

NEW SEARCH FOR DOUBLE ELECTRON CAPTURE OF ^{106}Cd WITH THE TGV-2 SPECTROMETER

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The new search for double electron capture decay of ^{106}Cd was performed at the Modane underground laboratory (LSM, France, depth 4800 m w.e.) using the multi-detector spectrometer TGV-2 (Telescope Germanium Vertical) [1]. The detector part of the spectrometer is composed of 32 HPGe planar type detectors with the sensitive volume of $2040\text{ mm}^2 \times 6\text{ mm}$ each mounted one over another together with double beta emitters placed between them in a common cryostat tower. Previous experimental runs performed with TGV-2 spectrometer to search for EC/EC, $\beta^+\text{EC}$, and $\beta^+\beta^+$ decays of ^{106}Cd used $\sim 10\text{ g}$ of ^{106}Cd [2] and $\sim 13.6\text{ g}$ of ^{106}Cd [3] with enrichment of 75%. As a result, the new experimental limit on $2\nu\text{EC/EC}$ decay of ^{106}Cd – $T_{1/2} > 4.2 \times 10^{20}\text{ y}$ (90%CL) [3] were obtained improving existing limits by more than two orders of magnitude and reaching the range of theoretical predictions for this decay [4]. The analysis of $KX\text{-}KX$ coincidences obtained in the last run [3] showed a small increase in the number of measured events in the region of $\sim 21\text{ keV}$ ($KX\text{Pd}$), which might be the $2\nu\text{EC/EC}$ decay of ^{106}Cd . But the statistics was not enough to make any significant claim about the presence of the process searched. A larger statistics should be accumulated with a higher mass of enriched ^{106}Cd in the new experimental run. The new measurement was started in December 2013 with the TGV-2 spectrometer and 16 foils of ^{106}Cd with enrichment of 99.57%. Investigated foils have a thickness of $70(10)\text{ }\mu\text{m}$ and a total mass of $\sim 23.2\text{ g}$. The foils of enriched ^{106}Cd were preliminary measured during 17 days at LSM with a high-efficiency low-background HPGe spectrometer [5] to obtain their contaminations. The limits on $0\nu\text{EC/EC}$ resonant decay to the excited states of ^{106}Pd were obtained in this measurement to be – $T_{1/2}(KL, 2741\text{ keV}) > 0.9 \times 10^{20}\text{ y}$ (90% CL) and $T_{1/2}(KK, 2718\text{ keV}) > 1.4 \times 10^{20}\text{ y}$ (90%CL).

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