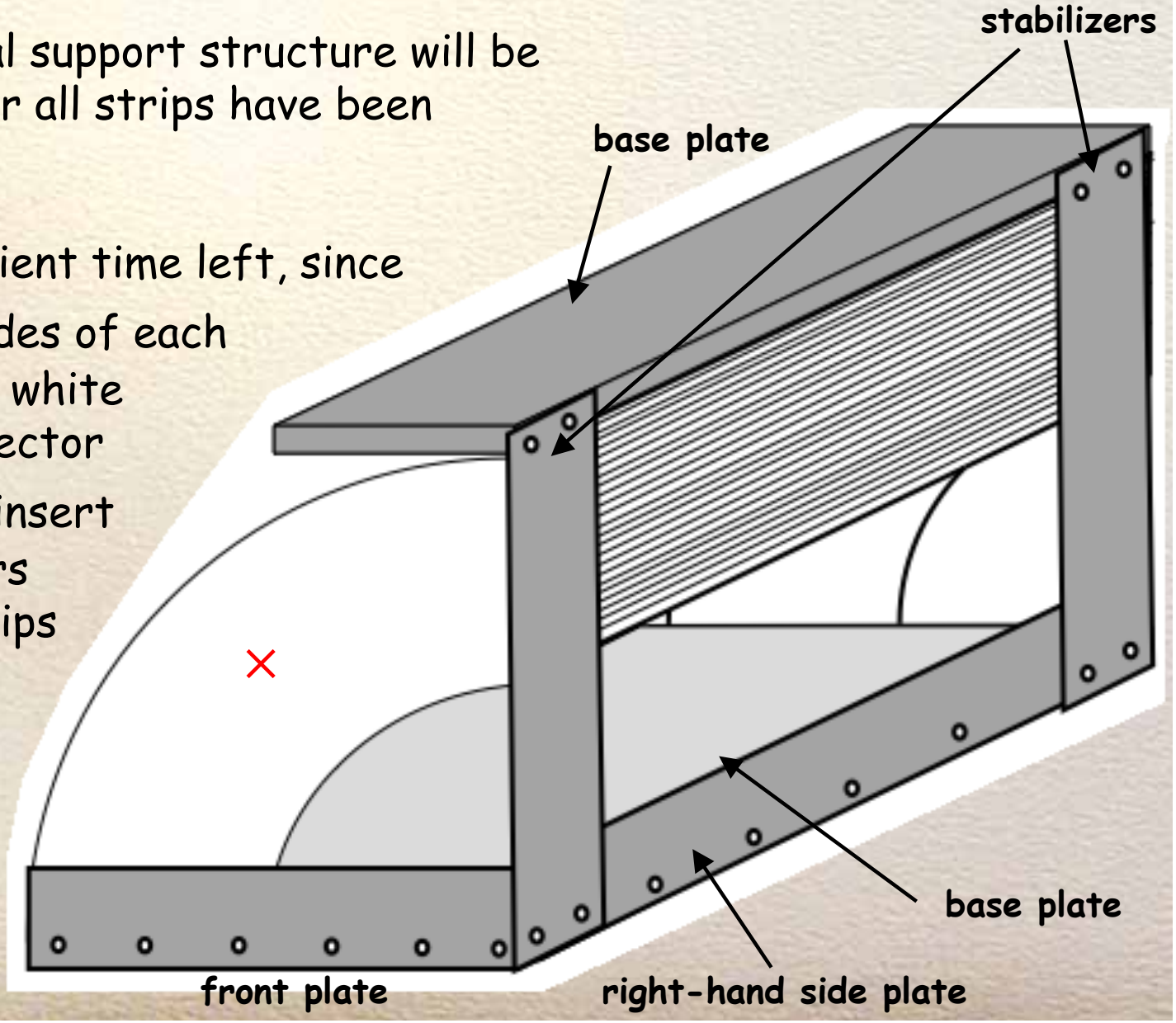
➔ cutting spiral strips is a big job and make several weeks after they start (not obvious yet)

➔ After the Elba meeting it became obvious that the October testbeam was out of reach

Mechanical Support Structure

- The mechanical support structure will be produced after all strips have been cut

- There is sufficient time left, since
  - paint the sides of each strip with a white diffuse reflector
  - we need to insert all Y11 fibers into the strips
  - we need to mount all MPPCs



Summary

- We have all major components in hand
- We have the financial resources to purchase the few missing items
- Presently, the machining of the strips is the bottleneck due to understaffing and lacking expertise in the machine shop
- The manpower situation is momentarily bad but will improve considerably in 2011

Next Steps

- I am pushing hard to have one spiral strip produced rather soon
  ➔ Measure light yield and study its uniformity
- Redo cross talk measurements for full-size sector strip
- Perform light output study with different diffuse reflectors
- Order missing components and borrow calibration system
- Measure properties of 2 strip segments connected via one Y11 fiber
- Push machine shop to start scintillator strip production (144 strips)
- Perform detailed shower simulations
- Understand the functions of SPIROC chip, integrate it into the readout and calibration chains