Toward a RPC basic structure for the inner zone of CBM RPC-TOF wall *

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For the inner zone of the CBM-TOF wall (polar angles between 50 mrad and 220 mrad) we proposed as basic unit a completely differential Multi-strip Multi-gap Resistive Plate Chamber (MSMGRPC) with a new geometry for the readout electrode of 7.1 mm strip pitch (5.6 mm strip width) and 96 mm strip length [1, 2]. With this value of the pitch size, the number of readout channels is reduced to one third of the estimated values of readout channels for the case of considering as basic unit the MGMSRPC with 2.5 mm strip pitch. High counting rate tests performed at COSY-Jülich with a proton beam of 2.5 GeV/c showed that even at 100,000 particles/cm^2·sec, the time resolution is better than 70 ps and the efficiency higher than 90% [2]. Constrained by the available dimensions of low resistivity glass ($\sim 10^{10}$ Ωcm) [3], the solutions foreseen for the present design is based on glass electrodes of 300 mm x 96 mm size. A modular structure divided in eight

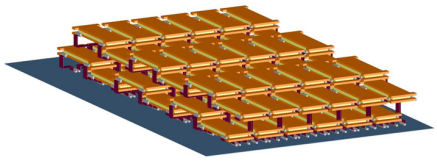

Figure 1: 3D image of RPC cells inside a supermodule

supermodules (SM) is proposed for the inner region of the CBM-TOF. A continuous coverage of the active area requires a staggered arrangement of RPC cells inside a supermodules and of supermodules, one relative to the other, as can be followed in Fig.1 and Fig.2, respectively. A demon-

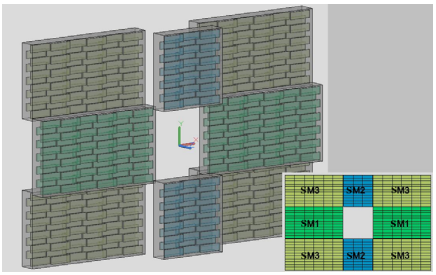

Figure 2: The 8 SM covering the inner wall active area

strator for the basic architecture of a supermodule contains four identical chambers staggered along (16.5 mm overlap) and across (17.5 mm overlap) the readout strips inside a gas tight box as it is illustrated in Fig3. The RPC cell structure is identical with the one reported in [1, 2]. The

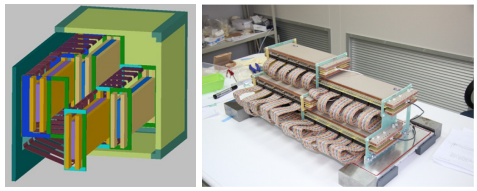

Figure 3: Sketch (left side) and photo (right side) of a basic architecture proposed for the inner zone of the CBM-TOF

lateral and front walls of the tight gas box are constructed from honeycomb sheets of 10 mm, sandwiched between two stesalit layers of 0.4 mm plated on the inner side by a pcb of 0.13 mm. The back plate, made from aluminum of 12 mm thickness supports the RPC cells. On rectangular openings machined on the plate are glued pcb plates with the connectors, for signal transmission from RPC cells to the front-end electronics.

The in beam test was performed at T9 beam line of CERN PS accelerator with a mixed electron and pion beam of 2 - 8 GeV/c momenta. Figure 4 left side shows the

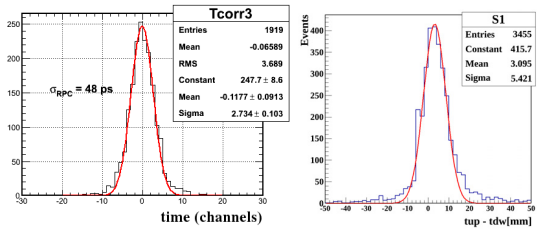

Figure 4: The TOF spectrum (left side); calibrated difference of the times measured at both strip ends (right side)

obtained time resolution of 48 ps measured for the overlapping zone along the strips of two MGMSRPC cells, after walk correction, including the electronics contributions. The 5.4 mm position resolution along the strip shown in Fig.4 right side was obtained from the calibrated time difference measured at both strip ends using position information from narrow strip reference RPC [2].

References

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