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uRANIA: a micro-Resistive WELL for neutron detection

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In the uRANIA project (μ -RWELL Advanced Neutron Imaging Apparatus) the μ -RWELL technology is applied to neutrons detection, a key point for homeland security. The device is a compact resistive detector, composed of two elements: the micro-RWELL_PCB, incorporating the amplification stage and the readout plane, and the cathode. This latter works as well as main element for thermal neutron detection: a thin 10B layer, sputtered on the metallic surface, allows the neutron capture with the release of heavy charged particles (alpha or Lithium ion) in the detector gas active volume. The sputtering has been made by the ESS Neutron Detector Coatings Section (Linköping, SE).

Prototypes with 10 x 10 cm² active area and different cathodic profiles have been realized and tested at the HOTNES facility of the ENEA Frascati. Meshes sputtered with Boron have been moreover introduced in the device active volume and tested at the same facility.

A remarkable efficiency between 5 and 10% has been measured for thermal neutron, with single detector, with two methods: current and counting mode (CREMAT pre-amplifier). This work required an extensive simulation and validation campaign made with GEANT4.

The project pushes also for strong engineering activities to include FEE and the HV supply system in a compact device. The final goal is to produce an optimized design to start the development of large-area and cost-effective neutron detector for the Radioactive Portal Monitor (RPM) and Radioactive Waste Monitor (RWM), exploiting the compactness of the device that allows a stack of different detectors to increase the efficiency.

Collaboration

on behalf of the uRANIA collaboration

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