

**Adopted Levels, Gammas**

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	S. Kumar(a), J. Chen(b) and F. G. Kondev		NDS 137, 1 (2016)	31-May-2016

$Q(\beta^-)=6456$  13;  $S(n)=6431$  13;  $S(p)=10807$  14;  $Q(\alpha)=-6794$  10 [2012Wa38](#)

$^{109}\text{Tc}$  Levels

Cross Reference (XREF) Flags

- A  $^{109}\text{Mo}$   $\beta^-$  decay
- B  $^{248}\text{Cm}$  SF decay
- C  $^{252}\text{Cf}$  SF decay

E(level) <sup>‡</sup>	$J^\pi$ <sup>†</sup>	$T_{1/2}$	XREF	Comments
0.0 <sup>#</sup>	(5/2 <sup>+</sup> )	0.91 s 3	ABC	$\% \beta^- = 100$ ; $\% \beta^- n = 0.08$ 2 ( <a href="#">1996Me09</a> ) $\% \beta^- n$ : Other: $\leq 1$ ( <a href="#">2009Pe06</a> ). $J^\pi$ : direct feeding in $^{109}\text{Mo}$ $\beta^-$ decay ( $J^\pi = (5/2^+)$ ); systematics of odd-Z Tc isotopes; configuration assignment. $T_{1/2}$ : weighted average of 1.04 s 11 (using $\beta(t)$ in <a href="#">2009Pe06</a> and the maximum likelihood method, but the uncertainty was deduced by the evaluators by taking in quadrature the systematic uncertainty of 0.10 and the statistical uncertainty of 0.05), 0.82 10 (using $\beta(t)$ in <a href="#">1996Me09</a> ), 0.87 s 4 (using 96.1,128.7,195.6 $\gamma$ - $\beta(t)$ in <a href="#">1992PeZX</a> ), 0.93 s 3 (using 96.1,122.2,128.5,376.9,445.0 $\gamma$ - $\beta(t)$ in <a href="#">1969WiZX</a> ) and 0.9 s 1 (using 68.7 $\gamma(t)$ in <a href="#">1990A143</a> ). Other: 1.4 s 4 ( <a href="#">1976Tr02</a> , from the growth of 206 $\gamma(t)$ in $^{109}\text{Ru}$ ). configuration: $K^\pi = 5/2^+$ , $\pi 5/2[422]$ Nilsson orbital. The assignment is consistent with the observed $g_K$ values from in-band cascade-to-crossover branching ratios, compared to $g_K = 1.49$ expected from deformed Woods-Saxon model ( $\beta_2 = 0.322$ , $\beta_4 = -0.003$ and $\beta_6 = -0.005$ ).
7.0 <sup>a</sup> 3	(5/2 <sup>-</sup> )		AB	$J^\pi$ : based on comparisons of the structure of low-lying states in $^{109}\text{Tc}$ in $^{109}\text{Mo}$ $\beta^-$ decay ( <a href="#">2012Ku28</a> ); assigned configuration. The assignment is tentative. configuration: possible $\pi 5/2[303]$ Nilsson orbital. The assignment is consistent with the observed $g_K$ values from in-band cascade-to-crossover branching ratios, compared to $g_K = 0.45$ expected from deformed Woods-Saxon model ( $\beta_2 = 0.322$ , $\beta_4 = -0.003$ and $\beta_6 = -0.005$ ).
18.37 24	(3/2 <sup>-</sup> )		A	$J^\pi$ : based on comparisons of the structure of low-lying states in $^{109}\text{Tc}$ in $^{109}\text{Mo}$ $\beta^-$ decay ( <a href="#">2012Ku28</a> ). The assignment is tentative. configuration: possible $\pi 3/2[301]$ Nilsson orbital ( <a href="#">2012Ku28</a> ).
50.63 22	(3/2 <sup>+</sup> )		A	$J^\pi$ : 32.2 $\gamma$ (E1) to (3/2 <sup>-</sup> ) and 43.6 $\gamma$ (E1) to (5/2 <sup>-</sup> ). configuration: Likely a member of the $K^\pi = 1/2^+$ , $\pi 1/2[431]$ band ( <a href="#">2012Ku28</a> ). The assignment is tentative.
69.13 <sup>#</sup> 8	(7/2 <sup>+</sup> )		ABC	$J^\pi$ : 69.1 $\gamma$ M1+E2 to (5/2 <sup>+</sup> ); band assignment.
172.00 <sup>a</sup> 10	(7/2 <sup>-</sup> )		AB	$J^\pi$ : 165.0 $\gamma$ to (5/2 <sup>-</sup> ); band assignment.
206.17 <sup>#</sup> 10	(9/2 <sup>+</sup> )		ABC	$J^\pi$ : 137.0 $\gamma$ M1(+E2) to (7/2 <sup>+</sup> ), 206.1 $\gamma$ to (5/2 <sup>+</sup> ); band assignment.
333.14 <sup>c</sup> 13	(3/2 <sup>+</sup> )		A	$J^\pi$ : 333.3 $\gamma$ to (5/2 <sup>+</sup> ), 314.8 $\gamma$ to (3/2 <sup>-</sup> ), 282.5 $\gamma$ to (3/2 <sup>+</sup> ); direct $\beta^-$ feeding from (5/2 <sup>+</sup> ); band assignment.
358.60 <sup>c</sup> 12	(7/2 <sup>+</sup> )		A	$J^\pi$ : 152.1 $\gamma$ to (9/2 <sup>+</sup> ), 358.7 $\gamma$ to (5/2 <sup>+</sup> ); band assignment.
387.80 <sup>a</sup> 10	(9/2 <sup>-</sup> )		B	$J^\pi$ : 380.8 $\gamma$ E2 to (5/2 <sup>-</sup> ), 215.8 $\gamma$ to (7/2 <sup>-</sup> ).
423.78 <sup>c</sup> 12	(5/2 <sup>+</sup> )		A	$J^\pi$ : 65.2 $\gamma$ M1+E2 to (7/2 <sup>+</sup> ), 90.7 $\gamma$ M1+E2 to (3/2 <sup>+</sup> ); band assignment.
489.32 25	(3/2,5/2)		A	$J^\pi$ : 471.0 $\gamma$ to (3/2 <sup>-</sup> ), 438.6 $\gamma$ to (3/2 <sup>+</sup> ); direct feeding in $^{109}\text{Mo}$ $\beta^-$ decay ( $J^\pi = (5/2^+)$ ) (5/2 <sup>+</sup> ).
494.55 <sup>@</sup> 8	(9/2 <sup>+</sup> )		B	$J^\pi$ : 494.6 $\gamma$ Q to (5/2 <sup>+</sup> ), 425.4 $\gamma$ D to (7/2 <sup>+</sup> ); band assignment.
504.20 <sup>#</sup> 12	(11/2 <sup>+</sup> )		BC	$J^\pi$ : 298.0 $\gamma$ to (9/2 <sup>+</sup> ), 435.0 $\gamma$ to (7/2 <sup>+</sup> ); band assignment.
605.70 <sup>a</sup> 14	(11/2 <sup>-</sup> )		B	$J^\pi$ : 433.7 $\gamma$ E2 to (7/2 <sup>-</sup> ), band assignment.

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**Adopted Levels, Gammas (continued)** $^{109}\text{Tc}$  Levels (continued)

E(level) <sup>‡</sup>	J <sup>π</sup> <sup>†</sup>	XREF	Comments
632.37 <sup>@</sup> 13	(11/2 <sup>+</sup> )	BC	J <sup>π</sup> : 426.2γ to (9/2 <sup>+</sup> ), 563.9γ to (7/2 <sup>+</sup> ); band assignment.
643.68 <sup>#</sup> 13	(13/2 <sup>+</sup> )	BC	J <sup>π</sup> : 437.5γ E2 to (9/2 <sup>+</sup> ), 139.4γ to (11/2 <sup>+</sup> ); band assignment.
702.9 3	(3/2,5/2,7/2 <sup>+</sup> )	A	J <sup>π</sup> : 652.3γ to (3/2 <sup>+</sup> ); direct feeding in $^{109}\text{Mo}$ β <sup>-</sup> decay (J <sup>π</sup> =(5/2 <sup>+</sup> )).
745.00 13	(7/2 <sup>+</sup> )	A	J <sup>π</sup> : 386.6γ to (7/2 <sup>+</sup> ), 412.0γ to (3/2 <sup>+</sup> ); direct feeding in $^{109}\text{Mo}$ β <sup>-</sup> decay (J <sup>π</sup> =(5/2 <sup>+</sup> )). configuration: Likely the K <sup>π</sup> =7/2 <sup>+</sup> , π7/2[413] state (2012Ku28). The assignment is tentative.
915.20 <sup>a</sup> 22	(13/2 <sup>-</sup> )	B	J <sup>π</sup> : 527.4γ E2 to (9/2 <sup>-</sup> ), band assignment.
964.71 <sup>@</sup> 16	(13/2 <sup>+</sup> )	BC	J <sup>π</sup> : 332.4γ to (11/2 <sup>+</sup> ), 758.8γ to (9/2 <sup>+</sup> ); band assignment.
1083.94 <sup>#</sup> 16	(15/2 <sup>+</sup> )	BC	J <sup>π</sup> : 440.3γ to (13/2 <sup>+</sup> ), 579.7γ to (11/2 <sup>+</sup> ); band assignment.
1171.70 <sup>a</sup> 25	(15/2 <sup>-</sup> )	B	J <sup>π</sup> : 566.0γ E2 to (11/2 <sup>-</sup> ); band assignment.
1231.35 <sup>#</sup> 15	(17/2 <sup>+</sup> )	BC	J <sup>π</sup> : 147.2γ M1+E2 to (15/2 <sup>+</sup> ), 587.6γ E2 to (13/2 <sup>+</sup> ); band assignment.
1262.28 <sup>@</sup> 17	(15/2 <sup>+</sup> )	BC	J <sup>π</sup> : 297.6γ to (13/2 <sup>+</sup> ), 629.9γ to (11/2 <sup>+</sup> ); band assignment.
1383.1 <sup>b</sup> 4	(15/2 <sup>+</sup> )	C	J <sup>π</sup> : 414.8γ to (13/2 <sup>+</sup> ), 750.8γ to (11/2 <sup>+</sup> ); band assignment.
1440.75 15	(13/2 <sup>+</sup> )	B	J <sup>π</sup> : 808.4γ to (11/2 <sup>+</sup> ), 946.3γ E2 to (9/2 <sup>+</sup> ); band assignment.
1575.2 <sup>a</sup> 4	(17/2 <sup>-</sup> )	B	J <sup>π</sup> : 660.0γ to (13/2 <sup>-</sup> ); band assignment.
1635.9 <sup>@</sup> 3	(17/2 <sup>+</sup> )	BC	J <sup>π</sup> : 374.0γ to (15/2 <sup>+</sup> ), 671.0γ to (13/2 <sup>+</sup> ); band assignment.
1680.4 <sup>b</sup> 5	(17/2 <sup>+</sup> )	C	J <sup>π</sup> : 297.3γ to (15/2 <sup>+</sup> ), 715.7γ to (13/2 <sup>+</sup> ); band assignment
1749.61 <sup>&amp;</sup> 15	(15/2 <sup>-</sup> )	B	J <sup>π</sup> : 308.9γ d to (13/2 <sup>+</sup> ); band assignment.
1756.0 4	(3/2,5/2,7/2)	A	
1796.06 <sup>#</sup> 23	(19/2 <sup>+</sup> )	BC	J <sup>π</sup> : 564.7γ to (17/2 <sup>+</sup> ), 712.2γ to (15/2 <sup>+</sup> ); band assignment
1861.3 <sup>a</sup> 4	(19/2 <sup>-</sup> )	B	J <sup>π</sup> : 689.6γ Q to (15/2 <sup>-</sup> ); band assignment.
1930.69 <sup>&amp;</sup> 16	(17/2 <sup>-</sup> )	BC	J <sup>π</sup> : 181.1γ to (15/2 <sup>-</sup> ); band assignment.
1951.06 <sup>#</sup> 17	(21/2 <sup>+</sup> )	BC	J <sup>π</sup> : 155.1γ to (19/2 <sup>+</sup> ), 719.7γ E2 to (17/2 <sup>+</sup> ); band assignment.
2022.85 18	(3/2 <sup>+</sup> ,5/2,7/2 <sup>+</sup> )	A	J <sup>π</sup> : 1664.2γ to (7/2 <sup>+</sup> ), 1689.6γ to (3/2 <sup>+</sup> ); direct feeding in $^{109}\text{Mo}$ β <sup>-</sup> decay (J <sup>π</sup> =(5/2 <sup>+</sup> )).
2068.4 5	(3/2,5/2,7/2)	A	J <sup>π</sup> : 1365.5γ to (3/2,5/2,7/2 <sup>+</sup> ); direct feeding in $^{109}\text{Mo}$ β <sup>-</sup> decay (J <sup>π</sup> =(5/2 <sup>+</sup> )).
2078.1 <sup>b</sup> 6	(19/2 <sup>+</sup> )	C	J <sup>π</sup> : 695.0γ to (15/2 <sup>+</sup> ); band assignment.
2136.91 <sup>&amp;</sup> 16	(19/2 <sup>-</sup> )	BC	J <sup>π</sup> : 206.3γ to (17/2 <sup>-</sup> ), 387.3γ to (15/2 <sup>-</sup> ); band assignment.
2286.4 4	(3/2,5/2,7/2 <sup>+</sup> )	A	J <sup>π</sup> : 2235.7γ to (3/2 <sup>+</sup> ); direct feeding in $^{109}\text{Mo}$ β <sup>-</sup> decay (J <sup>π</sup> =(5/2 <sup>+</sup> )).
2346.2 <sup>a</sup> 6	(21/2 <sup>-</sup> )	B	J <sup>π</sup> : 771.0γ to (17/2 <sup>-</sup> ); band assignment.
2375.58 <sup>&amp;</sup> 20	(21/2 <sup>-</sup> )	BC	J <sup>π</sup> : 238.6γ to (19/2 <sup>-</sup> ), 444.9γ to (17/2 <sup>-</sup> ); band assignment.
2552.4 <sup>#</sup> 4	(23/2 <sup>+</sup> )	C	J <sup>π</sup> : 601.3γ to (21/2 <sup>+</sup> ), 756.4γ to (19/2 <sup>+</sup> ); band assignment.
2642.68 <sup>&amp;</sup> 23	(23/2 <sup>-</sup> )	BC	J <sup>π</sup> : 267.0γ to (21/2 <sup>-</sup> ), 505.9γ to (19/2 <sup>-</sup> ); band assignment.
2660.2 <sup>a</sup> 5	(23/2 <sup>-</sup> )	B	J <sup>π</sup> : 798.9γ to (19/2 <sup>-</sup> ); band assignment.
2753.4 <sup>#</sup> 3	(25/2 <sup>+</sup> )	BC	J <sup>π</sup> : 201.1γ to (23/2 <sup>+</sup> ), 802.3γ E2 to (21/2 <sup>+</sup> ); band assignment.
2940.3 <sup>&amp;</sup> 3	(25/2 <sup>-</sup> )	B	J <sup>π</sup> : 297.5γ to (23/2 <sup>-</sup> ), 564.8γ to (21/2 <sup>-</sup> ); band assignment.
3217.4 <sup>#</sup> 4	(27/2 <sup>+</sup> )	C	J <sup>π</sup> : 464.1γ to (25/2 <sup>+</sup> ), 665.0γ to (23/2 <sup>+</sup> ); band assignment.
3438.9 <sup>#</sup> 4	(29/2 <sup>+</sup> )	BC	J <sup>π</sup> : 221.5γ to (27/2 <sup>+</sup> ), 685.5γ E2 to (25/2 <sup>+</sup> ); band assignment.
4072.1 <sup>#</sup> 5	(33/2 <sup>+</sup> )	BC	J <sup>π</sup> : 633.2γ E2 to (29/2 <sup>+</sup> ); band assignment.
4833.1 <sup>#</sup> 7	(37/2 <sup>+</sup> )	BC	J <sup>π</sup> : 761.0γ to (33/2 <sup>+</sup> ); band assignment.

<sup>†</sup> From  $^{248}\text{Cm}$  SF decay (2010Ur03), based on angular correlation measurements, ce data and observed band structure, unless otherwise noted.

<sup>‡</sup> From a least-squares fit to Eγ.

# Band(A): K<sup>π</sup>=5/2<sup>+</sup>, π5/2[422] band.

@ Band(B): K<sup>π</sup>=(9/2<sup>+</sup>), π5/2[422]⊗2<sup>+</sup> γ-vibrational band.

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**Adopted Levels, Gammas (continued)** **$^{109}\text{Tc}$  Levels (continued)**

- & Band(C):  $K^\pi=(15/2^-)$  band. Possible configuration= $\pi 5/2[422]\otimes\nu(1/2[420],9/2[514])$ .  
*a* Band(D):  $K^\pi=5/2^-$ ,  $\pi 5/2[303]$  band.  
*b* Band(E): Band at 1383 keV, observed only in  $^{252}\text{Cf}$  SF decay (2010Gu07).  
*c* Band(F): Likely  $K^\pi=1/2^+$ ,  $\pi 5/2[422]\otimes 2^+$  band.

Adopted Levels, Gammas (continued)

E <sub>i</sub> (level)	J <sub>i</sub> <sup>π</sup>	γ( <sup>109</sup> Tc)		E <sub>f</sub>	J <sub>f</sub> <sup>π</sup>	Mult. <sup>†</sup>	δ <sup>@</sup>		α&	Comments
		E <sub>γ</sub> <sup>‡</sup>	I <sub>γ</sub> <sup>‡</sup>				δ <sup>@</sup>	α&		
7.0	(5/2 <sup>-</sup> )	(7.0)		0.0	(5/2 <sup>+</sup> )					
18.37	(3/2 <sup>-</sup> )	(18.3)		0.0	(5/2 <sup>+</sup> )					
50.63	(3/2 <sup>+</sup> )	32.2 <sup>‡</sup> 2	39 <sup>‡</sup> 11	18.37	(3/2 <sup>-</sup> )	(E1)			3.28 8	α(K)=2.83 7; α(L)=0.374 9; α(M)=0.0668 16 α(N)=0.01008 23; α(O)=0.000474 11 Mult.: α(K)exp=4.7 4 for 32.2γ+43.6γ (2012Ku28).
		43.6 <sup>‡</sup> 2	100 <sup>‡</sup> 6	7.0	(5/2 <sup>-</sup> )	(E1)			1.42 3	α(K)=1.234 24; α(L)=0.155 3; α(M)=0.0277 6 α(N)=0.00423 9; α(O)=0.000216 4 Mult.: α(K)exp=4.7 4 for 32.2γ+43.6γ (2012Ku28).
69.13	(7/2 <sup>+</sup> )	69.1 1	100	0.0	(5/2 <sup>+</sup> )	M1+E2	0.11 10		0.84 12	α(K)=0.73 9; α(L)=0.09 3; α(M)=0.017 6 α(N)=0.0027 8; α(O)=0.000162 14 Mult.: α(K)exp=0.90 20 and α(exp)=0.90 20 in 2012Ku28. Also α(K)exp = 1.12 25 for 65.2γ+69.1γ in 2012Ku28. Other: α(K)exp=2.9 8 in 2010Ur03. δ: From α(K)exp=0.90 20 (2012Ku28). Other: 1.9 9 in <sup>248</sup> Cm SF decay (2010Ur03) and 0.16 +7-12 in <sup>252</sup> Cf SF decay (2004Lu20).
172.00	(7/2 <sup>-</sup> )	165.0 1	100	7.0	(5/2 <sup>-</sup> )	[M1+E2]				Mult.: α(K)exp=2.2 7 (2010Ur03) from comparison of I <sub>γ</sub> (165γ) and I <sub>γ</sub> (Kα x rays), but the value is too large for either Mult=E1, M1 or E2. (433γ)(165γ)(θ) data (2010Ur03) are also inconclusive.
206.17	(9/2 <sup>+</sup> )	137.0 1	100.0 18	69.13	(7/2 <sup>+</sup> )	M1(+E2)	0.6 6		0.19 10	Mult.,δ: from α(exp)=0.19 9 in <sup>252</sup> Cf SF decay (2004Lu20) and (437.5γ)(137.0γ)(θ) in <sup>248</sup> Cm SF decay (2010Ur03).
		206.1 2	1.9 4	0.0	(5/2 <sup>+</sup> )					
333.14	(3/2 <sup>+</sup> )	282.5 <sup>‡</sup> 2	8.7 <sup>‡</sup> 9	50.63	(3/2 <sup>+</sup> )					
		314.8 <sup>‡</sup> 3	4.8 <sup>‡</sup> 6	18.37	(3/2 <sup>-</sup> )					
		333.3 <sup>‡</sup> 2	100 <sup>‡</sup> 5	0.0	(5/2 <sup>+</sup> )					
358.60	(7/2 <sup>+</sup> )	152.1 <sup>‡</sup> 5	1.4 <sup>‡</sup> 3	206.17	(9/2 <sup>+</sup> )					
		289.5 <sup>‡</sup> 2	100 <sup>‡</sup> 6	69.13	(7/2 <sup>+</sup> )					
		358.7 <sup>‡</sup> 2	56 <sup>‡</sup> 6	0.0	(5/2 <sup>+</sup> )					
387.80	(9/2 <sup>-</sup> )	215.8 2	48 2	172.00	(7/2 <sup>-</sup> )					
		380.8 1	100 7	7.0	(5/2 <sup>-</sup> )	E2				Mult.: (380.8γ)(527.4γ)(θ) in <sup>248</sup> Cm SF decay (2010Ur03); band assignment.
423.78	(5/2 <sup>+</sup> )	65.2 <sup>‡</sup> 2	45 <sup>‡</sup> 4	358.60	(7/2 <sup>+</sup> )	M1+E2	0.30 6		1.34 16	Mult.,δ: from α(K)exp=1.1 1 in <sup>109</sup> Mo β <sup>-</sup> decay (2012Ku28). Also: α(K)exp=1.12 25 for 65.2γ+69.1γ (2012Ku28).
		90.7 <sup>‡</sup> 2	47 <sup>‡</sup> 7	333.14	(3/2 <sup>+</sup> )	M1+E2	0.37 +10-11		0.54 9	Mult.,δ: from α(K)exp=0.45 6 in <sup>109</sup> Mo β <sup>-</sup> decay (2012Ku28).
		354.6 <sup>‡</sup> 4	15.8 <sup>‡</sup> 13	69.13	(7/2 <sup>+</sup> )					
		423.9 <sup>‡</sup> 2	100 <sup>‡</sup> 10	0.0	(5/2 <sup>+</sup> )					
489.32	(3/2,5/2)	438.6 <sup>‡</sup> 2	100 <sup>‡</sup> 9	50.63	(3/2 <sup>+</sup> )					

Adopted Levels, Gammas (continued)

$\gamma(^{109}\text{Tc})$  (continued)

$E_i(\text{level})$	$J_i^\pi$	$E_\gamma^\dagger$	$I_\gamma^\dagger$	$E_f$	$J_f^\pi$	Mult. $^\dagger$	Comments
489.32	(3/2,5/2)	471.0 <sup>‡</sup> 2	77 <sup>‡</sup> 7	18.37	(3/2 <sup>-</sup> )		
494.55	(9/2 <sup>+</sup> )	425.4 1	38 4	69.13	(7/2 <sup>+</sup> )	D	Mult.: from (946.3 $\gamma$ )(425.4 $\gamma$ )( $\theta$ ) (2010Ur03).
		494.6 1	100 8	0.0	(5/2 <sup>+</sup> )	Q	Mult.: from (946.3 $\gamma$ )(494.6 $\gamma$ )( $\theta$ ) (2010Ur03).
504.20	(11/2 <sup>+</sup> )	298.0 1	100 3	206.17	(9/2 <sup>+</sup> )		
		435.0 2	25 2	69.13	(7/2 <sup>+</sup> )		
605.70	(11/2 <sup>-</sup> )	433.7 1	100	172.00	(7/2 <sup>-</sup> )	E2	Mult.: from (566.0 $\gamma$ )(433.7 $\gamma$ )( $\theta$ ); band assignment (2010Ur03).
632.37	(11/2 <sup>+</sup> )	426.2 1	100	206.17	(9/2 <sup>+</sup> )		
		563.9 <sup>#</sup> 1	9	69.13	(7/2 <sup>+</sup> )		$I_\gamma$ : from 2004Lu20 in <sup>252</sup> Cf SF decay.
643.68	(13/2 <sup>+</sup> )	139.4 2	32.2 22	504.20	(11/2 <sup>+</sup> )		
		437.5 1	100 3	206.17	(9/2 <sup>+</sup> )	E2	Mult.: from (437.5 $\gamma$ )(587.6 $\gamma$ )( $\theta$ ); band assignment (2010Ur03).
702.9	(3/2,5/2,7/2 <sup>+</sup> )	213.5 <sup>‡</sup> 2	100 <sup>‡</sup> 4	489.32	(3/2,5/2)		
		652.3 <sup>‡</sup> 3	23 <sup>‡</sup> 4	50.63	(3/2 <sup>+</sup> )		
745.00	(7/2 <sup>+</sup> )	321.4 <sup>‡</sup> 2	29.6 <sup>‡</sup> 15	423.78	(5/2 <sup>+</sup> )		
		386.6 <sup>‡</sup> 3	18.7 <sup>‡</sup> 25	358.60	(7/2 <sup>+</sup> )		
		412.0 <sup>‡</sup> 2	100 <sup>‡</sup> 15	333.14	(3/2 <sup>+</sup> )		
		744.6 <sup>‡</sup> 2	70 <sup>‡</sup> 8	0.0	(5/2 <sup>+</sup> )		
915.20	(13/2 <sup>-</sup> )	527.4 2	100	387.80	(9/2 <sup>-</sup> )	Q	Mult.: from (380.8 $\gamma$ )(527.4 $\gamma$ )( $\theta$ ); band assignment (2010Ur03).
964.71	(13/2 <sup>+</sup> )	332.4 2	100 20	632.37	(11/2 <sup>+</sup> )		
		460.4 2	55 10	504.20	(11/2 <sup>+</sup> )		$I_\gamma$ : 15 in <sup>252</sup> Cf SF decay (2004Lu20).
		758.8 <sup>#</sup> 5		206.17	(9/2 <sup>+</sup> )		
1083.94	(15/2 <sup>+</sup> )	440.3 2	100 9	643.68	(13/2 <sup>+</sup> )		
		579.7 2	27 7	504.20	(11/2 <sup>+</sup> )		
1171.70	(15/2 <sup>-</sup> )	566.0 2	100	605.70	(11/2 <sup>-</sup> )	E2	Mult.: from (566.0 $\gamma$ )(433.7 $\gamma$ )( $\theta$ ); band assignment (2010Ur03).
1231.35	(17/2 <sup>+</sup> )	147.2 3	11.4 14	1083.94	(15/2 <sup>+</sup> )	M1+E2	Mult.: from (719.7 $\gamma$ )(147.2 $\gamma$ )( $\theta$ ); band assignment (2010Ur03).
		587.6 1	100 3	643.68	(13/2 <sup>+</sup> )	E2	Mult.: from (719.7 $\gamma$ )(587.6 $\gamma$ )( $\theta$ ); band assignment (2010Ur03).
1262.28	(15/2 <sup>+</sup> )	297.6 2	88 13	964.71	(13/2 <sup>+</sup> )		
		618.7 <sup>#</sup> 5		643.68	(13/2 <sup>+</sup> )		
		629.9 3	100 13	632.37	(11/2 <sup>+</sup> )		
		758.4 <sup>#</sup> 5		504.20	(11/2 <sup>+</sup> )		
1383.1	(15/2 <sup>+</sup> )	418.4 <sup>#</sup> 5		964.71	(13/2 <sup>+</sup> )		
		750.8 <sup>#</sup> 5		632.37	(11/2 <sup>+</sup> )		
1440.75	(13/2 <sup>+</sup> )	808.4 2	27 6	632.37	(11/2 <sup>+</sup> )		
		946.3 2	100 9	494.55	(9/2 <sup>+</sup> )	E2	Mult.: from (946.3 $\gamma$ )(494.6 $\gamma$ )( $\theta$ ); band assignment (2010Ur03).
1575.2	(17/2 <sup>-</sup> )	660.0 3	100	915.20	(13/2 <sup>-</sup> )		
1635.9	(17/2 <sup>+</sup> )	374.0 5	80 20	1262.28	(15/2 <sup>+</sup> )		
		552.1 <sup>#</sup> 5		1083.94	(15/2 <sup>+</sup> )		
		671.0 5	100 20	964.71	(13/2 <sup>+</sup> )		
		992.4 <sup>#</sup> 5		643.68	(13/2 <sup>+</sup> )		
1680.4	(17/2 <sup>+</sup> )	297.3 <sup>#</sup> 5		1383.1	(15/2 <sup>+</sup> )		

Adopted Levels, Gammas (continued)

$\gamma(^{109}\text{Tc})$  (continued)

$E_i(\text{level})$	$J_i^\pi$	$E_\gamma^\dagger$	$I_\gamma^\dagger$	$E_f$	$J_f^\pi$	Mult. <sup>†</sup>	Comments
1680.4	(17/2 <sup>+</sup> )	715.7 <sup>#</sup> 5		964.71	(13/2 <sup>+</sup> )		
1749.61	(15/2 <sup>-</sup> )	308.9 1	100	1440.75	(13/2 <sup>+</sup> )	D	Mult.: from (946.3 $\gamma$ )(308.9 $\gamma$ )( $\theta$ ) (2010Ur03).
1756.0	(3/2,5/2,7/2)	1332.2 <sup>‡</sup> 3	100 <sup>‡</sup>	423.78	(5/2 <sup>+</sup> )		
1796.06	(19/2 <sup>+</sup> )	564.7 3	100 18	1231.35	(17/2 <sup>+</sup> )		
		712.2 3	29 8	1083.94	(15/2 <sup>+</sup> )		$I_\gamma$ : 58 in <sup>252</sup> Cf SF decay (2004Lu20).
1861.3	(19/2 <sup>-</sup> )	689.6 2	100	1171.70	(15/2 <sup>-</sup> )	Q	Mult.: from (566.0 $\gamma$ )(689.6 $\gamma$ )( $\theta$ ) (2010Ur03).
1930.69	(17/2 <sup>-</sup> )	181.1 1	100 7	1749.61	(15/2 <sup>-</sup> )		
		294.9 <sup>#</sup> 5		1635.9	(17/2 <sup>+</sup> )		
		668.5 2	80 12	1262.28	(15/2 <sup>+</sup> )		
		699.7 <sup>#</sup> 5		1231.35	(17/2 <sup>+</sup> )		
		847.0 <sup>#</sup> 5		1083.94	(15/2 <sup>+</sup> )		
1951.06	(21/2 <sup>+</sup> )	155.1 <sup>#</sup> 5		1796.06	(19/2 <sup>+</sup> )		
		719.7 1	100	1231.35	(17/2 <sup>+</sup> )	E2	Mult.: from (719.7 $\gamma$ )(802.3 $\gamma$ )( $\theta$ ); band assignment (2010Ur03).
2022.85	(3/2 <sup>+</sup> ,5/2,7/2 <sup>+</sup> )	1599.1 <sup>‡</sup> 3	31.6 <sup>‡</sup> 17	423.78	(5/2 <sup>+</sup> )		
		1664.2 <sup>‡</sup> 4	12.5 <sup>‡</sup> 15	358.60	(7/2 <sup>+</sup> )		
		1689.6 <sup>‡</sup> 3	100 <sup>‡</sup> 6	333.14	(3/2 <sup>+</sup> )		
		2022.9 <sup>‡</sup> 3	20.5 <sup>‡</sup> 17	0.0	(5/2 <sup>+</sup> )		
2068.4	(3/2,5/2,7/2)	1365.5 <sup>‡</sup> 4	100 <sup>‡</sup>	702.9	(3/2,5/2,7/2 <sup>+</sup> )		
2078.1	(19/2 <sup>+</sup> )	695.0 <sup>#</sup> 5		1383.1	(15/2 <sup>+</sup> )		
2136.91	(19/2 <sup>-</sup> )	206.3 1	100 14	1930.69	(17/2 <sup>-</sup> )		
		387.3 1	54 10	1749.61	(15/2 <sup>-</sup> )		
		905.2 2	96 7	1231.35	(17/2 <sup>+</sup> )		
		1053.0 <sup>#</sup> 5		1083.94	(15/2 <sup>+</sup> )		
2286.4	(3/2,5/2,7/2 <sup>+</sup> )	2235.7 <sup>‡</sup> 3	100 <sup>‡</sup>	50.63	(3/2 <sup>+</sup> )		
2346.2	(21/2 <sup>-</sup> )	771.0 4	100	1575.2	(17/2 <sup>-</sup> )		
2375.58	(21/2 <sup>-</sup> )	238.6 2	100 25	2136.91	(19/2 <sup>-</sup> )		
		444.9 2	43 8	1930.69	(17/2 <sup>-</sup> )		
2552.4	(23/2 <sup>+</sup> )	601.3 <sup>#</sup> 5		1951.06	(21/2 <sup>+</sup> )		
		756.4 <sup>#</sup> 5		1796.06	(19/2 <sup>+</sup> )		
2642.68	(23/2 <sup>-</sup> )	267.0 2	39 11	2375.58	(21/2 <sup>-</sup> )		
		505.9 3	100	2136.91	(19/2 <sup>-</sup> )		
		691.6 <sup>#</sup> 5		1951.06	(21/2 <sup>+</sup> )		
2660.2	(23/2 <sup>-</sup> )	798.9 3	100	1861.3	(19/2 <sup>-</sup> )		
2753.4	(25/2 <sup>+</sup> )	201.1 <sup>#</sup> 5	14	2552.4	(23/2 <sup>+</sup> )		$I_\gamma$ : from 2004Lu20 in <sup>252</sup> Cf SF decay.
		802.3 2	100	1951.06	(21/2 <sup>+</sup> )	E2	Mult.: from (719.7 $\gamma$ )(802.3 $\gamma$ )( $\theta$ ); band assignment (2010Ur03).
2940.3	(25/2 <sup>-</sup> )	297.5 3	100 33	2642.68	(23/2 <sup>-</sup> )		
		564.8 3	100 33	2375.58	(21/2 <sup>-</sup> )		
3217.4	(27/2 <sup>+</sup> )	464.1 <sup>#</sup> 5		2753.4	(25/2 <sup>+</sup> )		

Adopted Levels, Gammas (continued)

$\gamma(^{109}\text{Tc})$  (continued)

$E_i(\text{level})$	$J_i^\pi$	$E_\gamma$ †	$I_\gamma$ †	$E_f$	$J_f^\pi$	Mult. †	Comments
3217.4	(27/2 <sup>+</sup> )	665.0 <sup>#</sup> 5		2552.4	(23/2 <sup>+</sup> )		
3438.9	(29/2 <sup>+</sup> )	221.5 <sup>#</sup> 5		3217.4	(27/2 <sup>+</sup> )		
		685.5 2	100	2753.4	(25/2 <sup>+</sup> )	E2	Mult.: from (685.5 $\gamma$ )(802.3 $\gamma$ )( $\theta$ ); band assignment (2010Ur03).
4072.1	(33/2 <sup>+</sup> )	633.2 3	100	3438.9	(29/2 <sup>+</sup> )	E2	Mult.: from (685.5 $\gamma$ )(633.2 $\gamma$ )( $\theta$ ); band assignment (2010Ur03).
4833.1	(37/2 <sup>+</sup> )	761.0 5	100	4072.1	(33/2 <sup>+</sup> )		

† From <sup>248</sup>Cm SF decay (2010Ur03), unless otherwise stated.

‡ From <sup>109</sup>Mo  $\beta^-$  decay (2012Ku28).

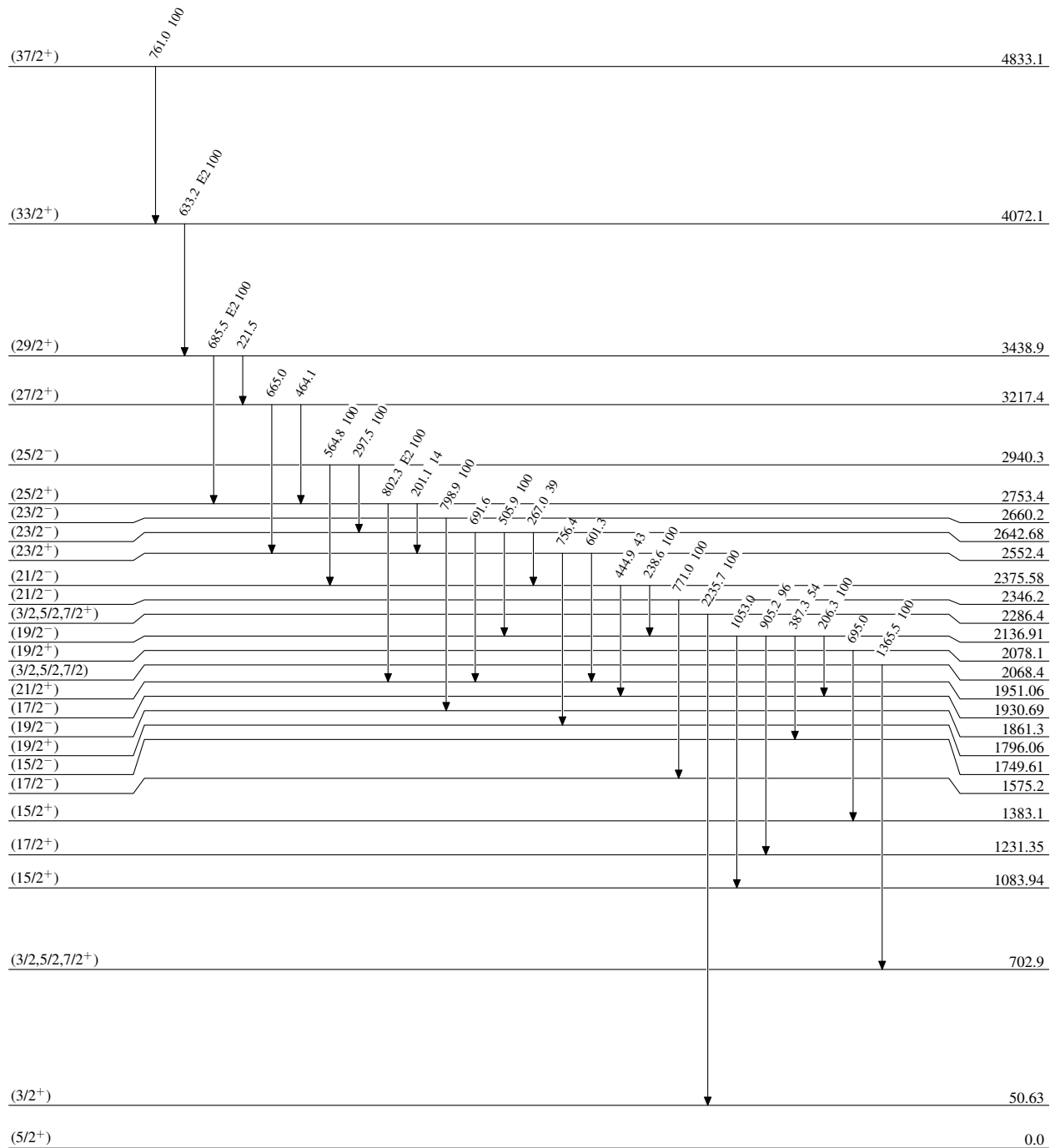
# From <sup>252</sup>Cf SF decay;  $\Delta E_\gamma=0.5$  keV were estimated by the evaluators.

@ Deduced by evaluators using experimental conversion coefficient and BrIccMixing v2.3 program.

& Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on  $\gamma$ -ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

Adopted Levels, GammasLevel Scheme

Intensities: Relative photon branching from each level

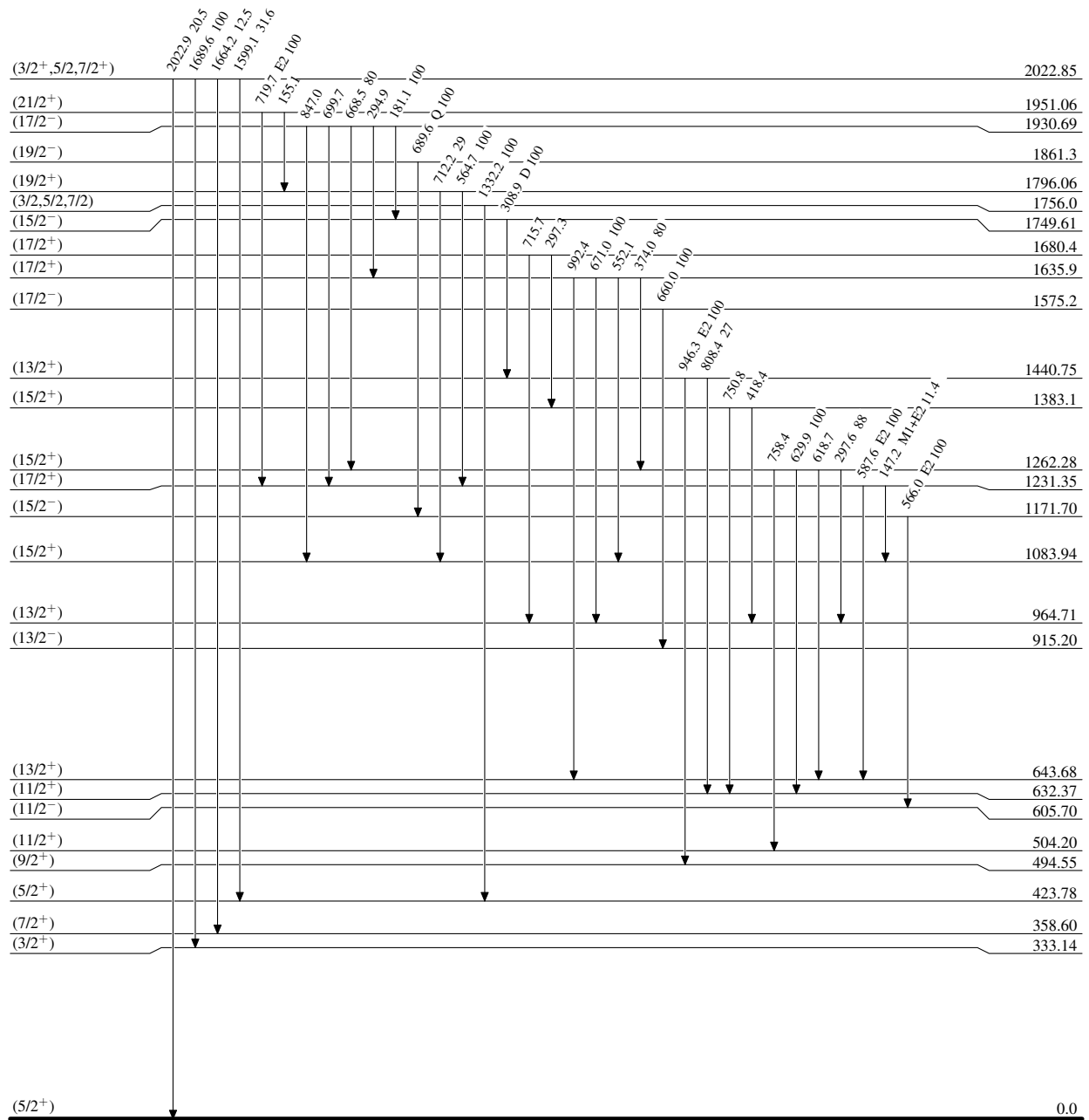


0.91 s 3



Adopted Levels, GammasLevel Scheme (continued)

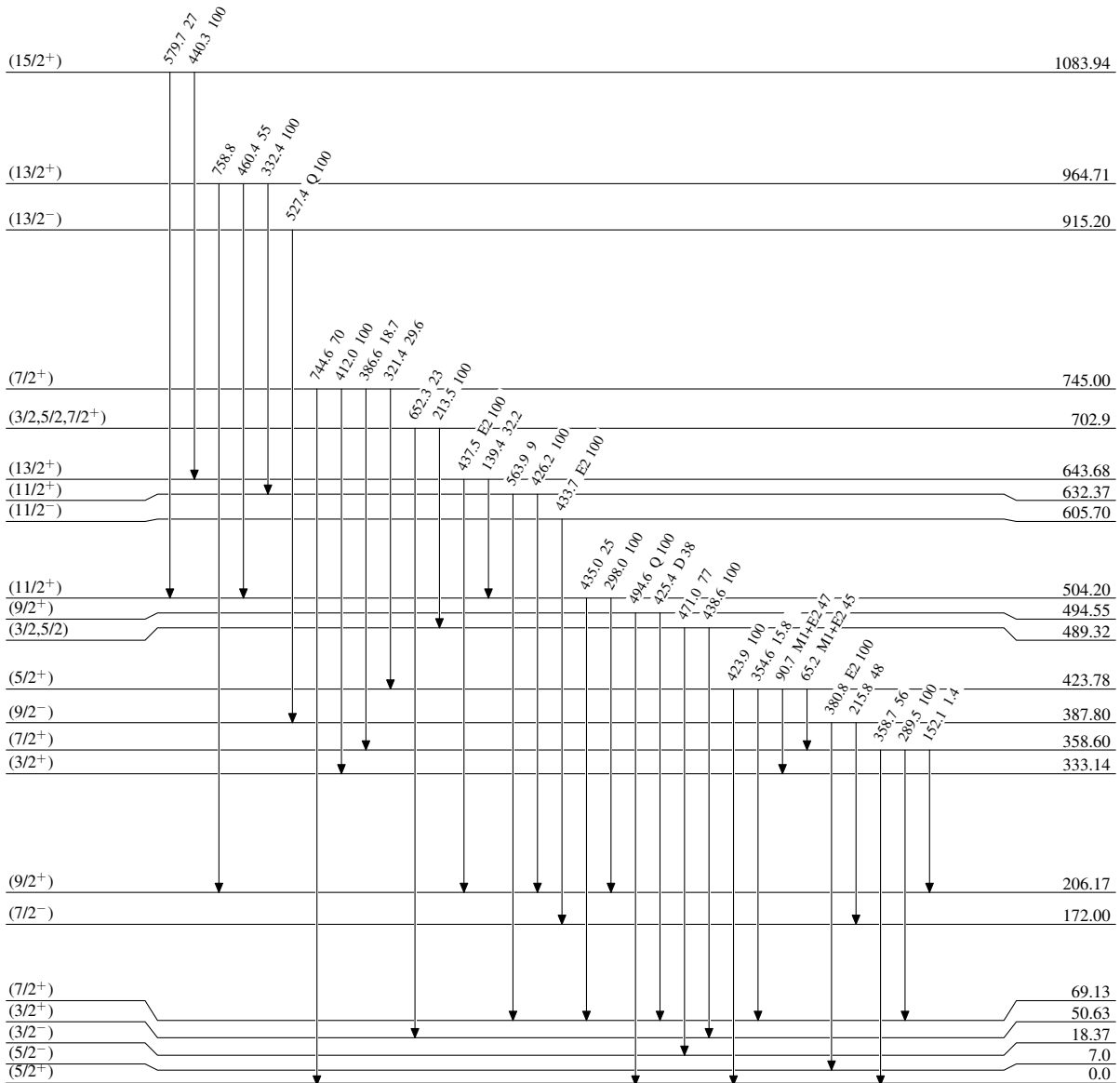
Intensities: Relative photon branching from each level



0.91 s 3

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

Intensities: Relative photon branching from each level



0.91 s 3

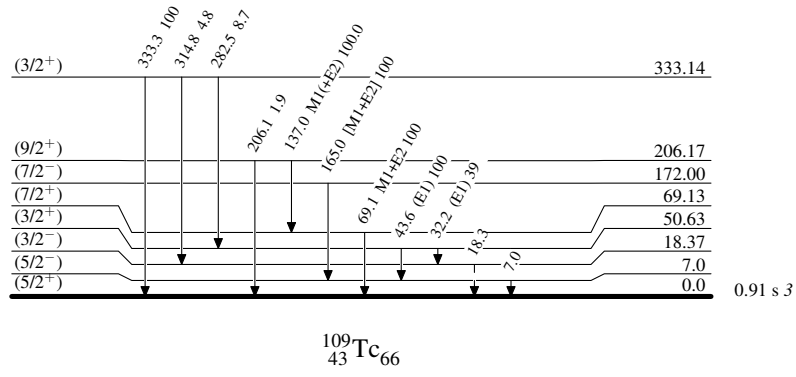
 $^{109}_{43}\text{Tc}_{66}$

Adopted Levels, Gammas

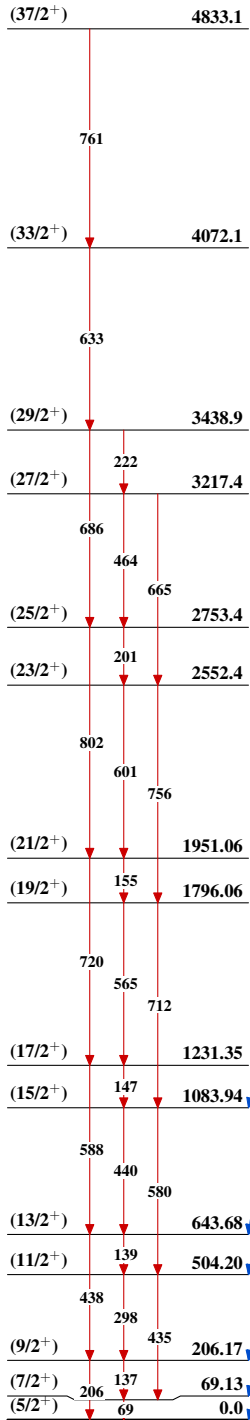
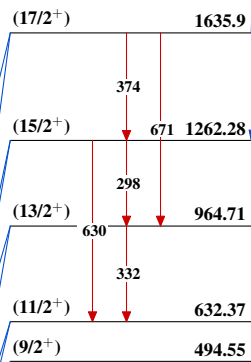
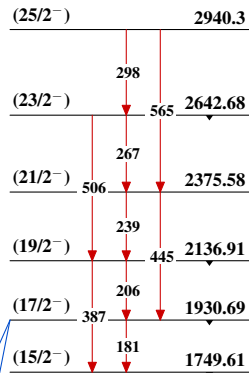
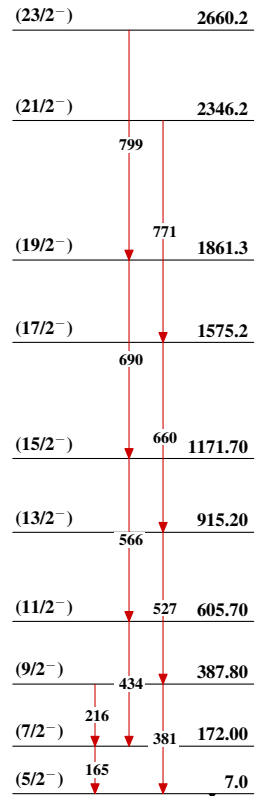
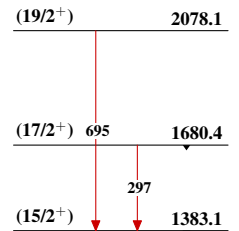
Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

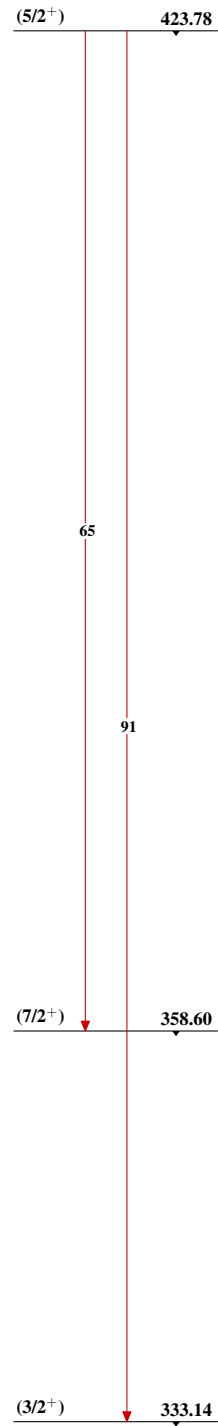
-----►  $\gamma$  Decay (Uncertain)

## Adopted Levels, Gammas

Band(A):  $K^\pi=5/2^+$ ,  $\pi 5/2[422]$   
bandBand(B):  $K^\pi=(9/2^+)$ ,  
 $\pi 5/2[422] \otimes 2^+$   $\gamma$ -vibrational  
bandBand(C):  $K^\pi=(15/2^-)$  bandBand(D):  $K^\pi=5/2^-$ ,  $\pi 5/2[303]$   
bandBand(E): Band at 1383  
keV, observed only in  
 $^{252}\text{Cf}$  SF decay  
(2010Gu07)

**Adopted Levels, Gammas (continued)**

Band(F): Likely  $K^\pi=1/2^+$ ,  
 $\pi 5/2[422] \otimes 2^+$  band

 $^{109}_{43}\text{Tc}_{66}$