Adopted Levels, Gammas

Туре	Author	History Citation	Literature Cutoff Date		
Full Evaluation	N. Nica	NDS 154, 1 (2018)	20-Nov-2018		

 $Q(\beta^{-})=-11.3 \times 10^{3} \ 8$; $S(n)=12220 \ SY$; $S(p)=3670 \ 30$; $Q(\alpha)=2600 \ 30$ 2017Wa10 $\Delta S(n)=200$ based on syst (2017Wa10).

Q(\varepsylon p)=3309 30 (2017Wa10).

¹⁴⁰Gd Levels

Cross Reference (XREF) Flags

- $^{140}\mathrm{Tb}\;\varepsilon$ decay A
- ¹⁴¹Dy ε p decay:0.9 s ⁹²Mo(⁵⁴Fe, α 2p γ) (HI,xn γ) В
- C D

E(level) [†]	Jπ‡	T _{1/2}	XREF	Comments
0.0 [@]	0+	15.8 s 4	ABCD	$%ε+%β^+=100$ %ε+%β ⁺ : from 2005TuZX. T _{1/2} : from ¹⁴⁰ Tb ε (1991Fi03).
328.6 [@] 3	2+		ABCD	
713.3 ^{&} 4	(2^{+})		A D	
836.2 [@] 5	4+		ABCD	
1068.2 ^{&} 4	(3 ⁺)		A D	
1281.4 ^{&} 5	(4^{+})		A D	
1464.0 [@] 6	6+		ABCD	
1693.4 & 5	(5 ⁺)		A D	
1881.4 ^{&} 11	(6+)		A D	
2139.7 [@] 6	8+		A CD	
2211.0 ^c 6	8-#	1.5 ns 4	С	 J^π: M2 γ to 6⁺ and E1 γ to 8⁺. T_{1/2}: based on observed intensity loss and energy shifts of transitions below the isomer (2006Ol09, ⁹²Mo(⁵⁴Fe,α2pγ) dataset). Configuration: ν7/2⁺[404]⊗ν9/2⁻[514], K^π=8⁻ (2006Ol09, ⁹²Mo(⁵⁴Fe,α2pγ) dataset).
2411.4 ^{&} 11	(7^{+})		A D	
2456.8 ^C 6	9- #		С	
2632? <mark>&</mark>	(8+)		D	
2743.8 ^C 6	10 ^{-#}		С	
2796.8 [@] 7	10^{+}		D	
2926.8 ^b 7	10^{+}		D	
3033.7 ^{<i>a</i>} 7	9(-)		D	
3061.1 [°] 6	11 ^{-#}		С	
3267.6 [@] 7	12+		D	
3403.1 [°] 6	12 ^{-#}		С	
3617? <mark>b</mark>	(12^{+})		D	
3624.7 ^{<i>a</i>} 7	11 ⁽⁻⁾		D	
3766.7 [°] 6	13-#		C	
3849.4 ^{^w} 7	14+		D	
4025.6 7	(12, 13)		D	

Adopted Levels, Gammas (continued)

¹⁴⁰Gd Levels (continued)

E(level) [†]	J ^π ‡	XREF	E(level) [†]	$J^{\pi \ddagger}$	XREF
4150.0 [°] 6	$(14^{-})^{\#}$	С	4592.9 [@] 8	16+	D
4319.9 ^a 8	(13 ⁻)	D	4976.3 [°] 7	(16 ⁻) [#]	С
4552.8 [°] 7	(15 ⁻) [#]	С	5461.0 [@] 9	(18 ⁺)	D
			6423.0 [@] 13	(20^{+})	D

[†] From least-squares fit to γ energies.

^{\ddagger} Unless noted otherwise from (HI,xn γ) (1989Pa01) (see (HI,xn γ) for details).

[#] Assigned by 2006Ol09 (92 Mo(54 Fe, $\alpha 2p\gamma$) dataset) from γ -ray multipolarities based on DCO measurements, with no listed DCO values or explicit multipolarities; 8⁻ for the isomer established from explicit determination of the multipolarities for its decaying transitions.

[@] Band(A): yrast g.s. band.

& Band(B): $K=2^+ \gamma$ -vibrational band (tentative).

^{*a*} Band(C): negative parity band (tentative).

^b Band(D): positive parity band (tentative).

^c Band(E): K=8⁻ strongly coupled band (2006O109).

$\gamma(^{140}\text{Gd})$

E _i (level)	\mathbf{J}_i^{π}	E_{γ}^{\dagger}	I_{γ}^{\dagger}	$\mathbf{E}_f = \mathbf{J}_f^{\pi}$	Mult. [‡]	$\alpha^{\&}$	Comments
328.6	2+	328.6 3	100	0.0 0+	E2	0.0457	$\begin{aligned} \alpha(\mathbf{K}) &= 0.0354 \ 5; \ \alpha(\mathbf{L}) &= 0.00798 \ 12; \\ \alpha(\mathbf{M}) &= 0.00180 \ 3 \\ \alpha(\mathbf{N}) &= 0.000408 \ 6; \ \alpha(\mathbf{O}) &= 5.83 \times 10^{-5} \ 9; \\ \alpha(\mathbf{P}) &= 2.25 \times 10^{-6} \ 4 \end{aligned}$
713.3	(2 ⁺)	384.8 <i>3</i>	100	328.6 2+	(M1+E2)	0.039 11	$\alpha(K) = 0.0324 \ 97; \ \alpha(L) = 0.0053 \ 7; \ \alpha(M) = 0.00116$ 12 $\alpha(N) = 0.00027 \ 3; \ \alpha(O) = 4.0 \times 10^{-5} \ 6;$ $\alpha(P) = 2.29 \times 10^{-6} \ 81$
		713.8 [@] 2	64 [@] 18	$0.0 \ 0^+$			
836.2	4+	507.6 3	100	328.6 2+	(E2)	0.01341	$\alpha(\mathbf{K})=0.01092 \ 16; \ \alpha(\mathbf{L})=0.00195 \ 3;$ $\alpha(\mathbf{M})=0.000431 \ 6$ $\alpha(\mathbf{N})=9.83\times10^{-5} \ 14; \ \alpha(\mathbf{O})=1.454\times10^{-5} \ 21;$ $\alpha(\mathbf{M})=7.23\times10^{-7} \ 11$
1068.2	(3 ⁺)	355.0 <i>3</i>	40 20	713.3 (2 ⁺)	(M1+E2)	0.049 13	$\alpha(\mathbf{r}) = 7.53 \times 10^{-11} \text{ m}$ $\alpha(\mathbf{K}) = 0.040 \ 12; \ \alpha(\mathbf{L}) = 0.0067 \ 6; \ \alpha(\mathbf{M}) = 0.00148 \text{ m}$ $\alpha(\mathbf{N}) = 0.00034 \ 3; \ \alpha(\mathbf{O}) = 5.1 \times 10^{-5} \ 6; \ \alpha(\mathbf{M}) = 2.8 \times 10^{-6} \ 10^{-5} \text{ m}$
		739.6 3	100 20	328.6 2+	(M1+E2)	0.0074 21	$\alpha(\mathbf{r}) = 2.8 \times 10^{-1} I^{0}$ $\alpha(\mathbf{K}) = 0.0063 \ 19; \ \alpha(\mathbf{L}) = 0.00090 \ 21;$ $\alpha(\mathbf{M}) = 0.00020 \ 5$ $\alpha(\mathbf{N}) = 4.5 \times 10^{-5} \ 11; \ \alpha(\mathbf{O}) = 6.9 \times 10^{-6} \ 17;$ $\alpha(\mathbf{P}) = 4.5 \times 10^{-7} \ 15$
1281.4	(4+)	568.1 <i>3</i>	100	713.3 (2+)	(E2)	0.01004	$\alpha(K) = 0.00825 \ 12; \ \alpha(L) = 0.001403 \ 20; \alpha(M) = 0.000310 \ 5 \alpha(N) = 7.07 \times 10^{-5} \ 10; \ \alpha(O) = 1.054 \times 10^{-5} \ 15; \alpha(P) = 5.59 \times 10^{-7} \ 8$
1464.0	6+	627.8 <i>3</i>	100	836.2 4+	(E2)	0.00784	$\alpha(K) = 0.00648 \ 10; \ \alpha(L) = 0.001063 \ 15; \alpha(M) = 0.000234 \ 4 \alpha(N) = 5.34 \times 10^{-5} \ 8; \ \alpha(O) = 8.02 \times 10^{-6} \ 12; \alpha(P) = 4.42 \times 10^{-7} \ 7$

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

γ ⁽¹⁴⁰Gd) (continued)</sup>

E _i (level)	\mathbf{J}_i^{π}	E_{γ}^{\dagger}	I_{γ}^{\dagger}	E_f	\mathbf{J}_{f}^{π}	Mult. [‡]	α &	Comments
1693.4	(5 ⁺)	625.2 3	100	1068.2	(3 ⁺)	(E2)	0.00792	$\alpha(K)=0.00655 \ 10; \ \alpha(L)=0.001075 \ 16; \\ \alpha(M)=0.000237 \ 4 \\ \alpha$
1881.4	(6+)	600.2 2	100	1281.4	(4+)	(E2)	0.00876	$\alpha(N)=5.41\times10^{-5} 8; \ \alpha(O)=8.11\times10^{-6} 12; \\ \alpha(P)=4.47\times10^{-7} 7 \\ \alpha(K)=0.00722 \ 11; \ \alpha(L)=0.001204 \ 18; \\ \alpha(M)=0.000265 \ 4 \\ \alpha(N)=6.06\times10^{-5} \ 9; \ \alpha(O)=9.06\times10^{-6} \ 14; $
2139.7	8+	675.7 3	100	1464.0	6+	(E2)	0.00658	$\begin{array}{l} \alpha(\mathrm{R})=4.91\times10^{-7}\ 8\\ \alpha(\mathrm{K})=0.00546\ 8;\ \alpha(\mathrm{L})=0.000873\ 13;\\ \alpha(\mathrm{M})=0.000192\ 3\\ \alpha(\mathrm{N})=4.38\times10^{-5}\ 7;\ \alpha(\mathrm{O})=6.60\times10^{-6}\ 10; \end{array}$
2211.0	8-	71.3 [#] 2	96 [#] 15	2139.7	8+	E1	0.721 12	α (P)=3.74×10 ⁻⁷ 6 α (K)=0.599 <i>10</i> ; α (L)=0.0957 <i>16</i> ; α (M)=0.0208 4 α (N)=0.00467 8; α (O)=0.000671 <i>11</i> ; α (P)=3.19×10 ⁻⁵ 5 B(E1)(W,u)=0.00017 6
		747.1 [#] 3	100 [#] 23	1464.0	6+	(M2)	0.0253	Mult.: from $\alpha(\exp)$ (2006Ol09 in 2006Ol09, ${}^{92}Mo({}^{54}Fe,\alpha 2p\gamma)$ dataset). $\alpha(K)=0.0212 \ 3; \ \alpha(L)=0.00319 \ 5; \ \alpha(M)=0.000699$
2411.4	(7+)	718.0 2	100	1693.4	(5+)	(E2)	0.00570	$\alpha(K) = 0.00475 \ 7; \ \alpha(L) = 0.000746 \ 11; \ \alpha(M) = 0.0001635 \ 24 \ \alpha(N) = 3.74 \times 10^{-5} \ 6; \ \alpha(O) = 5.65 \times 10^{-6} \ 9; \ 2.26 \times 10^{-7} \ 5.26 \times 10^{-$
2456.8 2632? 2743.8	9 ⁻ (8 ⁺) 10 ⁻	$245.8^{\#} 1$ $750^{a} 1$ $287.0^{\#} 1$	$100^{\#}$ 100 100^{\#} 7	2211.0 1881.4 2456.8	8 ⁻ (6 ⁺) 9 ⁻			$\alpha(P)=3.26\times 10^{-7}$ 5
2796.8	10+	532.9 [#] 10 657.1 3	18 [#] 4 100	2211.0 2139.7	8 ⁻ 8 ⁺	(E2)	0.00703	α (K)=0.00583 9; α (L)=0.000940 14; α (M)=0.000207 3
2926.8	10+	787.1 <i>3</i>	100	2139.7	8+	(E2)	0.00462	$\alpha(N)=4.72\times10^{-5}7; \ \alpha(O)=7.10\times10^{-6}70; \ \alpha(P)=3.98\times10^{-7}6 \ \alpha(K)=0.003876; \ \alpha(L)=0.0005929; \ \alpha(M)=0.000129479 \ \alpha(N)=2.96\times10^{-5}5; \ \alpha(O)=4.49\times10^{-6}7; \ \alpha(P)=267\times10^{-7}4$
3033.7	9(-)	894.0 <i>3</i>	100	2139.7	8+	D		
3061.1	11-	$317.4^{\#}$ 1	100 [#] 7	2743.8	10-			
3267.6	12+	604.0" 3 340.8 3	38" 6 25 6	2456.8 2926.8	9 10 ⁺	(E2)	0.0409	$\alpha(K)=0.0319 5; \alpha(L)=0.00702 10;$ $\alpha(M)=0.001582 23$ $\alpha(N)=0.000359 6; \alpha(O)=5.15\times10^{-5} 8;$
		470.7 3	100 6	2796.8	10+	(E2)	0.01638	$\alpha(P)=2.04\times10^{-6} 3$ $\alpha(K)=0.01326 19; \ \alpha(L)=0.00244 4;$ $\alpha(M)=0.000543 8$ $\alpha(N)=0.0001237 18; \ \alpha(O)=1.82\times10^{-5} 3;$ $\alpha(P)=8.84\times10^{-7} 13$

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

$\gamma(^{140}\text{Gd})$ (continued)

E _i (level)	\mathbf{J}_i^{π}	E_{γ}^{\dagger}	I_{γ}^{\dagger}	$\mathbf{E}_f = \mathbf{J}_f^{\pi}$	Mult. [‡]	α &	Comments
3403.1	12-	342.1 [#] <i>1</i> 658.8 [#] <i>3</i>	$100^{\#} 7$ $100^{\#} 14$	3061.1 11 ⁻ 2743.8 10 ⁻			
3617?	(12^{+})	690 ^{<i>a</i>} 1	100	2926.8 10+			
3624.7	11(-)	591.0 <i>3</i>	100	3033.7 9 ⁽⁻⁾	(E2)	0.00910	$\alpha(K)=0.00749 \ 11; \ \alpha(L)=0.001255 \ 18; \ \alpha(M)=0.000277 \ 4 \ \alpha(N)=6.32\times10^{-5} \ 9; \ \alpha(O)=9.44\times10^{-6} \ 14; \ \alpha(D)=5.00\times10^{-7} \ 8$
		828 1	<83	2796.8 10+			$u(r) = 3.09 \times 10 - 8$
3766.7	13-	$363.7^{\#}$ 1	90 [#] 10	3403.1 12			
		704.9 [#] 3	100 [#] 13	3061.1 11-			
3849.4	14+	581.8 3	100	3267.6 12+	(E2)	0.00946	$\alpha(\mathbf{K})=0.00778 \ 11; \ \alpha(\mathbf{L})=0.001312 \ 19; \ \alpha(\mathbf{M})=0.000289 \ 4 \ \alpha(\mathbf{N})=6.60\times10^{-5} \ 10; \ \alpha(\mathbf{O})=9.86\times10^{-6} \ 14; \ \alpha(\mathbf{P})=5 \ 28\times10^{-7} \ 8$
4025.6	(12.13)	758.0 <i>3</i>	100	3267.6 12+	D		$u(1) = 5.20 \times 10^{-5}$
4150.0	(14 ⁻)	383.3 [#] 1	100 [#] 11	3766.7 13-			
		747.1 [#] 8	25 [#] 11	3403.1 12-			
4319.9	(13 ⁻)	695.2 <i>3</i>	100	3624.7 11(-	-)		
4552.8	(15 ⁻)	403.1 [#] 3	32 [#] 7	4150.0 (14	_)		
		785.7 [#] 3	100 [#] 15	3766.7 13-			
4592.9	16+	743.5 3	100	3849.4 14+	(E2)	0.00526	α (K)=0.00439 7; α (L)=0.000682 10; α (M)=0.0001494 21
							α (N)=3.42×10 ⁻⁵ 5; α (O)=5.17×10 ⁻⁶ 8; α (P)=3.02×10 ⁻⁷ 5
4976.3	(16 ⁻)	423.0 [#] 15	6 [#] 6	4552.8 (15	_)		
		826.3 [#] 3	100 ^{#} 12	4150.0 (14	-)		
5461.0	(18 ⁺)	868.1 <i>3</i>	100	4592.9 16+			
6423.0	(20^{+})	962 1	100	5461.0 (18	+)		

[†] From (HI,xn γ) (1989Pa01) unless noted otherwise.

[‡] Unless noted otherwise, from (HI,xnγ) based on 1989Pa01 measured DCO values (intensity asymmetries) compared with typical values for stretched-Q and stretched-D transitions given in cited ref. See (HI,xn γ) for details.

[#] From 2006O109 (92 Mo(54 Fe, $\alpha 2$ p γ) dataset). [@] From ¹⁴⁰Tb ε decay dataset.

& Additional information 1.

^{*a*} Placement of transition in the level scheme is uncertain.



 $^{140}_{64}\rm{Gd}_{76}$

Adopted Levels, Gammas



 $^{140}_{64}\rm{Gd}_{76}$