

Applications of GEM Detectors in Security Screening and Agricultural Imaging

The Gas Electron Multiplier (GEM) detector has emerged as a valuable tool in radiation imaging technologies due to its high particle detection efficiency, good timing, and spatial resolutions. Its capacity to enable the manufacturing of large size detectors makes it ideal for applications such as cargo scanning, soil imaging like geophysical studies, particularly for the detection and analysis of the materials beneath the soil surface, and other industrial purposes. This study discusses the usage of GEM detectors in the range of imaging applications. The detector's unique construction, which consists of thin, gas-filled layers sandwiched between perforated electrodes, allows for precise tracking and localization of ionizing particles. When GEM detectors are integrated into imaging systems, they produce high-quality images with spatial resolutions of better than a millimeter. Image reconstruction is accomplished by analyzing the interaction locations of incoming radiation and the ensuing charge avalanche, allowing for precise dimension measurements, object identification, and material property assessments. It proves valuable in agriculture by quantitative measurement of density and gauging moisture levels in soil, which is vital for crop health. The experimental results show dimensional resolution greater than one millimeter and material identification uncertainty less than 1%. We will present preliminary results from prototype systems and explore their potential use in both the security and agriculture fields.

Workshop topics

Applications

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