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SEARCH FOR β+EC AND ECEC PROCESSES IN 74Se

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Search for double beta decay processes (β+EC, EC/EC) of 74Se was performed at the Modane underground laboratory (LSM, France, 4800 m w.e.) using an ultra low-background HPGe detector OBELIX with sensitive volume of 600 cm3 and a sample of natural selenium. The sample of natural selenium was powder with a total mass of 1.6 kg containing ~0.89% (~14.24 g) of 74Se. Selenium was filled in a circular Teflon box and placed on the end cap of HPGe detector. The measurement of selenium sample was lasted during 3040 h. The efficiency of measurement was obtained by using Monte Carlo simulations performed on the base of GEANT 4 and GEANT 3 and then tested by measurement of. low active samples placed on the end cap of Obelix detector. Low active samples were prepared on the base of La2O3 powder containing ~0.09% of 138La (T1/2≈1.02×10^11 yr) and had activities of –19.3 and 61.8 Bq. . The main goals of present investigation were searches for radiative 0νECEC decay of 74Se into the ground 0+ state of 74Ge, 2νECEC decay of 74Se into 2+1, 596 keV and 2+2,1204 keV exited states of 74Ge, and β+EC decay into 2+1, 596 keV excited state of 74Ge. Based on preliminary calculations of experimental data new limits on β+EC and ECEC decays of 74Se into ground 0+, 2+1, 596 keV and 2+2,1204 keV exited states of 74Ge was obtained. They are ranged from T1/2 ~1×10^19 yr (90% CL) to T1/2 ~ 5 ×10^19 yr (90% CL) and significantly improved previous experimental limits.

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