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Optimisation of Operating High Voltage of large area Resistive Plate Chambers for the ICAL experiment

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As a part of its R\&D, the ICAL collaboration has built a small prototype module called mini-ICAL to study the detector performance, engineering challenges in the construction of large-scale magnet, magnetic field measurement system as well as to test the ICAL electronics in the presence of the magnetic field. This detector was also used to measure the charge-dependent muon flux as well as to study the feasibility of cosmic muon veto for a shallow depth neutrino experiments. The mini-ICAL detector consists of 11 layers of iron plates (dimension $4\,m \times 4\,m \times 0.056\,m$) with an inter-layer gap of 45\,mm. The RPC (area $\sim 2\,m \times 2\,m$) detectors are inserted between iron layers. The characterisation of RPC detectors and its electronics is an important part of the experiment before looking for physics data and results. Detector efficiencies, position resolution, time resolution are the major parameters to characterise. In general, the operating potential of this chamber is determined by the optimisation of the efficiency and noise rate of the device. This optimisation is based on the assumption that the performance of the device over the whole surface area is uniform. The INO-ICAL experiment is going to use $\sim\,30000$ RPCs of size $\sim\,2\,m \times 2\,m$. All the RPCs will have to pass a minimum quality assurance criteria, but may not be able to maintain a good uniformity over the whole surface area, particularly for the whole running period of about twenty years. This paper describes our studies on the choice of the optimum operating HV for an RPC of non-uniform response.

Session

Future Experiments and Detector Development

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