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The Micro Vertex Detector for the CBM Experiment at FAIR

The Micro Vertex Detector (MVD) is the first downstream detector of the fixed-target CBM experiment at the future Facility for Antiproton and Ion Research (FAIR). It enables high-precision tracking of low-momentum particles in direct proximity of the target, e.g., the first out of four planar stations is placed only 8 cm downstream the interaction point. Thus, minimizing the material budget while operating the dedicated CMOS (MAPS) pixel sensors called MIMOSIS in the moderate target chamber vacuum is challenging. Each detector plane will feature a material budget x/X_0 ranging between 0.3 and 0.5%. The harsh radiation environment of up to $7 \cdot 10^{13} \text{ n}_{\text{eq}}/\text{cm}^2$ and 5 Mrad per CBM running year poses challenging constraints on the choice of technologies and materials employed, and in particular on the sensors. Stable sub-0° C operation to maintain high detection efficiency and low fake rate is mandatory.

The contribution will highlight the technological challenges w.r.t. the CMOS pixel sensor and its integration in dedicated detector stations featuring full geometrical acceptance and minimum material budget for operation in vacuum. The status of the detector R&D and pre-production will be reviewed.

Category

Experiment

Collaboration (if applicable)

CBM Collaboration

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