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Surface resistivity measurements and related performance studies of the Bakelite RPC detectors

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During the last few years at SINP/VECC, significant work on the prototype silicone coated bakelite based resistive plate chamber (RPC) for the Iron Calorimeter (ICAL) of the proposed India-based Neutrino Observatory (INO) has been carried out. Bakelite RPC detectors of various sizes from 10 cm X 10 cm to 1 m X 1 m, with capacitive read-out strips made of 16-conductor ribbon cables, have been fabricated, characterized and optimized for efficiency and time resolution. Thin layers of different grades of silicone compound are applied to the inner electrode surfaces to make them smooth and also to reduce the surface resistivity. Effectiveness of different silicone coating in modifying the surface resistivity was evaluated by an instrument developed for monitoring the I-V curve of a high resistive surface. The results indicate definite correlation of the detector efficiency for the atmospheric muons and the RPC noise rates with the surface resistivity and its variation with the applied bias voltage. It was also found that the surface resistivity varies for different grades of silicone material applied as coating, and the results are found to be consistent with the detector efficiency measurements done with these RPCs.

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