^{238}U IT decay (280 ns)

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 127, 191 (2015)	1-Jun-2014

Parent: ^{238}U: E=2557.9 *5*; J$^\pi$=0$^+$; T$_{1/2}$=280 ns *6*; %IT decay=97.4 *4*

Additional information 1.

Shape isomer.

Conversion electrons from electromagnetic transitions preceding the fission decay of the shape isomer have been measured. A highly converted transition is observed which is tentatively interpreted as the decay of the lowest β-vibrational band, via E0 transition, at excitation energy of 647.8 *9* (1982Go02).

See 1983Ha29 for other γ transitions that are tentatively interpreted as deexcitation of the β-vibrational band in the second minimum.

Isomer not excited by muon capture (3% limit) (1976Ka37).

^{238}U Levels

E(level)‡	J$^{\pi\dagger}$	T$_{1/2}$‡	Comments
0.0	0$^+$	4.468×10^9 y *6*	
44.916 *13*	2$^+$	206 ps *3*	
680.11 *4*	1$^-$		
2557.9 *5*	0$^+$	280 ns *6*	%IT=97.4 *4*; %SF=2.6 *4*

Comments for level 2557.9:

Intrinsic electric-quadruple moment: Q$_0$=29 *3* (1979Ul01).

J$^\pi$: 2558γ to 0$^+$ is E0.

σ(d,pnγ)/σ(d,pnSF)=15 to 25 (1975Ru03). Γ(45γ)/Γ(SF)=10 (1976Be55). See 1972We09 for predicted T$_{1/2}$(SF) and T$_{1/2}$(γ).

T$_{1/2}$: weighted average of (n,n') values of 270 ns *40* (1974WoZW), 300 ns *32* (1977VoZU), 290 ns *30* (1983Dm04), 267 ns *13* (1989Ma54), 274 ns 10 (1991Ku23) and (d,pn) values of 295 ns *15* (1974WoZW), and 298 ns 18 (1992St05). Others: (d,pn) values of 200 ns *70* (1970Po01), 195 ns *30* (1970Wo06), 191 ns *44* (1975Ru03), 184 ns *13* (reference 13 of 1991Ku23) and 211 ns *60* (1982Go02) cluster around 200 ns, and (d,pn) values of 110 ns *30* (1970Re05) and 130 ns *50* (reference 13 of 1991Ku23), the (n,n') value of 125 ns *35* (1977ArZZ) and the (γ,γ') values of 146 ns *22* (1983Dr14) and 155 ns *33* (1985Dr01) are lower still. See 1991Ku23 for a discussion of these data. These authors argue against the earlier suggestions that there could be two isomers. See also the discussion in 1992St05 of the T$_{1/2}$ discrepancies.

For calculated energy, see 1969Ni13, 1971Pa33, 1972Mo27, 1972Ma11, 1972We09, 1994Kr06.

%SF: 1992St05 report σ(μb)(1879γ+2513γ)=132 *26*, and 1975Ru03 report 130 *32*. 1992St05 estimate σ(μb)=80 *30* for unobserved decay to the six known 1$^-$ and 2$^+$ states and 1975Ru03 estimate 70 *20*. 1983Ka11 report 0.230 μb *50* for decay of the 2558 E0 transition via ce(K). A weighted average for decay from the isomer based on these data is 206 μb *28*. With σ=5.4 μb *4* for delayed fission as quoted by 1992St05 from 1980Ti03 and 1970Wo06, one gets %SF=2.6 *4* and %IT=97.4 *4*. Other: 1983Ka11 report σ(2513γ)<50 μb, and 1984Ka10 report 42 μb *12*.

† From Adopted Levels, unless otherwise noted.

‡ From Adopted Levels.

^{238}U IT decay (280 ns) (continued)

γ(^{238}U)

Iγ normalization: From Σ(1879γ + 2513γ + 2558γ) = 97.4 % *4*.

E_γ	I_γ[†]	E_i(level)	J^π_i	E_f	J^π_f	Mult.	$I_{(\gamma+ce)}$[†]	Comments
(44.915)		44.916	2^+	0.0	0^+	E2		L and M conversion lines were observed following the photofission reaction on ^{238}U. They were identified by 1976Be55 as belonging to the 44.9γ from decay of the 44.9 level following IT decay of the shape isomer. They showed a half-life of 300 ns. Half-life = 202 ps, calculated value (2008Pa04).
(635.18 *3*)		680.11	1^-	44.916	2^+	[E1]		
(680.1 *3*)		680.11	1^-	0.0	0^+	[E1]		
1879	49 *13*	2557.9	0^+	680.11	1^-	[E1]		E_γ: from 1975Ru03, also confirmed by 1992St05. I_γ: weighted average from 1975Ru03 and 1992St05 is 43 μb *11*. %γ= 32 *7*.
2512.7 *5*	100 *19*	2557.9	0^+	44.916	2^+	[E2]		%γ= 65 *7*. E_γ: from 1984Ka10, also confirmed by 1992St05. I_γ: weighted average from 1975Ru03 and 1992St05 is 88 μb *17*.
2558 *2*		2557.9	0^+	0.0	0^+	E0	0.34 *6*	%e=0.22 *6*. E_γ: from 1983Ka11. Energy of the E0 K-conversion electrons is 2442.4 *20*. No photons were observed. $I_{(\gamma+ce)}$: 1983Ka11 report σ(ce(K))=0.230 μb *50*. The authors add 16% to account for the higher shell conversion electrons, and 15% to account for internal pair production. The total ce intensity is thus 0.30 μb *5*.

[†] For absolute intensity per 100 decays, multiply by 0.65 *11*.

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Decay Scheme

Intensities: I$_\gamma$ per 100 parent decays

%IT=97.4 *4*

Legend

→ I$_\gamma$ < 2%×I$_\gamma^{max}$
→ I$_\gamma$ < 10%×I$_\gamma^{max}$
→ I$_\gamma$ > 10%×I$_\gamma^{max}$
⇢ γ Decay (Uncertain)

$^{238}_{92}$U$_{146}$