Contribution to the construction of the CMS Tracker Endcaps (2)

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4 Thermal conductivity measurement of carbon fiber frames

Responsible : Barbara

5 Deformation of the silicon sensors

The CMS detector modules consist of a sandwich of different materials glued together at room-temperature, and its operating-temperature is -10°C, so distortions will be induced because of the different expansion-coefficients. These distortions may induce several unwanted effects on the detector-modules:

- degrading of the coordinate-measurements of the module by shifting the wafers out of their original positions
- inducing of 'micro-cracks' in the silicon-wafers at the gluing areas, leading to higher noise-ratings
- destruction of the module

The distortions are measured with an optical method illustrated in Figure 5. A regular array of white dots is reflected by the wafers and viewed with a ccd-camera. Any deformation of the surface translates into movement of the dots. The setup consists of the following components:

- grid: the white dots are arranged in a way that ensures homogeneous scanning of the investigated surface every 5mm in each direction
- ccd-camera: BW-camera with PAL-Resolution (752x582 pixel) and a zoom-objective (12-70mm focal length)
- cooling machine: temperature range -25^oC to $+40^oC$, with 250W cooling power at -20^oC
- PC: controlling the cooling machine and reading out the camera via a frame grabber card, running under Linux

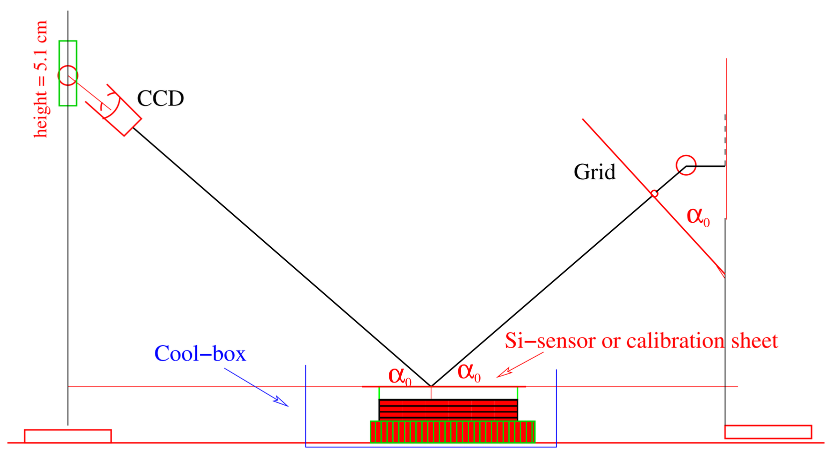

Figure 5: Schematic front view of the setup used for the measurement of the sensor deformation.

The calibration-parameters are evaluated by measuring a well known surface with the setup. In order to calibrate the setup over a wide range of distortions a special device is used consisting of a small sheet of metal which is bend using a high precision differential micrometer screw. For a silicon sensor the maximum deformation is preliminary measured to be of the order of 80μm.

6 Mounting on the petals

Responsible : Lionel
Mounting and electronic test (+ Long Term tests)

7 Outlook

Responsible : Barbara
Assembly of petals on larger structures and final integration in the CMS detector. Achievable resolution on track momenta.

References

[1] Authors, *Title*, Journal information.