STUDY OF THE OBSERVATION FEASIBILITY FOR THE NEUTRINO-ACCOMPANIED DOUBLE BETA-DECAY OF ^{76}Ge TO THE 0^+_1-EXCITED STATE OF ^{76}Se USING SEGMENTED Ge DETECTORS

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S u m m a r y

Neutrino-accompanied double beta-decay of ^{76}Ge can populate the ground state and excited states of ^{76}Se. While the decay to the ground state has been observed with a half-life of $1.74^{+0.18}_{-0.16} \times 10^{21}$ years, the decays to the excited states have not yet been observed. Nuclear matrix elements depend on details of the nuclear transitions. A measurement of the half-life of the transition considered here would help to reduce the uncertainties of the calculations of the nuclear matrix element for the neutrinoless double beta-decay of ^{76}Ge. This parameter relates the half-life of the process to the effective Majorana neutrino mass. Here, we present the results of study of the feasibility to detect the neutrino-accompanied double beta-decay of ^{76}Ge to the excited states of ^{76}Se with the use of segmented germanium detectors. Such detectors enriched in ^{76}Ge to a level of about 86% will be deployed in the GERDA experiment located at the INFN Gran Sasso National Laboratory, Italy. It is shown that the decay of ^{76}Ge to the 1 122 keV 0^+_1-level of ^{76}Se can be observed in GERDA provided that the half-life of the process is in the range favored by the present calculations which is 7.5×10^{21} y to 3.1×10^{23} y.