Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	T. D. Johnson and W. D. Kulp(a)	NDS 129, 1 (2015)	27-Jul-2015

Q(β^-)=−6988 *7*; S(n)=12812 *9*; S(p)=3194 *8*; Q(α)=−4094 *20* 2012Wa38
Q(β^-n)=−17834 *8*, Q(εcp)=−−1879 *16* 2012Au05.
Mass measurement using the JYFLTRAP trap mass spectrometer yields mass excess −73873.0 *65* keV using ^{98}Mo as a reference 2012Ka13.
Mass measurement using the Canadian Penning trap mass spectrometer yields 86.920675 *28* u, with mass excess −73891 *26* keV, 2011Fa10.
Other mass measurement using the JYFLTRAP Penning trap reported a mass excess of −73868 *7* keV, but possible contributions from an isomeric state were not taken into account (2006Ka48).
With the exception of the 400-keV level, these data are from the ^{58}Ni(^{32}S,3pγ) studies.
For model calculations of level energies, electromagnetic moments, and decay probabilities see 2000Ga57.
Recent theory and calculations: 2004La18.

^{87}Nb Levels

See 2003Pa09 for configurations of non-superdeformed bands.

Cross Reference (XREF) Flags

A ^{58}Ni(^{32}S,3pγ),^{40}Ca(^{50}Cr,3pγ)
B ^{87}Mo β^+ decay

E(level)[†]	J$^\pi$[#@]	T$_{1/2}$[‡]	XREF	Comments
0[i]	(1/2)$^-$	3.7 min *1*	AB	%ε+%β^+=100 J$^\pi$: Consistent with log*ft* of 5.34 to (1/2)$^-$ level of ^{87}Zr and systematics of niobium isotopes, see e.g., ^{93}Nb. T$_{1/2}$: weighted average of 3.5 *2* (1971Do01), 3.9 *2* (1972Tu03), and 3.7 *1* (1974Vo03).
3.9[o] *1*	(9/2)$^+$	2.6 min *1*	AB	%ε+%β^+=100 Additional information 1. E(level): From 1991Ju05 ^{58}Ni(^{32}S,3pγ). J$^\pi$: from systematics of odd-A niobium isotopes, see e.g., ^{93}Nb. Consistent with log*ft* of 5.6 to (9/2)$^+$ level of ^{87}Zr (1991Mi15). T$_{1/2}$: from 2.6 *1* (1972Tu03) and 2.6 *1* (1974Vo03).
200.2[e] *4*	(3/2$^-$)		A	
266.9[p] *2*	(7/2)$^+$		A	T$_{1/2}$: effective half-life, not corrected for feeding, is 67 ps *9* (1991Ju05).
334.0[i] *1*	(5/2$^-$)	28 ns *2*	AB	T$_{1/2}$: from γ-n(t) between beam pulses (1995Ka06).
400.76 *13*	(9/2,7/2,5/2)$^+$		B	
784.5[o] *2*	(13/2)$^+$	1.8 ps *3*	A	T$_{1/2}$: From 1991Ju05.
839.8[e] *2*	(7/2$^-$)		A	T$_{1/2}$: effective half-life, not corrected for feeding is 44 ps *15* (1991Ju05).
995.4 *2*	(11/2$^+$)		A	
1051.5[p] *2*	(11/2)$^+$		A	
1168.6[i] *1*	(9/2$^-$)		A	
1603.5[e] *1*	(11/2$^-$)		A	T$_{1/2}$: effective half-life, not corrected for feeding, is 21 ps *7* (1991Ju05).
1737.1[o] *2*	(17/2)$^+$	0.69 ps *21*	A	T$_{1/2}$: from 1991Ju05.
1954.4[p] *2*	(15/2)$^+$	23 ps *18*	A	T$_{1/2}$: from 1991Ju05.
1976.6[i] *2*	(13/2$^-$)		A	T$_{1/2}$: effective half-life, not corrected for feeding, is 37 ps *9* (1991Ju05).
2114.5 *2*	(15/2$^+$)		A	
2277.2[e] *2*	(15/2$^-$)		A	T$_{1/2}$: Effective half-life, not corrected for feeding, is 11.1 ps *14* (1991Ju05).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{87}Nb Levels (continued)

E(level)†	Jπ#@	$T_{1/2}$‡	XREF	Comments
2307.8 *3*	(15/2+)		A	
2412.4[h] *2*	(17/2−)	58 ps *5*	A	g=+0.82 *10* $T_{1/2}$: from 1991Ju05, although the different feeding due to the revised level scheme may impact the half-life somewhat. g-factor from 1995We03 by impad method.
2490.8[m] *2*	(21/2)+	13.9 ps *7*	A	g=+0.38 *11* g-factor from +0.41 *13* (1995We03) by impad method and +0.36 *11* (1999Te02 as well as 1998Ju02 and 1998Te06 by the same authors) by the recoil distance transient field method. Changes in the level scheme imply a new feeding pattern which leads to a possible small change where which should be addressed. $T_{1/2}$: from 1991Ju05 and may be slightly impacted by revised level scheme.
2581.2 *2*	(17/2−)		A	
2861.20[o] *19*	(21/2)+	0.8 ps *5*	A	g=−0.6 *11* $T_{1/2}$: from 1991Ju05. g-factor from 1999Te02 by recoil distance transient field method.
2905.6[d] *2*	(19/2−)		A	
2988.2 *2*	(19/2−)		A	
3219.0[h] *2*	(21/2−)	0.55 ps *14*	A	$T_{1/2}$: From 1991Ju05.
3219.7[n] *2*	(23/2+)	0.55 ps *14*	A	g=+1.4 *7* $T_{1/2}$: From 1991Ju05. g-factor from 1999Te02 by recoil distance transient field method.
3445.9[m] *2*	(25/2)+	1.7 ps *1*	A	g=+0.22 *15* $T_{1/2}$: From 1991Ju05. g-factor from 1999Te02 by recoil distance transient field method.
3741.9[o] *2*	(25/2+)		A	g=+0.04 *22* g-factor from 1999Te02 by recoil distance transient field method.
3781.2[d] *4*	(23/2−)		A	
3869.0 *2*	(25/2+)		A	
4130.7[h] *2*	(25/2−)	2.1 ps *3*	A	g=+0.51 *39* g-factor from 1999Te02 by recoil distance transient field method.
4285.8[f] *4*	(25/2−)		A	
4301.1[n] *2*	(27/2+)		A	
4591.7[m] *2*	(29/2)+		A	$T_{1/2}$: Effective half-life, not corrected for feeding is 0.62 ps *21* (1991Ju05).
4779.1[d] *4*	(27/2−)		A	
4939.8[o] *2*	(29/2)+		A	
5009.7[h] *3*	(29/2−)	3.5 ps *3*	A	g=+0.53 *11* $T_{1/2}$: from 1991Ju05. g-factor from 1999Te02 by the recoil distance transient method.
5301.5[f] *5*	(29/2−)		A	
5592.4[g] *3*	(31/2−)		A	$T_{1/2}$: Effective half-life, not corrected for feeding is 0.62 ps *14* (1991Ju05).
5620.29[n] *20*	(31/2+)		A	
5776.3[d] *4*	(31/2−)	0.28 ps *9*	A	
5841.0[m] *2*	(33/2)+	0.29 ps *+9−6*	A	
6039.2[h] *2*	(33/2−)	0.24 ps *4*	A	
6196.9 *4*	(33/2+)		A	
6367.2[o] *3*	(33/2)+		A	
6393.1 *3*	(33/2−)		A	
6443.6[f] *4*	(33/2−)		A	
6539.6 *4*	(33/2+)		A	
6744.7[g] *3*	(35/2−)	0.33 ps *5*	A	
6810.3[n] *3*	(35/2+)	0.44 ps *6*	A	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{87}Nb Levels (continued)

E(level)[†]	Jπ[#@]	$T_{1/2}$[‡]	XREF	Comments
6973.5[d] 5	(35/2−)	0.31 ps +16−8	A	
7139.7[m] 3	(37/2)+	0.30 ps 4	A	
7225.6[h] 3	(37/2−)	0.58 ps 9	A	
7618.8 3	(37/2+)	0.33 ps +7−5	A	
7647.2[f] 4	(37/2−)	0.26 ps +12−9	A	
7942.2[o] 6	(37/2+)		A	
8061.7[n] 3	(39/2+)	0.49 ps 8	A	
8254[g] 1	(39/2−)	0.46 ps 7	A	
8365.5[d] 5	(39/2−)		A	$T_{1/2}$: effective half-life, not corrected for side feeding is 0.36 ps +7−6.
8432.3[k] 4	(41/2)+	0.40 ps 6	A	
8535[h] 1	(41/2−)	0.33 ps 5	A	
8571.5[m] 6	(41/2+)	0.64 ps +14−10	A	
8873.5 5	(41/2+)		A	
8934.5[f] 5	(41/2−)	0.152 ps 28	A	
9014.5 5	(41/2+)		A	
9514.3[n] 5	(43/2+)	0.062 ps +28−21	A	
9575.3[o] 8	(41/2+)		A	
9843.4[g] 5	(43/2−)	0.28 ps +5−4	A	
9888.3[d] 7	(43/2−)		A	
9997[k] 2	(45/2+)	0.222 ps 35	A	
10236.6[h] 7	(45/2−)	0.34 ps 5	A	
10459.7[f] 6	(45/2−)	0.090 ps 21	A	
11023.8 8	(45/2+)		A	
11186.7[n] 7	(47/2+)	0.07 ps +7−3	A	
11545.0[d] 8	(47/2−)		A	
11579.7[g] 7	(47/2−)		A	$T_{1/2}$: effective half-life, not corrected for side feeding is 0.194 ps +35−28.
11948[k] 2	(49/2+)		A	$T_{1/2}$: effective half-life, not corrected for side feeding is 0.028 ps +35−21.
12017.2[f] 7	(49/2−)	0.152 ps 21	A	
12492.4 12	(49/2+)		A	
13119.7[n] 9	(51/2+)	0.028 ps +35−21	A	
13258.7[l] 9	(51/2+)		A	
13476.1[d] 10	(51/2−)		A	
13577.8[g] 8	(51/2−)		A	
13752.4[j] 16	(53/2+)		A	
13880[f] 3	(53/2−)	0.083 ps 14	A	
14201.5[k] 16	(53/2+)		A	
14590.2 9	(53/2−)		A	
15329.3[n] 10	(55/2+)	0.021 ps +21−7	A	
15672.1[d] 11	(55/2−)		A	
15867.2[j] 17	(57/2+)		A	
16187.6[f] 22	(57/2−)		A	$T_{1/2}$: effective half-life, not corrected for side feeding is 0.12 ps +27−6.
17927.8[n] 11	(59/2+)		A	
18260.1[j] 17	(61/2+)		A	
18894.5[f] 23	(61/2−)		A	
x[&]	J		A	
1250+x[&]	J+2		A	
2679+x[&]	J+4		A	
4251+x[&]	J+6		A	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{87}Nb Levels (continued)

E(level)[†]	Jπ[#@]	XREF	E(level)[†]	Jπ[#@]	XREF	E(level)[†]	Jπ[#@]	XREF
5970+x[&]	J+8	A	4924+y[a]	J1+6	A	15831+y[a]	J1+16	A
7849+x[&]	J+10	A	5035+y[b]	J1+6	A	18169+y[b]	J1+18	A
9894+x[&]	J+12	A	6795+y[b]	J1+8	A	18374+y[a]	J1+18	A
12110+x[&]	J+14	A	6916+y[a]	J1+8	A	z[c]	J2	A
14505+x[&]	J+16	A	8759+y[b]	J1+10	A	1697+z[c]	J2+2	A
17090+x[&]	J+18	A	8994+y[a]	J1+10	A	3563+z[c]	J2+4	A
y[a]	J1	A	10876+y[a]	J1+12	A	5604+z[c]	J2+6	A
1492+y[a]	J1+2	A	11170+y[a]	J1+12	A	7815+z[c]	J2+8	A
1870+y[b]	J1+2	A	13150+y[a]	J1+14	A	10199+z[c]	J2+10	A
3134+y[a]	J1+4	A	13438+y[a]	J1+14	A	12736+z[c]	J2+12	A
3378+y[b]	J1+4	A	15582+y[b]	J1+16	A			

[†] From least-squares fit to γ-ray energies. When no uncertainties were reported, they were estimated to be 0.5 keV for fitting purposes.

[‡] From measurements in ^{58}Ni(^{32}S,3pγ), 2003Pa09, unless otherwise noted.

[#] Suggested from ^{58}Ni(^{32}S,3pγ) DCO measurements. with support from band placement. Exceptions are noted.

[@] For the superdeformed bands, the spins are from 1997La02.

[&] Band(A): SD-1 band.

[a] Band(B): SD-2 band.

[b] Band(C): SD-3 band.

[c] Band(D): SD-4 band.

[d] Band(E): Band based on (19/2$^-$).

[e] Band(F): Band based on (3/2$^-$).

[f] Band(G): Band based on (25/2$^-$).

[g] Band(H): Band based on (31/2$^-$).

[h] Band(I): Band based on (17/2$^-$).

[i] Band(J): g.s. band.

[j] Band(K): Band based on (53/2$^+$).

[k] Band(L): Band based on (41/2$^+$).

[l] Band(M): Band based on (51/2$^+$).

[m] Band(N): Band based on (21/2$^+$).

[n] Band(O): Band based on (23/2$^+$).

[o] Band(P): Band based on (9/2)$^+$.

[p] Band(Q): Band based on 7/2$^{(+)}$.

$\gamma(^{87}Nb)$

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[#@]	α[&b]	Comments
200.2	(3/2⁻)	200.1 5	100.0	0	(1/2)⁻			
266.9	(7/2)⁺	263.0 1	100.0	3.9	(9/2)⁺	M1	0.01690	α(K)=0.01485 21; α(L)=0.001700 24; α(M)=0.000300 5 α(N)=4.39×10^{-5} 7; α(O)=2.53×10^{-6} 4
334.0	(5/2⁻)	67.0 3	7.4 9	266.9	(7/2)⁺	[E1]	0.383 8	
		334.0 1	100 3	0	(1/2)⁻	(E2)	0.01613	B(E2)(W.u.)=0.191 16 α(K)=0.01404 20; α(L)=0.001744 25; α(M)=0.000308 5 α(N)=4.41×10^{-5} 7; α(O)=2.22×10^{-6} 4
400.76	(9/2,7/2,5/2)⁺	133.9[a] 1	16[a] 8	266.9	(7/2)⁺			
		396.8[a] 1	100[a] 14	3.9	(9/2)⁺			
784.5	(13/2)⁺	780.7 1	100.0	3.9	(9/2)⁺	E2	1.31×10^{-3}	B(E2)(W.u.)=48 8 α(K)=0.001153 17; α(L)=0.0001314 19; α(M)=2.31×10^{-5} 4 α(N)=3.37×10^{-6} 5; α(O)=1.90×10^{-7} 3
839.8	(7/2⁻)	505.8 1	100 7	334.0	(5/2⁻)	(M1)	0.00343	α(K)=0.00302 5; α(L)=0.000339 5; α(M)=5.97×10^{-5} 9 α(N)=8.76×10^{-6} 13; α(O)=5.10×10^{-7} 8 I_γ: From branching ratios from ^{40}Ca(^{50}Cr,3p) in 1991Ju05. Mult.: deduced from angular distribution (1991Mi15).
		639.5 7	<14	200.2	(3/2⁻)	(E2)	0.00222	α(K)=0.00195 3; α(L)=0.000225 4; α(M)=3.96×10^{-5} 6 α(N)=5.76×10^{-6} 8; α(O)=3.19×10^{-7} 5 I_γ: From branching ratios from ^{40}Ca(^{50}Cr,3p) in 1991Ju05.
		835.8 1	79 7	3.9	(9/2)⁺			I_γ: From branching ratios from ^{40}Ca(^{50}Cr,3p) in 1991Ju05.
995.4	(11/2⁺)	991.5 1	100.0	3.9	(9/2)⁺	(E2)	7.36×10^{-4}	α(K)=0.000648 9; α(L)=7.28×10^{-5} 11; α(M)=1.281×10^{-5} 18 α(N)=1.87×10^{-6} 3; α(O)=1.073×10^{-7} 15
1051.5	(11/2)⁺	267.0 1	26 4	784.5	(13/2)⁺			
		784.5 1	100 4	266.9	(7/2)⁺	(E2)	1.30×10^{-3}	α(K)=0.001140 16; α(L)=0.0001298 19; α(M)=2.29×10^{-5} 4 α(N)=3.33×10^{-6} 5; α(O)=1.88×10^{-7} 3
		1047.6 1	32 12	3.9	(9/2)⁺	(E2)	6.48×10^{-4}	α(K)=0.000571 8; α(L)=6.40×10^{-5} 9; α(M)=1.126×10^{-5} 16 α(N)=1.646×10^{-6} 23; α(O)=9.46×10^{-8} 14
1168.6	(9/2⁻)	834.7 1	100	334.0	(5/2⁻)	(E2)	1.11×10^{-3}	α(K)=0.000976 14; α(L)=0.0001107 16; α(M)=1.95×10^{-5} 3 α(N)=2.84×10^{-6} 4; α(O)=1.610×10^{-7} 23
		1164.8 3		3.9	(9/2)⁺			
1603.5	(11/2⁻)	434.9 1	35.2 22	1168.6	(9/2⁻)	(M1+E2)		I_γ: From 1991Mi15, 32.
		763.7 1	100 3	839.8	(7/2⁻)	(E2)	1.39×10^{-3}	α(K)=0.001218 17; α(L)=0.0001390 20; α(M)=2.45×10^{-5} 4 α(N)=3.56×10^{-6} 5; α(O)=2.01×10^{-7} 3
1737.1	(17/2)⁺	952.5 1	100	784.5	(13/2)⁺	(E2)	8.07×10^{-4}	B(E2)(W.u.)=45 +19−10 α(K)=0.000711 10; α(L)=8.00×10^{-5} 12; α(M)=1.407×10^{-5} 20 α(N)=2.06×10^{-6} 3; α(O)=1.175×10^{-7} 17
1954.4	(15/2)⁺	903.0 1	100 10	1051.5	(11/2)⁺	(E2)	9.16×10^{-4}	B(E2)(W.u.)=1.0 +38−5 α(K)=0.000807 12; α(L)=9.11×10^{-5} 13; α(M)=1.603×10^{-5} 23 α(N)=2.34×10^{-6} 4; α(O)=1.333×10^{-7} 19
		959.0 1	42 9	995.4	(11/2⁺)	(E2)	7.94×10^{-4}	B(E2)(W.u.)=0.3 +13−2 α(K)=0.000699 10; α(L)=7.87×10^{-5} 11; α(M)=1.384×10^{-5} 20 α(N)=2.02×10^{-6} 3; α(O)=1.156×10^{-7} 17

$^{87}_{41}Nb_{46}$-5

Adopted Levels, Gammas (continued)

γ(^{87}Nb) (continued)

E_i(level)	J^{π}_i	E_{γ}[†]	I_{γ}[†]	E_f	J^{π}_f	Mult.[#@]	α[&b]	Comments
1954.4	(15/2)$^+$	1169.9 1	31 3	784.5	(13/2)$^+$	(M1+E2)	5.30×10^{-4}	α(K)=0.000465 7; α(L)=5.13×10^{-5} 8; α(M)=9.02×10^{-6} 13 α(N)=1.324×10^{-6} 19; α(O)=7.81×10^{-8} 11; α(IPF)=3.39×10^{-6} 5
1976.6	(13/2$^-$)	808.0 1	100.0	1168.6	(9/2$^-$)			
2114.5	(15/2$^+$)	1063.0 1	100.0	1051.5	(11/2)$^+$			
2277.2	(15/2$^-$)	300.6 1	77 16	1976.6	(13/2$^-$)	(M1+E2)		
		673.6 1	100 21	1603.5	(11/2$^-$)	(E2)	0.00192	α(K)=0.001688 24; α(L)=0.000194 3; α(M)=3.42×10^{-5} 5 α(N)=4.98×10^{-6} 7; α(O)=2.77×10^{-7} 4
		1492.9 2	80 9	784.5	(13/2)$^+$	(E1+M2)		
2307.8	(15/2$^+$)	1312.4		995.4	(11/2$^+$)			
		1523.4		784.5	(13/2)$^+$			
2412.4	(17/2$^-$)	104.6 3		2307.8	(15/2$^+$)	(E1)	0.1051	α(K)=0.0924 13; α(L)=0.01055 15; α(M)=0.00185 3 α(N)=0.000265 4; α(O)=1.379×10^{-5} 20
		135.2 1	100 24	2277.2	(15/2$^-$)	(M1)	0.0969	α(K)=0.0850 12; α(L)=0.00992 14; α(M)=0.001752 25 α(N)=0.000256 4; α(O)=1.455×10^{-5} 21 B(M1)(W.u.)=(0.057 16) Mult.: Consistent with RUL.
		297.9 3	18 4	2114.5	(15/2$^+$)	(E1)	0.00527	B(E1)(W.u.)=1.5×10^{-5} 5 α(K)=0.00465 7; α(L)=0.000519 8; α(M)=9.11×10^{-5} 13 α(N)=1.326×10^{-5} 19; α(O)=7.44×10^{-7} 11
		435.6[c] 1		1976.6	(13/2$^-$)	[E2]	0.00682	α(K)=0.00596 9; α(L)=0.000715 10; α(M)=0.0001261 18 α(N)=1.82×10^{-5} 3; α(O)=9.60×10^{-7} 14
		458.0 1	53 6	1954.4	(15/2)$^+$	(E1)	0.00185 16	B(E1)(W.u.)=(1.23×10^{-5} 23) α(K)=0.00163 14; α(L)=0.000182 17; α(M)=3.2×10^{-5} 3 α(N)=4.7×10^{-6} 5; α(O)=2.67×10^{-7} 25
		675.2 1	83 17	1737.1	(17/2)$^+$	[E1]	6.92×10^{-4}	B(E1)(W.u.)=6.1×10^{-6} 16 α(K)=0.000611 9; α(L)=6.73×10^{-5} 10; α(M)=1.183×10^{-5} 17 α(N)=1.731×10^{-6} 25; α(O)=1.000×10^{-7} 14
2490.8	(21/2)$^+$	753.7 1	100.0	1737.1	(17/2)$^+$	(E2)	1.43×10^{-3}	B(E2)(W.u.)=7.3 6 α(K)=0.001261 18; α(L)=0.0001440 21; α(M)=2.54×10^{-5} 4 α(N)=3.69×10^{-6} 6; α(O)=2.08×10^{-7} 3
2581.2	(17/2$^-$)	168.9 1	100.0	2412.4	(17/2$^-$)			
2861.20	(21/2)$^+$	370.0 2	100 10	2490.8	(21/2)$^+$	[M1]	0.00729 12	B(M1)(W.u.)=(0.36 +59−14) α(K)=0.00641 10; α(L)=0.000727 12; α(M)=0.0001282 21 α(N)=1.88×10^{-5} 3; α(O)=1.087×10^{-6} 17 Mult.: M1 or E1 consistent with RUL.
		1123.9 2	51 6	1737.1	(17/2)$^+$	(E2)	5.56×10^{-4}	B(E2)(W.u.)=6 +11−3 α(K)=0.000489 7; α(L)=5.46×10^{-5} 8; α(M)=9.61×10^{-6} 14 α(N)=1.405×10^{-6} 20; α(O)=8.11×10^{-8} 12; α(IPF)=1.295×10^{-6} 19
2905.6	(19/2$^-$)	324.5 1	100 10	2581.2	(17/2$^-$)	(M1+E2)		
		628.9	50 10	2277.2	(15/2$^-$)	(E2)	0.00231	α(K)=0.00203 3; α(L)=0.000235 4; α(M)=4.14×10^{-5} 6 α(N)=6.02×10^{-6} 9; α(O)=3.33×10^{-7} 5
2988.2	(19/2$^-$)	575.8 1	100	2412.4	(17/2$^-$)			

$^{87}_{41}Nb_{46}$-6

γ(^{87}Nb) (continued)

E$_i$(level)	J$^{\pi}_i$	E$_{\gamma}$†	I$_{\gamma}$†	E$_f$	J$^{\pi}_f$	Mult.#@	α&b	Comments
3219.0	(21/2$^-$)	230.8 *1*	14.0 *23*	2988.2	(19/2$^-$)	[M1]	0.0236	α(K)=0.0208 *3*; α(L)=0.00239 *4*; α(M)=0.000421 *6* α(N)=6.16×10^{-5} *9*; α(O)=3.54×10^{-6} *5* B(M1)(W.u.)=0.28 *+10−5* Mult.: E1 or M1 from RULs. M1 from level scheme placement.
		313.4 *1*	41 *4*	2905.6	(19/2$^-$)	[M1]	0.01093	α(K)=0.00961 *14*; α(L)=0.001094 *16*; α(M)=0.000193 *3* α(N)=2.82×10^{-5} *4*; α(O)=1.633×10^{-6} *23* B(M1)(W.u.)=0.33 *+12−7* Mult.: M1 or E1 consistent with RUL.
		637.9 *3*	4.0 *20*	2581.2	(17/2$^-$)			
		806.4 *1*	100 *20*	2412.4	(17/2$^-$)	(E2)	1.21×10^{-3}	B(E2)(W.u.)=83 *+28−17* α(K)=0.001060 *15*; α(L)=0.0001206 *17*; α(M)=2.12×10^{-5} *3* α(N)=3.09×10^{-6} *5*; α(O)=1.749×10^{-7} *25*
3219.7	(23/2$^+$)	358.1 *2*	6.3 *23*	2861.20	(21/2)$^+$	(M1+E2)		
		729.0 *1*	100 *12*	2490.8	(21/2)$^+$	(M1+E2)		
3445.9	(25/2)$^+$	226.3 *1*	100 *11*	3219.7	(23/2$^+$)	[M1]	0.0250	α(K)=0.0220 *3*; α(L)=0.00253 *4*; α(M)=0.000446 *7* α(N)=6.52×10^{-5} *10*; α(O)=3.75×10^{-6} *6* B(M1)(W.u.)=(0.61 *11*) Mult.: E1 or M1 consistent with RUL.
		955.2 *1*	77 *17*	2490.8	(21/2)$^+$	(E2)	8.02×10^{-4}	B(E2)(W.u.)=7.9 *20* α(K)=0.000706 *10*; α(L)=7.95×10^{-5} *12*; α(M)=1.399×10^{-5} *20* α(N)=2.04×10^{-6} *3*; α(O)=1.168×10^{-7} *17*
3741.9	(25/2$^+$)	522.1 *1*	7 *4*	3219.7	(23/2$^+$)	(M1+E2)	0.00320	α(K)=0.00282 *4*; α(L)=0.000317 *5*; α(M)=5.58×10^{-5} *8* α(N)=8.18×10^{-6} *12*; α(O)=4.77×10^{-7} *7*
		880.7 *1*	100 *10*	2861.20	(21/2)$^+$	(E2)	9.77×10^{-4}	α(K)=0.000860 *12*; α(L)=9.72×10^{-5} *14*; α(M)=1.711×10^{-5} *24* α(N)=2.50×10^{-6} *4*; α(O)=1.420×10^{-7} *20*
3781.2	(23/2$^-$)	875.5 *3*	100.0	2905.6	(19/2$^-$)	(E2)	9.85×10^{-4}	α(K)=0.000867 *13*; α(L)=9.81×10^{-5} *14*; α(M)=1.727×10^{-5} *25* α(N)=2.52×10^{-6} *4*; α(O)=1.432×10^{-7} *20*
3869.0	(25/2$^+$)	1378.2 *1*	100.0	2490.8	(21/2)$^+$	(E2)	4.05×10^{-4}	α(K)=0.000317 *5*; α(L)=3.51×10^{-5} *5*; α(M)=6.17×10^{-6} *9* α(N)=9.04×10^{-7} *13*; α(O)=5.26×10^{-8} *8*; α(IPF)=4.54×10^{-5} *7*
4130.7	(25/2$^-$)	911.8 *1*	100.0	3219.0	(21/2$^-$)	(E2)	8.96×10^{-4}	B(E2)(W.u.)=19 *3* α(K)=0.000789 *11*; α(L)=8.90×10^{-5} *13*; α(M)=1.566×10^{-5} *22* α(N)=2.29×10^{-6} *4*; α(O)=1.303×10^{-7} *19*
4285.8	(25/2$^-$)	154.4 *5*	8 *8*	4130.7	(25/2$^-$)			
		1067 *1*	100 *10*	3219.0	(21/2$^-$)	(E2)	6.24×10^{-4}	α(K)=0.000550 *8*; α(L)=6.15×10^{-5} *9*; α(M)=1.082×10^{-5} *16* α(N)=1.583×10^{-6} *23*; α(O)=9.11×10^{-8} *13*
4301.1	(27/2$^+$)	559.1 *1*	100 *10*	3741.9	(25/2$^+$)	(M1+E2)	0.00270	α(K)=0.00238 *4*; α(L)=0.000267 *4*; α(M)=4.70×10^{-5} *7* α(N)=6.89×10^{-6} *10*; α(O)=4.02×10^{-7} *6*
		855.5 *1*	87 *9*	3445.9	(25/2)$^+$	(M1+E2)	1.04×10^{-3}	α(K)=0.000914 *13*; α(L)=0.0001014 *15*; α(M)=1.784×10^{-5} *25* α(N)=2.62×10^{-6} *4*; α(O)=1.538×10^{-7} *22*
		1080.5 *3*	20 *5*	3219.7	(23/2$^+$)	(E2)	6.05×10^{-4}	α(K)=0.000533 *8*; α(L)=5.96×10^{-5} *9*; α(M)=1.048×10^{-5} *15* α(N)=1.533×10^{-6} *22*; α(O)=8.83×10^{-8} *13*

$^{87}_{41}$Nb$_{46}$-7

γ(^{87}Nb) (continued)

E_i(level)	J_i^π	E_γ†	I_γ†	E_f	J_f^π	Mult.#@	α&b	Comments
4591.7	(29/2)$^+$	290.9 *1*	24.3 *24*	4301.1	(27/2$^+$)	(M1+E2)	0.01330 *23*	α(K)=0.01169 *20*; α(L)=0.001337 *24*; α(M)=0.000236 *5* α(N)=3.45×10^{-5} *6*; α(O)=1.98×10^{-6} *4*
		1145.6 *1*	100 *10*	3445.9	(25/2)$^+$	(E2)	5.34×10^{-4}	α(K)=0.000469 *7*; α(L)=5.23×10^{-5} *8*; α(M)=9.20×10^{-6} *13* α(N)=1.346×10^{-6} *19*; α(O)=7.77×10^{-8} *11*; α(IPF)=2.37×10^{-6} *4*
4779.1	(27/2$^-$)	493.3 *1*	80 *9*	4285.8	(25/2$^-$)	[M1+E2]	0.00363 *6*	α(K)=0.00320 *5*; α(L)=0.000360 *6*; α(M)=6.33×10^{-5} *10* α(N)=9.28×10^{-6} *14*; α(O)=5.41×10^{-7} *8*
		997 *1*	100 *21*	3781.2	(23/2$^-$)	[E2]	7.25×10^{-4}	α(K)=0.000639 *9*; α(L)=7.17×10^{-5} *10*; α(M)=1.261×10^{-5} *18* α(N)=1.84×10^{-6} *3*; α(O)=1.057×10^{-7} *15*
4939.8	(29/2)$^+$	1197.8 *1*	100.0	3741.9	(25/2$^+$)	(E2)	4.88×10^{-4}	α(K)=0.000424 *6*; α(L)=4.72×10^{-5} *7*; α(M)=8.29×10^{-6} *12* α(N)=1.214×10^{-6} *17*; α(O)=7.03×10^{-8} *10*; α(IPF)=7.81×10^{-6} *11*
5009.7	(29/2$^-$)	879.0 *1*	100.0	4130.7	(25/2$^-$)	(E2)	9.75×10^{-4}	B(E2)(W.u.)=13.4 *12* α(K)=0.000858 *12*; α(L)=9.71×10^{-5} *14*; α(M)=1.708×10^{-5} *24* α(N)=2.49×10^{-6} *4*; α(O)=1.418×10^{-7} *20*
5301.5	(29/2$^-$)	521.8 *8*	14 *3*	4779.1	(27/2$^-$)	(M1+E2)		
		1016 *1*	100 *10*	4285.8	(25/2$^-$)	(E2)	6.95×10^{-4}	α(K)=0.000612 *9*; α(L)=6.87×10^{-5} *10*; α(M)=1.208×10^{-5} *17* α(N)=1.766×10^{-6} *25*; α(O)=1.013×10^{-7} *15*
		1172 *1*		4130.7	(25/2$^-$)			
5592.4	(31/2$^-$)	582.8 *1*	100.0	5009.7	(29/2$^-$)	(M1+E2)		α(K)=0.00217 *3*; α(L)=0.000243 *4*; α(M)=4.29×10^{-5} *6* α(N)=6.29×10^{-6} *9*; α(O)=3.67×10^{-7} *6*
5620.29	(31/2$^+$)	680.7 *2*	100 *21*	4939.8	(29/2)$^+$	(M1+E2)		
		1028 *1*	55 *21*	4591.7	(29/2)$^+$			
		1319.2 *1*	61 *7*	4301.1	(27/2$^+$)	(E2)	4.24×10^{-4}	α(K)=0.000347 *5*; α(L)=3.85×10^{-5} *6*; α(M)=6.76×10^{-6} *10* α(N)=9.91×10^{-7} *14*; α(O)=5.76×10^{-8} *8*; α(IPF)=3.09×10^{-5} *5*
5776.3	(31/2$^-$)	475.0 *4*	100 *11*	5301.5	(29/2$^-$)	[M1]		Mult.: M1 or E1 consistent with RUL.
		997.1 *1*	78 *16*	4779.1	(27/2$^-$)	[E2]	7.25×10^{-4}	B(E2)(W.u.)=39 *+17−10* α(K)=0.000639 *9*; α(L)=7.18×10^{-5} *10*; α(M)=1.262×10^{-5} *18* α(N)=1.84×10^{-6} *3*; α(O)=1.057×10^{-7} *15*
5841.0	(33/2)$^+$	220.9 *2*	4.7 *16*	5620.29	(31/2$^+$)	(M1)		Mult.: E1 or M1 consistent with RUL.
		1249.4 *1*	100 *11*	4591.7	(29/2)$^+$	(E2)	4.58×10^{-4}	B(E2)(W.u.)=27 *7* α(K)=0.000390 *6*; α(L)=4.33×10^{-5} *6*; α(M)=7.62×10^{-6} *11* α(N)=1.116×10^{-6} *16*; α(O)=6.47×10^{-8} *9*; α(IPF)=1.576×10^{-5} *22*
6039.2	(33/2$^-$)	447.0 *4*	100 *11*	5592.4	(31/2$^-$)	(M1)	0.00459	α(K)=0.00405 *6*; α(L)=0.000456 *7*; α(M)=8.03×10^{-5} *12* α(N)=1.177×10^{-5} *17*; α(O)=6.85×10^{-7} *10* B(M1)(W.u.)=(0.94 *20*) Mult.: Only E1 excluded from RUL.
		1029.4 *1*	10 *4*	5009.7	(29/2$^-$)	(E2)	6.75×10^{-4}	B(E2)(W.u.)=8 *4* α(K)=0.000595 *9*; α(L)=6.67×10^{-5} *10*; α(M)=1.173×10^{-5} *17* α(N)=1.715×10^{-6} *24*; α(O)=9.85×10^{-8} *14*
6196.9	(33/2$^+$)	1605.1 *3*	100.0	4591.7	(29/2)$^+$			
6367.2	(33/2)$^+$	747.5 *3*	15 *9*	5620.29	(31/2$^+$)	[M1+E2]		
		1426.7 *3*	100 *20*	4939.8	(29/2)$^+$	(E2)	3.94×10^{-4}	α(K)=0.000296 *5*; α(L)=3.27×10^{-5} *5*; α(M)=5.75×10^{-6} *8* α(N)=8.42×10^{-7} *12*; α(O)=4.91×10^{-8} *7*; α(IPF)=5.89×10^{-5} *9*

$^{87}_{41}Nb_{46}$-8

$\gamma(^{87}Nb)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[#@]	α[&b]	Comments
6393.1	(33/2⁻)	800.5 *5*	100.0	5592.4	(31/2⁻)	(M1+E2)		
6443.6	(33/2⁻)	666.9	11 *6*	5776.3	(31/2⁻)			
		1141.9	100 *10*	5301.5	(29/2⁻)			
6539.6	(33/2⁺)	172.0	100 *71*	6367.2	(33/2)⁺			
		342.7	71 *36*	6196.9	(33/2⁺)			
		1598.7	64 *36*	4939.8	(29/2)⁺			
6744.7	(35/2⁻)	351.6 *1*	22.3 *23*	6393.1	(33/2⁻)	(M1)	0.00825	α(K)=0.00726 *11*; α(L)=0.000823 *12*; α(M)=0.0001451 *21* α(N)=2.12×10^{-5} *3*; α(O)=1.231×10^{-6} *18* B(M1)(W.u.)=(0.20 *4*) Mult.: E1 or M1 consistent with RUL allowed for M1.
		705.5 *1*	100 *10*	6039.2	(33/2⁻)	(M1+E2)	1.59×10^{-3}	B(M1)(W.u.)=(0.112 *22*) α(K)=0.001402 *20*; α(L)=0.0001561 *22*; α(M)=2.75×10^{-5} *4* α(N)=4.03×10^{-6} *6*; α(O)=2.36×10^{-7} *4*
		1152.4 *1*	46 *5*	5592.4	(31/2⁻)	(E2)	5.28×10^{-4}	B(E2)(W.u.)=10.1 *20* α(K)=0.000463 *7*; α(L)=5.16×10^{-5} *8*; α(M)=9.08×10^{-6} *13* α(N)=1.329×10^{-6} *19*; α(O)=7.67×10^{-8} *11*; α(IPF)=2.81×10^{-6} *4*
6810.3	(35/2⁺)	269.1	42 *8*	6539.6	(33/2⁺)	[M1]	0.01608	α(K)=0.01413 *20*; α(L)=0.001616 *23*; α(M)=0.000285 *4* α(N)=4.17×10^{-5} *6*; α(O)=2.40×10^{-6} *4* B(M1)(W.u.)=(0.59 *15*); B(E2)(W.u.)=(9.E+1 *+10−9*) Mult.: E1 or M1 consistent with RUL.
		969.2 *1*	100 *10*	5841.0	(33/2)⁺	(M1+E2)	7.87×10^{-4}	B(M1)(W.u.)=(0.030 *6*) α(K)=0.000695 *10*; α(L)=7.68×10^{-5} *11*; α(M)=1.352×10^{-5} *19* α(N)=1.99×10^{-6} *3*; α(O)=1.168×10^{-7} *17*
		1188.6	37 *7*	5620.29	(31/2⁺)	[E2]	4.97×10^{-4}	B(E2)(W.u.)=4.9 *12* α(K)=0.000433 *6*; α(L)=4.82×10^{-5} *7*; α(M)=8.47×10^{-6} *12* α(N)=1.240×10^{-6} *18*; α(O)=7.17×10^{-8} *10*; α(IPF)=6.32×10^{-6} *9*
6973.5	(35/2⁻)	529.9 *3*	67 *7*	6443.6	(33/2⁻)	[M1]		Mult.: E1 or M1 consistent with RUL.
		1196 *2*	1.0×10^{2} *5*	5776.3	(31/2⁻)	(E2)	4.91×10^{-4}	B(E2)(W.u.)=19 *+7−6* α(K)=0.000426 *6*; α(L)=4.75×10^{-5} *7*; α(M)=8.34×10^{-6} *12* α(N)=1.222×10^{-6} *18*; α(O)=7.07×10^{-8} *10*; α(IPF)=7.37×10^{-6} *11*
7139.7	(37/2)⁺	329.2 *1*	38 *4*	6810.3	(35/2⁺)	[M1]	0.00968	α(K)=0.00851 *12*; α(L)=0.000968 *14*; α(M)=0.0001706 *24* α(N)=2.50×10^{-5} *4*; α(O)=1.446×10^{-6} *21* B(M1)(W.u.)=(0.56 *13*) Mult.: E1 or M1 consistent with RUL.
		1298.8 *1*	100 *20*	5841.0	(33/2)⁺	(E2)	4.33×10^{-4}	B(E2)(W.u.)=16 *5* α(K)=0.000359 *5*; α(L)=3.98×10^{-5} *6*; α(M)=7.00×10^{-6} *10* α(N)=1.026×10^{-6} *15*; α(O)=5.95×10^{-8} *9*; α(IPF)=2.61×10^{-5} *4*
7225.6	(37/2⁻)	480.9 *1*	100 *11*	6744.7	(35/2⁻)	(M1)	0.00387	α(K)=0.00341 *5*; α(L)=0.000383 *6*; α(M)=6.75×10^{-5} *10* α(N)=9.89×10^{-6} *14*; α(O)=5.76×10^{-7} *8* B(M1)(W.u.)=(0.28 *6*) Mult.: E1 or M1 consistent with RUL.
		1186.4 *1*	20 *4*	6039.2	(33/2⁻)	(E2)	5.00×10^{-4}	B(E2)(W.u.)=3.0 *10*

$^{87}_{41}Nb_{46}$-9

$\gamma(^{87}Nb)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.#@	α&b	Comments
								α(K)=0.000435 6; α(L)=4.85×10^{-5} 7; α(M)=8.53×10^{-6} 12 α(N)=1.248×10^{-6} 18; α(O)=7.22×10^{-8} 11; α(IPF)=5.92×10^{-6} 9
7618.8	(37/2$^+$)	808.5 3	100 20	6810.3	(35/2$^+$)	(M1+E2)		
		1777.6 3	81 8	5841.0	(33/2)$^+$	(E2)	4.19×10^{-4}	B(E2)(W.u.)=1.9 +4−3 α(K)=0.000192 3; α(L)=2.11×10^{-5} 3; α(M)=3.71×10^{-6} 6 α(N)=5.45×10^{-7} 8; α(O)=3.19×10^{-8} 5; α(IPF)=0.000201 3
7647.2	(37/2$^-$)	422.2	16 9	7225.6	(37/2$^-$)	(M1+E2)		
		673.4	60 13	6973.5	(35/2$^-$)	[M1+E2]		
		902.4	100 20	6744.7	(35/2$^-$)	(M1+E2)		
		1203.3	9.×10^1 5	6443.6	(33/2$^-$)	[E2]	4.86×10^{-4}	B(E2)(W.u.)=11 +6−3 α(K)=0.000422 6; α(L)=4.69×10^{-5} 7; α(M)=8.25×10^{-6} 12 α(N)=1.207×10^{-6} 17; α(O)=6.99×10^{-8} 10; α(IPF)=8.26×10^{-6} 12
		1253.7	33 17	6393.1	(33/2$^-$)	(E2)	4.55×10^{-4}	B(E2)(W.u.)=3.4 +18−11 α(K)=0.000386 6; α(L)=4.29×10^{-5} 6; α(M)=7.54×10^{-6} 11 α(N)=1.105×10^{-6} 16; α(O)=6.40×10^{-8} 9; α(IPF)=1.684×10^{-5} 24
7942.2	(37/2$^+$)	1575.0	100.0	6367.2	(33/2)$^+$	[E2]	3.88×10^{-4}	α(K)=0.000243 4; α(L)=2.68×10^{-5} 4; α(M)=4.70×10^{-6} 7 α(N)=6.90×10^{-7} 10; α(O)=4.03×10^{-8} 6; α(IPF)=0.0001131 16
8061.7	(39/2$^+$)	442.9 1	44 5	7618.8	(37/2$^+$)	[M1]	0.00471	α(K)=0.00414 6; α(L)=0.000467 7; α(M)=8.23×10^{-5} 12 α(N)=1.206×10^{-5} 17; α(O)=7.02×10^{-7} 10 B(M1)(W.u.)=(0.16 4) Mult.: E1 or M1 consistent with RUL.
		1251.2	100 20	6810.3	(35/2$^+$)	[E2]	4.56×10^{-4}	B(E2)(W.u.)=11 4 α(K)=0.000388 6; α(L)=4.31×10^{-5} 6; α(M)=7.58×10^{-6} 11 α(N)=1.110×10^{-6} 16; α(O)=6.43×10^{-8} 9; α(IPF)=1.635×10^{-5} 23
8254	(39/2$^-$)	1028 1	8 4	7225.6	(37/2$^-$)	(M1+E2)	6.93×10^{-4}	B(M1)(W.u.)=(0.0032 18) α(K)=0.000612 9; α(L)=6.76×10^{-5} 10; α(M)=1.189×10^{-5} 17 α(N)=1.746×10^{-6} 25; α(O)=1.028×10^{-7} 15
		1510 1	100 10	6744.7	(35/2$^-$)	[E2]	3.86×10^{-4}	B(E2)(W.u.)=6.4 14 α(K)=0.000265 4; α(L)=2.92×10^{-5} 4; α(M)=5.13×10^{-6} 8 α(N)=7.52×10^{-7} 11; α(O)=4.39×10^{-8} 7; α(IPF)=8.66×10^{-5} 13
8365.5	(39/2$^-$)	718.2	60 12	7647.2	(37/2$^-$)	[M1+E2]	1.52×10^{-3}	α(K)=0.001344 19; α(L)=0.0001497 21; α(M)=2.64×10^{-5} 4 α(N)=3.87×10^{-6} 6; α(O)=2.27×10^{-7} 4
		1392 1	100 10	6973.5	(35/2$^-$)	(E2)	4.01×10^{-4}	B(E2)(W.u.)=8.2 +18−20 α(K)=0.000311 5; α(L)=3.44×10^{-5} 5; α(M)=6.05×10^{-6} 9 α(N)=8.87×10^{-7} 13; α(O)=5.16×10^{-8} 8; α(IPF)=4.88×10^{-5} 7
8432.3	(41/2)$^+$	370 1	63 13	8061.7	(39/2$^+$)	(M1)	0.00728	α(K)=0.00640 9; α(L)=0.000725 11; α(M)=0.0001279 18 α(N)=1.87×10^{-5} 3; α(O)=1.086×10^{-6} 16 B(M1)(W.u.)=(0.42 12) Mult.: E1 or M1 consistent with RUL.
		1292.8 3	100 10	7139.7	(37/2)$^+$	(E2)	4.36×10^{-4}	B(E2)(W.u.)=10.5 22 α(K)=0.000363 5; α(L)=4.03×10^{-5} 6; α(M)=7.08×10^{-6} 10 α(N)=1.037×10^{-6} 15; α(O)=6.02×10^{-8} 9; α(IPF)=2.46×10^{-5} 4

$\gamma(^{87}Nb)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[#@]	α[&b]	Comments
8535	(41/2⁻)	282 *1*	77 *7*	8254	(39/2⁻)	[M1]	0.01428	α(K)=0.01255 *18*; α(L)=0.001434 *20*; α(M)=0.000253 *4* α(N)=3.70×10⁻⁵ *6*; α(O)=2.13×10⁻⁶ *3* B(M1)(W.u.)=(1.3 *3*) Mult.: Only M1 allowed from RUL with small E2 admixture.
		1310 *1*	100 *11*	7225.6	(37/2⁻)	[E2]	4.28×10⁻⁴	B(E2)(W.u.)=10.9 *22* α(K)=0.000352 *5*; α(L)=3.91×10⁻⁵ *6*; α(M)=6.87×10⁻⁶ *10* α(N)=1.006×10⁻⁶ *14*; α(O)=5.84×10⁻⁸ *9*; α(IPF)=2.88×10⁻⁵ *4*
8571.5	(41/2⁺)	140[c]		8432.3	(41/2)⁺			
		1431.8	100	7139.7	(37/2)⁺	[E2]	3.93×10⁻⁴	α(K)=0.000294 *5*; α(L)=3.25×10⁻⁵ *5*; α(M)=5.70×10⁻⁶ *8* α(N)=8.36×10⁻⁷ *12*; α(O)=4.87×10⁻⁸ *7*; α(IPF)=6.05×10⁻⁵ *9*
8873.5	(41/2⁺)	441.6	100.0	8432.3	(41/2)⁺			
8934.5	(41/2⁻)	399.3	32 *6*	8535	(41/2⁻)	[M1]	0.00603	α(K)=0.00530 *8*; α(L)=0.000600 *9*; α(M)=0.0001056 *15* α(N)=1.548×10⁻⁵ *22*; α(O)=8.99×10⁻⁷ *13* B(M1)(W.u.)=0.38 *11* Mult.: E1 or M1 consistent with RUL.
		568.9	56 *6*	8365.5	(39/2⁻)	[M1]	0.00260	α(K)=0.00229 *4*; α(L)=0.000256 *4*; α(M)=4.51×10⁻⁵ *7* α(N)=6.62×10⁻⁶ *10*; α(O)=3.87×10⁻⁷ *6* B(M1)(W.u.)=(0.23 *6*) M E1 or M1 consistent with RUL.
		1287.1	100 *21*	7647.2	(37/2⁻)	(E2)	4.38×10⁻⁴	B(E2)(W.u.)=24 *8* α(K)=0.000366 *6*; α(L)=4.06×10⁻⁵ *6*; α(M)=7.13×10⁻⁶ *10* α(N)=1.044×10⁻⁶ *15*; α(O)=6.06×10⁻⁸ *9*; α(IPF)=2.37×10⁻⁵ *4*
9014.5	(41/2⁺)	952.7		8061.7	(39/2⁺)			
9514.3	(43/2⁺)	499.6	40 *9*	9014.5	(41/2⁺)	[M1]		
		641.1	13 *7*	8873.5	(41/2⁺)	[M1+E2]		
		1452.3	100 *10*	8061.7	(39/2⁺)	(E2)	3.90×10⁻⁴	B(E2)(W.u.)=40 *+21−12* α(K)=0.000285 *4*; α(L)=3.15×10⁻⁵ *5*; α(M)=5.54×10⁻⁶ *8* α(N)=8.12×10⁻⁷ *12*; α(O)=4.73×10⁻⁸ *7*; α(IPF)=6.70×10⁻⁵ *10*
9575.3	(41/2⁺)	1633.0	100.0	7942.2	(37/2⁺)	[E2]	3.94×10⁻⁴	α(K)=0.000226 *4*; α(L)=2.49×10⁻⁵ *4*; α(M)=4.38×10⁻⁶ *7* α(N)=6.42×10⁻⁷ *9*; α(O)=3.76×10⁻⁸ *6*; α(IPF)=0.0001377 *20*
9843.4	(43/2⁻)	908.8		8934.5	(41/2⁻)	[M1+E2]	9.04×10⁻⁴	α(K)=0.000798 *12*; α(L)=8.84×10⁻⁵ *13*; α(M)=1.555×10⁻⁵ *22* α(N)=2.28×10⁻⁶ *4*; α(O)=1.342×10⁻⁷ *19*
		1308.1	61 *22*	8535	(41/2⁻)	[M1+E2]	4.41×10⁻⁴	B(M1)(W.u.)=0.013 *6* α(K)=0.000369 *6*; α(L)=4.06×10⁻⁵ *6*; α(M)=7.14×10⁻⁶ *10* α(N)=1.049×10⁻⁶ *15*; α(O)=6.19×10⁻⁸ *9*; α(IPF)=2.30×10⁻⁵ *4*
		1590.1	100 *22*	8254	(39/2⁻)	[E2]	3.90×10⁻⁴	B(E2)(W.u.)=5.4 *+18−19* α(K)=0.000239 *4*; α(L)=2.63×10⁻⁵ *4*; α(M)=4.62×10⁻⁶ *7* α(N)=6.77×10⁻⁷ *10*; α(O)=3.96×10⁻⁸ *6*; α(IPF)=0.0001194 *17*
9888.3	(43/2⁻)	953.8	1.0×10² *3*	8934.5	(41/2⁻)	[M1+E2]		
		1522 *2*	27 *7*	8365.5	(39/2⁻)	(E2)	3.86×10⁻⁴	α(K)=0.000260 *4*; α(L)=2.86×10⁻⁵ *4*; α(M)=5.03×10⁻⁶ *7* α(N)=7.38×10⁻⁷ *11*; α(O)=4.31×10⁻⁸ *6*; α(IPF)=9.21×10⁻⁵ *13*
9997	(45/2⁺)	1565 *1*	100.0	8432.3	(41/2)⁺	(E2)	3.88×10⁻⁴	B(E2)(W.u.)=11.8 *19*

$\gamma(^{87}Nb)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#@]	α[&b]	Comments
								α(K)=0.000246 *4*; α(L)=2.71×10^{-5} *4*; α(M)=4.76×10^{-6} *7* α(N)=6.99×10^{-7} *10*; α(O)=4.08×10^{-8} *6*; α(IPF)=0.0001090 *16*
10236.6	(45/2⁻)	1301.9	59 *12*	8934.5	(41/2⁻)	[E2]	4.31×10^{-4}	B(E2)(W.u.)=7.2 *21* α(K)=0.000357 *5*; α(L)=3.96×10^{-5} *6*; α(M)=6.96×10^{-6} *10* α(N)=1.019×10^{-6} *15*; α(O)=5.92×10^{-8} *9*; α(IPF)=2.69×10^{-5} *4*
		1701 *2*	100 *10*	8535	(41/2⁻)	(E2)	4.04×10^{-4}	B(E2)(W.u.)=3.2 *7* α(K)=0.000209 *3*; α(L)=2.30×10^{-5} *4*; α(M)=4.04×10^{-6} *6* α(N)=5.93×10^{-7} *9*; α(O)=3.47×10^{-8} *5*; α(IPF)=0.0001673 *24*
10459.7	(45/2⁻)	223		10236.6	(45/2⁻)			
		616.3	100 *16*	9843.4	(43/2⁻)	[M1]		
		1525.1	$7.\times10^{1}$ *4*	8934.5	(41/2⁻)	(E2)	3.86×10^{-4}	α(K)=0.000259 *4*; α(L)=2.85×10^{-5} *4*; α(M)=5.02×10^{-6} *7* α(N)=7.36×10^{-7} *11*; α(O)=4.30×10^{-8} *6*; α(IPF)=9.30×10^{-5} *13*
11023.8	(45/2⁺)	2452.3	100.0	8571.5	(41/2⁺)			
11186.7	(47/2⁺)	1672.4	100.0	9514.3	(43/2⁺)	(E2)	4.00×10^{-4}	B(E2)(W.u.)=27 *+19−13* α(K)=0.000216 *3*; α(L)=2.38×10^{-5} *4*; α(M)=4.18×10^{-6} *6* α(N)=6.13×10^{-7} *9*; α(O)=3.59×10^{-8} *5*; α(IPF)=0.0001547 *22*
11545.0	(47/2⁻)	1656.7	100.00	9888.3	(43/2⁻)	[E2]	3.97×10^{-4}	α(K)=0.000220 *3*; α(L)=2.42×10^{-5} *4*; α(M)=4.26×10^{-6} *6* α(N)=6.24×10^{-7} *9*; α(O)=3.65×10^{-8} *6*; α(IPF)=0.0001479 *21*
11579.7	(47/2⁻)	1736.3	100.0	9843.4	(43/2⁻)	[E2]	4.11×10^{-4}	α(K)=0.000201 *3*; α(L)=2.21×10^{-5} *3*; α(M)=3.88×10^{-6} *6* α(N)=5.70×10^{-7} *8*; α(O)=3.34×10^{-8} *5*; α(IPF)=0.000183 *3*
11948	(49/2⁺)	1951 *1*	100.0	9997	(45/2⁺)	(E2)	4.67×10^{-4}	α(K)=0.0001613 *23*; α(L)=1.766×10^{-5} *25*; α(M)=3.10×10^{-6} *5* α(N)=4.55×10^{-7} *7*; α(O)=2.68×10^{-8} *4*; α(IPF)=0.000284 *4*
12017.2	(49/2⁻)	437.6		11579.7	(47/2⁻)	(M1+E2)	0.00485	α(K)=0.00427 *7*; α(L)=0.000482 *7*; α(M)=8.49×10^{-5} *13* α(N)=1.243×10^{-5} *19*; α(O)=7.22×10^{-7} *11*
		1557.6	79 *8*	10459.7	(45/2⁻)	(E2)	3.87×10^{-4}	B(E2)(W.u.)=7.8 *16* α(K)=0.000248 *4*; α(L)=2.74×10^{-5} *4*; α(M)=4.81×10^{-6} *7* α(N)=7.05×10^{-7} *10*; α(O)=4.12×10^{-8} *6*; α(IPF)=0.0001060 *15*
		1778 *2*	100 *10*	10236.6	(45/2⁻)	(E2)	4.20×10^{-4}	B(E2)(W.u.)=5.1 *10* α(K)=0.000192 *3*; α(L)=2.11×10^{-5} *3*; α(M)=3.70×10^{-6} *6* α(N)=5.43×10^{-7} *8*; α(O)=3.18×10^{-8} *5*; α(IPF)=0.000203 *3*
12492.4	(49/2⁺)	2495.1	100.0	9997	(45/2⁺)			
13119.7	(51/2⁺)	1933.0	100.0	11186.7	(47/2⁺)	[E2]	4.60×10^{-4}	B(E2)(W.u.)=33 *+98−18* α(K)=0.0001646 *23*; α(L)=1.80×10^{-5} *3*; α(M)=3.17×10^{-6} *5* α(N)=4.65×10^{-7} *7*; α(O)=2.73×10^{-8} *4*; α(IPF)=0.000274 *4*
13258.7	(51/2⁺)	2072.0	100.0	11186.7	(47/2⁺)			
13476.1	(51/2⁻)	1931.0	100.0	11545.0	(47/2⁻)	[E2]	4.60×10^{-4}	α(K)=0.0001649 *23*; α(L)=1.81×10^{-5} *3*; α(M)=3.17×10^{-6} *5* α(N)=4.66×10^{-7} *7*; α(O)=2.74×10^{-8} *4*; α(IPF)=0.000273 *4*
13577.8	(51/2⁻)	1998.1	100.00	11579.7	(47/2⁻)			
13752.4	(53/2⁺)	1263[c]		12492.4	(49/2⁺)			
		1804.1		11948	(49/2⁺)			
13880	(53/2⁻)	1862 *2*	100	12017.2	(49/2⁻)	(E2)	4.40×10^{-4}	B(E2)(W.u.)=13.3 *23*

$^{87}_{41}Nb_{46}$-12

γ(^{87}Nb) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[#@]	α[&b]	Comments
								α(K)=0.0001766 25; α(L)=1.94×10^{-5} 3; α(M)=3.40×10^{-6} 5 α(N)=4.99×10^{-7} 7; α(O)=2.93×10^{-8} 5; α(IPF)=0.000240 4
14201.5	(53/2$^+$)	2253.1	100.0	11948	(49/2$^+$)			
14590.2	(53/2$^-$)	2573.0	100.0	12017.2	(49/2$^-$)			
15329.3	(55/2$^+$)	2071[c]		13258.7	(51/2$^+$)	[E2]	5.05×10^{-4}	α(K)=0.0001451 21; α(L)=1.586×10^{-5} 23; α(M)=2.79×10^{-6} 4 α(N)=4.09×10^{-7} 6; α(O)=2.41×10^{-8} 4; α(IPF)=0.000341 5
		2209.6		13119.7	(51/2$^+$)	[E2]	5.54×10^{-4}	α(K)=0.0001291 18; α(L)=1.409×10^{-5} 20; α(M)=2.48×10^{-6} 4 α(N)=3.63×10^{-7} 5; α(O)=2.14×10^{-8} 3; α(IPF)=0.000408 6
15672.1	(55/2$^-$)	2196.0	100.0	13476.1	(51/2$^-$)			
15867.2	(57/2$^+$)	2114.7	100.0	13752.4	(53/2$^+$)			
16187.6	(57/2$^-$)	2308.4	100.0	13880	(53/2$^-$)	[E2]	5.91×10^{-4}	α(K)=0.0001194 17; α(L)=1.302×10^{-5} 19; α(M)=2.29×10^{-6} 4 α(N)=3.36×10^{-7} 5; α(O)=1.98×10^{-8} 3; α(IPF)=0.000456 7
17927.8	(59/2$^+$)	2598.4	100.0	15329.3	(55/2$^+$)	(E2)	7.03×10^{-4}	α(K)=9.72×10^{-5} 14; α(L)=1.057×10^{-5} 15; α(M)=1.86×10^{-6} 3 α(N)=2.73×10^{-7} 4; α(O)=1.612×10^{-8} 23; α(IPF)=0.000594 9
18260.1	(61/2$^+$)	2392.9	100.0	15867.2	(57/2$^+$)			
18894.5	(61/2$^-$)	2706.8	100.0	16187.6	(57/2$^-$)	[E2]	7.46×10^{-4}	α(K)=9.06×10^{-5} 13; α(L)=9.85×10^{-6} 14; α(M)=1.730×10^{-6} 25 α(N)=2.54×10^{-7} 4; α(O)=1.503×10^{-8} 21; α(IPF)=0.000644 9
1250+x	J+2	997	[‡]	?				
		1250	[‡]	x	J			
		1362	[‡]	?				
		1382	[‡]	?				
2679+x	J+4	1421	[‡]	?				This transition is shown (1997La02) to feed a level deexciting by a 2225 γ.
		1429	[‡]	1250+x	J+2			
4251+x	J+6	1572	100[‡]	2679+x	J+4			
5970+x	J+8	1719	100[‡]	4251+x	J+6			
7849+x	J+10	1879	100[‡]	5970+x	J+8			
9894+x	J+12	2045	100[‡]	7849+x	J+10			
12110+x	J+14	2216	100[‡]	9894+x	J+12			
14505+x	J+16	2395	100[‡]	12110+x	J+14			
17090+x	J+18	2585	100[‡]	14505+x	J+16			
1492+y	J1+2	1492	100[‡]	y	J1			
3134+y	J1+4	1642	100[‡]	1492+y	J1+2			
3378+y	J1+4	1508	100[‡]	1870+y	J1+2			
4924+y	J1+6	1790	100[‡]	3134+y	J1+4			
5035+y	J1+6	1657	100[‡]	3378+y	J1+4			
6795+y	J1+8	1760	[‡]	5035+y	J1+6	(E2)	4.15×10^{-4}	α(K)=0.000196 3; α(L)=2.15×10^{-5} 3; α(M)=3.78×10^{-6} 6 α(N)=5.55×10^{-7} 8; α(O)=3.26×10^{-8} 5; α(IPF)=0.000193 3 Mult.: from R(DCO)=0.94 12 (1997La02).
		1871	[‡]	4924+y	J1+6	(E2)	4.42×10^{-4}	α(K)=0.0001749 25; α(L)=1.92×10^{-5} 3; α(M)=3.37×10^{-6} 5

$^{87}_{41}$Nb$_{46}$-13

$\gamma(^{87}Nb)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[#@]	α[&b]	Comments
								α(N)=4.94×10^{-7} *7*; α(O)=2.90×10^{-8} *4*; α(IPF)=0.000245 *4* Mult.: from R(DCO)=0.97 *17* (1997La02).
6916+y	J1+8	1881	[‡]	5035+y	J1+6	(E2)	4.45×10^{-4}	α(K)=0.0001731 *25*; α(L)=1.90×10^{-5} *3*; α(M)=3.33×10^{-6} *5* α(N)=4.89×10^{-7} *7*; α(O)=2.87×10^{-8} *4*; α(IPF)=0.000249 *4* Mult.: from R(DCO)=0.89 13 (1997La02).
		1992	[‡]	4924+y	J1+6	(E2)	4.79×10^{-4}	α(K)=0.0001557 *22*; α(L)=1.704×10^{-5} *24*; α(M)=2.99×10^{-6} *5* α(N)=4.39×10^{-7} *7*; α(O)=2.58×10^{-8} *4*; α(IPF)=0.000303 *5* Mult.: from R(DCO)=1.06 16 (1997La02).
8759+y	J1+10	1964	100[‡]	6795+y	J1+8			
8994+y	J1+10	2078	100[‡]	6916+y	J1+8			
10876+y	J1+12	2117	100[‡]	8759+y	J1+10			
11170+y	J1+12	2176	100[‡]	8994+y	J1+10			
13150+y	J1+14	2274	100[‡]	10876+y	J1+12			
13438+y	J1+14	2268	100[‡]	11170+y	J1+12			
15582+y	J1+16	2432	100[‡]	13150+y	J1+14			
15831+y	J1+16	2393	100[‡]	13438+y	J1+14			
18169+y	J1+18	2587	100[‡]	15582+y	J1+16			
18374+y	J1+18	2543	100[‡]	15831+y	J1+16			
1697+z	J2+2	1697	100[‡]	z	J2			
3563+z	J2+4	1866	100[‡]	1697+z	J2+2			
5604+z	J2+6	2041	100[‡]	3563+z	J2+4			
7815+z	J2+8	2211	100[‡]	5604+z	J2+6			
10199+z	J2+10	2384	100[‡]	7815+z	J2+8			
12736+z	J2+12	2537	100[‡]	10199+z	J2+10			

[†] From ^{58}Ni(^{32}S,3pγ), unless indicated otherwise. Uncertainties estimated by the evaluators to be 0.3 keV.

[‡] Experimental results not available.

[#] From ^{58}Ni(^{32}S,3pγ), DCO (directional correlation of oriented nuclei) ratios, with additional support from from angular distributions in some cases. See the (^{32}S,3pγ) dataset for more details. The exception is for the 263 γ which is from the ^{87}Mo ε+β+ decay. The transitions that are determined to be quadrupole are presumed to be E2 rather than M2. When half lives are known and additional support can be obtained by comparing with Recommended Upper Limits (RUL), that is mentioned.

[@] In cases of mixed multipolarity, transition strengths were calculated assuming negligible mixing ratios of around 0.1, as they are usually small in this nuclei. In 2003Pa09, they were assumed to be 0.

[&] Value is given when needed for transition strengths.

[a] From ^{87}Mo ε+β+ decay.

γ(^{87}Nb) (continued)

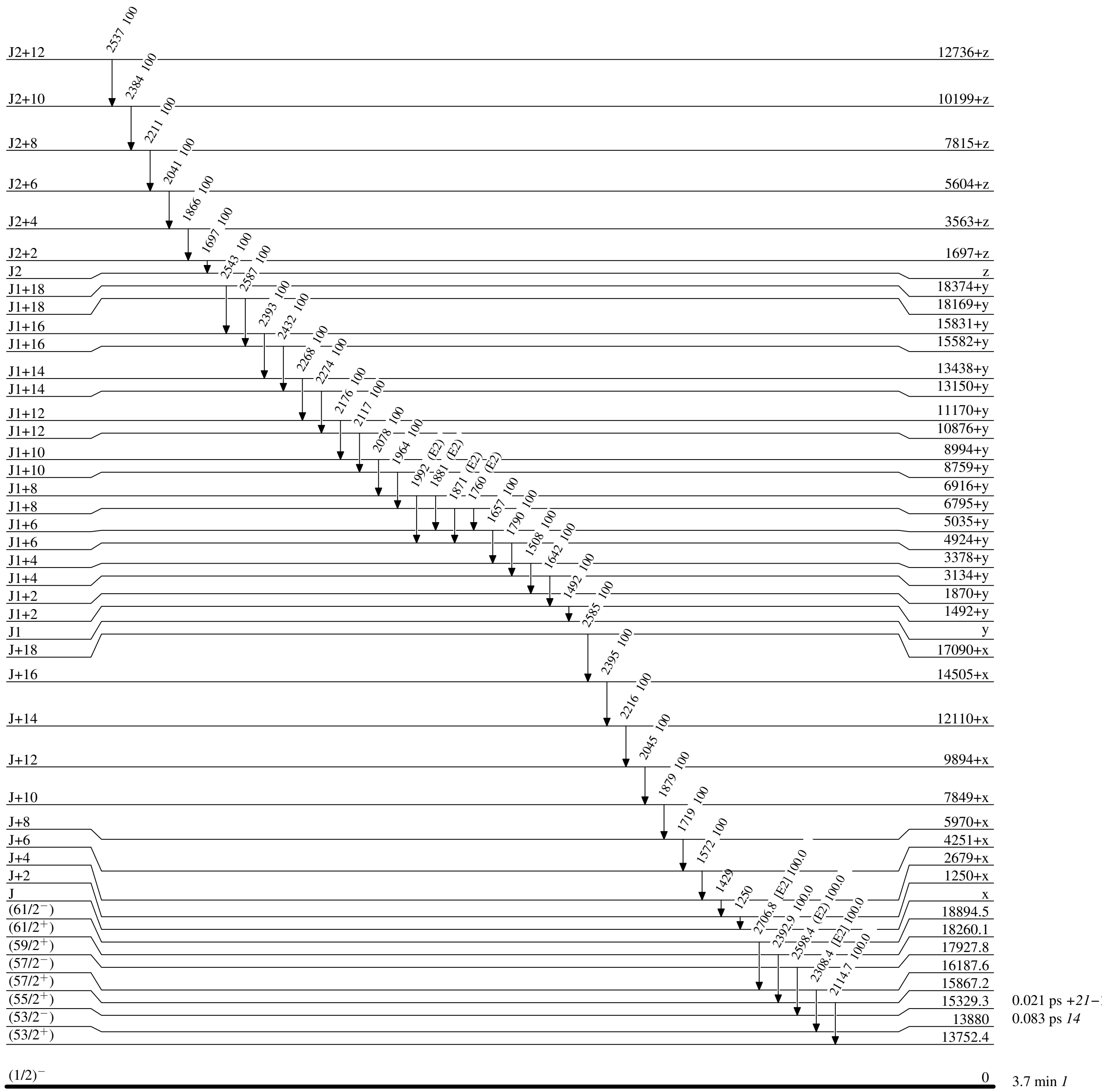
[b] @B@0@0@@@@ @B@0@1@@@@@2 B(M1) transitions strengths are calculated for these cases since the δ has only a small effect.
[c] Placement of transition in the level scheme is uncertain.

$^{87}_{41}Nb_{46}$-15

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level



$^{87}_{41}Nb_{46}$

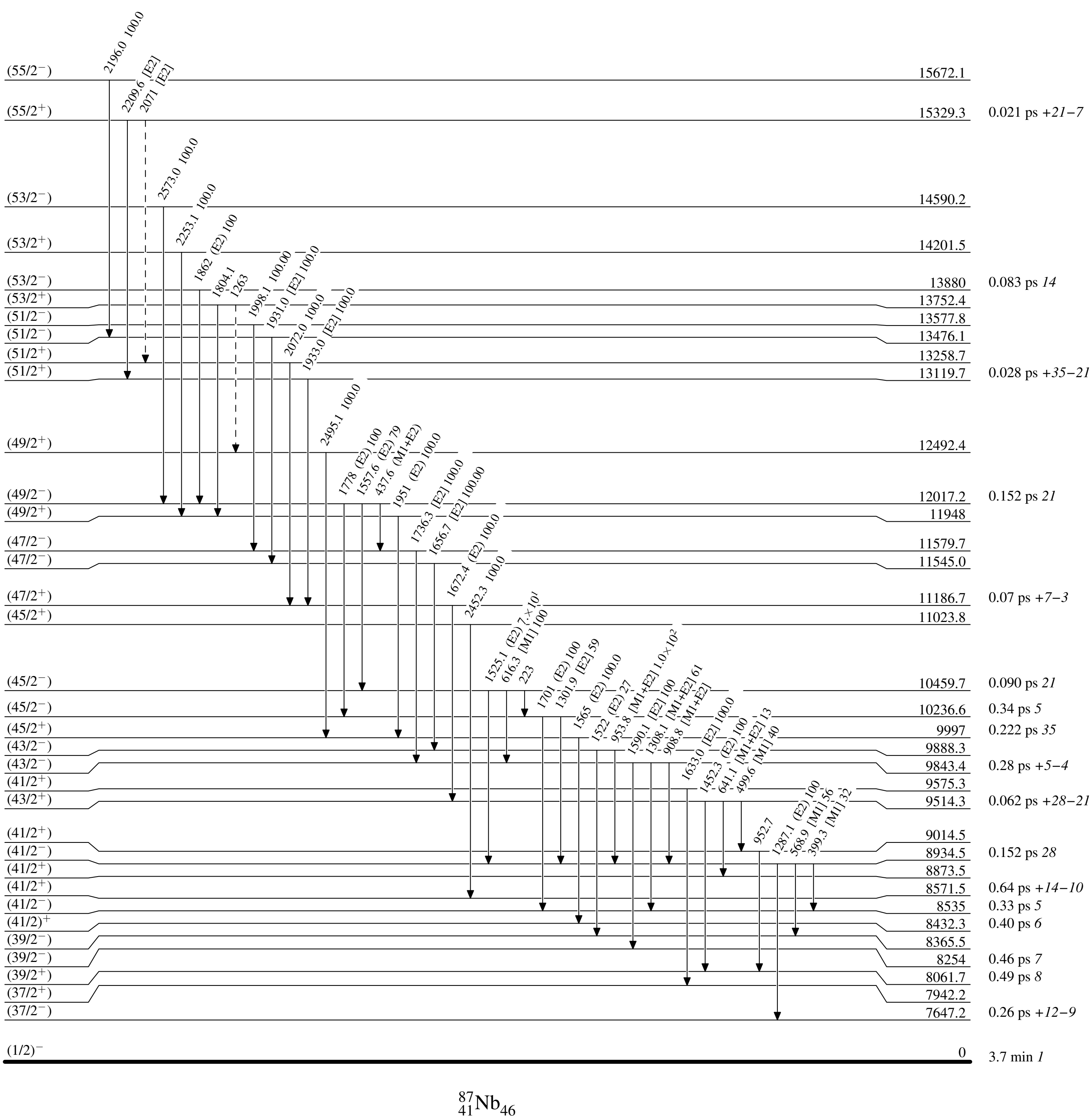
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

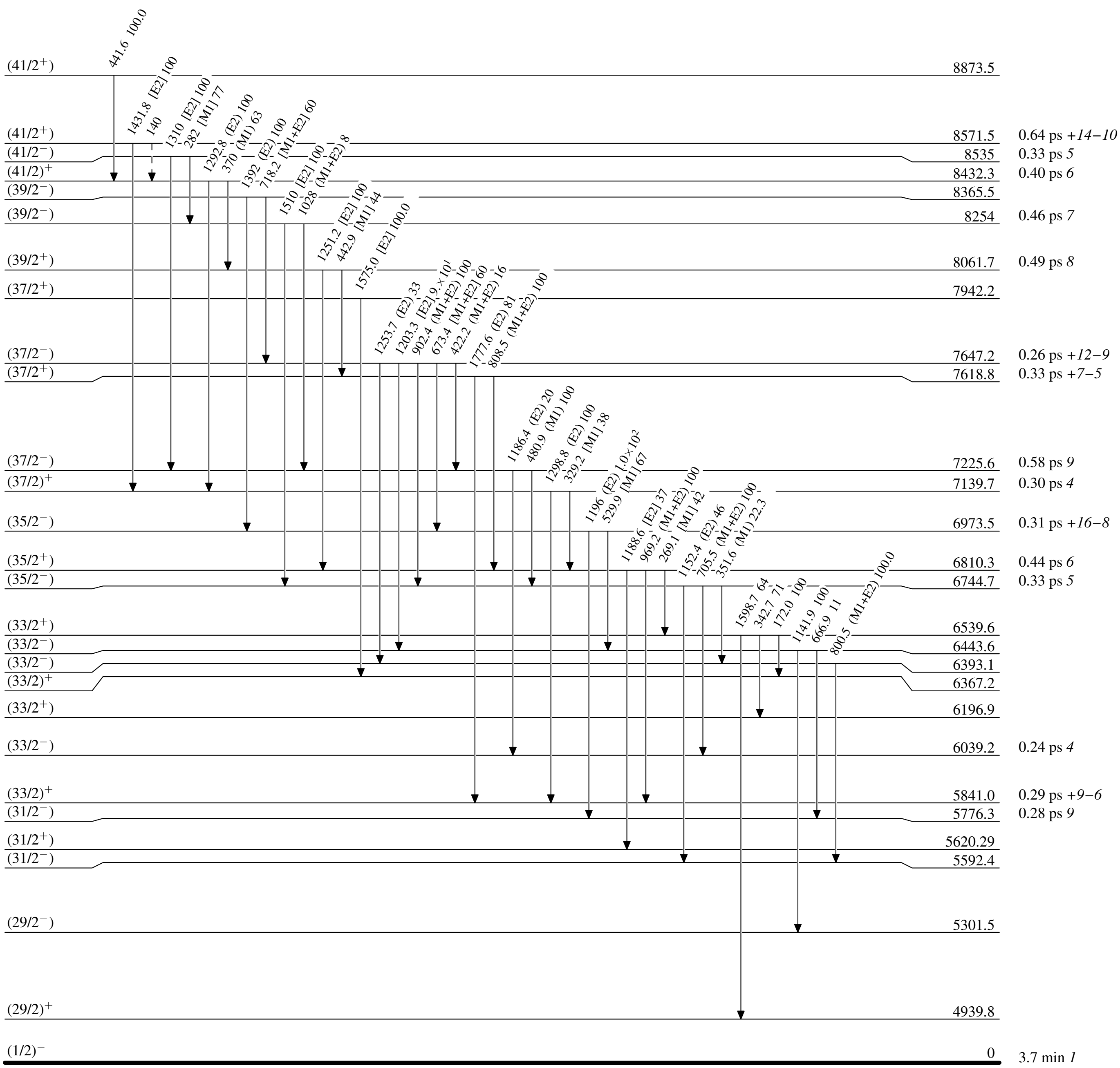
γ Decay (Uncertain)



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{87}_{41}Nb_{46}$

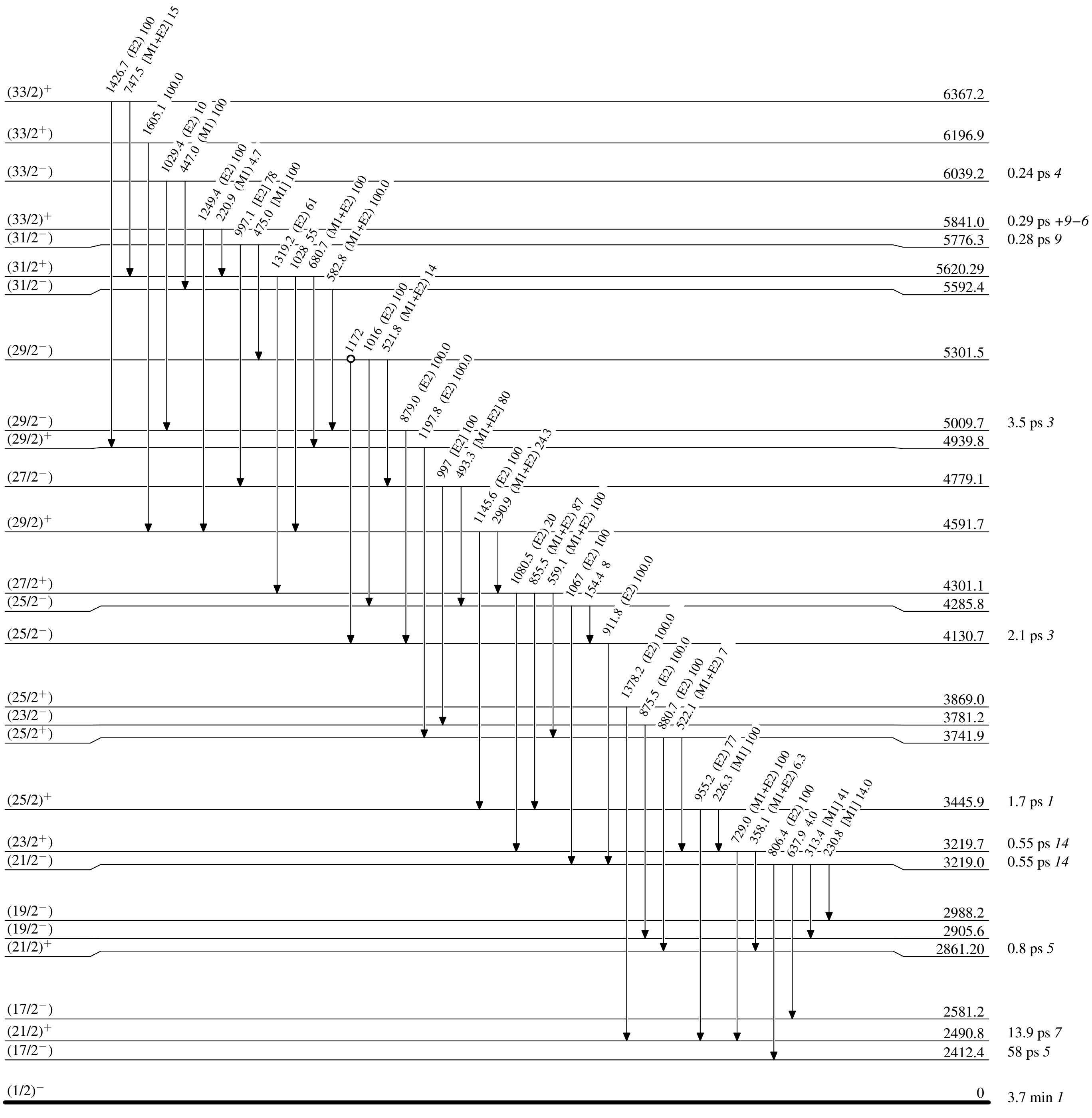
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

Legend

● Coincidence
○ Coincidence (Uncertain)

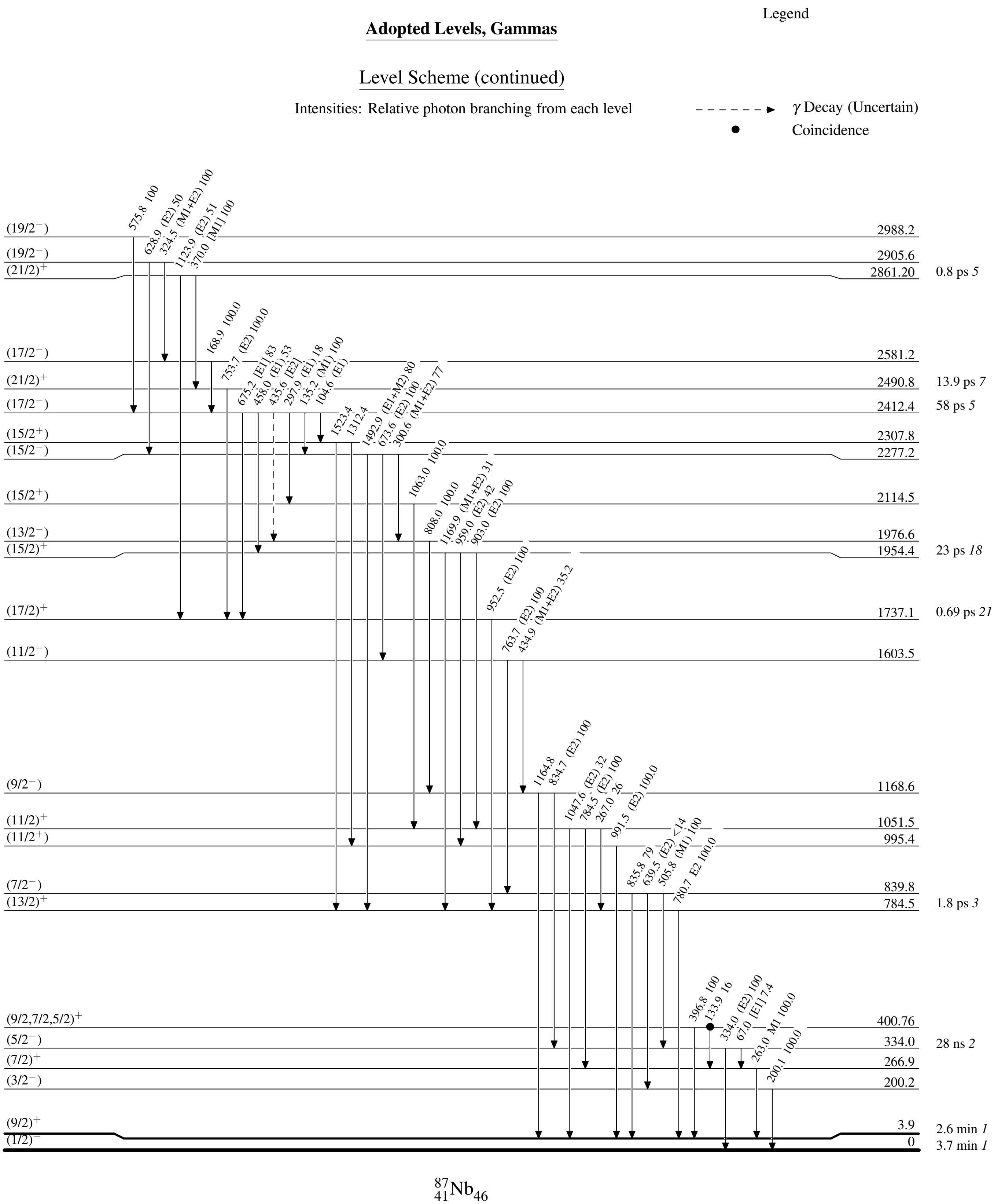


$^{87}_{41}Nb_{46}$

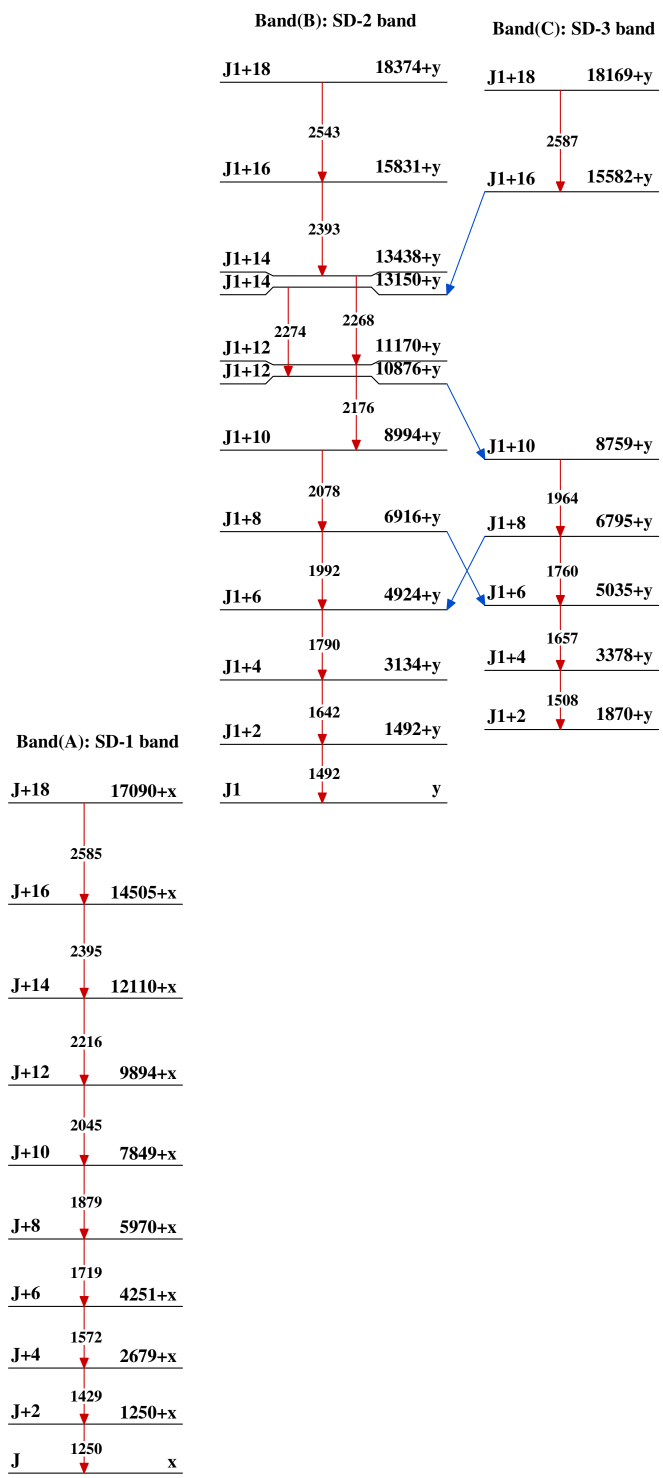
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

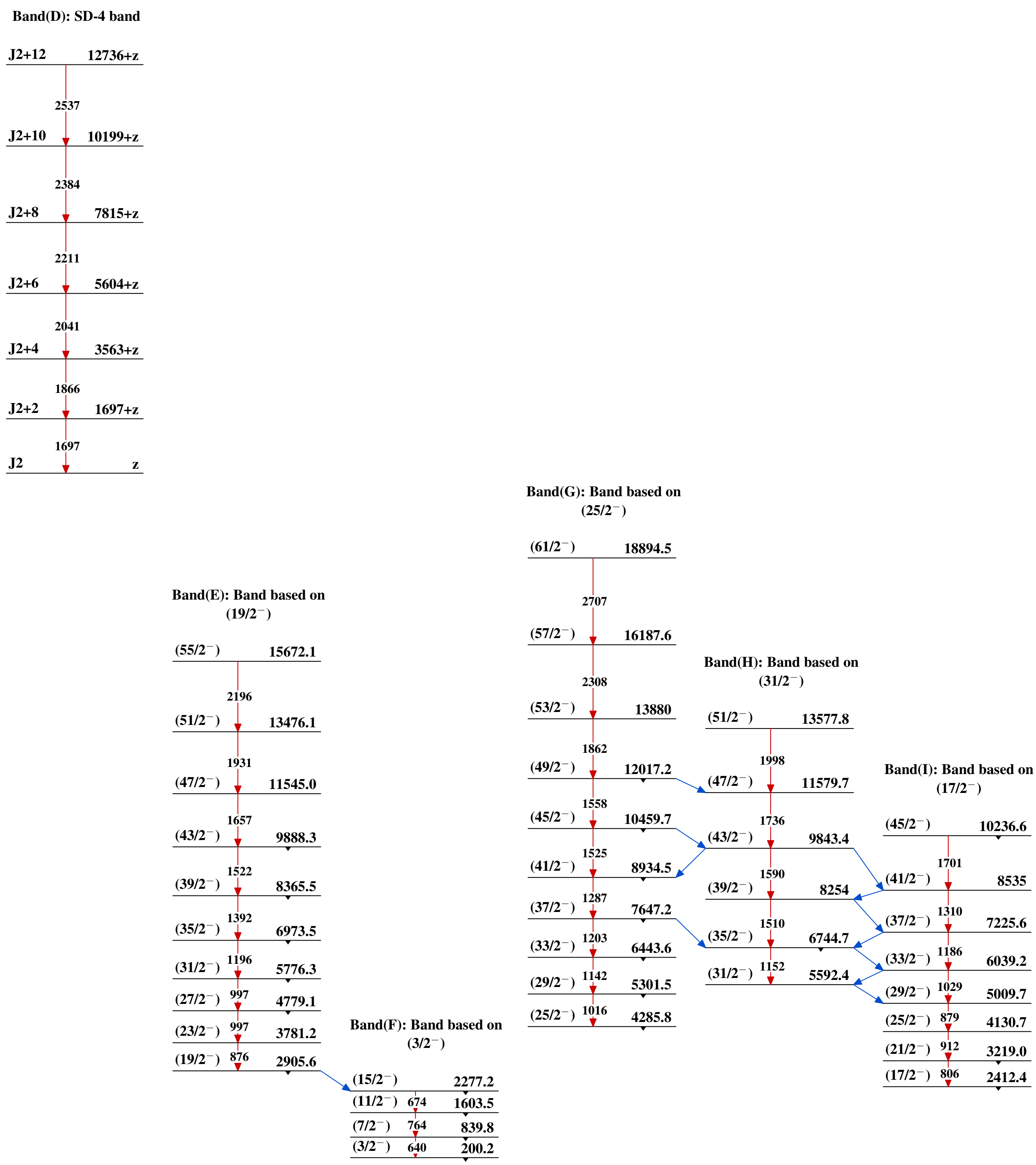


Adopted Levels, Gammas



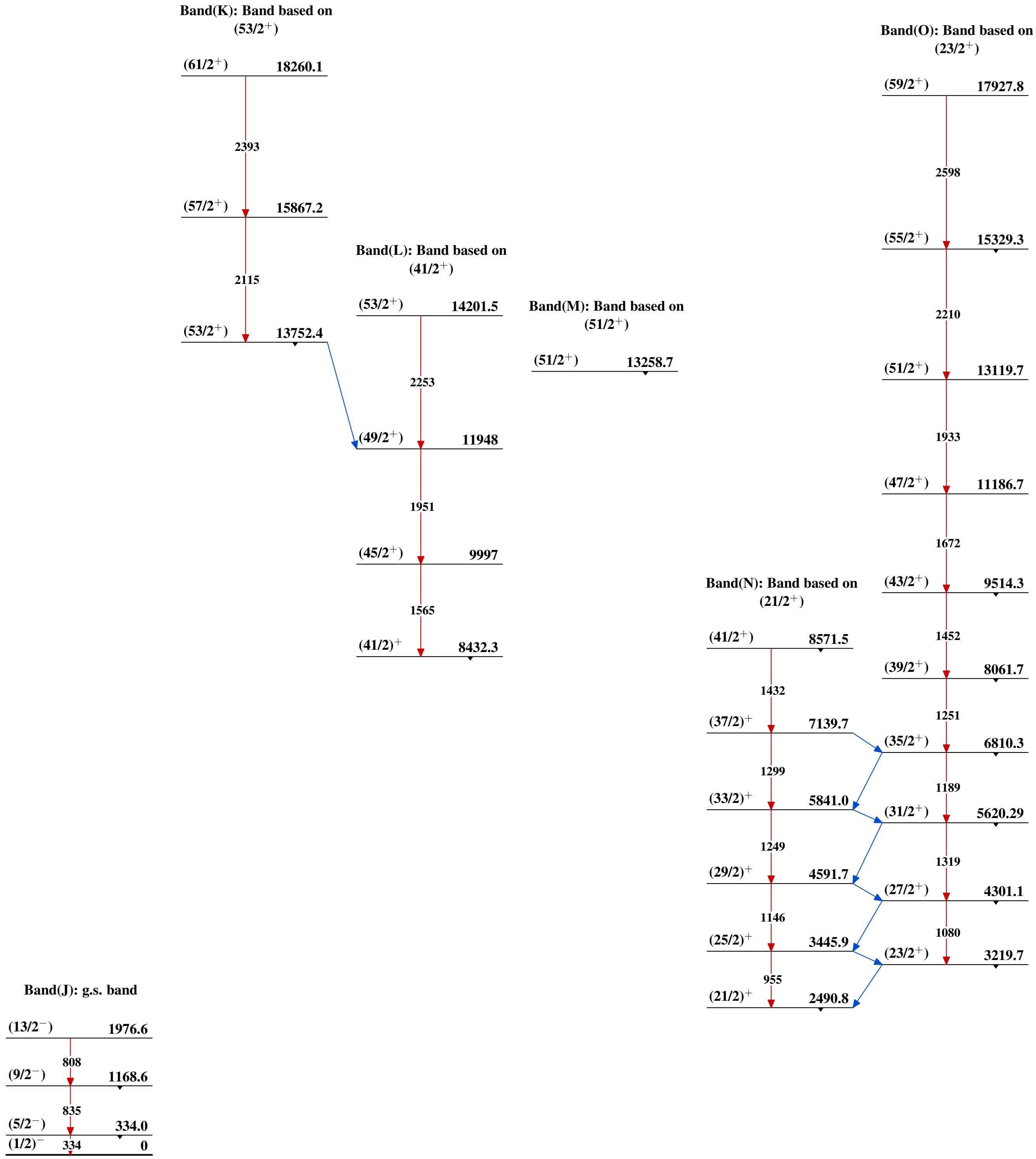
$^{87}_{41}Nb_{46}$

Adopted Levels, Gammas (continued)



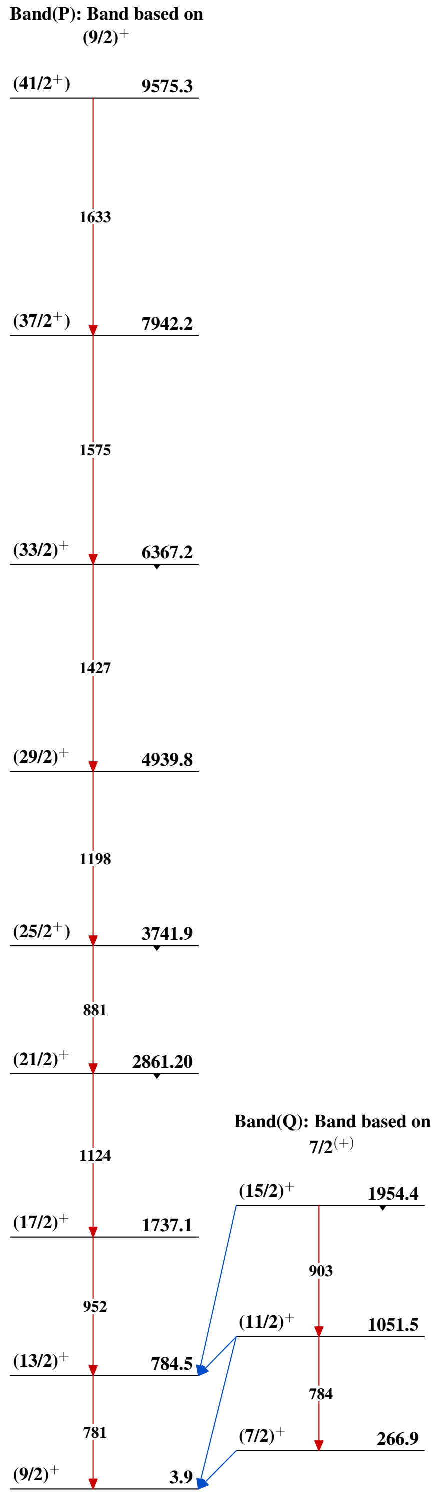
$^{87}_{41}Nb_{46}$

Adopted Levels, Gammas (continued)



$^{87}_{41}Nb_{46}$

Adopted Levels, Gammas (continued)



$^{87}_{41}Nb_{46}$