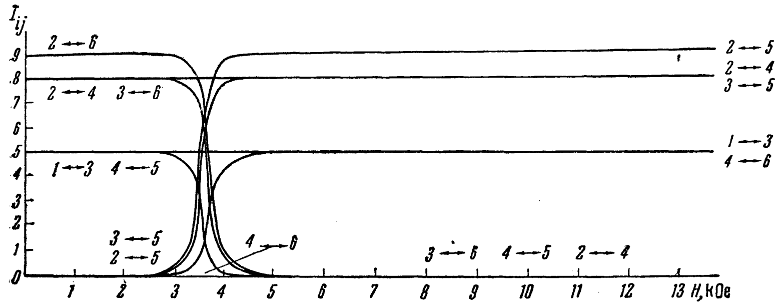

FIG. 2. Dependence of transition probabilities I_{ij} of magnetic dipole transitions on the magnetic field (H || z).

ing expressions for the energy levels:

$$\varepsilon_{1,2} = H - {}^3/_2(a-F) + D \pm {}^1/_6\sqrt{[9H + (a-F) + 18D]^2 + 40a^2},$$

$$\varepsilon_{3,4} = \pm {}^3/_2 H, \qquad \varepsilon_{5,6} = -H - {}^3/_2\ (a-F) + D \pm {}^1/_6\sqrt{[-9H + (a-F) + 18D]^2 + 40a^2}. \qquad (2)$$

The values of ϵ_i $(i = 1, \ldots, 6)$ are expressed in units of $g\beta$. The dependence of ϵ_i on H is shown graphically in Fig. 1.

We have calculated the relative transition probabilities I_{ij}, for magnetic dipole transitions between energy levels ϵ_i. The results are shown in Fig. 2. Transitions between other pairs of energy levels are forbidden.

A comparison of the spectrum observed with that calculated shows that the values of the constants in the Hamiltonian Eq. (1) for natural sapphire are, within the limits of experimental error, the same as those for Fe^{3+} ions artificially introduced into Al_2O_3, i.e.,

$$g = 2.003 \pm 0.001, \quad |D| = (1801 \pm 3)\ \text{Oe},$$
$$|a - F| = (357 \pm 2)\ \text{Oe}, \quad |a| = (280 \pm 20)\ \text{Oe}.$$

Finally we may note that Kornienko and Prokhorov[2] found a splitting of the atomic Fe^3 lines in Al_2O_3 for directions of the magnetic field other than parallel and perpendicular to the trigonal axis of the electric field. We found the same effect in natural sapphire crystals.

*Small constants, dependent on the spin quantum number S, are omitted.

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Translated by R. Berman
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DECAY OF Te^{131} *($T_{1/2}$ = 30 HOURS)*

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Submitted to JETP editor April 8, 1959

J. Exptl. Theoret. Phys. (U.S.S.R.) **37**, 314-315 (July, 1959)

INVESTIGATIONS of the decay of Te^{131} were reported in many papers.[1-3] The only decay scheme proposed in one of these papers[3] is based practically only on the energy balance of the observed beta and gamma transitions. In the present investigation we obtained a more accurate scheme for the lower levels of I^{131} excited in the decay of the 30-hour isomer Te^{131}, and obtained several new data on gamma transitions in this nucleus.

The investigation was carried out with a magnetic lens spectrometer and a scintillation coincidence spectrometer. The Te^{131} was obtained by irradiating metallic tellurium of high chemical purity with slow neutrons. After irradiation, the I^{131} that accumulated during the irradiation process was removed. Measurements of the gamma spectrum with a single-crystal scintillation spectrometer and with a beta spectrometer (using the secondary electrons) have shown that whereas the soft portion of the spectrum contains gamma radiation due to other isotopes of Te and to I^{131}, the gamma rays produced in the region $E_\gamma > 720$ kev belong only to Te^{131}.

We determined the relative intensities of the gamma transitions in this region. These are listed in Table I.

TABLE I

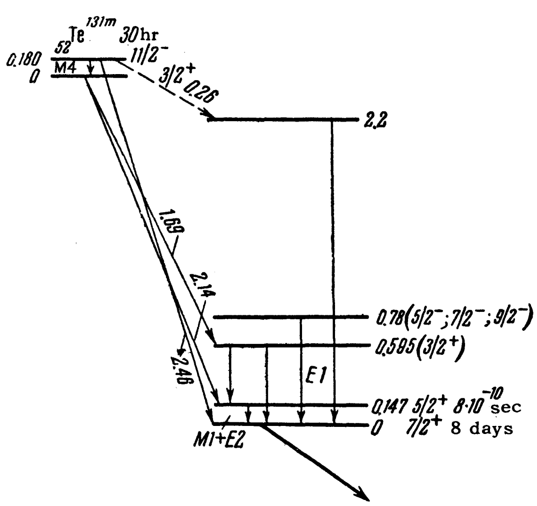
E, kev	I,%	E, kev	I,%
780	100	1220*	25
850	40	1600	~5
925	15	1850*	~2
1140	35	2200*	~0.5

The transitions marked with an asterisk in the table were observed first. Among the gamma transitions observed in the soft region, those at 80, 100, 147, 240, 330, 440, and 590 kev, which were seen both in single spectra and in spectra of β-γ and γ-γ coincidences, were ascribed to Te^{131}. Measurements of the coincidences have shown that the first excited level of I^{131} is the 147-kev level, and that the 780-kev transition goes into the ground state of I^{131}. In addition, we confirmed the 780 — 1150 and 780 — 850 kev γ-γ cascades reported by Hebb,[3] and observed in addition also the following cascades: 780 — 80, 780 — 100, 780 — 330, and 850 — 330 kev.

The K-shell conversion coefficient for the 780 and 850 kev transitions were determined with the magnetic spectrometer from the ratio of the areas of the peaks of the external and internal conversions; for the 147-kev transition the determination was from the ratio of the peaks of the gamma rays and the accompanying K radiation of iodine in the spectrum of coincidences with the hard beta rays of Te^{131}. The results are listed in Table II.

The delayed-coincidence setup was also used to measure the lifetime of the 147 kev level. The result obtained, $T_{1/2} = (8 \pm 1) \times 10^{-10}$ sec, is in good agreement with the results of de Waard and Gerholm[5] and indicates that the M1 component is l-forbidden.

The diagram shows the decay scheme for Te^{131},



containing only the most reliable of the established facts; the characteristics of the levels are based on the multiplicities of the gamma transitions and on the well known value of spin and parity of the ground state of I^{131} (reference 6). The energies of the beta transitions, indicated by solid lines, are taken from Hebb's paper.[3]

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Translated by J. G. Adashko
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TABLE II

E_γ, kev	α_K^{exp} 10^3	$\alpha_K^{theoret} \cdot 10^3$			Identification
		$E1$	$E2$	$M1$	
780	0.8±0.2	0.84	2.3	3.0	$E1$
850	1.6±0.6	0.71	1.9	2.5	$E2$ (+ $M1$)
147	260±50	—	330	220	$M1 + E2$