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In beam studies of the Resistive-Plate WELL gaseous multiplier

We present the results of the first in beam studies of medium size ($100 \times 100 \text{ mm}^2$) Resistive-Plate WELL (RPWELL): a single-faced THGEM coupled to a copper anode through a resistive layer of high bulk resistivity ($\sim 10^9 \Omega\text{cm}$). The 6.2 mm thick configuration (excluding readout electronics) was studied with relativistic muons and pions in CERN-SPS test beam. The signal was read out through $10 \times 10 \text{ mm}^2$ square copper pads with an APV25-SRS electronics. The detector was operated in Ne/(5%CH₄) gas mixture and reached a detection efficiency of 99% at average pad multiplicity as low as 1.2. Operation at particle fluxes up to $\sim 10^5 \text{ Hz/cm}^2$ resulted in 30% gain drop and a 0.8% efficiency drop that could be restored by small increase of the THGEM voltage. The striking feature of this detector is being completely discharge-free (discharge probability $< 10^{-8}$ in high rate pion beam). These results show that the detector is an excellent choice for applications that require cost-effective solutions for radiation detection at moderate spatial and energy resolutions.

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