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Construction of LMRPC modules for STAR-MTD

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Data taken over the last several years have demonstrated that the Relative Heavy Ion Collider (RHIC) has created dense and rapidly thermalizing matter. The next objective at RHIC is to study properties of this partonic matter in detail in terms of color degrees of freedom and the equation of state. The precise measurement of transverse momentum distributions of quarkonia at different centralities, collision systems, and energies will serve as a thermometer of QGP. A large-area and cost-effective Muon Telescope Detector (MTD) at mid-rapidity for the STAR was proposed. The MTD will be constructed with LMRPC instead of small pad read-out MRPC. With this design the number of electronic channels can be reduced effectively and the hit position along the strip can be obtained by the time differences of two ends of the strips.

A prototype of Long-strip Multi-gap Resistive Plate Chamber (LMRPC) for STAR-MTD has been developed. This 5-gap prototype has an active area of 52x87 cm² and the signals are read out from 12 strips, which are 3.8cm wide and 87cm long. The 5-gap STAR-MTD LMRPC module has a efficiency up to 98% and time resolution is in the order of 95 ps. The noise level of such modules is quite low. A special machine was developed to make the colloidal graphite electrodes. Using the time difference of the two PMT signals of each of the two long scintillators, a selection of perpendicular cosmic-ray particles is done to get a better time resolution evaluation. 22 LMRPC modules we have been built all passed QC and they have very good performance. The whole MTD consists of 117 LMRPCs and 60 modules will be produced in Tsinghua university. In this paper, the performance of the prototype, cosmic test facility and production status are described.

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