

LOOKING FOR AN ELECTRON BRIDGE IN ^{229m}Th

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The isomeric state ^{229m}Th has the energy of 8.3(2) eV [1]. The small natural width and the location of the transition in the optical range give hope for the use of this state as an oscillator with a quality-factor several orders of magnitude higher than the Q-factor of the systems currently in operation.

Changes in the electron shell with changes in the degree of ionization, chemical environment, environmental parameters and the presence of external fields can have a significant impact on the probability of both discharge and settlement of the isomeric state through the mechanism of electronic bridges. Knowledge of the features of the decay of the isomer under the condition of the energy prohibition of direct electron emission will allow us to determine the optimal parameters of the feeding of the isomer using the electronic bridge mechanism. The "tuning" of the electron shell can increase the probability of isomer excitation by several orders of magnitude [2]. The probability of discharge through electronic states is a good indicator for such adjustment.

The existing limitation on the lifetime of the isomer in a singly-charged thorium-229 ($T_{1/2} < 10\text{ms}$ [3]) ion allows us to hope for using the lifetime of the isomeric state as an indicator of the width of the electronic bridge. The report presents the details of the preparation of an experiment to search for the decay of the isomeric state of thorium-229 through the mechanism of an electronic bridge. The method [4, 5] of formation of a beam of ions of the thorium isomer, the scheme of ion transport and preparation of a thin source and registration of conversion electrons will be considered.

1. B. Seiferle et al., Nature 573, 238 (2019).
2. F.F. Karpeshin, M.B. Trzhaskovskaya Nucl. Phys. A 1010 (2021) 122173
3. B. Seiferle, et al., Phys. Rev. Lett. 118, 042501 (2017)
4. V. Sonnenschein, et al., Eur. Phys. J. A, 2012, vol. 48, p. 52.
5. Y.I. Gusev, et al., Bull. Russ. Acad. Sci.: Phys., 2016, vol. 80, no.8, p. 875.

The speaker is a student or young scientist

No

Section

1. Applications of nuclear methods in science and technology

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