Neutron radiation damage on a planar segmented germanium detector

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Recent advancements in HPGe contacts technology based on the innovative pulsed laser melting (PLM) technique open the route to the fabrication of stable electrons-collecting segments with better energy resolution for each single gamma interaction in the crystal than the present generation of detectors. In addition, these new detectors will attain higher counting rates and better response under particle radiation damage.

The segments of AGATA-like detectors are known to be much more subjected to trapping induced by neutron damage with a detrimental effect on the resolution due to the use of holes (h+) to generate the signals [1]. For this reason, testing if new type of detectors that collect electrons on the segments are more resistant to radiation damage is important for future applications in high neutron radiation environments.

A p-type planar segmented detector was exposed to a neutron flux of the order of 5×10^9 neutrons/cm^2 from the BELINA neutron activation beamline at the CN at Legnaro national laboratory, Italy. The detector response as a function of the damage was evaluated by taking the resolution using low and high-energy gamma-ray emitting sources.

[1] L.S. Darken, Role of disordered regions in fast-neutron damage of HPGe detectors Nuclear Instruments and Methods in Physics Research B74, 523-526 (1993).