
# NTD-Ge development in the LUMINEU project for Rare Events searches with cryogenic detectors

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Although Metallic Magnetic Calorimeters (MMCs) and Transition Edge Sensors (TESs) have demonstrated the highest sensitivities and excellent energy resolutions, a certain number of experiments searching for Dark Matter or Neutrinoless Double Beta Decay are planning to use Neutron Transmutation Doped Germanium thermistors (NTDs) as main solution for their heat channel measurements, in their present or even in their next stages, to take benefit from their robustness, reliability, ease of use over a large range of temperature and large dynamic range in energy. This is the case of the LUMINEU and EURECA projects, as examples.

The requirements for long term, large scale production and reproducibility, the need for improvements in energy resolution and threshold (for Dark Matter detection), led us to develop NTDs with optimal and homogeneous doping in large volume. Our development plan is first to demonstrate our ability to produce NTD sensors, then to study the dependence of their sensitivity on the production parameters and finally to realize NTD with optimal contacts and heat capacity.

In this paper we present the different possibilities for estimating and measuring the real neutron dose received by each HPGe wafers irradiated in the thermal neutron reactor ORPHEE at Saclay. Measurements of their resistivity at 300K indicate a dose discrepancy from the expected value and the homogeneity of the doping in volume. The neutron dose and the resistivity at a given low temperature are strongly correlated with the ratio of NTD's resistivity at 77K and 4K. We present a method allowing a better prevision of the impedance below 30mK just by measuring this ratio.