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Study of ^{150}Nd 2β decay to the 0_1^+ excited level of ^{150}Sm

The ^{150}Nd nuclide is one of the most promising ones to search for double beta decay among the 35 naturally occurring double beta isotopes because of the high energy release: 3371.38(20) keV, and of the comparatively high isotopic abundance: 5.638(28)%. The 2β transition to the 740.5 keV 0_1^+ excited level of ^{150}Sm was observed in few experiments with half-lives in a wide range $(7-14) \times 10^{19}$ y. The investigation of this decay is performed at the Gran Sasso underground laboratory (Italy) with a highly purified 2.381-kg Nd_2O_3 sample in the low-background setup with 4 HP Ge detectors ($\approx 225 \text{ cm}^3$ each), mounted in one cryostat. Two gamma-quanta with energies 334.0 keV and 406.5 keV emitted after the deexcitation of the 0_1^+ excited level of ^{150}Sm have been observed in the coincidence spectra accumulated over 25947 h giving the preliminary half-life value of the ^{150}Nd relatively to the decay searched for: $T_{1/2} = [6.9_{-1.9}^{+4.0}(\text{stat}) \pm 1.1(\text{syst})] \times 10^{19}$ y. The experiment is in progress in order to improve the half-life value accuracy.

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