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Discharge quenching in Thick-GEM based WELL detectors

The occurrence of discharges, the consequent dead-time, and potential damage to the detector and electronics limit the dynamic range of gaseous detectors. Various resistive anode configurations are used to mitigate these effects. We have been characterizing discharges and the resulting performance of three different resistive Thick-GEM-based WELL configurations. In a bare WELL, the very energetic discharges induce rapid current spikes of a few hundreds of nA on the electrodes, preventing the operation of the detector. In RWELL configuration, placing a resistive layer on an insulator (e.g. DLC on Kapton) in front of the anode shields the readout electronics. This reduces the intensity of the discharge at the cost of current flowing sideways on the resistive layer. A more effective way of discharge quenching is implemented in RPWELL where the charges are evacuated via a highly-resistive plate. Using bulk resistivity at the range of 10^9-10^{12} Ω-cm results in significant quenching of the discharge intensity such that the current induced is at a level of a few nA.
We will present a newly-developed method to detect low-intensity discharges in RPWELL detectors. The results will show the role of applied voltage, detector gain, and the rate of incident radiation on discharge production. We will also present the effect of discharges on RPWELL performance as a function of distance from the discharge origin and as a function of time.

Primary experiment

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