

# RPC2007

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## Development of conductive coated polyester film as RPC electrodes using screen printing

Each of the three 16 kton ICAL detector modules at the India based Neutrino Observatory will use RPCs as the active element, sandwiched between 6 cm thick soft iron plates, for measurements on atmospheric neutrinos. The electrodes of the RPC are float glass sheets having a volume resistivity of about  $10^{12} - 10^{13} \Omega \text{ cm}$  (at room temperature) covered with carbon/graphite or a conductive paint with a surface resistivity of  $\sim 800 \text{ K}\Omega/\text{square}$  to  $1 \text{ M}\Omega/\text{square}$  to apply high voltage on the glass surface, so that this surface does not shield the discharge signal from the external pickup plates and is small compared to the resistivity of the glass to provide a uniform potential across the entire surface.

We initially coated the surface with locally available graphite powder, mixed with binder and thinner, and were able to get a few hundred  $\text{k}\Omega/\text{square}$  resistivity. However we observed a drastic reduction in surface resistivity with time and it came unstuck from the glass. Subsequently a conductive paint developed by Kansai-Nerolac was used. This paint uses modified acrylic resin as binder, conductive black pigment and solvents which include aromatic hydrocarbons and alcohols. At room temperature the surface dries in 10 minutes while complete drying takes  $\sim 18$  hours. The spraying is done at a pressure of  $4 \text{ kg/cm}^2$  with the glass plate kept at a distance of 20-25 cm. Using this paint we are able to achieve the required resistance of  $\sim$  few hundred  $\text{K}\Omega/\text{square}$ .

We still need to study the long term stability and best curing method. We need to automate the procedure to get a uniform coat and to coat a large number of glasses for the final detector. While robotic systems are available abroad costing about 50 lakh rupees, we are exploring other alternatives. In particular, we are in the process of developing a polyester film, with a conductive coating on one side, which can be glued on to the glass. The coating was done using a local commercial screen printing machine (Grafica, Vasai, India) using the screen printing ink, CARBO PASTE DC-1000M and DC-20 (Dozen Tech, Korea). A surface resistivity of a few hundred  $\text{k}\Omega/\text{square}$  was obtained on a  $100 \mu\text{m}$  thick polyester sheet of dimension  $0.7 \text{ m} \times 1.2 \text{ m}$ . Curing was done for  $\sim 30$  mins at  $150^\circ \text{C}$ . We are planning to test this film on a glass RPC very soon.

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