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An experimental performance comparison of glass RPC detector with HARDOC based readout electronics and custom electronics

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The proposed 50 kton magnetized Iron Calorimeter (ICAL) detector at India-based Neutrino Observatory (INO) aims to investigate atmospheric neutrino oscillations. The ICAL will employ about 29000 glass Resistive Plate Chambers (RPCs) as the active detector elements and requires millions of electronic channels to be read out. Therefore, a multi-channel readout application specific integrated circuit (ASIC) named as HARDROC is under consideration as a possible option. The ASIC is a 64 channel analog-digital front-end chip which can read negative fast and short input signals with each channel featuring a current sensitive pre-amplifier coupled to triple-branch shaper stage followed by 3 low offset discriminators. A comparative performance study of RPC detector with HARDROC based readout electronics and with custom electronics, based on CAEN modules and HMC pre-amplifiers, was conducted. Measurements were made on a 30cm X 30cm glass RPC detector, using the cosmic rays. The purpose of this work was to compare detector performance in terms of their strip detective efficiency, count rate, and cluster size.

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