LIFETIME OF THE 5-keV ($3/2^+$) LEVEL OF Tu^{171}

R. B. Begzhanov and Kh. M. Sadykov
Institute of Nuclear Physics, Uzbek Academy of Sciences
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We present here the first experimental results obtained on the lifetime of the 5.1 and 425.1 keV levels populated in the decay $Er^{171} \rightarrow Tu^{171}$.

The source was produced by bombarding the natural mixture of erbium isotopes with thermal neutrons in the VVRS reactor of the Uzbek Academy of Sciences.

In measuring the lifetimes of the 5.1-keV level, particular attention was paid to the selection and adjustment of the vital units of the delayed-coincidence apparatus. Plastic scintillators of 1 mm thickness were used in conjunction with a photomultiplier (FEU-36) to register the β particles and γ rays with energy 5 keV. The use of other scintillators with large light yield was not advantageous in view of their poor time-dependent characteristics. The measurements were made in the presence of interfering noise pulses in the selected energy range. The time resolution amounted in this case to $2\tau = 2.65$ nsec with prompt curve slope $T_{1/2} = 1.28$ nsec. Figure 1a shows the spectrum of the prompt $\gamma\gamma$ coincidences (Co^{60}) with the energy tuned to the measured 5.1-keV level. The asymmetrical character of the prompt spectrum of Fig. 1a is due to different additional effects that appear when working in this energy region. The distortion of the time spectrum of the 5.1-keV level by these effects was disregarded, in view of its small probable value.

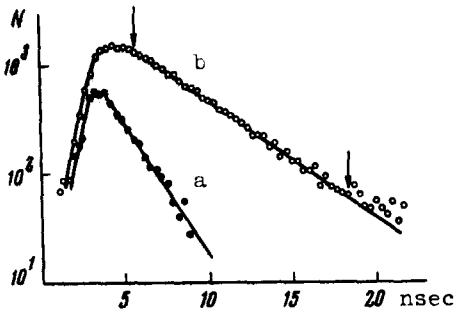

Fig. 1. a - Spectrum of prompt coincidences (Co^{60}) with tuning to γ (308.2 keV) - γ (5.1 keV) coincidence; b - spectrum of delayed γ (308 keV) - γ (5.1 keV) coincidences of the 5.1-keV level. The arrows show the processed portion of the time spectrum.

The contribution of the other γ rays to the time spectrum was smaller by an approximate factor of 20. This was determined by placing a thin compound absorber for the 5-keV γ rays between the source and the γ detector. The background of random coincidence in the time spectrum was of the order of 2 - 3%.

The lifetime of the 5.1-keV level was measured by using both β (1485 keV) - γ (5.1 keV) and γ (308.2 keV) - γ (5.1 keV) coincidences. Both methods yielded results that agree within the limits of error: $T_{1/2} = 2.98$ and $T_{1/2} = 2.77$ nsec, respectively.

Figure 1b shows the spectrum of the delayed $\gamma\gamma$ coincidences of the 5.1-keV level, corresponding to

$$T_{1/2} = (2.88 \pm 0.27) \times 10^{-9} \text{ sec.}$$

The lifetime of the 425.1-keV level was determined with microsecond apparatus:

$$T_{1/2} = (2.63 \pm 0.05) \times 10^{-6} \text{ sec.}$$

This value agrees with the results of [1].

To check on the correct operation of the apparatus at low energies, we measured also the lifetime of the 8.4-keV level of Tu^{169}. This source was also obtained by bombarding erbium oxide with thermal neutrons. The result corresponds to

$$T_{1/2} = 5.12 \times 10^{-9} \text{ sec,}$$

which is in satisfactory agreement with the data of [2,3,4]. Estimates were also obtained for the lifetimes of the first excited levels of Tb^{161} (56.6 keV)

$$T_{1/2} \leq 0.3 \text{ nsec,}$$

and Au^{199} (74.6 keV)

$$T_{1/2} \leq 0.2 \text{ nsec.}$$

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[1] F. P. Cranston, M. E. Bunker, and J. W. Starner, Phys. Rev. 110, 1427 (1958).
[2] R. E. McAdams et al., Phys. Lett. 6, 219 (1963).
[3] T. Sundstrom et al., ibid. 6, 56 (1963).
[4] D. Bloess and F. Munnich, Z. Naturf. 18a, 1028 (1963).

Errata

Article by I. S. Baikov in Vol. 4, No. 8.

On page 201, line 16 from top, substitute "will be paid" for "was paid." In line 20 from top substitute "We shall investigate" for "We investigated." In line 22 from the top substitute "hydrodynamics [1]" for "hydrodynamics." In the first line of Eq. (1) substitute $\frac{\partial n_0}{\partial x}$ for $\frac{\partial \ln n_0}{\partial x}$. In the last line substitute "omitted" for "omitted [1]."

On page 304 add the following sentence to the footnote: "Therefore the coefficients a^e an a^i should be set equal to zero."