

Redesign of LumiCal mechanical structure

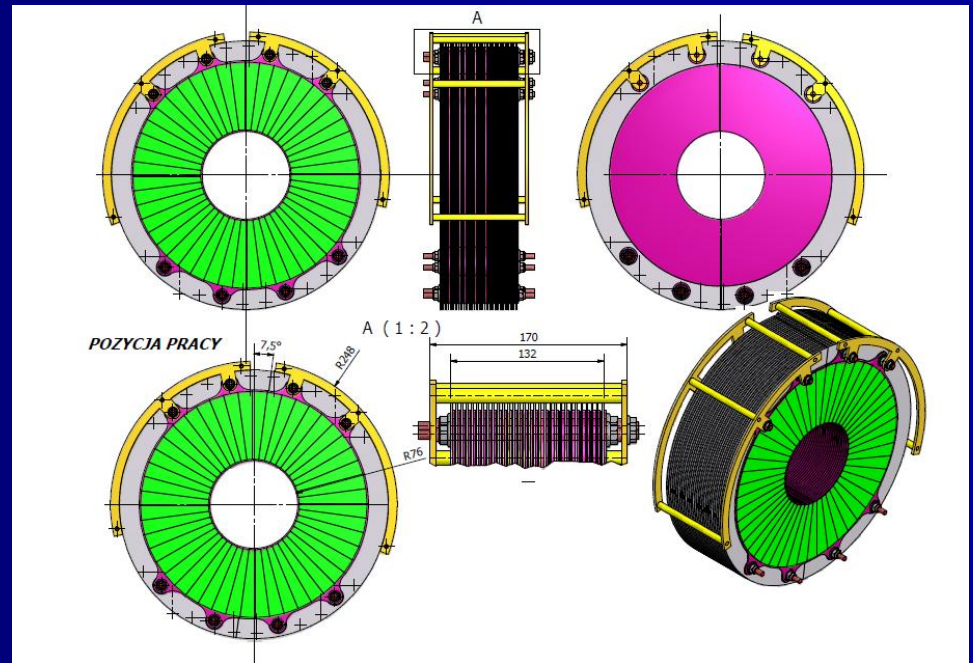
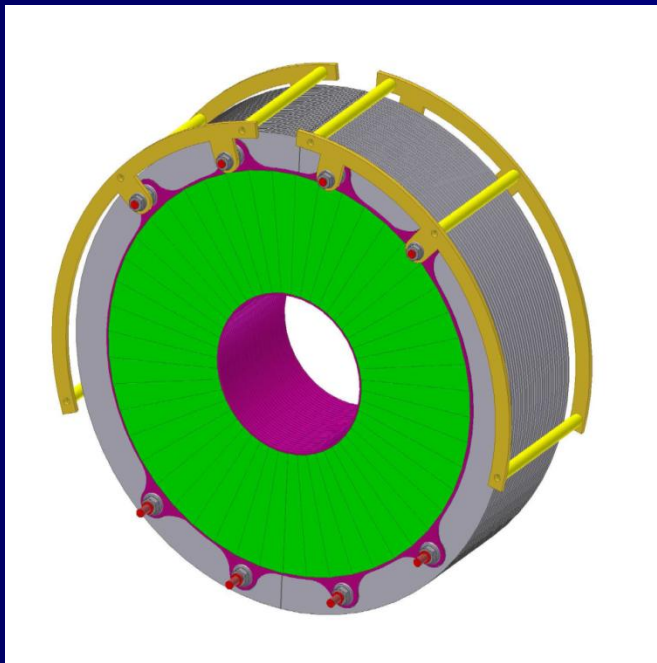
W.Daniluk, E.Kielar, J.Kotula, K.Oliwa, Wojciech Wierba, L.Zawiejski
Institute of Nuclear Physics PAN
Cracow, Poland

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Motivation

- Reduce heavy material (tungsten) in inactive zone (ring between radius from ~ 200 mm to ~ 250 mm) .
- Find more space for FE electronics and some 'symmetry' – same layout for all fan out and FE PCB.
- We have found some misunderstanding among many people concerning the LumiCal mechanical structure – clarify the design.

“Old” design of LumiCal

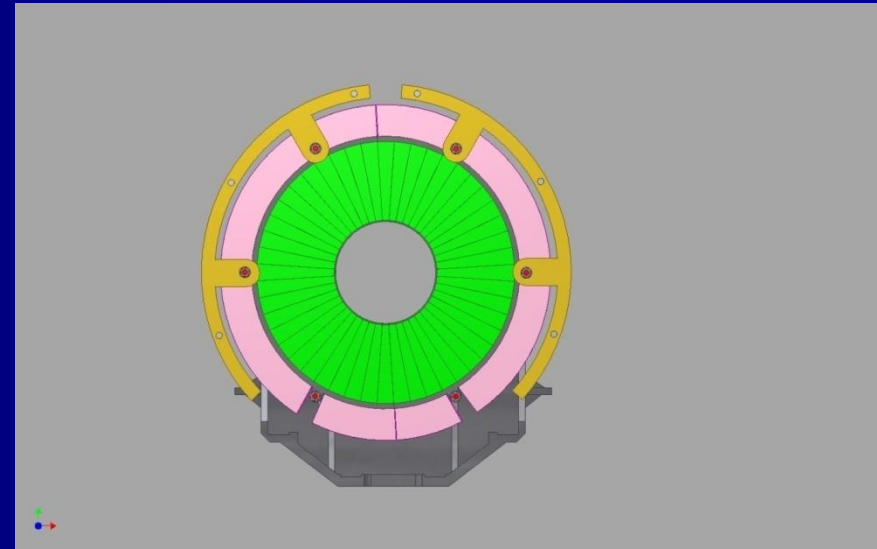
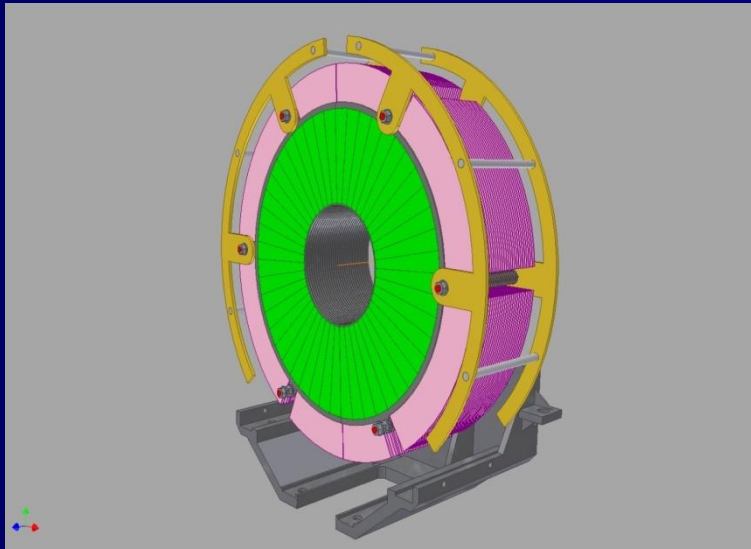


No 'symmetry', leak of space for fan out bonding.

Design overview

- Each calorimeter is in a form of a barrel which is divided into two parts along the vertical plane .
- The proposed LumiCal detector will consists of 30 layers of tungsten of 1 radiation length thickness and 320 μm silicon sensors layers.
- The sensitive region extends from 80 mm to 195.2 mm in radius.
- The outer radius of calorimeter is foreseen to be 280 mm to cover the space for front end electronics, readout cables, cooling and precision positioning sensors.
- The mechanical inner radius is 76 mm.

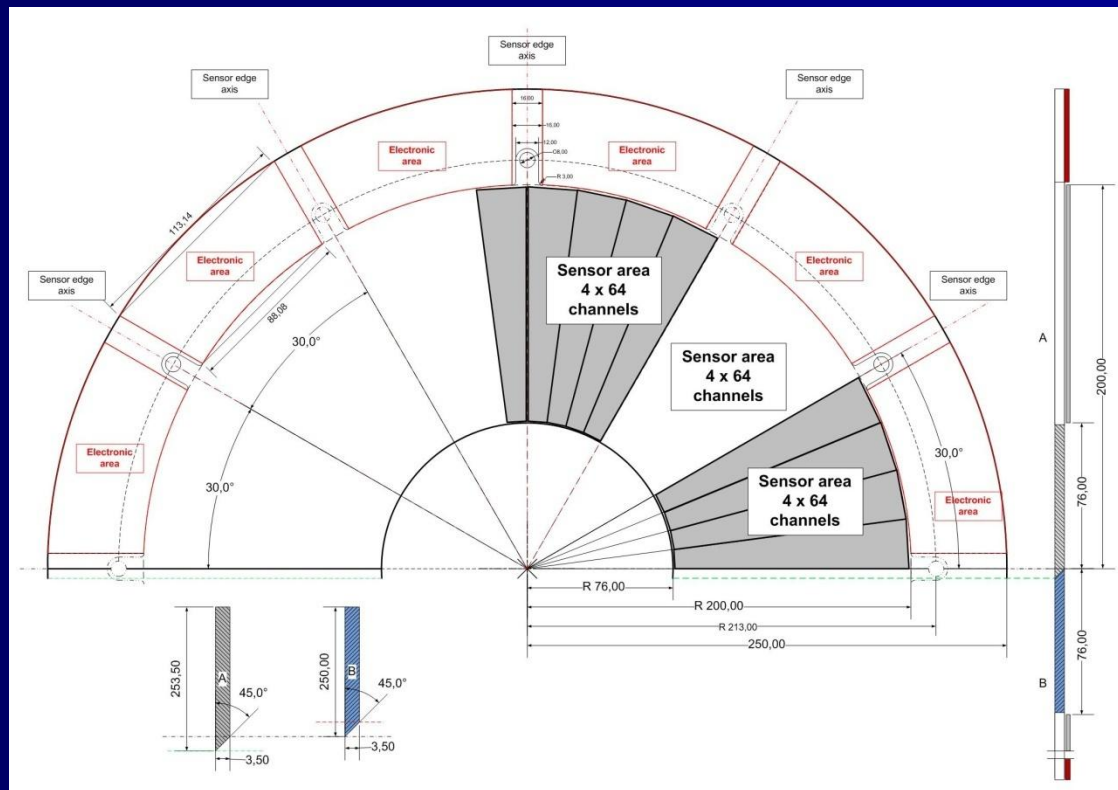
“New” design of LumiCal



Smaller in diameter fixing bolts, more space for FE electronics, 'full symmetry'.

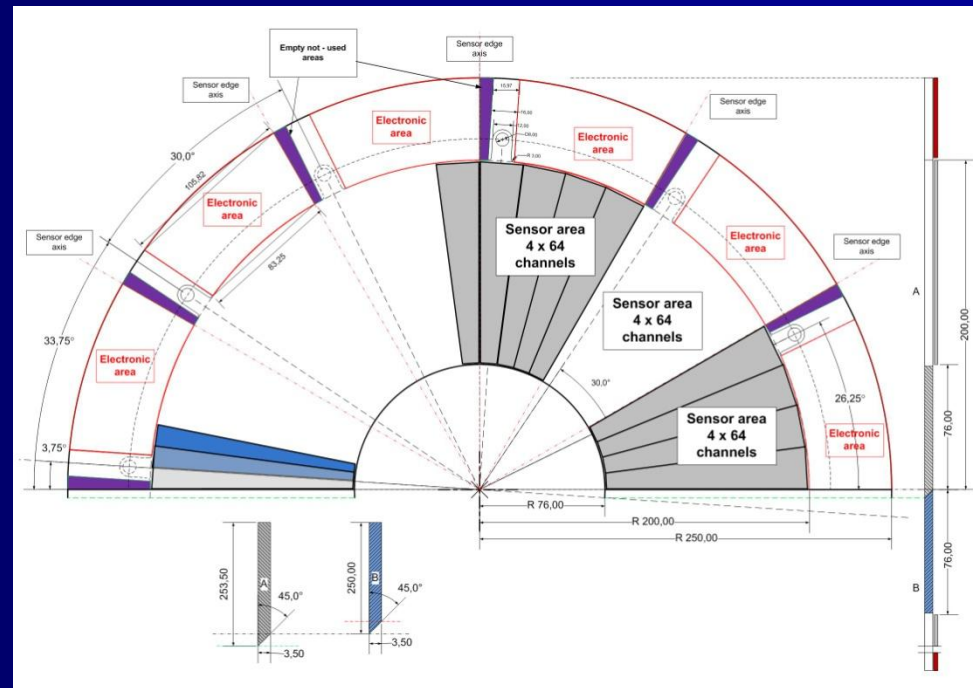
Fan out layout and FE PCB can have identical shape for all sensor tiles (4 sectors).

Space for FE electronics



- One LumiCal will have 92160 electronic readout channels. On one half plane it should be a place for 1536 electronic channels.
- The goal was to have all electronics for silicon tiles identical.

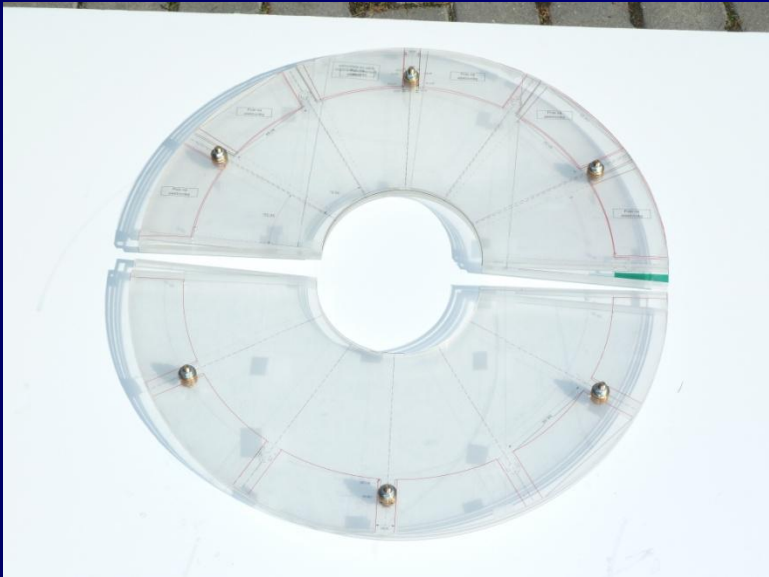
Detailed half plate design



□ Due to rotation of odd and even sensor planes by 3.75° to overlap the gaps in Tungsten absorber, some space for electronics (with full symmetry) is lost, but our design minimize it.

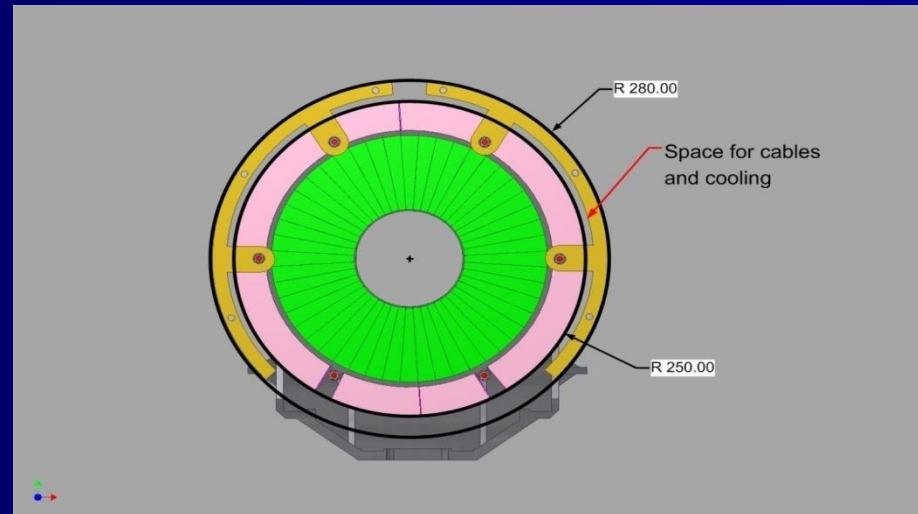
□ We foresee 3 fixing bolts to mount one half plane, but it is possible to have 5 fixing bolts per half plane. More fixing bolts will increase the stiffness of LumiCal mechanical construction.

Proof of the design



Simple model in 1:1 scale of a part of the mechanical structure from transparent plastics has been made to proof the design.

Space for cables and cooling



The electronic channels of LumiCal will be read in digital form to the DAQ placed ~ 10 m far from the detector outside the ILD. The copper LVDS TP cables will go from each half plane of LumiCal around the barrel to the back side of each LumiCal where Data Concentrator will be placed. From Data Concentrator we foresee optical links to the DAQ. The fibre optics cables will go over LHCaI and inside the square support tube (near QD_0 magnet) outside the ILD detector.

Conclusions

- To find a space for FE electronics with some symmetry, we have to sacrifice the simplicity of LumiCal mechanical design – we will have 4 different shape tungsten half plates instead of 1 (2?).
- Design of new FE placement has started.
- Simple model in 1:1 scale of a part of the mechanical structure from transparent plastics has been made to proof the design.
- Real model in 1 :1 scale of full LumiCal from steel will be made in second half of 2010.