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

Briancon Ch.[2], Brudanin V.B.[1], Egorov V.G.[1], Fajt L.[3], Hodak R.[3], Jose J.M.[3], Klimenko A.A.[1], Kovalik A.[1], Rozov S.V.[1], Rukhadze E.N.[3], Rukhadze N.I.[1], Salamatin A.V.[1], Shitov Yu.A.[1], Šimkovic F.[1,4], Spavorova M.[3], Štekl I.[3], Timkin V.V.[1], Yakushev E.A.[1]

[1]*Joint Institute for Nuclear Research, Dubna, Russia;*
[2]*Centre de Spetromėtrie Nuclėaire et de Spetromėtrie de Masse, Orsay, France;*
[3]*Institute of Experimental and Applied Physics, CTU in Prague, Prague, Czech Republic;*
[4]*Comenius University in Bratislava, Bratislava, Slovakia*
E-mail: rukhadze@jinr.ru

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 mm^2 ×6 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, β^+EC, and $\beta^+\beta^+$ decays of ^{106}Cd used ~10 g of ^{106}Cd [2] and ~13.6 g of ^{106}Cd [3] with enrichment of 75%. As a result, the new experimental limit on 2νEC/EC decay of ^{106}Cd – $T_{1/2}$>4.2×10^{20}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*-*KX* coincidences obtained in the last run [3] showed a small increase in the number of measured events in the region of ~21 keV (*KX*Pd), which might be the 2νEC/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 ^{10i6}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) μm and a total mass of ~23.2 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 0νEC/EC resonant decay to the excited states of ^{106}Pd were obtained in this measurement to be – $T_{1/2}$(*KL*, 2741 keV) > 0.9×10^{20} y (90% CL) and $T_{1/2}$(*KK*, 2718 keV) > 1.4×10^{20} y (90%CL).

This work was partly supported by RFBR under grant № 14-02-00568.

1. V.B.Brudanin *et al*. // Izvestia RAN. Ser. Phys. 2003. V.67. P.618.
2. N.I.Rukhadze *et al*. // Izvestia RAN. Ser. Phys. 2008. V.72. P.777.
3. N.I.Rukhadze *et al*. // Izvestia RAN. Ser. Phys. 2011. V.75. P.934.
4. V.I.Tretyak, Yu.G.Zdesenko // At. Data and Nucl. Data Tables. 2002. V.80. P.83.
5. N.I.Rukhadze *et al*. // Izvestia RAN. Ser. Phys. 2013. V.77. P.424.