

Construction and test of a new CBM-TRD prototype in Frankfurt *

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A new TRD prototype based on a thin Multi Wire Proportional Chamber (MWPC) without a drift region and with carbon frame was designed at the Institute for Nuclear Physics in Frankfurt (IKF) and tested in the test beam at CERN-PS in November 2014. According to this design, two identical real-size prototypes in outer dimensions of $586 \times 580 \times 38.5 \text{ mm}^3$ were developed with a pitch of 2.5 mm between field and sense wires. Cathode (field) wires made of Cu-Be with a diameter of $80 \mu\text{m}$ are placed between gold-plated tungsten anode (sense) wires with a diameter of $20 \mu\text{m}$. The gas gap region, distance between entrance window and pad-plane, is $3.5+3.5 \text{ mm}$ (see Fig. 1). The chamber were build with the same type of pad-plane as used in the prototypes from Münster [1].

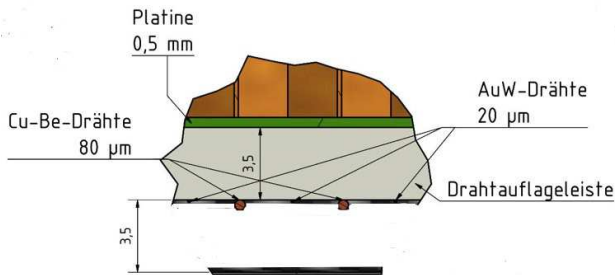


Figure 1: Schematic drawing of alternating wires, their pitch and diameters.

Applying cathode wires with alternating HV (alternating wires) has an improving result as it reduces the effect of a deformation of the cathode plane by about a factor of 6, which distorts the gas gain inside the detector via electric field deformation [2].

The MWPC with thin and symmetric geometry ($3.5+3.5 \text{ mm}$) provides fast signal collection and efficient e/π separation, which is desired in the CBM experiment [3]. The carbon frame, instead of an aluminium or vetronit frame, provides optimum mechanical properties, low thermal expansion, high friction resistance and low material budget. Figure 2 shows the technical drawing of the prototype with the aforementioned components.

Figure 3 shows the gas feed-through that is embedded inside the frame in the corners. Thus, it meets the structural conditions of the TRD chambers, which will have to be mounted close to each other in the final setup.

The data from the CERN-PS test beam in November 2014 are currently being analysed. The development of a

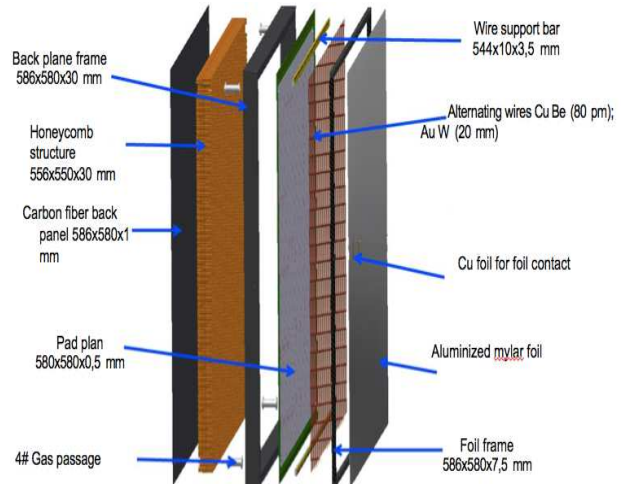


Figure 2: Technical drawing of a TRD prototype with alternating wires and carbon frame.

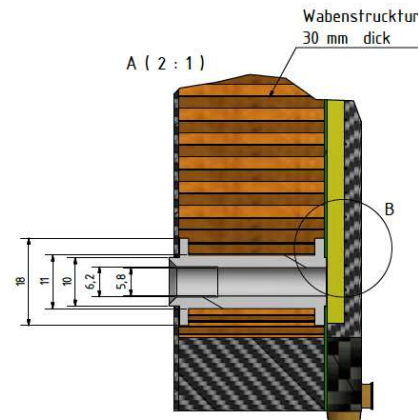


Figure 3: The gas feed-through inside the frame.

large size ($1.0 \times 1.0 \text{ m}^2$) prototype of the TRD is planned at the IKF.

References

- [1] C. Bergmann et al., "Test of Münster CBM-TRD real-size detector and radiator prototypes at the CERN PS/T9 beam line", CBM Progress Report 2014.
- [2] S. Gläbel, CBM Progress Report 2013, p. 70.
- [3] E. Hellbär, CBM Progress Report 2012, p. 54.

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