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Applications of Detectors based on THGEM-like Configurations

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After the development of the Micro Strip Gaseous Chamber (MSGC) based on the semi-conductor technology processes, the genesis of the gaseous detectors has undergone a rapid evolution leading to spatial, temporal and energy resolution, rate capability, radiation hardness etc. This evolution has ushered in a new genre of micro-structured devices, commonly known as Micro-Pattern Gaseous Detectors (MPGDs). Within the broad family of MPGDs, the THick Gaseous Electron Multiplier (THGEM) has been attracting significant attention due to its simplicity and robustness. THGEM-based detectors may be constructed with very large area and their implementation does not require any particular mechanical support. The range of excellent characteristics features and the possibility of industrial production capability of large-area detectors, pave ways towards a broad spectrum of potential applications. These rely on THGEM's single-electron sensitivity, moderate (sub-mm) localization resolution, timing in the 10ns range, high-rate capability, low-temperature and broad pressure-range (mbar to few bar) operation. However, the single THGEM often suffers from occasional discharges which can potentially damage the electrodes affecting detector performance. The Resistive-Plate WELL detector was developed successfully utilizing resistive material to prevent electrical instabilities in the detector. It is a single-sided THGEM coupled to the segmented readout electrode through a sheet of large bulk resistivity. In the last few years, systematic investigations of the RPWELL detector performance and response were conducted. Its performance was characterized both in a generic context and in the context of future digital hadronic calorimeter sampling element. In parallel single- and dual- stage RPWELL-based UV photon detectors exhibit Polya-like spectra at high gains, under stable operation which could make them applicable for single photon imaging in RICH detectors.
In this presentation I will focus on the recent studies aiming to understand the underlying physics processes governing the operation and performance of the new RPWELL detector in the context of the above two applications. Lastly, I will discuss about another new device based on hybrid THGEM Multi-Wire concept which has been considered as a possible candidate for low energy fission studies.

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