



Contribution ID: 134

Type: Talk

Alpha decay of naturally occurring neodymium isotopes

Tuesday, July 11, 2023 5:00 PM (20 minutes)

From 7 naturally occurring Nd isotopes, 5 are unstable in relation to α decay. Only for ^{144}Nd , α decay was experimentally registered (to the ground state of the daughter nucleus), with half-life measured as 2.3×10^{15} y [1]. This value is in a good agreement with our calculations. Theoretical $T_{1/2}$ estimations of possible transitions for other Nd isotopes are higher. If these decays are accompanied by γ quanta, we could search for them with HPGe detector. We used a Nd_2O_3 sample with mass of 2.381 kg and a low-background set-up with four HPGe detectors in one cryostat. Measurements were performed at the STELLA facility of the Gran Sasso underground laboratory (Italy) over 51237 h. No effect was observed and new improved half-life limits were set which are 2-3 orders of magnitude better than those known previously. In particular, for α decays of ^{143}Nd , ^{145}Nd and ^{146}Nd the lower limits are 2.8×10^{19} y, 6.1×10^{19} y and 3.3×10^{21} y, respectively (for ^{143}Nd and ^{145}Nd –for α decays to the ground state and all possible excited levels, for ^{146}Nd –for decay to the excited level 641 keV of ^{142}Ce) with C.L. 90%. The estimated lower limit for ^{144}Nd is 8.9×10^{21} y (to the excited level 1596 keV of ^{140}Ce). The lower limits on α decay and 2α decay of ^{148}Nd were set as 1.2×10^{19} y and 3.4×10^{20} y for the first time.

[1] A.A. Sonzogni, Nucl. Data Sheets 93 (2001) 599.

Is this abstract from experiment?

No

Name of experiment and experimental site

N/A

Is the speaker for that presentation defined?

Yes

Details

Nazar Sokur

Alpha decay of naturally occurring neodymium isotopes

Institute for Nuclear Research of the National Academy of Sciences of Ukraine

Internet talk

Yes

Primary authors: LEONCINI, Alice (INFN - National Institute for Nuclear Physics); INCICCHITTI, Antonella (INFN); KASPEROVYCH, D.V.; Dr CAPPELLA, Fabio (INFN - Sezione di Roma); DANEVICH, Fedir; Dr LAUBENSTEIN, Matthias (Istituto Nazionale di Fisica Nucleare - Laboratori Nazionali del Gran Sasso); Mr SOKUR, Nazar

(Institute for Nuclear Research of NASU); POLISCHUK, Oksana; BELLI, Pierluigi; BOIKO, R.S.; Dr CERULLI, Riccardo (INFN-Roma Tor Vergata); Prof. BERNABEI, Rita (INFN); KOBYCHEV, V.V.; CARACCIOLO, Vincenzo (Physics Department, University of Roma Tor Vergata, I-00133 Rome, Italy); MERLO, Vittorio; Dr TRETAK, Volodymyr (Institute for Nuclear Research of the Nat. Ac. Sci. of Ukraine)

Presenter: Mr SOKUR, Nazar (Institute for Nuclear Research of NASU)

Session Classification: High Energy Particle Physics

Track Classification: Main topics: High Energy Particle Physics