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High Counting Rate Two-Dimensional Position Sensitive Transition Radiation Detector

Electron-pion discrimination in high multiplicity environment at collision rates up to 10⁷events/sec its a real challenge for future experiments as CBM at FAIR. This requires intensive R&D activity for developing high efficiency and high granularity transition radiation detectors (TRD) at affordable cost.
A new two-dimension position sensitive Transition Radiation Detector (TRD) based on a symmetric architecture is proposed. The performance of the prototype in terms of energy and two-dimension position resolutions using radioactive sources is presented.

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

High Counting Rate Two-Dimensional Position Sensitive Transition Radiation Detector

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A new double-sided two-dimension position sensitive Transition Radiation Detector (TRD) proposed by us is presented. Double-sided geometry showed an electron-pion discrimination efficiency better than 1% for a six layers TRD configuration and a position resolution of the order of 0.160 mm up to average particle rates of 2x10⁵particles/(cm² s¹) [1,2].

The size of the prototypes developed up to now is too small to provide a reasonable geometrical efficiency for a large array based on such cells. Therefore, a larger prototype with an increased pad size had to be developed. Obviously this conflicts with the requirement of high granularity and position resolution. In order to cope with this, the rectangular pads of the central double sided read-out electrode were split on diagonal.

The results in terms of pulse height resolution and position resolution using X-ray sources are presented. Position resolutions of 0.900 mm across the pads (x direction) and 2.5 mm along the pads (y direction) were obtained using events with at least three rectangular pads fired.

These results combined with previous ones, in terms of high counting rate performance, recommend this prototype as a real size cell based on which the low polar angles area of final CBM-TRD subdetector could be built.

1. M. Petrovici et al., Nucl. Instr. and Meth. in Phys. Res. A579(2007), 961
2. M. Klein-Boesing et al., Nucl. Instr. and Meth. in Phys. Res. A585(2008),83

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