# Calibration of a laser scanning system for quality assurance of CBM prototype silicon microstrip sensors *

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For the characterization and Quality Assurance (QA) of prototype sensors produced for the Silicon Tracking System (STS) at the Compressed Baryonic Matter Experiment (CBM), a infrared pulsed Laser Testing System (LTS) has been developed. The main aim for the LTS is to scan and characterize the prototype sensors. These QA scans are intended to understand charge sharing in the interstrip region and investigate uniformity of sensor performance in the active area of prototype sensors. The prototype sensor CBM02 which has 256 strips with a pitch of 50 $\mu$m on each side has been investigated in the LTS [1]. The strips on the sensors are wire bonded to connectors on a board and readout via self-triggering n-XYTER prototype electronics.

The goal for the LTS is to have automatized quality assurance tests in a controlled manner at several thousands positions across the sensor with focused infra-red laser light ($\sigma_{spotsize} \approx 15$ $\mu$m). The duration ($\sim$10 ns) and power (few mW) of the laser pulses are selected such that the absorption of the laser light in the 300 $\mu$m thick silicon sensors produces about 24 000 electrons,which is similar to the charge created by minimum ionizing particles (MIP) there.The wavelength of the laser was chosen to be 1060 nm because the absorption depth of infra-red light with this wavelength is of the order of the thickness of the silicon sensors [2]

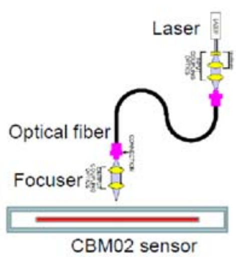


Figure 1: Schematic representation of the laser setup.

A schematic view of the measurement setup is shown in Figure 1. The laser light is transmitted through a 6 $\mu$m thick optical fiber to a two-lens focusing system, which focuses the light to a spot of about 15 $\mu$m diameter and the working distance is about 10 mm. Figure 2 shows a dependence of the distanceto the sensor surface as a function of the number of strips fired with a signal just above threshold. With this measurement the proper focus distance has been achieved. Figure 3 shows the charge sharing function between neighboring strips represented in the form of fraction of amplitudes collected by the individual strip.

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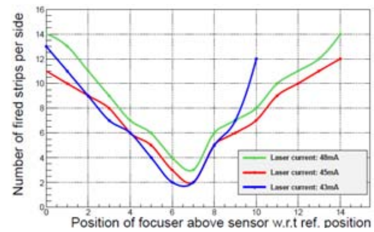


Figure 2: Dependence of distance to focuser from the sensor surface as a function of strips fired.

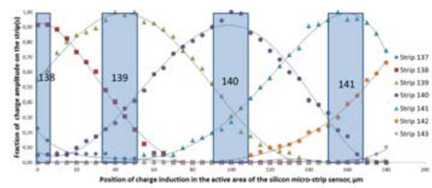


Figure 3: Charge division (fraction of amplitude) in the interstrip region as a function of position of laser spot.

The LTS has recently been upgraded with motor controls using EPICS [3] and programs have been written to step over the active area make several measurements automatically. Figure 4 shows an operator interface of the running system using EPICS tools. The next step is to integrate the data acquisition software DABC [4] plugin for the EPICS position information for data taking, logging and further analysis using the Go4 analysis software.

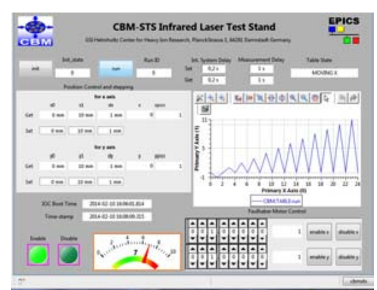


Figure 4: Run time operator interface for the LTS.

## References

[1] J.M. Heuser et al., CBM Progress Report 2011

[2] P.O'Connor et al., Proc. of SPIE Vol. 6276 62761W-1, p.2

[3] EPICS: http://www.aps.anl.gov/epics

[4] DABC: http://dabc.gsi.de

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