



Heat signals associated with energy deposits within the NTD Ge thermometer in a cryogenic germanium detector for dark matter search

Main author:

PIRO Marie-Cécile

Co-authors:

Bergé Laurent, CSNSM-Orsay
Broniatowski Alexandre, CSNSM-Orsay
Chapellier Maurice, CSNSM-Orsay
Dumoulin Louis, CSNSM-Orsay
Marnieros Stefanos, CSNSM-Orsay
Piro Marie-Cécile, CSNSM-Orsay (France)

Cryogenic ionization-and-heat germanium detectors fitted with NTD (neutron-transmutation doped) Ge thermometers exhibit occasionally heat signals with unusual shapes, associated with energy deposits within the thermometer. Based on risetime measurements of the heat signals, a variety of situations are shown to occur, depending on whether the energy deposit took place within the thermometer or the detector crystal alone, or the energy was shared between both (as could be the case for a multiple interaction associated with the Compton scattering of a photon for instance). Templates for single energy deposits within the detector crystal on the one hand, and the thermometer on the other were obtained from a calibration experiment with 60 keV photon interactions from a ^{241}Am gamma source. In the case of a compound interaction a fit of the heat signal to a linear combination of the templates enables to determine the amounts of energy deposited in the thermometer and the detector crystal respectively. Results are shown to be consistent with the data for the ionization charge created in the detector crystal, as measured by the amplitude of the charge collection signals of the device.