

PRESTO: PREcursor of the Second sTatiOn of the CBM-MVD*

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This report summarizes the activities undertaken to construct a precursor of a quadrant of the second MVD-station.

The PRESTO (PREcursor of the Second sTatiOn) project of the CBM-MVD addresses the double-sided integration of 15 MIMOSA-26 sensors (dummies and working sensors, 9 of these on the front in a 3×3 and 6 sensors on the back in a 2×3 arrangement) onto a $8 \times 8 \text{ cm}^2$ CVD diamond carrier [1] featuring a thickness of $150 \mu\text{m}$. The PRESTO module will employ new flex cables (FPC) [2] providing all signals needed to operate and read out the sensors (10 FPCs in total), see fig. 1.

To assemble this module, new sensor positioning jigs aiming for a sensor positioning precision with respect to the support and the neighboring sensors of below $100 \mu\text{m}$ were manufactured. To evaluate the integration concept, the RAL-247 adhesive [3] and the new jigs, a dummy PRESTO module has been assembled employing $50 \mu\text{m}$ thin MIMOSA-26 dummies and a $200 \mu\text{m}$ thin glass plate which serves as sensor carrier, see fig. 2.

In the process of gluing, the inclusion of air bubbles should be avoided due to the vacuum operation of the MVD and the use of thinned sensors. This triggered a study focusing on optimizing the preparation of the glue, its dispensing and the quality assurance of the results. The number of air bubbles introduced into the glue during its mixing process has been significantly reduced by degassing it in an excicator at about $4 \cdot 10^{-1} \text{ mbar}$ for about 1 hour. However, this did not prevent the air bubbles to appear after the gluing of the sensors onto the carrier. The introduced air bubbles featured a size of about $100 - 300 \mu\text{m}$ diameter. To verify their impact on the $50 \mu\text{m}$ thin sensor dummies, the cured module has been placed inside a small vacuum chamber which has been evacuated for about 48 hours to a value of $4 \cdot 10^{-1} \text{ mbar}$. The visual inspection of the sensor dummies using a high precision microscope did not reveal any mechanical damage. Further studies will be addressed with working sensors to check on-the-fly any possible correlation between sensor performance, pressure and bubble sizes.

The gluing of the dummy sensors onto the glass carrier demonstrated that a glue volume of $3 - 5 \mu\text{l}$ (different glue volume used for each row of sensors) is sufficient to dispense a uniform and thin (about $10 - 17 \mu\text{m}$) layer underneath the sensors. The horizontal sensor-to-sensor distances were measured to be below $5 \mu\text{m}$. The vertical variation in the distances between the sensor edges were

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measured to be of about $20 \mu\text{m}$. The achieved precision is significantly below the envisioned one. Next steps comprise the establishing of procedures for the integration of the FPCs, the exercise of double-sided bonding and the verification of the vacuum compatibility.

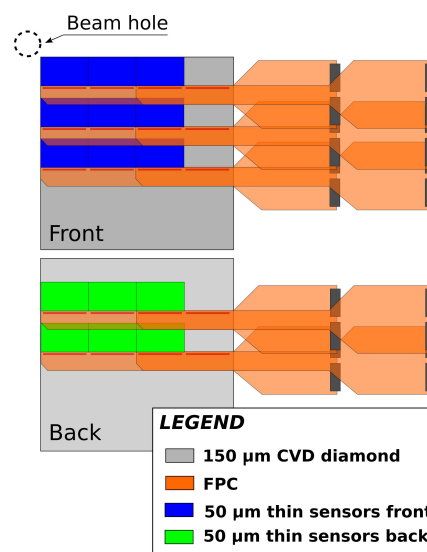


Figure 1: Sketch of the arrangement of the sensors and the FPCs with respect to the support carrier within the PRESTO module.

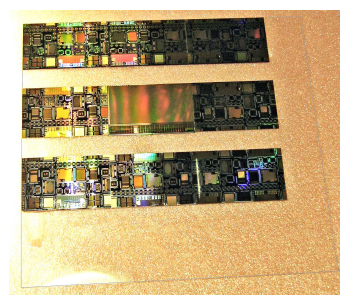


Figure 2: Assembled dummy module of PRESTO.

References

- [1] Diamond Materials GmbH, Germany
- [2] P. Klaus et al., "Ultra-low material budget Cu flex cable for the CBM-MVD." GSI annual report 2014.
- [3] Private communication, Simon Canfer Rutherford Appleton Laboratory, Composites and Materials Testing Group, UK.