

MPGD hole-by-hole gain scanning by UV excited single photoelectron detection

The developed high resolution scanner using focused UV light gave the possibility to study single photoelectron response of MPGDs on the sub-millimeter scale. This technology reveals the microstructure of photoefficiency and local gain to quantitatively compare different GEM geometries and thus provides a powerful tool for GEM quality assurance.

The readout detector uses a single GEM with the combination of an asymmetric MWPC (Close Cathode Chamber) as post-amplification stage. A pulsed UV LED source with emission at 240 nm is focused to 0.03 mm diameter on the GEM surface, while a single photoelectron charge spectra is recorded over a selected 2D region. As opposed to continuous illumination, here the GEM gain and photoelectron detection efficiency is clearly separated. Both the photoelectron yield and gain map fluctuates from hole to hole. The gain appears constant taking a hexagonal shape around each hole, pointing to the fact that the gain depends more on hole geometry and less on the position where the electron enters. High resolution gain map allows us to measure edge-effect, chargeup and the effect of GEM faults amongst others. The single photoelectron spectra provides valuable information on the avalanche formation in GEM detectors.

The presentation will introduce the scanning system and share results from photoelectron yield and gain maps from different types of GEMs.

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