

Adopted Levels, Gammas

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen [#]		NDS 147, 1 (2018)	30-Nov-2017

Q(β^-)=-5047 30; S(n)=8820 50; S(p)=1310 40; Q(α)=4560 60 2017Wa10

S(2n)=19650 60, S(2p)=5030 80, Q(ϵ p)=4220 40 (2017Wa10).

1983Sc18, 1982Ei03: ¹⁶⁴Ta produced and identified in ¹²⁷I(⁴⁰Ca,3n) (1983Sc18) and ¹⁵¹Eu(²⁰Ne,7n) (1982Ei03) reactions, followed by detection of γ rays in ¹⁶⁴Hf from the decay ¹⁶⁴Ta. Also 1982Li17, where ¹⁶⁴Ta was produced in Lu(³He,xn),E=280 MeV reaction, and half-life was measured. The Z assignment was based on γ (x ray)-coin measurement in ¹⁶⁴Ta ϵ decay. The mass assignment was deduced from measured excitation functions by 1983Sc18. Later studies of ¹⁶⁴Ta decay: 1986Ru05, 1989Hi04, 1989Br19, 1992Ha10.

Additional information 1.

¹⁶⁴Ta Levels

B(M1)/B(E2) ratios listed in the table assume mixing ratio $\delta=0$ for cascading transitions in the bands.

Cross Reference (XREF) Flags

- A ¹⁶⁴W ϵ decay (6.3 s)
- B ¹⁶⁸Re α decay (4.4 s)
- C ¹⁴²Nd(²⁷Al,5n γ), ¹⁴¹Pr(²⁸Si,5n γ)

E(level) [†]	J ^{π}	T _{1/2}	XREF	Comments
0.0	(3 ⁺)	14.2 s 3	AB	% ϵ +% β^+ =100 J ^{π} : probable allowed log ft values to 2 ⁺ and 4 ⁺ states in ¹⁶⁴ Hf. T _{1/2} : weighted average of 13.6 s 2 (1983Sc18), 20 s 5 (1982Ei03, 1989Br19), 13.7 s 6 (1982Li17) and 14.9 s 2 (1986Ru05,1989Hi04). A 4625 15 (0.016% 5) α group was attributed to the decay of ¹⁶⁴ Ta by 1983Sc18; however, it was assigned to the decay of ¹⁶³ Ta by 1986Ru05 (also 1992Ha10,1988MeZY) from its half life and from its energy fit to the Q(α) systematics. Thus ¹⁶⁴ Ta is not considered as an α emitter.
0+x			C	
0+y&			C	
93.7+x 3			C	
111.5 3			AB	
131.0+y& 10			C	
188.7+x 4			C	
321.0+y& 15			C	
329.2+x@ 4 (11 ⁻)			C	T _{1/2} : based on recoil-shadow method, 2004Gu06 propose that this level is an isomer of few ns. B(M1)/B(E2)=0.10 1, assuming E2 for 235 γ and M1 for 140.5 γ .
515.0+y& 18			C	
523.4+x# 5 (12 ⁻)			C	
704.1+x@ 5 (13 ⁻)			C	B(M1)/B(E2)=1.3 4 assuming E2 for 375 γ .
743.1+y& 19			C	
987.4+x# 5 (14 ⁻)			C	B(M1)/B(E2)=1.03 21.
999.9+y& 19			C	B(M1)/B(E2)=1.1 3, assuming E2 for 485 γ and M1 for 257 γ .
1234.1+x@ 5 (15 ⁻)			C	B(M1)/B(E2)=1.33 14.
1281.3+y& 20			C	B(M1)/B(E2)=1.1 3, assuming M1 for 281 γ .
1572.7+x# 6 (16 ⁻)			C	B(M1)/B(E2)=0.89 18.

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Adopted Levels, Gammas (continued)

¹⁶⁴Ta Levels (continued)

E(level) [†]	J ^π [‡]	XREF	Comments
1594.4+y & 21		C	B(M1)/B(E2)=1.0 9, assuming M1 for 313γ and E2 for 595γ.
1872.6+x @ 6	(17 ⁻)	C	B(M1)/B(E2)=1.6 3.
1925.7+y & 21		C	
2247.9+x # 6	(18 ⁻)	C	B(M1)/B(E2)=2.7 12.
2285.6+y & 22		C	
2591.6+x @ 7	(19 ⁻)	C	B(M1)/B(E2)=3.6 16.
2995.9+x # 7	(20 ⁻)	C	B(M1)/B(E2)=4.5 6.
3350.7+x? @ 10	(21 ⁻)	C	

[†] From ¹⁴²Nd(²⁷Al,5nγ), ¹⁴¹Pr(²⁸Si,4nγ), except for the 111.5-keV level which is populated in decay data. Tentative levels at 11.4, 443.6, 483.6 and 513.1 keV are populated in ¹⁶⁴W decay (see ¹⁶⁴W ε decay (6.3 s) level scheme in ¹⁶⁴W ε decay.

[‡] As proposed by 2002Ro01 based on 11⁻ for the bandhead and interlocking cascades of M1 and E2 transitions in the π9/2[514]ν1/2[660]band. The measured DCO ratios and polarization asymmetries are in general agreement.

Band(A): π9/2[514]⊗ν1/2[660],α=0.

@ Band(a): π9/2[514]⊗ν1/2[660],α=1.

& Band(B): πh_{11/2}⊗vh_{9/2}⊗(v_{13/2}²) (?). Tentative configuration, no spin-parities assigned to any of the levels in the band.

γ(¹⁶⁴Ta)

E _i (level)	J ^π _i	E _γ	I _γ	E _f	J ^π _f	Mult. [†]	Comments
93.7+x		93.7 3		0+x			
111.5		111.5 3		0.0	(3 ⁺)		E _γ : average of 111.8 in ¹⁶⁸ Re α decay and 111.2 in ¹⁶⁴ W ε decay. A 99.9γ may also deexcite 111 level with I _γ about 18% of that for 111γ (see ¹⁶⁴ W ε decay).
131.0+y		131 [‡] 1	100	0+y			
188.7+x		95.0 3		93.7+x			
321.0+y		190 [‡] 1		131.0+y			
329.2+x	(11 ⁻)	140.5 3 235.5 3	57.2 11 100 4	188.7+x 93.7+x			
515.0+y		194 [‡] 1	100	321.0+y			
523.4+x	(12 ⁻)	194.3 3	100	329.2+x	(11 ⁻)	(M1)	
704.1+x	(13 ⁻)	180.7 3 374.8 3	100 21 66 14	523.4+x 329.2+x	(12 ⁻) (11 ⁻)	(M1)	
743.1+y		228 1	100	515.0+y		(M1)	
987.4+x	(14 ⁻)	283.3 3 464.0 3	100 3 64 13	704.1+x 523.4+x	(13 ⁻) (12 ⁻)	(M1) (E2)	
999.9+y		257 1 485 [‡] 1	98 18 100 23	743.1+y 515.0+y			
1234.1+x	(15 ⁻)	246.7 3 530.0 3	70 3 100 9	987.4+x 704.1+x	(14 ⁻) (13 ⁻)	(M1) (E2)	
1281.3+y		281 1 538 1	100 50 90 40	999.9+y 743.1+y		(E2)	
1572.7+x	(16 ⁻)	338.6 3 585.3 3	73 8 100 17	1234.1+x 987.4+x	(15 ⁻) (14 ⁻)	(M1) (E2)	
1594.4+y		313 1 595 1	57 39 100 59	1281.3+y 999.9+y		(M1)	
1872.6+x	(17 ⁻)	299.9 5	57 11	1572.7+x	(16 ⁻)	(M1)	

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Adopted Levels, Gammas (continued) $\gamma({}^{164}\text{Ta})$ (continued)

<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>E_γ</u>	<u>I_γ</u>	<u>E_f</u>	<u>J_f^π</u>	<u>Mult.[†]</u>
1872.6+x	(17 ⁻)	638.5 3	100 8	1234.1+x	(15 ⁻)	(E2)
1925.7+y		332 1		1594.4+y		(M1)
		644 1	100	1281.3+y		
2247.9+x	(18 ⁻)	375.3 5	100 33	1872.6+x	(17 ⁻)	(M1)
		675.2 5	69 17	1572.7+x	(16 ⁻)	(E2)
2285.6+y		360 1		1925.7+y		
		691 1		1594.4+y		(E2)
2591.6+x	(19 ⁻)	343.7 5	100 14	2247.9+x	(18 ⁻)	(M1)
		719.0 5	91 45	1872.6+x	(17 ⁻)	(E2)
2995.9+x	(20 ⁻)	404.3 3	100 3	2591.6+x	(19 ⁻)	(M1)
		748.0 5	55 7	2247.9+x	(18 ⁻)	(E2)
3350.7+x?	(21 ⁻)	355 [‡]		2995.9+x	(20 ⁻)	
		759 [‡]		2591.6+x	(19 ⁻)	

[†] From DCO ratios and POL values for transitions in coupled band structures populated in ${}^{142}\text{Nd}({}^{27}\text{Al}, 5n\gamma)$ reaction.

[‡] Placement of transition in the level scheme is uncertain.

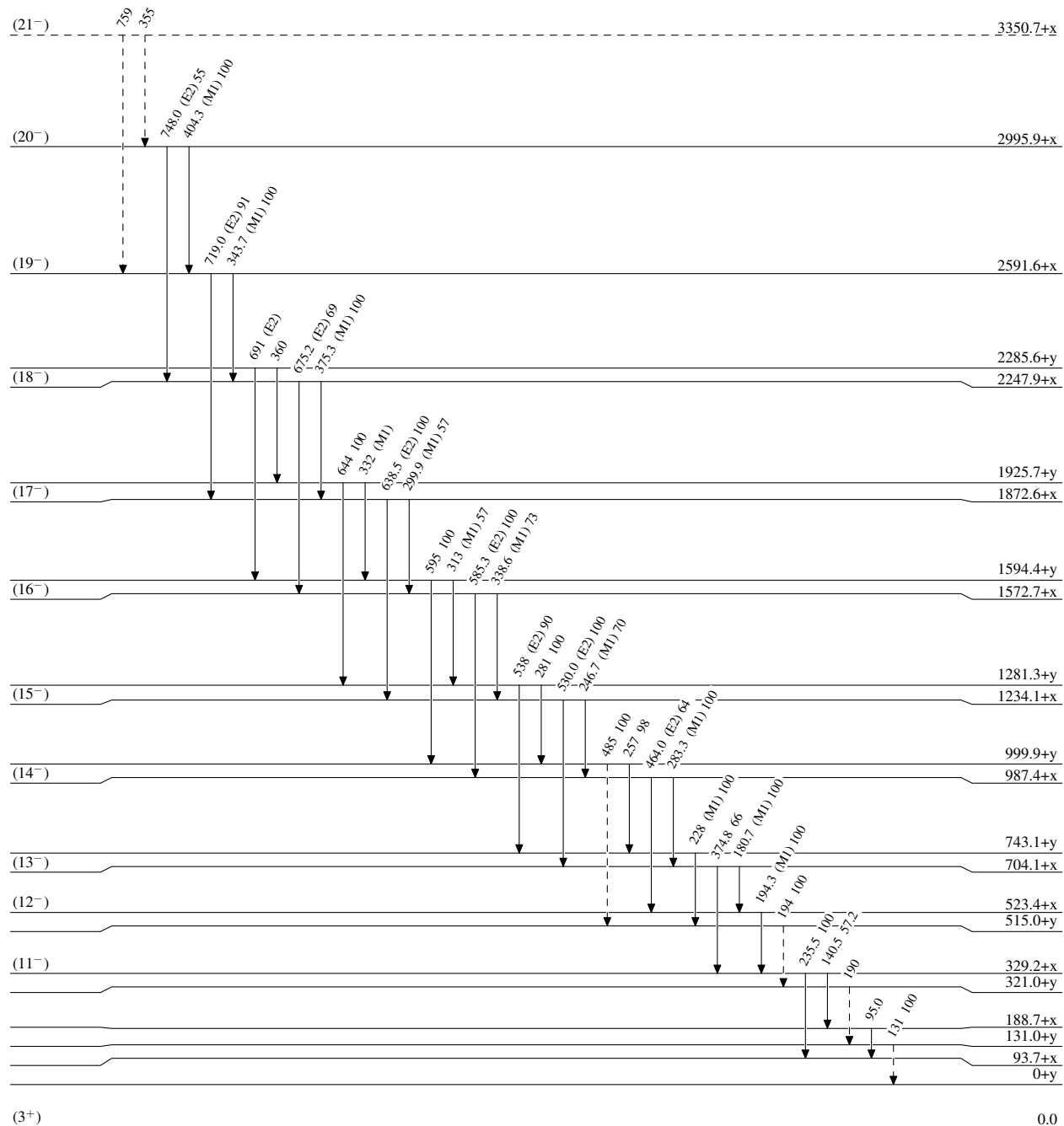
Adopted Levels, Gammas

Legend

Level Scheme

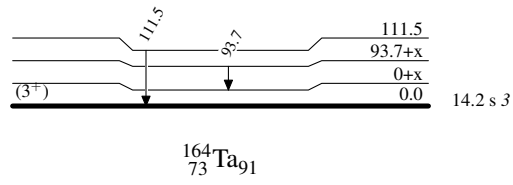
Intensities: Relative photon branching from each level

-----▶ γ Decay (Uncertain)

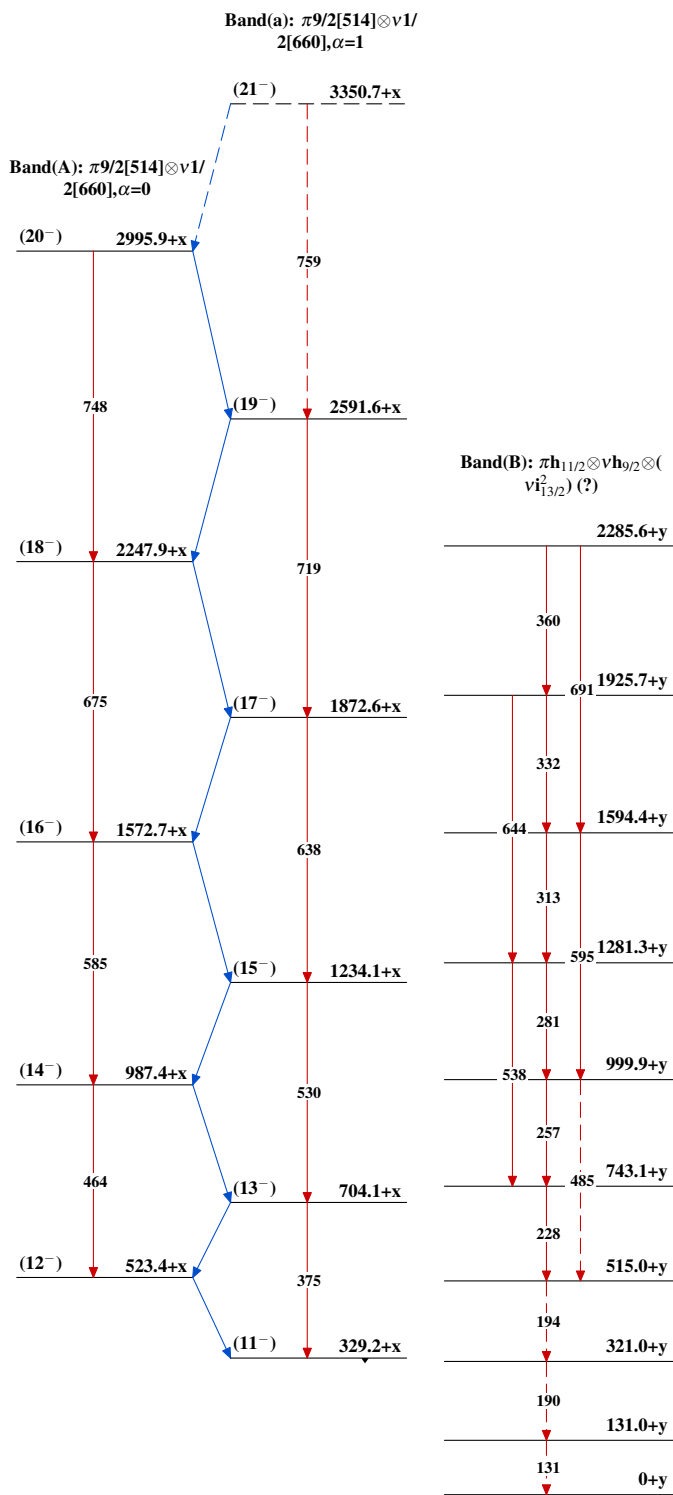


Adopted Levels, Gammas**Level Scheme (continued)**

Intensities: Relative photon branching from each level



Adopted Levels, Gammas



$^{164}_{73}\text{Ta}_{91}$