**u-RANIA: a neutron detector based on µ-RWELL technology**

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### THE PROJECT

Development of an innovative neutron imaging detector based on micro-resistive well technology [1]:

- compact,
- spark-protected,
- single-amplification stage Micro-Pattern Gas Detector.

Construction and test of small planar prototypes with readout boards segmented with strip/mini-pad readout equipped with already existing electronics.

Its characterization will be done by means of a neutron beam test.

This proof of concept will lead to the development of detectors for neutron beam diagnostic.

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### THE BEAM TEST

A preliminary characterization of the prototypes has been performed at the ENEA HOTNES in Frascati [5]. To measure the neutron detection efficiency, the detectors are read-out in current mode through a CAEN HV module A1561HDM.

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### THE SOURCE

**HOTNES Homogeneous Thermal Neutron Source**

- Production: ²⁴Mg-Am-B source placed in the cylindrical cavity delimited by polyethylene walls. A shadow bar prevents fast neutrons to directly reach the samples.
- Characterization: full energy spectrum and fluence known at various height in the irradiation volume.

### THE OPERATING RANGE

The detector shows a linear behavior at very low gamma at the reference point.

### THE CALIBRATION

A fine gain calibration of each detector is performed to reproduce the beam test conditions using an X-ray gun.

### THE FUTURE

An overall neutron detection efficiency ranging between 1.5 ± 2.0 (±0.2) % has been measured with ⁸⁹Sr source in the range 1.5 ± 4.5 micron thick.

Systematic effects (measured and simulated) due to the absorption and back-scattering of the thermal neutron on the FR-4 glass epoxy structure of the cathode PCB is taken into account.

To increase the detection efficiency, a stack of Boron-coated aluminum mesh will be placed between the cathode and the readout PCB.

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[5] The cathode deposition is performed by the ESI Coating Workshop in Linköping, Sweden [3].

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