

Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jean Blachot	NDS 108,2035 (2007)	30-Mar-2007

Q(β^-)=2151 25; S(n)=7460 13; S(p)=12620 10; Q(α)=-6399 12 [2012Wa38](#)
 Note: Current evaluation has used the following Q record 2157 287550 9012300 90-6150 70 [2003Au03](#).

¹⁰⁴Mo Levels

Cross Reference (XREF) Flags

A	¹⁰⁴ Nb β^- decay (4.8 s)	D	¹⁰⁴ Nb β^- decay (0.94 s)
B	²⁵² Cf SF decay	E	²³⁸ U(α ,F γ)
C	²⁴⁸ Cm SF decay		

E(level) [‡]	J π [†]	T _{1/2}	XREF	Comments
0.0 [#]	0 ⁺	60 s 2	ABCDE	% β^- =100 J π : even-even nucleus g.s. T _{1/2} : from β^- decay (1976KaYO). Others: 66 s 6 (1962Ki06), 96 s 6 (1964Te02), 58.8 s 13 (1981TiZZ).
192.19 [#] 9	2 ⁺	0.97 ns 8	ABC E	$\mu=0.38 +24-22$ (1985Me13); B(E2) $\uparrow=1.08$ 8 (1987Ra01) T _{1/2} : from SF decay (2002Sm10). Others: 0.72 ns 4 (1991Li39), 0.45 ns 9 (1970Ch11), 1.2 ns 2 (1970Wa05), 0.91 ns 3 (1974JaZN), 0.74 ns 5 (1990LiZZ). J π : $\gamma(\theta)$ (1972Wi15), stretched E2.
560.68 [#] 12	4 ⁺	26.1 ps 8	ABC E	T _{1/2} : from SF decay (2002Sm10). Others: 28 ps 8 (1990LiZZ), 26.6 ps 35 (1986Ma22), 26.8 ps 35 (1991Li39). J π : $\gamma(\theta)$ (1972Wi15).
812.36 [@] 11	2 ⁺		ABC E	J π : γ to 2 ⁺ and 0 ⁺ .
886.08 13	0 ⁺		A	J π : $\gamma\gamma(\theta)$ (1979Si02).
1028.35 [@] 12	3 ⁺		ABC E	
1079.97 [#] 15	6 ⁺	4.73 ps 15	ABC E	T _{1/2} : from SF decay (2002Sm10). Other: 6.0 23 (2001Kr13), 4.2 ps 6 (2003Hu07). J π : $\gamma(\theta)$ (1972Wi15).
1214.82 [@] 13	4 ⁺		A C E	
1275.20 22			A	
1468.61 18			A	
1475.67 [@] 15	5 ⁺		ABC E	
1544.57 20			A	
1583.50 ^{&} 14	4 ⁺		ABC E	
1607.00 20			A	
1610.68 23			A	
1624.02 24			A	
1721.79 [#] 21	8 ⁺	2.21 ps 11	BC E	T _{1/2} : from SF decay (2002Sm10).
1724.39 [@] 16	6 ⁺		BC E	
1790.28 23			A	
1824.26 ^{&} 14	5 ⁺		BC E	
1882.2 3			A	
1884.1 ^b 6	(5 ⁻)		B E	
2036.61 [@] 19	7 ⁺		BC E	
2061.15 ^a 17	(4 ⁻)		ABC	
2083.55 ^{&} 15	(6 ⁺)		BC E	
2180.2 ^c 4	(6 ⁺)		B	

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Adopted Levels, Gammas (continued) ^{104}Mo Levels (continued)

E(level) [‡]	J ^π [†]	T _{1/2}	XREF	Comments
2211.95 ^a 15	(5 ⁻)		BC	
2305.01 ^b 22	(7 ⁻)		BC E	
2316.84 22			A	
2326.19 [@] 20	8 ⁺		BC E	
2372.86 ^{&} 20	(7 ⁺)		BC E	
2396.18 ^a 16	(6 ⁻)		BC	
2455.4 [#] 3	10 ⁺	1.08 ps 7	BC E	T _{1/2} : from SF decay (2002Sm10).
2611.50 ^a 18	(7 ⁻)		BC	
2656.0 3			B	
2656.40 19			A	
2670.76 18			A	
2682.97 [@] 22	9 ⁺		BC E	
2684.6 3			A	
2685.4 ^{&} 4	(8 ⁺)		B	
2706.9 ^c 4	(8 ⁺)		B	
2791.99 25			A	
2862.2 5			B	
2864.29 ^a 21	(8 ⁻)		BC	
2866.51 ^b 24	(9 ⁻)		BC E	
2888.2 4			A	
3004.6 [@] 3	10 ⁺		BC E	
3011.0 ^{&} 5	(9 ⁺)		B	
3131.5 5			B	
3149.2 ^a 4	(9 ⁻)		B	E(level): level from 2001Ya06 and 2003Ha49 only.
3253.4 [#] 4	12 ⁺		BC E	
3358.4 ^c 4	(10 ⁺)		B	
3396.1 [@] 5	11 ⁺		B E	
3555.8 ^b 6	(11 ⁻)		B E	
3701.6? 6			B	
3765.4 [@] 6	12 ⁺		B E	
4114.7 [#] 6	14 ⁺		B E	
4115.5 ^c 5	(12 ⁺)		B	
4184.0 [@] 7	13 ⁺		B E	
4359.6 ^b 8	(13 ⁻)		B E	
4625.1 [@] 8	14 ⁺		B E	
5059.7 [#] 8	16 ⁺		B E	
5064.1 [@] 9	15 ⁺		E	
5268.9 ^b 9	(15 ⁻)		E	
5589.0 [@] 10	16 ⁺		E	
6022.0? [@] 10	17 ⁺		E	
6111.2 [#] 10	18 ⁺		E	
6284.4 ^b 11	(17 ⁻)		E	
6624.7 [@] 11	18 ⁺		E	
7283.2 [#] 11	20 ⁺		E	

[†] J^π without comments are from band assignments in SF decay, (α,Fγ) studies.

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Adopted Levels, Gammas (continued) ^{104}Mo Levels (continued)

‡ Level energies are from least-squares adjustment.

Band(A): g.s. Band.

@ Band(B): γ band.& Band(C): Band based on 4^+ .^a Band(D): Band based on (4^-) .^b Band(E): Band based on (5^-) .^c Band(F): Band based on (6^+) .

$\gamma(^{104}\text{Mo})$									
$E_i(\text{level})$	J_i^π	E_γ^\ddagger	I_γ^\ddagger	E_f	J_f^π	Mult.#	$\alpha^@$	Comments	
192.19	2^+	192.2 1	100	0.0	0^+	E2	0.12	B(E2)(W.u.)=92 6 Mult.: from $\gamma(\theta)$ (1972Wi15).	
560.68	4^+	368.4 1	100	192.19	2^+	[E2]		B(E2)(W.u.)=110 4	
812.36	2^+	620.2 1	100 10	192.19	2^+				
		812.4 2	78 8	0.0	0^+				
886.08	0^+	73.6 2	13 2	812.36	2^+	[E2]	3.67		
		693.9 1	100 10	192.19	2^+				
1028.35	3^+	216.7 3	22 2	812.36	2^+			E γ : this transition not given in ^{248}Cm SF decay.	
		467.4 2	11 1	560.68	4^+				
		836.3 1	100 10	192.19	2^+	M1			
1079.97	6^+	519.2 1	100	560.68	4^+	E2		B(E2)(W.u.)=109 4	
1214.82	4^+	402.3 5	32 4	812.36	2^+				
		654.1 1	95 9	560.68	4^+				
		1022.7 2	100 10	192.19	2^+			I γ : the branching in ^{248}Cm SF decay is different: 51/100/53 for 402/654/1022.	
1275.20		1083.0 2	100 11	192.19	2^+				
1468.61		1276.5 2	46 5	192.19	2^+				
		1468.4 3	100 11	0.0	0^+				
1475.67	5^+	447.6 2	54 3	1028.35	3^+	E2			
		914.9 2	100 3	560.68	4^+	M1			
1544.57		1352.3 2	100	192.19	2^+				
1583.50	4^+	368.5 2	33 6	1214.82	4^+				
		555.5 2	75 4	1028.35	3^+				
		771.3	100 4	812.36	2^+				
		1390.9 2	21 3	192.19	2^+			E γ : this transition not given in ^{248}Cm SF decay.	
1607.00		1046.4 2	53 6	560.68	4^+				
		1414.6 3	100 12	192.19	2^+				
1610.68		1050.0 2	100 11	560.68	4^+				
1624.02		595.1 3	71 7	1028.35	3^+				
		1063.9 3	100 14	560.68	4^+				
1721.79	8^+	641.7 2	100	1079.97	6^+	E2		B(E2)(W.u.)=81 4	
1724.39	6^+	509.8 2	100 7	1214.82	4^+	E2			
		644.2 2	76 7	1079.97	6^+				
		1163.6 2	47 4	560.68	4^+	E2			
1790.28		1229.6 2	100 8	560.68	4^+				
1824.26	5^+	240.6 2	56 6	1583.50	4^+				
		348.5 2	25 8	1475.67	5^+				
		609.3 2	97 8	1214.82	4^+	M1			
		796.1 2	100 6	1028.35	3^+				
1882.2		1322.5 5	100 13	560.68	4^+				
1884.1	(5^-)	804.3		1079.97	6^+				
		1323.4		560.68	4^+				
2036.61	7^+	561.2 2	100 4	1475.67	5^+				
		956.5 2	45 4	1079.97	6^+	M1			

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Adopted Levels, Gammas (continued) $\gamma(^{104}\text{Mo})$ (continued)

<u>$E_i(\text{level})$</u>	<u>J_i^π</u>	<u>E_γ^\ddagger</u>	<u>I_γ^\dagger</u>	<u>E_f</u>	<u>J_f^π</u>
2061.15	(4 ⁻)	477.5 2	100	1583.50	4 ⁺
2083.55	(6 ⁺)	259.3 2	18 10	1824.26	5 ⁺
		500.1 2	66 12	1583.50	4 ⁺
		868.6 2	100 12	1214.82	4 ⁺
2180.2	(6 ⁺)	1099.8		1079.97	6 ⁺
		1619.2		560.68	4 ⁺
2211.95	(5 ⁻)	150.7 2	77 6	2061.15	(4 ⁻)
		387.8 2	100 9	1824.26	5 ⁺
		628.6 2	89 6	1583.50	4 ⁺
		997.1 2	20 6	1214.82	4 ⁺
2305.01	(7 ⁻)	421.2		1884.1	(5 ⁻)
		584.0		1721.79	8 ⁺
		1225.0 2	100	1079.97	6 ⁺
2316.84		1756.0 20	50 12	560.68	4 ⁺
		2124.8 3	100 25	192.19	2 ⁺
2326.19	8 ⁺	601.7 2	100 5	1724.39	6 ⁺
		1246.3 2	22 5	1079.97	6 ⁺
2372.86	(7 ⁺)	289.3 2	100	2083.55	(6 ⁺)
		548.6 2	100	1824.26	5 ⁺
2396.18	(6 ⁻)	184.3 2	100 6	2211.95	(5 ⁻)
		312.7 2	12.8 21	2083.55	(6 ⁺)
		335.4 2	23.4 21	2061.15	(4 ⁻)
		571.6 2	77 4	1824.26	5 ⁺
		920.4 2		1475.67	5 ⁺
2455.4	10 ⁺	733.6 2	100	1721.79	8 ⁺
2611.50	(7 ⁻)	215.3 2	100 9	2396.18	(6 ⁻)
		399.6 2	30 7	2211.95	(5 ⁻)
		527.8 2	46 7	2083.55	(6 ⁺)
2656.0		443.4		2211.95	(5 ⁻)
		595.2		2061.15	(4 ⁻)
		1628.1		1028.35	3 ⁺
2656.40		1072.8 2	100 9	1583.50	4 ⁺
		1441.8 3	82 9	1214.82	4 ⁺
		2095.7 3	45 9	560.68	4 ⁺
2670.76		354.0 2	57 6	2316.84	
		609.2 2	71 7	2061.15	(4 ⁻)
		1195.4 3	57 6	1475.67	5 ⁺
		2110.5 3	100 14	560.68	4 ⁺
2682.97	9 ⁺	646.5 2	100	2036.61	7 ⁺
		961.0 2	100	1721.79	8 ⁺
2684.6		802.5 1	100 20	1882.2	
		1139.7 3	<25	1544.57	
		2492.3 20	<50	192.19	2 ⁺
2685.4	(8 ⁺)	312.1 &		2372.86	(7 ⁺)
		601.6		2083.55	(6 ⁺)
2706.9	(8 ⁺)	526.7		2180.2	(6 ⁺)
		985.0		1721.79	8 ⁺
		1626.5		1079.97	6 ⁺
2791.99		1247.6 3	<22	1544.57	
		1905.7 3	100 22	886.08	0 ⁺
		2600.0 20	56 22	192.19	2 ⁺
2862.2		206.2		2656.0	
2864.29	(8 ⁻)	252.7 2	100	2611.50	(7 ⁻)
		468.2 2	100	2396.18	(6 ⁻)
2866.51	(9 ⁻)	561.5 2	100	2305.01	(7 ⁻)

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Adopted Levels, Gammas (continued) $\gamma(^{104}\text{Mo})$ (continued)

$E_i(\text{level})$	J_i^π	E_γ^\ddagger	I_γ^\dagger	E_f	J_f^π	$E_i(\text{level})$	J_i^π	E_γ^\ddagger	I_γ^\dagger	E_f	J_f^π
2866.51	(9 ⁻)	1144.7 2	100	1721.79	8 ⁺	3765.4	12 ⁺	760.8 5	100	3004.6	10 ⁺
2888.2		1419.6 3	43 29	1468.61		4114.7	14 ⁺	861.3 5	100	3253.4	12 ⁺
		2696.0 20	100 29	192.19	2 ⁺	4115.5	(12 ⁺)	757.1 5	100	3358.4	(10 ⁺)
3004.6	10 ⁺	678.4 2	100	2326.19	8 ⁺	4184.0	13 ⁺	787.9 5	100	3396.1	11 ⁺
3011.0	(9 ⁺)	637.7		2372.86	(7 ⁺)	4359.6	(13 ⁻)	803.8 5	100	3555.8	(11 ⁻)
3131.5		1409.6		1721.79	8 ⁺	4625.1	14 ⁺	859.7 5	100	3765.4	12 ⁺
3149.2?	(9 ⁻)	284.2&		2864.29	(8 ⁻)	5059.7	16 ⁺	945.0 5	100	4114.7	14 ⁺
		537.0&		2611.50	(7 ⁻)	5064.1	15 ⁺	880.1 5	100	4184.0	13 ⁺
3253.4	12 ⁺	798.0 2	100	2455.4	10 ⁺	5268.9	(15 ⁻)	909.3 5	100	4359.6	(13 ⁻)
3358.4	(10 ⁺)	651.5		2706.9	(8 ⁺)	5589.0	16 ⁺	963.9 5	100	4625.1	14 ⁺
		902.5		2455.4	10 ⁺	6022.0?	17 ⁺	957.9 5	100	5064.1	15 ⁺
		1636.5		1721.79	8 ⁺	6111.2	18 ⁺	1051.5 5	100	5059.7	16 ⁺
3396.1	11 ⁺	712.9 5		2682.97	9 ⁺	6284.4	(17 ⁻)	1015.5 5	100	5268.9	(15 ⁻)
		941.0 5		2455.4	10 ⁺	6624.7	18 ⁺	1035.7 5	100	5589.0	16 ⁺
3555.8	(11 ⁻)	689.3 5	100	2866.51	(9 ⁻)	7283.2	20 ⁺	1172.0 5	100	6111.2	18 ⁺
3701.6?		570.1 6	100	3131.5							

[†] Photon branching from each level.

[‡] $\Delta E(\gamma)$ assumed to be 0.5 keV for those only given by [2004Hu02](#).

From DCO in ^{248}Cm SF decay.

@ Total theoretical internal conversion coefficients, calculated using the BrIcc code ([2008Ki07](#)) with Frozen orbital approximation based on γ -ray energies, assigned multiplicities, and mixing ratios, unless otherwise specified.

& Placement of transition in the level scheme is uncertain.

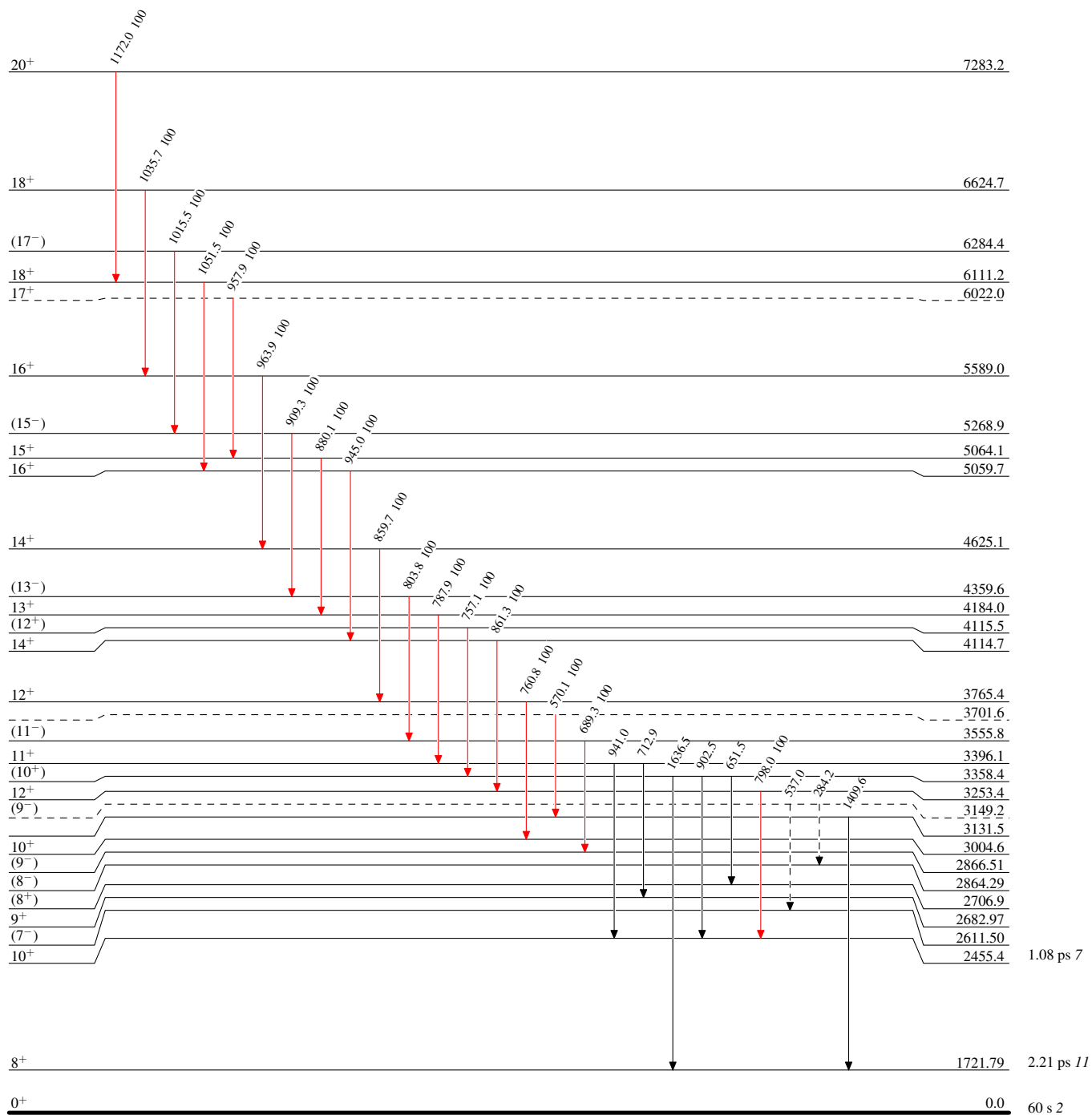
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Type not specified

- ▶ $I_\gamma < 2\% \times I_\gamma^{\max}$
- ▶ $I_\gamma < 10\% \times I_\gamma^{\max}$
- ▶ $I_\gamma > 10\% \times I_\gamma^{\max}$
- - -▶ γ Decay (Uncertain)

 $^{104}_{42}\text{Mo}_{62}$

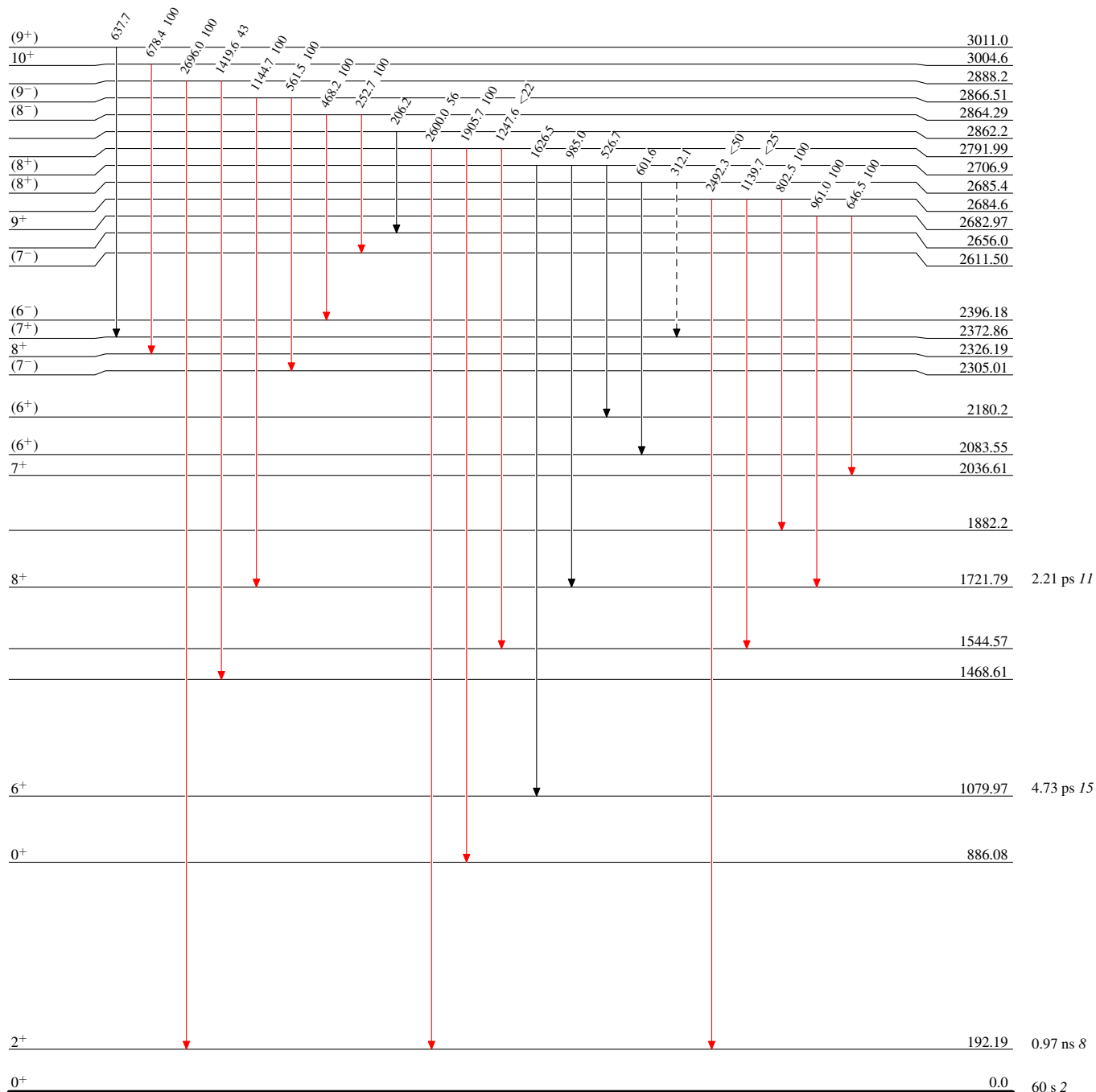
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Type not specified

- ▶ $I_\gamma < 2\% \times I_\gamma^{\text{max}}$
- ▶ $I_\gamma < 10\% \times I_\gamma^{\text{max}}$
- ▶ $I_\gamma > 10\% \times I_\gamma^{\text{max}}$
- - -▶ γ Decay (Uncertain)



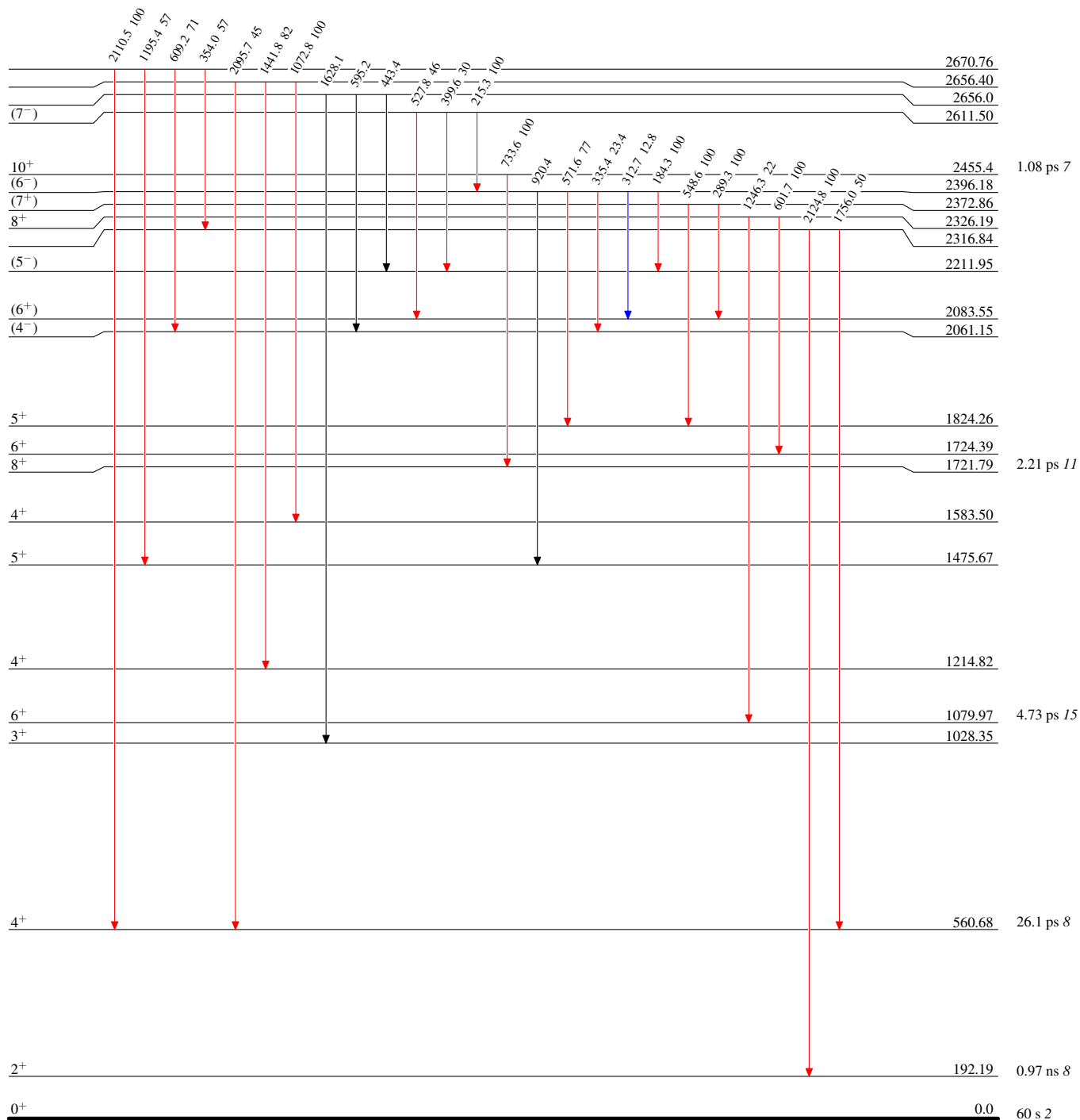
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$



$^{104}_{42}\text{Mo}_{62}$

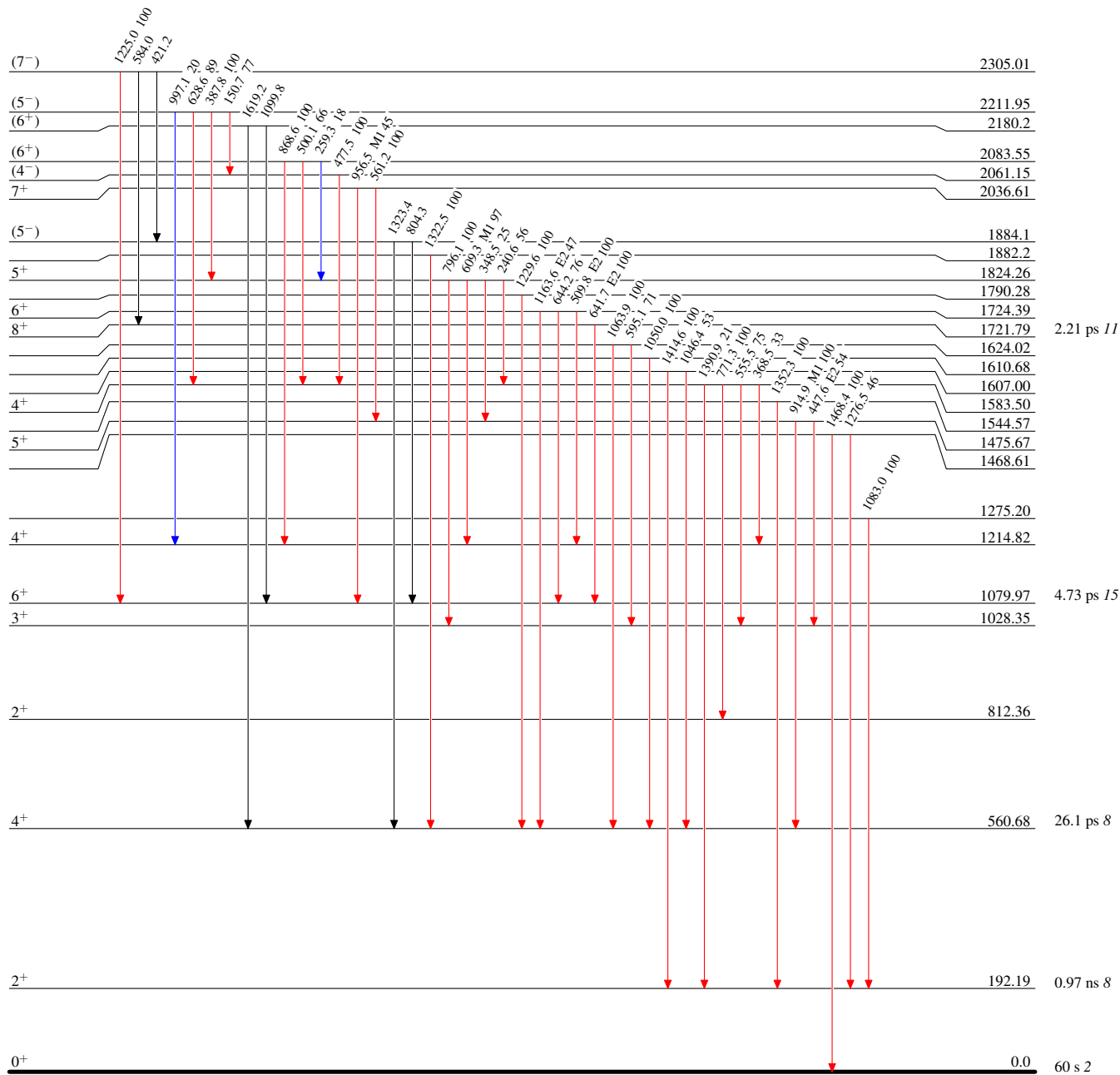
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Type not specified

Legend

- $I_\gamma < 2\% \times I_\gamma^{\text{max}}$
- $I_\gamma < 10\% \times I_\gamma^{\text{max}}$
- $I_\gamma > 10\% \times I_\gamma^{\text{max}}$

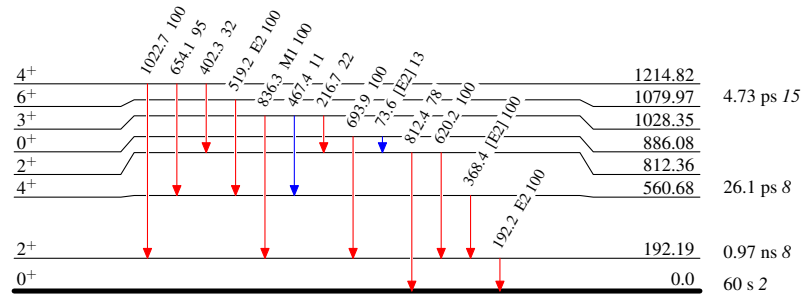


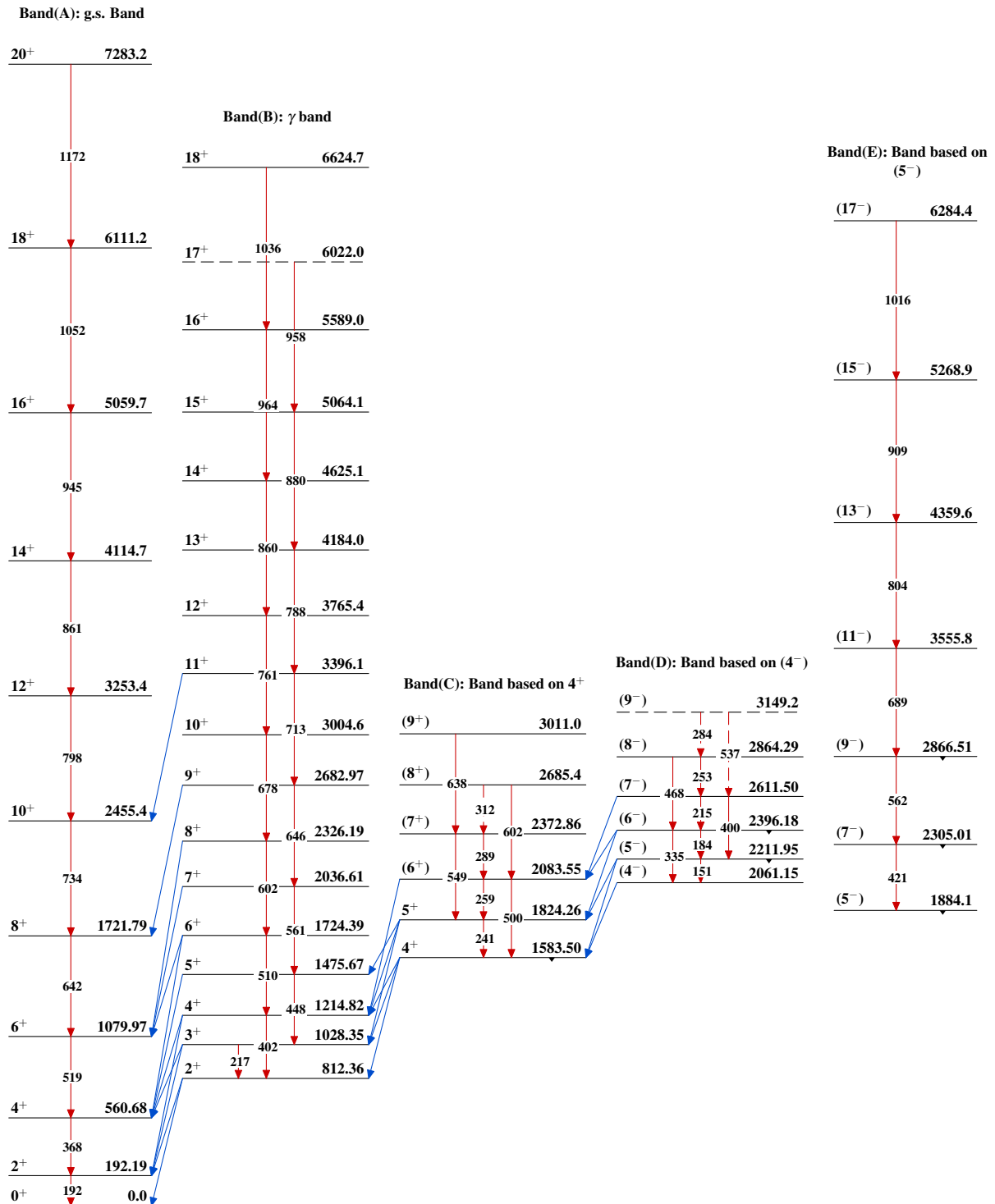
Adopted Levels, Gammas**Level Scheme (continued)**

Intensities: Type not specified

Legend

- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$

 $^{104}_{42}\text{Mo}_{62}$

Adopted Levels, Gammas $^{104}_{42}\text{Mo}_{62}$

Adopted Levels, Gammas (continued)

Band(F): Band based on
(6⁺)

(12⁺) 4115.5

757

(10⁺) 3358.4

652

(8⁺) 2706.9

527

(6⁺) 2180.2

$^{104}_{42}\text{Mo}_{62}$