A setup for adjustment of process parameters for CBM module production

D. Soyk[1], *C. Simons*[1], *C. Schmidt*[1], *I. Tymchuk*[2], *M. Protsenko*[2], *and V.M. Borshchov*[2]
[1]GSI, Darmstadt, Germany; [2]LTU, Kharkov, Ukraine

The sensor modules for the CBM STS comprise an STS microstrip sensor, 16 CBM STS-XYTER readout chips and 32 microcables of 64 leads each. The double-sided STS sensor has 1024 strips on each side. Consequently 2048 channels per module must be connected by means of 4096 bonds. It is obvious that the quality assurance of theses tab-bonds is a major ingredient to the yield of module production and reliability of the detector as a whole. Especially the large number (around 1000) of modules needed for the entire CBM STS requires to have a detailed look at the tab-bond process and its parameters, as potentially required repair actions on defective modules will be time consuming and adds the risk of additional inadvertent damage to the module. Therefore it is the best solution to improve and bring the tab-bond process to perfection before starting the serial production of modules for the CBM STS.

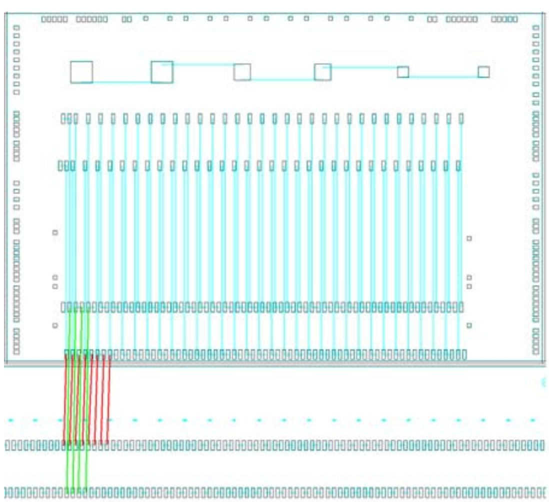

Figure 1: Dummy CBM STS-XYTER chip (up) and a partial plan of a CBM sensor dummy (down). The red lines are the connections via the microcable for the first row of bond pads. The green lines are the connections via a second microcable for the second row of the pads. In the upper part of the Dummy CBM STS-XYTER are the contact pads for the test equipment directly connected to the tab-bond pads in the lower part of the chip.

It is clear that for such process optimization no original full functional STS sensor and CBM STS-XYTER chip will be used or needed. The first reason is the costs of the original components and second reason is the missing of fast and easy ways to check the quality of the tab-bonds. For this reason, dedicated dummy-sensors as well as dummy-chips have been designed and manufactured. To check the quality of bonding two tests are necessary. One is the pull test to check mechanical adhesion of the aluminum lead of the microcable to the bond pad. The second is the electrical connectivity of the bond.

In order to make this test conclusive for the real module the microcable must the original, the surface and the material of the bond pads for dummy-sensors and chips must be identical to the material on the original sensors and chips. Also, the Silicone wafer material and thickness should be identical. If these requirements to the microcables, dummy sensors and chips are fulfilled, it is possible to transfer the process data to the serial production process.

To improve the test routines for the electrical contacts, additional pads for test needles and connections between the pads were added to the dummy-sensors and -chips. (These additional features will not be part of the layout of the final devices.) In Fig. 1 the scheme of electrical connections is shown with the layout of the dummy chip and sensor. On the dummy chip, each second pad of each row is electrically connected to a pad far away from the tab-bond area. (The first pad of a row is like the second also electrically connected to a shifted pad.) The non duplicated pad is electrically connected to its left neighbor. On the dummy sensor two neighboring pads of a row are electrically connected together.

The idea behind this set-up is to make an electrical connection between the pad of the test needle via the tab-bond on the chip, the microcable, the tab-bond on the sensor and back to the second test pad for each row. With this simple serial routing it is possible to check 4 tab-bond connections and two leads of the microcable with one single measurement. If the connection is good the first needle is kept on its starting position whereas the second needle is shifted to the next pad of the row. This daisy chaining now allows to check 8 tab-bonds and 4 leads of the microcable in one go. While continuing this daisy chaining it is possible to check numerous tab-bonds and microcable leads. If a broken lead or damaged tab-bond is found the first needle of the test set-up must be moved to the unconnected pad and the second needle can step further. With this test strategy we can reduce the number of single tests, because only broken leads or tab-bonds will cause a restart of the test procedure. Additionally the test procedure could be done automatically on a wafer prober.

At the moment the dummy chips and sensors have been delivered. We are now waiting for a sufficient number of sample microcables to start process optimization.

 doi:10.15120/GR-2014-1-NQM-CBM-20