Improvement of ultra-light microcables production at LTU for the CBM Silicon Tracking System

V.M.Borshchov[1], *I.T.Tymchuk*[1], *C.J.Schmidt*[2], *V.G.Kucherenko*[1], *G.I.Nikitskiy*[1], *J.M.Heuser*[2], *M.A.Protsenko*[1], *J.Eschke*[2,3], *R.A.Kushniruk*[1], *L.V.Klimova*[1], *and K.M.Liholitova*[1]

[1]LED Technologies of Ukraine (LTU) Ltd, Kharkov, Ukraine; [2]GSI, Darmstadt, Germany; [3]FAIR, Darmstadt, Germany

Ultra-light micro-cables are the key component for the CBM-STS. They are employed to realize the analogue signal interconnection between detector and readout for the STS at minimized material budget. Taking into account the complexity of micro-cables and their required quantity a few “bottlenecks” in the production line have been identified and improvements were realized on the production line. Additionally the preliminary technological regimes were defined and a test batch of micro-cables (100 pieces) was manufactured within the framework of the STCU partner project P635.

For the detector modules two kinds of interconnection components will be employed [1-2]:

- ultra-light interconnection microcables based on aluminium-polyimide adhesiveless dielectrics (connecting microcables, interstrip cables, daisy-chain cables, shielding layers).
- meshed spacers based on Kapton or polyimide (narrow and wide meshed spacers).

The typical technological process of micro-cable and spacer manufacturing includes the following main technological operations based on photolithography and chemical wet etching processes: chemical cleaning of the substrate, photoresist coating on the substrate, photoresist exposure, photoresist development, aluminium etching (for interconnecting micro-cables), polyimide etching and finally photoresist removal.

Taking into account that large numbers of components in a considerable design variety need to be produced for the CBM STS (about 58 thousand micro-cables and spacers) the available technological equipment and the production line were analyzed with the aim to identify possible production “bottlenecks” which might result in production yield issues or even a suspension of production. The available equipment allows to produce the required components but two “bottlenecks” were identified:

- equipment for photoresist coating needed duplication,
- an exposure unit for photoresist exposing needed to be duplicated.

The following equipment was in consequence supplied by GSI to LTU Ltd within the STCU partner project, both from Bungard Elektronik, Germany:

- a Dip Coater RDC 21-K type,
- a parallel beam exposure unit EXP8000.

The equipment was installed and tuned in the clean room at the cable production site in Kharkov (Fig. 1). Process parameters for the operation of these machines for the different types of components were investigated and preliminary regimes were chosen.

Based on these parameters, a first pilot batch of micro-cables was produced and delivered to GSI so that the module assembly processes could be elaborated (48 laminated and 52 non-laminated test microcables 11 cm and 21 cm long). Samples of test cables are depicted in Fig. 2. The cable production line at LTU has been strengthened towards the large scale serial production of micro-cables for the CBM-STS. Technological regimes on the newly installed equipment were investigated and a batch of test microcables produced. This is a starting point for further production process optimization towards yield.

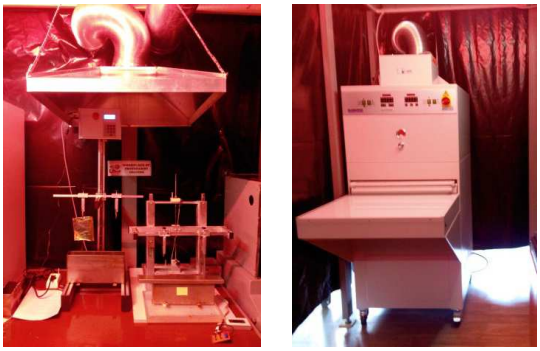

Figure 1: Dip coater RDC 21-K (left) and exposure unit EXP8000 (right) installed at LTU.

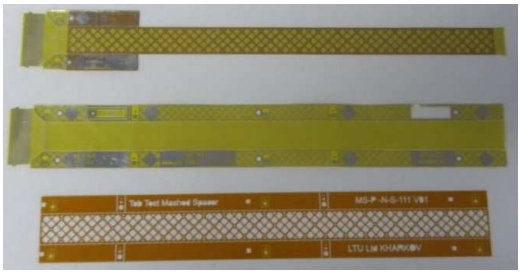

Figure 2: Experimental micro-cables for the development of the TAB-bonding assembly steps at GSI.

References

[1] V.M. Borshchov et al., CBM Progress Report 2013, p. 41
[2] C.J. Schmidt et al., CBM Progress Report 2012, p. 18

DOI:10.15120/GR-2015-1-MU-NQM-CBM-46