

Full-size silicon microstrip sensors for the CBM Silicon Tracking System*

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The layout of the CBM Silicon Tracking System foresees the application of double-sided microstrip sensors in three sizes. All sensors have the same width of 6.2 cm, matching the width of the detector ladders that build up the tracking stations, and are segmented into 1024 strips of 58 μm pitch. The sensor heights, essentially corresponding to the strip lengths, are 6.2, 4.2 and 2.2 cm, depending on the position of the sensors within the tracking stations. Sensors close to the beam line, which are exposed to the highest track densities, have the shortest strip length. Towards the periphery of the STS, sensors with longer strips, even daisy-chained sensors can be used still yielding small enough particle hit occupancies for efficient pattern recognition. A first series of silicon microstrip sensors in all three sizes has been designed in 2012. Their profiles are shown in Fig. 1. The projects, conducted in close cooperation of GSI (*CBM05*, *CBM05H4*) and JINR (*CBM05H2s*) complement the previous prototyping activities [1] in terms of design optimization towards the emerging silicon detector module structure, and high production yield. They will yield tested pre-series prototypes in 2013.

Full-size prototype CBM05

The largest of the three sensors is currently in production at CiS [1]. It is a p-in-n type double-sided sensor of 300 μm thickness with a 7.5° stereo angle between front and back side strips. Strips of the corner regions of the stereo side are interconnected through lines on a second metal layer so that their full read-out can be achieved from one edge. The complex sensor structure was optimized based on the good results with a similar single-sided technology sensor *CBM03*' built in 2012.

Full-size prototype CBM05H4

The mid-size sensor is being realized in parallel with Hamamatsu Photonics. Since 2011, Hamamatsu offers again the fabrication of double-sided sensors. With *CBM05H4* we realize a double-sided sensor with double-metal interconnecting lines in the complementing dimensions 6.2 cm by 4.2 cm. The layout of the sensor is essentially identical to the *CBM05* layout, including a double metal layer on the p-side.

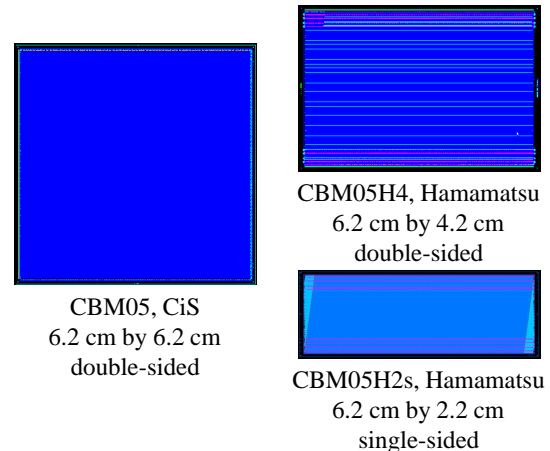


Figure 1: Prototype microstrip sensors, *CBM05* family.

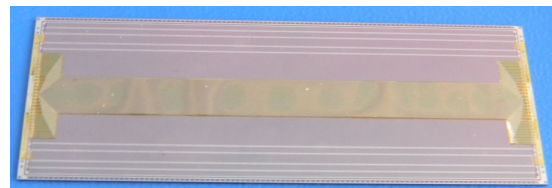


Figure 2: Microcable replacing the second metal layer mounted on a mockup of sensor *CBM05H2s*.

Full-size prototype CBM05H2s

The small prototype sensor is also developed in cooperation with Hamamatsu. The objective is to realize a sensor with minimum complexity to study an alternative for the double-metal interconnection layer. Its layout has no second metal layer but pads for the attachment of a separate microcable fulfilling the same function as the lines otherwise integrated into the sensor. The microcable is designed and produced at SE SRTIIE. A mock-up of the sensor fitted with its on-chip cable are shown in Fig. 2. The final sensor will be also produced as a double-sided structure.

References

- [1] GSI Scientific Reports 2009 70, 2010 21 and 2011 34
- [2] <http://www.cismst.de>
- [3] <http://www.hamamatsu.com>

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