

Ceramics high rate timing RPC

For the most forward, high rate environment, region of Compressed Baryonic Matter experiment at the future Facility for Antiproton and Ion Research in Darmstadt the installation of timing Resistive Plate Chambers (RPC) is under consideration. Prototype timing RPCs have been developed at Forschungszentrum Dresden-Rossendorf (FZD).

RPC electrodes with volume resistivity of about $10^9 \Omega\text{cm}$ are preferred for high rate capability purposes. After few years of investigations with different electrode materials (e.g. plastics with nano-fillers, semiconducting glasses) special ceramics composites have been developed and processed.

A first prototype with six ceramics electrodes has been assembled and the results of the detector test obtained with monochromatic electron beam will be presented.

The most important result shows an all-time high rate capability for resistive plate counters. The efficiency amounts to 95% for fluxes up to $5 \times 10^5 / \text{s/cm}^2$.

Summary (Additional text describing your work. Can be pasted here or give an URL to a PDF document):

A prototype of ceramics electrode timing RPCs has been developed at Forschungszentrum Dresden-Rossendorf.

The RPC with a dimension of the ceramics electrodes of 10 cm x 10 cm has been exposed at the electron accelerator ELBE at FZD with 32 MeV single-electron beam pulses. The flux of the primary beam is tunable from few electrons/s to 10^7 electrons/s. The diameter of the exposed region amounts to about 3 cm.

A careful analysis of the results allows a continuous improvement of the ceramics RPC properties. During an exposition in September 2009 it appeared that the ceramics RPC shows an all-time high rate capability for resistive plate counters. The efficiency of the four-gap device with 300 μm gas gap width amounts to 95% for fluxes up to $5 \times 10^5 / \text{s/cm}^2$. The time resolution is independent for fluxes up to $10^5 / \text{s/cm}^2$ and amounts to about 100 ps.

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