Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 112,1163 (2011)	15-Dec-2010

Q(β^-)=−406.7 *20*; S(n)=8830.6 *21*; S(p)=6042.3 *16*; Q(α)=−1928.8 *23* 2012Wa38
Note: Current evaluation has used the following Q record −406 4 *8831*.0 *20* 6042.9 *16*−1931.0 *22* 2003Au03,2009AuZZ.
Q(β^-), S(n), S(p), Q(α): from 2009AuZZ (cf. 405 *4*, 8831.3 *20*, 6043.4 *16*, −1931.4 *23*, respectively, from 2003Au03).

Other Reactions:

^{173}Yb(^{24}Mg,Fγ), E=134.5 MeV (2010Fo10): observed 950γ following fission of ^{197}Pb compound nucleus.

^{89}Y(α,α) (2009Ki16): Eα=16.21 and 19.47 MeV; measured $\sigma(\theta)$ in 1° to 2° steps from θ(lab)=20° to 170°; deduced local optical model parameters; predicted (89Y⊗α) α cluster states in ^{93}Nb and calculated E2 reduced transition strengths within a K^π=1/2$^-$ band based on the 31 level.

^{93}Nb(t,t) (2007Ch20):
E(t)=12 MeV; measured $\sigma(\theta)$; deduced optical-model parameters.

^{93}Nb(n,n′) (1996De01, 1994De41):
E(n)=14.1 MeV. Analyzed σ(E,θ) data of Takahashi et al. (OKTAVIAN report A-92-01); calculated contributions from multistep direct, compound nucleus, multistep compound nucleus mechanisms, and collective excitations.

^{93}Nb(α,α′) (1960Cr05):
Eα≈30 MeV, θ(c.m.)≈45°−85°; observed g.s. and E(level)=2400 *300* (possibly complex); measured $\sigma(\theta)$.

^{93}Nb Levels

Cross Reference (XREF) Flags

A	^{93}Mo ε decay (6.85 h)	J	^{90}Zr(α,pγ)	S	^{93}Nb IT decay (16.12 y)
B	^{92}Zr(α,t)	K	^{92}Zr(p,p′), (pol p,p) IAR	T	^{92}Zr(p,α) IAR
C	^{93}Nb(p,p′)	L	^{96}Mo(p,α)	U	^{89}Y(α,nγ)
D	Coulomb excitation	M	^{80}Se(^{16}O,p2nγ)	V	^{92}Zr(^{16}O,^{15}N)
E	^{93}Nb(n,n′γ)	N	^{93}Nb(d,d′), (pol d,d)	W	^{93}Nb(γ,γ′): E<2.75 MeV
F	^{93}Nb(γ,γ′) E=6465 keV	O	^{93}Nb(γ,xn)	X	^{94}Zr(p,2nγ)
G	^{92}Zr(^{3}He,d)	P	^{93}Zr β^- decay	Y	^{82}Se(^{16}O,p4nγ)
H	^{94}Mo(d,^{3}He)	Q	^{93}Nb(e,e′)		
I	^{91}Zr(α,d)	R	^{93}Mo ε decay (4.0×10^3 y)		

E(level)[†]	J$^\pi$	T$_{1/2}$[‡]	XREF	Comments
0.0	9/2$^+$	stable	ABCDEFGHIJ LMN PQRS WXY	μ=+6.1705 *3*; Q=−0.32 *2* J$^\pi$: L(^{3}He,d)=4; J=9/2 from optical spectroscopy (1947Me27,1976Fu06). μ: from NMR and optical spectroscopy (1989Ra17); value relative to ^{45}Sc and based on data of 1951Sh33 and 1947Me27. Q: from hyperfine structure in muonic ^{93}Nb (1989Ra17, from data of 1973Po15). Other: −0.366 *18* from atomic beam (without polarization correction) (1989Ra17). configuration: π g$_{9/2}$. Δ<r^2>(^{91g}Iβ normalization,^{93}Nb)=+0.312 *2* (2009Ch25) from LASER spectroscopy (optical pumping in ion beam cooler buncher); authors also report isotope shift and hfs coefficients. <r^2>$^{1/2}$(charge)=4.3241 *15* (2004An14).
30.77 *2*	1/2$^-$	16.12 y *12*	E GH J L P RS X	%IT=100 J$^\pi$: L=1 in (^{3}He,d); M4 γ to J$^\pi$=9/2$^+$. configuration: (π 2p$_{1/2}$)$^{-1}$. T$_{1/2}$: from IT decay.

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Adopted Levels, Gammas (continued)

^{93}Nb Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
686.79[@] *10*	3/2⁻	0.28 ps *+48−14*	B E GH J L X	J^π: L=1 in (^{3}He,d); D+Q 656γ to 1/2⁻ 31. $T_{1/2}$: from (α,pγ).
743.95[k] *5*	7/2⁺	0.51 ps *4*	CDE J N WX	J^π: M1+E2 744γ to 9/2⁺ g.s.; not 9/2 or 11/2 from γ(θ) in Coulomb excitation. $T_{1/2}$: weighted average of 0.48 ps *5* from ^{93}Nb(γ,γ′): E<2.75 MeV and 0.57 ps *7* from from Coulomb excitation. Other: >0.7 ps from (α,pγ).
808.82[k] *7*	5/2⁺	6.16 ps *20*	bcDE G iJ L X	XREF: i(800). J^π: L=2 in (^{3}He,d); stretched E2 809γ to 9/2⁺ g.s. Other $T_{1/2}$: >2.8 ps from (α,pγ).
810.32[@] *9*	5/2⁻	>1.0 ps	bc E iJ L X	XREF: i(800). J^π: L=3 component of L(p,α)=3+2 doublet; Q 780γ to 1/2⁻ 31. $T_{1/2}$: from (α,pγ); $T_{1/2}$<14 ns from (n,n′γ).
949.80[k] *3*	13/2⁺	4.36 ps *15*	AbCDEF iJ LMn WXY	XREF: i(960). J^π: 13/2 from Coulomb excitation; stretched E2 950γ to 9/2⁺ g.s. Supported by L(p,α)=6. $T_{1/2}$: other values 2.3 ps *7* from (γ,γ′): E<2.75 MeV; possibly low as a result of unknown feeding effects in (γ,γ′) (2007Or01). configuration: $\nu(d^2_{5/2})\ \pi(g_{9/2})$ suggested by 2007Wa45 and 2009Ho07.
970? *10*	1/2⁻,3/2⁻		G	J^π: L(^{3}He,d)=1.
978.91[k] *5*	11/2⁺	258 fs *18*	bCDEF iJ n WX	XREF: i(960). J^π: M1+E2 979γ to 9/2⁺ g.s.; 11/2 from 979γ(θ) in Coulomb excitation. $T_{1/2}$: weighted average of 0.236 ps *28*, 0.256 ps *26*, 0.31 ps *7* from DSAM in Coulomb excitation and 0.33 ps *6* from (γ,γ′): E<2.75 MeV. The unweighted average of these data is 283 fs *22*. Other: 0.50 ps *+24−13* from DSAM in (n,n′γ).
1082.68[k] *5*	9/2⁺	>2.8 ps	BCDEFG J L N X	J^π: L=4 in (^{3}He,d); J=9/2 from γ(θ) in Coulomb excitation; J=9/2,13/2 from (γ,γ′) E=6465 keV. $T_{1/2}$: >2.8 ps from DSAM in Coulomb excitation. Other $T_{1/2}$: <14 ns and >0.86 ps from (n,n′γ). $T_{1/2}$=3.5 ps *5* from measured B(E2) and adopted branching if δ(1082γ)=−2.47 (uncertainty unstated) from 2002Ka05 in Coulomb excitation is correct.
1127.09[h] *12*	3/2,5/2,7/2		E J X	J^π: D+Q 318γ to 5/2⁺ 809; J≤7/2 from (α,pγ). (5/2⁻) (1992De08) and 5/2⁺,(7/2⁺) (1982Av05) from statistical analysis in (n,n′γ) favor J=5/2.
1284.26[i] *13*	(5/2)⁻	0.17[d] ps *+6−4*	E X	J^π: M1+E2 597γ to 3/2⁻ 687; 1254γ to 1/2⁻ 31 is not M2 from RUL; candidate for 5/2⁻ member of 2-phonon isoscalar quintet (2010Or01). However, (1/2⁺) from statistical analysis in (n,n′γ).

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Adopted Levels, Gammas (continued)

^{93}Nb Levels (continued)

E(level)[†]	J$^{\pi}$	T$_{1/2}$[‡]	XREF	Comments
1290 *12*	1/2$^-$,3/2$^-$		bc GHi L	XREF: H(1320)L(1279). Additional information 1. J$^{\pi}$: L=1 in (^{3}He,d) and (p,α).
1297.22[j] *6*	9/2$^+$	0.21 ps *3*	bcDEF i WX	J$^{\pi}$: D 318γ to 11/2$^+$ 979; D(+Q) 553γ to 7/2$^+$ 744; M1+E2 1297γ to 9/2$^+$ g.s. T$_{1/2}$: from (γ,γ'): E<2.75 MeV. Others: 0.26 ps *+8−5* from (n,n′γ), 0.21 ps *+21−7* from Coulomb excitation (DSAM).
1315.50[j] *11*	5/2$^+$	0.37[d] ps *+31−12*	c E G i N X	XREF: G(1330)i(1330). J$^{\pi}$: D+Q 572γ to 7/2$^+$ 744; M1+E2 507γ to 5/2$^+$ 809; J=5/2 from $\gamma(\theta)$ (1982Av05) in (n,n′γ). Supported by L(^{3}He,d)=(2) for E=1330 *10* level. However, π=− from excit and J^{π}=7/2$^-$ from statistical analysis by 1992De08 in (n,n′γ).
1335.04[h] *4*	17/2$^+$	<14 ns	A E M XY	J$^{\pi}$: stretched E2 385γ to 13/2$^+$ 950; J=17/2 from $\gamma(\theta)$ in (n,n′γ). configuration: $\nu(d^2_{5/2})$ $\pi(g_{9/2})$ suggested by 2007Wa45 and 2009Ho07.
1369.86 *17*	5/2$^-$	>0.55[d] ps	b E h L X	XREF: h(1320). J$^{\pi}$: L(p,α)=3; D+Q 683γ to 3/2$^-$ 687; D+Q 559γ to 5/2$^-$ 810. This is probably the L=(3) component of the L=(1+3), E=1320 *40* doublet in (d,^{3}He). However, J^{π}=(3/2$^+$) from statistical analysis in (n,n′γ).
1395.42[i] *13*	(7/2$^-$)	>0.55[d] ps	E X	J$^{\pi}$: D+Q 585γ to 5/2$^-$ 810; 708γ to 3/2$^-$ 687; candidate for 7/2$^-$ member of quintet of 2-phonon isoscalar excitations (2010Or01). However, in (n,n′γ), $\gamma(\theta)$ favors 5/2 and statistical analysis suggests (7/2$^+$).
1455.0 *8*	(1/2$^+$,3/2$^+$)[b]		E i	
1483.58[j] *7*	7/2$^{(+)}$	45.7 fs *24*	EF i l WX	XREF: i(1480). J$^{\pi}$: D+Q 1483γ to 9/2$^+$ g.s.; D+Q 675γ to 5/2$^+$ 808; π=(+) from statistical analysis in (n,n′γ). T$_{1/2}$: weighted average of 47 fs *4* from (γ,γ'): E<2.75 MeV and 45 fs *3* from (n,n′γ).
1490.99[h] *5*	15/2$^+$	<14 ns	A EF i l XY	XREF: i(1480). J$^{\pi}$: M1+E2 541γ to 13/2$^+$ 950; 156γ to 17/2$^+$ 1335; J=15/2 from $\gamma(\theta)$ in (n,n′γ); γ from 11/2$^{(+)}$. Some statistical analyses in (n,n′γ) give conflicting assignments (9/2$^+$ or 17/2$^+$). configuration: $\nu(d^2_{5/2})$ $\pi(g_{9/2})$ suggested by 2009Ho07. Other T$_{1/2}$: >0.52 ps from (n,n′γ).
1499.94[i] *6*	(9/2$^-$)	0.84 ps *22*	E i N WX	XREF: i(1480).

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Adopted Levels, Gammas (continued)

^{93}Nb Levels (continued)

E(level)[†]	Jπ	$T_{1/2}$[‡]	XREF	Comments
				Jπ: D,E2 690γ to 5/2⁻ 810, D(+Q) 1500γ to 9/2⁺ g.s., 521γ to 11/2⁺ 980 imply Jπ=(7/2⁺,9/2⁻); candidate for 9/2⁻ member of 2-phonon isoscalar-excitation quintet (2010Or01). However, J=7/2 deduced from 1500γ(θ) by 1982Av02 in (n,n′γ). $T_{1/2}$: from (γ,γ′): E<2.75 MeV. Other: >0.96 ps from DSAM in (n,n′γ).
1571.82[i] *14*	3/2⁻	0.19[d] ps *+15−7*	B E G L X	Additional information 2. Jπ: L=1 in (^{3}He,d); M1+E2 761γ to 5/2⁻ 810.
1588.06[h] *17*	3/2$^{(-)}$,5/2$^{(-)}$	>0.87[d] ps	E X	Jπ: D+Q 778γ to 5/2⁻ 810; D+Q 901γ to 3/2⁻ 687; large δ(778γ) favors π=−.
1603.24? *16*	(9/2⁻)		E	Jπ: 859γ to 7/2⁺ 744; 625γ to 11/2⁺ 979; (7/2⁻,9/2⁻) from statistical analysis in (n,n′γ). Possibly the same level as that adopted at 1603.8 keV even though Jπ from (n,n′γ) differs.
1603.44[j] *9*	11/2⁺	0.32 ps *+17−9*	E X	Jπ: D(+Q) 521γ to 9/2⁺ 1083; M1+E2 654γ to 13/2⁺ 949; D,E2 860γ to 7/2⁺ 744. J=11/2,13/2 from statistical analysis in (n,n′γ).
1665.66[h] *12*	5/2⁺	0.24[d] ps *+7−5*	b E G i l n X	XREF: i(1660). Jπ: L=2 in (^{3}He,d); M1+E2 921γ to 7/2⁺ 744.
1679.50[h] *10*	5/2$^{(+)}$,7/2	0.22[d] ps *+6−4*	b Ef i l n X	XREF: i(1660). Jπ: D+Q 364γ to 5/2⁺ 1315; D(+Q) 936γ to 7/2⁺ 744; 1680γ to 9/2⁺ g.s. However, 9/2⁺,11/2⁺ (1992De08) and (5/2,7/2) (1973Va09) from statistical analysis in (n,n′γ).
1683.36 *8*	9/2⁺	104[d] fs *+17−14*	b Ef i l n X	XREF: i(1660). Jπ: M1+E2 704γ to 11/2⁺ 979; M1+E2 939γ to 7/2⁺ 744. 9/2⁺ from 939γ and 1682γ excit in (n,n′γ); 5/2⁺ from excit for 704γ to 11/2⁺ in (n,n′γ) is disregarded by evaluator because 704γ is complex.
1686.34 *9*	13/2⁺	0.17[d] ps *+4−3*	b Ef i X	XREF: i(1660). Jπ: M1+E2 707γ to 11/2⁺ 980; D+Q 737γ to 13/2⁺ 950; D,E2 1686γ to 9/2⁺ g.s.; J=13/2 from γ(θ) in (n,n′γ).
1694.0?			E n	
1703.51[h] *16*	3/2⁺,5/2⁺	0.15[d] ps *+19−6*	E G X	XREF: G(1710). Jπ: D+Q 895γ to 5/2⁺ 809; L(^{3}He,d)=2 for E(level)=1710 *10*.
1772.96[h] *17*	(≤7/2)	87[d] fs *+14−10*	E l X	Jπ: D,E2 964γ to 5/2⁺ 809 and possible 318γ to (1/2⁺,3/2⁺) 1454 level imply Jπ=(1/2⁺,3/2,5/2,7/2⁺); (5/2⁺) favored by statistical model analysis in (n,n′γ). If Jπ=(1/2⁺) and D,E2 646γ is correctly placed, J(1127)=7/2, as proposed in (p,2nγ), is very improbable.

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Adopted Levels, Gammas (continued)

^{93}Nb Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
1779.27[#] *17*	(5/2$^-$)	73 fs *+30−19*	E l X	J^π: D(+Q) gammas to 3/2$^-$ 687 and 5/2$^-$ 810 so J=3/2,5/2; (5/2$^-$) favored by statistical model analysis in (n,n′γ); large B(M1)(W.u.) and small B(E2)(W.u.) for 969γ to 5/2$^-$ one-phonon 810 level support proposed structure. $T_{1/2}$: from DSAM in (n,n′γ).
1784.40 *25*	(5/2$^+$)[b]		E l	
1812.34 *21*	(19/2)	104[d] fs *+35−24*	E X	J^π: 477γ to 17/2$^+$; (19/2$^-$) from statistical analysis in (n,n′γ). (19/2$^+$) proposed in (p,2nγ), but justification is unclear.
1840.07[#] *17*	3/2$^-$,5/2$^-$	71 fs *+24−17*	E X	J^π: M1+E2 1153γ to 3/2$^-$ 687; D+Q 1030γ to 5/2$^-$ 810. Large B(M1)(W.u.) for 1153γ to the 3/2$^-$ 687 one-phonon state along with level′s proximity to the 5/2$^-$ 1780 mixed-symmetry level may favor a J=3/2 assignment (2006Or09).
1908.1 *11*	(5/2)		c E	J^π: 5/2$^-$ from statistical analysis in (n,n′γ), but 1908γ to 9/2$^+$ g.s. favors π=+.
1910.68[g] *7*	7/2$^+$,9/2$^+$,11/2$^+$	162 fs *13*	c E WX	J^π: M1+E2 1911γ to 9/2$^+$ g.s. From statistical analysis in (n,n′γ), J^π=(7/2$^+$,9/2$^+$) (1992De08), 7/2$^+$ (1982Av05). $T_{1/2}$: weighted average of 168 fs *14* from (γ,γ′): E<2.75 MeV and 139 fs *+28−21* from (n,n′γ).
1915.92[g] *10*	7/2	62[d] fs *7*	E X	J^π: D+Q 600γ to 5/2$^+$ 1315; D(+Q) 833γ to 9/2$^+$ 1083. However, (9/2$^-$) from statistical analysis in (n,n′γ).
1947.73 *22*	3/2,5/2,7/2	0.16[d] ps *+9−5*	c E n X	J^π: D(+Q) 1138γ to 5/2$^-$ 810. Statistical analysis in (n,n′γ) favors (3/2$^+$,5/2$^+$) (1992De08), but 2010Or01 in (p,2nγ) suggest 7/2$^{(-)}$.
1949.72[ch] *10*	(7/2$^+$)	0.5[d] ps *+11−2*	c E n X	J^π: D+Q 1141γ to 5/2$^+$ 808; 971γ to 11/2$^+$ 980. However, 9/2$^+$ (1992De08) from statistical analysis in (n,n′γ).
1949.81[c] *13*	(11/2)	0.6[d] ps *+26−3*	EF n X	J^π: 1950γ to 9/2$^+$ g.s. and 346γ to 11/2$^+$ 1604 in (p,2nγ) favor J^π=(7/2$^+$,9/2,11/2,13/2$^+$); J=11/2 for E=1951 *3* level from γ(θ) for D 4514γ from 11/2$^{(+)}$ in (γ,γ′) E=6465 keV. However, (5/2$^-$) (1992De08) from statistical analysis (poor fit) in (n,n′γ).
1968.27[c] *17*	(13/2$^-$)		E WX	J^π: 477γ to 15/2$^+$ 1491, 365γ to 11/2$^+$ 1603 imply J^π=(11/2$^+$,13/2,15/2$^+$); (11/2$^-$,13/2$^-$) from statistical analysis in (n,n′γ).
1968.87[ch] *5*	11/2$^+$	111 fs *19*	E n WX	J^π: M1+E2 1019γ to 13/2$^+$ 949; ΔJ≤2

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Adopted Levels, Gammas (continued)

^{93}Nb Levels (continued)

E(level)†	J$^\pi$	$T_{1/2}$‡	XREF	Comments
				1225γ to 7/2$^+$ 743. However, (11/2$^-$,13/2$^-$) from statistical analysis in (n,n′γ). $T_{1/2}$: from (γ,γ′): E<2.75 MeV. Other: 111 fs +*24*−*21* from (n,n′γ).
1997.12 *17*	3/2$^-$,5/2$^-$	64[d] fs +*15*−*12*	E X	J$^\pi$: M1+E2 1187γ to 5/2$^-$ 810; D+Q 1310γ to 3/2$^-$ 687;
2002.52[h] *10*	(11/2$^+$)	>0.55[d] ps	B E X	J$^\pi$: (M1+E2) 1053γ to 13/2$^+$ 949; 502γ to 9/2$^-$. However, J=15/2 (1982Av05) from γ(θ) in (n,n′γ), and statistical analyses in (n,n′γ) give 9/2$^-$ or 17/2.
2012.41 *18*	(≤5/2)$^-$	21 fs +*20*−*8*	X	J$^\pi$: M1+E2 1326γ to 3/2$^-$ 687. $T_{1/2}$: from DSAM in (n,n′γ) (2005Mc13).
2019.7 *4*	(7/2$^-$,9/2$^-$)[b]		E	
2023.91[h] *18*	(≤5/2)$^-$	54[d] fs +*28*−*17*	X	J$^\pi$: M1+E2 1337γ to 3/2$^-$ 687.
2037.2 *3*	(9/2$^+$,11/2$^+$)		E	J$^\pi$: 1087γ to 13/2$^+$ 950; 537γ to (9/2$^-$) 1500; (9/2$^+$,11/2$^+$) (1992De08) from statistical analysis in (n,n′γ).
2099.23 *17*	(3/2$^-$,5/2,7/2)	92[d] fs +*43*−*25*	E l X	J$^\pi$: D(+Q) 1289γ to 5/2$^-$ 811; 704γ to (7/2$^-$) 1396. However, J$^\pi$=(3/2$^+$) from statistical analysis in (n,n′γ).
2122.67[h] *6*	9/2$^+$	97 fs *16*	E WX	J$^\pi$: M1+E2 1379γ to 7/2$^+$ 744; M1+E2 1144γ to 11/2$^+$ 979. $T_{1/2}$: weighted average of 113 fs *21* from (γ,γ′): E<2.75 MeV and 80 fs +*21*−*14* from (n,n′γ) (2007Or01).
2126.89 *12*	(5/2$^-$,7/2,9/2$^-$)	0.16[d] ps +*12*−*8*	E X	J$^\pi$: 627γ to (9/2$^-$) 1500; 1317γ to 5/2$^-$ 811.
2132.6 *5*	(≥7/2)		b E l	J$^\pi$: 1154γ to 11/2$^+$ 980. (5/2$^+$,7/2$^+$) from excit in (n,n′γ), but based on only two data points so may not be reliable.
2153.60 *20*	(1/2,3/2,5/2$^-$)[b]	80[d] fs +*19*−*14*	b E X	J$^\pi$: 2123γ to 1/2- 31-keV level. (3/2$^+$) from statistical analysis in (n,n′γ).
2162.64[h] *12*	(11/2$^+$,13/2,15/2$^+$)	0.28[d] ps +*21*−*9*	b E n X	J$^\pi$: 1184γ to 11/2$^+$ 980; 672γ to 15/2$^+$ 1491. However, J$^\pi$=(9/2$^+$) from statistical analysis (1992De08) and (17/2$^+$) from excit (1973Va09) in (n,n′γ).
2170.65[h] *10*	9/2$^+$	0.24[d] ps +*11*−*6*	b E X	J$^\pi$: D,E2 1361γ to 5/2$^+$ 809; D,E2 1222γ to 13/2$^+$ 950. However, J$^\pi$=(13/2$^+$) from statistical analysis (1992De08) and (15/2$^+$) from excit in (n,n′γ).
2180 *10*	3/2$^+$,5/2$^+$		G n	J$^\pi$: L=2 in (^{3}He,d).
2180.04 *5*	(17/2)$^-$		A Y	J$^\pi$: E1 689γ to 15/2$^+$ 1491; 573γ from (19/2$^+$) 2753; consistent with log $f^{1u}t$>8.5 from 21/2$^+$. However,

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Adopted Levels, Gammas (continued)

^{93}Nb Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
				statistical analysis of a 689γ, whose second placement in (n,n′γ) is from a 2180 level, indicates J^π=(7/2$^+$); if correct, a separate level must exist at approximately this energy, but evaluator does not adopt it for lack of supporting evidence. configuration: $\nu(g_{9/2})^2\ \pi(p_{1/2})^{-1}$ suggested by 2007Wa45 and 2009Ho07.
2184.14 *21*		76[d] ps *+31−21*	E X	J^π: 849γ to 17/2$^+$ 1335 so J=(13/2 to 21/2). J^π=19/2$^+$ is proposed in (p,2nγ).
2203.5 *3*	(9/2$^+$)		E	J^π: 600γ to 11/2$^+$ 1603, 808γ to (7/2$^-$) 1395 imply J^π=(7/2$^+$,9/2,11/2$^-$); (9/2$^+$) from statistical analysis in (n,n′γ).
2250			C	
2280.7 *7*	(7/2$^-$)[b]		C E	
2310.9 *9*			Y	J^π: 976γ to 17/2$^+$ 1335.
2320 *10*	3/2$^+$,5/2$^+$		b G	J^π: L=2 in (^{3}He,d).
2330.0 *5*			b E	J^π: 1351γ to 11/2$^+$ 980.
2367.5 *10*	9/2,13/2$^{(+)}$		Bc EF	J^π: 9/2, 13/2 from 4095$\gamma(\theta)$ from 11/2$^{(+)}$ 6465 in (γ,γ′) E=6465 keV; 2367γ to 9/2$^+$ g.s.
2506.88 *8*		66 fs *+21−14*	WX	J^π: 2507γ to 9/2$^+$ g.s., 1528γ to 11/2$^+$ 979, so J^π=(7/2$^+$,9/2,11/2,13/2$^+$). 9/2$^+$ proposed in (p,2nγ) but justification is unclear. $T_{1/2}$: from DSAM in (n,n′γ).
2520 *10*	(1/2$^+$)		Bc G N	Additional information 3. J^π: L=(0) in (^{3}He,d).
2584.2 *7*	3/2$^+$,5/2$^+$		Bc E G	J^π: L=2 in (^{3}He,d).
2752.84 *5*	(19/2)$^+$		A	J^π: log *ft*=5.0 from 21/2$^+$ 2833; 1262γ to 15/2$^+$ 1491; 1418γ to 17/2$^+$ 1335. configuration: $\nu(d_{5/2})(g_{7/2})\ \pi(g_{9/2})$ suggested by 2009Ho07.
2832.8 *9*	21/2$^+$		M Y	J^π: stretched E2 1498γ to 17/2$^+$ 1335. configuration: $\nu(d_{5/2})(g_{7/2})\ \pi(g_{9/2})$ suggested by 2007Wa45.
2838 *4*	11/2		Bc F N	XREF: B(2810). J^π: from 3626$\gamma(\theta)$ in (γ,γ′) E=6465 keV.
2980 *20*			Bc	
3086.0 *10*	(21/2)[f]		Y	J^π: stretched Q 906γ to (17/2)$^-$ 2180. configuration: $\nu(d_{5/2})^2\ \pi(g_{9/2})^2(p_{1/2})_1$ suggested by 2007Wa45.
3150 *20*			BC	XREF: C(3050).
3512 *17*			B I	Additional information 4.
3667.8 *13*			Y	J^π: 835γ to 21/2$^+$ 2833.
3674.0 *15*	(25/2)[f]		Y	J^π: 588γ to (21/2) 3086. configuration: $\nu(d_{5/2})^2\ \pi(g_{9/2})^2(p_{1/2})_1$ suggested by 2007Wa45.
3684.8 *12*			Y	J^π: 852γ to 21/2$^+$ 2833.
3720 *30*			B	
3840 *17*			B I	Additional information 5.
3930 *30*			I	
4060 *30*			I	
4104.7 *12*	25/2$^{(+)}$		M Y	J^π: stretched Q 1272γ to 21/2$^+$ 2833. configuration: $\nu(d_{5/2})^2\ \pi(g_{9/2})^3$ suggested by 2007Wa45.
4224 *17*			B I	Additional information 6.

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Adopted Levels, Gammas (continued)

^{93}Nb Levels (continued)

E(level)[†]	J$^{\pi}$	T$_{1/2}$[‡]	XREF	Comments
4340 *20*			B	
4403.0 *18*	(29/2)[f]		Y	J$^{\pi}$: 729γ to (25/2) 3674. configuration: $\nu(d_{5/2})(g_{7/2})$ $\pi(g_{9/2})(p_{1/2})^{-1}$ suggested by 2007Wa45.
4460 *20*			B	
4548 *17*			B I	Additional information 7.
4650? *20*			B	
4700 *30*			B	
4810 *30*			B	
4864.6 *16*	29/2$^{(+)}$		M Y	E(level): alternative E=5144 if order of 1040γ and 760γ is reversed as suggested by authors in (^{16}O,p2nγ). J$^{\pi}$: stretched E2 760γ to 25/2$^{(+)}$ 4105. configuration: $\nu(d_{5/2})^2$ $\pi(g_{9/2})^3$ suggested by 2007Wa45.
5000 *30*			B	
5155.1 *18*			Y	J$^{\pi}$: 1481γ to (25/2) 3674.
5340 *40*			B	
5490 *40*			B	
5904.3 *19*	33/2$^{(+)}$		M Y	J$^{\pi}$: stretched E2 1040γ to 29/2$^{(+)}$ 4865. configuration: $\nu(d_{5/2})(g_{7/2})$ $\pi(g_{9/2})^3$ suggested by 2007Wa45.
6464.3 *10*	11/2$^{(+)}$		F	Γ_{γ}=0.038 eV *17* J$^{\pi}$: D (probably M1) 6465γ to 9/2$^+$ g.s.; D 5516γ to 13/2$^+$ 950. Γ_{γ}: from (γ,γ') E=6465 keV.
7372.3 *21*	(35/2$^-$)[f]		Y	J$^{\pi}$: D+Q 1468γ to 33/2$^{(+)}$ 5905.
7435.3[e] *21*	37/2$^{(-)}$[f]		Y	J$^{\pi}$: Q 1531γ to 33/2$^{(+)}$ 5905; stretch-coupled configuration of $\nu(d_{5/2})(h_{11/2})$ $\pi(g_{9/2})^3$ suggested by 2007Wa45, and their deformed independent particle model calculations predict β=−0.14.
7828.3[e] *23*	39/2$^{(-)}$[f]		Y	J$^{\pi}$: M1 393γ to 37/2$^{(-)}$ 7436.
8325.4[e] *25*	41/2$^{(-)}$[f]		Y	J$^{\pi}$: D 497γ to 39/2$^{(-)}$ 7829; π from band assignment.
8377.4 *21*	(37/2)[f]		Y	J$^{\pi}$: D+Q 942γ to 37/2$^{(-)}$ 7436; D 1005γ to (35/2$^-$) 7373.
8940[e] *3*	(43/2$^-$)[f]		Y	J$^{\pi}$: M1 615γ to 41/2$^{(-)}$ 8326.
9134.4 *22*	(41/2$^-$)[f]		Y	J$^{\pi}$: (E2) 1699γ to 37/2$^{(-)}$ 7435.
9425 *3*	(45/2$^+$)[f]		Y	J$^{\pi}$: E1 485γ to (43/2$^-$) 8940.
9699.4 *22*	(39/2$^-$,41/2$^-$)		Y	J$^{\pi}$: 223γ from (43/2$^-$) 9922; 2264γ to 37/2$^{(-)}$ 7435.
9782.4? *23*			Y	J$^{\pi}$: 1405γ to (37/2) 8377.
9922.4 *23*	(43/2$^-$)[f]		Y	J$^{\pi}$: M1 788γ to (41/2$^-$) 9134.
10955.4 *25*			Y	J$^{\pi}$: 1033γ to (43/2$^-$) 9923.
7435.3+x		1.5 μs *5*	Y	T$_{1/2}$: from delayed coin in (^{16}O,p4nγ); interpreted by 2007Wa45 as a high-spin shape isomer.
11059	5/2$^+$	13[&] keV *5*	G K	Γ_{p0}=4 keV *2*. E(level): from Zr(p,p). Other: 11020 *40* from (^{3}He,t).

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Adopted Levels, Gammas (continued)

^{93}Nb Levels (continued)

E(level)[†]	J^π	$T_{1/2}$[‡]	XREF	Comments
				Γ_{p0}=4 keV *2*. E(level): from Zr(p,p). Other: 11020 *40* from (^{3}He,t). E(level): isobaric analog of ^{93}Zr g.s. J^π: analyzing power in ^{92}Zr(pol p,p); L(^{3}He,d)=2.
11981 *5*	1/2$^+$	90[&] keV *9*	K TU	E(level): isobaric analog of ^{93}Zr(947 level). J^π: L=0 from interference pattern in excitation functions in ^{92}Zr(p,p).
≈12171		24 keV	U	Analog of possible ^{93}Zr(1169 level) (1972Ri04).
12503	3/2$^+$[a]	38[&] keV *3*	G K	Γ_{p0}=8.0 keV *8*. J^π: L(^{3}He,d)=2. E(level): from Zr(p,p). Other: 12470 *40* from (^{3}He,t). E(level): possible analog of ^{93}Zr 1450 or 1425 level.
12570 *40*	7/2$^+$,9/2$^+$		G	E(level): possible analog of ^{93}Zr(1598 level). J^π: L=4 in (^{3}He,d).
12993	1/2$^+$	42[&] keV *3*	K	Γ_{p0}=10 keV *1*. J^π: L=0 from interference pattern in excitation functions in (p,p). E(level): possible analog of ^{93}Zr 1910 or 1918 level.
13090 *40*	9/2$^-$,11/2$^-$		G	E(level): possible analog of ^{93}Zr(2025 level). J^π: L=5 in (^{3}He,d).
13542		68[&] keV *5*	K	E(level): possible analog of ^{93}Zr 2458 or 2474 level.
13581	3/2$^+$[a]	45[&] keV *5*	K	E(level): possible analog of ^{93}Zr 2531 or 2548 level.
13839	3/2$^+$[a]	63[&] keV *3*	K	Γ_{p0}=14.0 keV *14*. E(level): possible analog of ^{93}Zr(2770 level).
14091		30[&] keV *3*	K	E(level): possible analog of ^{93}Zr(3077 level).
14363	5/2$^+$[a]	51[&] keV *5*	K	Γ_{p0}≤2.0 keV. E(level): possible analog of ^{93}Zr(3391 level). J^π: L=2 from interference pattern in excitation functions in (p,p).
14477	7/2$^-$	43[&] keV *7*	K	Γ_{p0}=2.0 keV *3*. E(level): possible analog of ^{93}Zr(3421 level). J^π: from L and analyzing power in Zr(p,p), (pol p,p).
16400 *50*	$^-$	5.05 MeV	O	GDR. Γ from (γ,xn).

† From least-squares fit to adopted Eγ, assigning 1 keV uncertainty to Eγ data for which the authors did not assign an uncertainty.
‡ From Coulomb excitation, if not indicated otherwise.
\# Band(A): π=− mixed symmetry states. Interpreted in (p,2nγ) as mixed-symmetry state associated with (π 2p$_{1/2}$)⊗(first 2$^+$ in ^{94}Mo). The assignment is based on M1 and E2 transition strengths to 687 and 811 states (interpreted as symmetric one-phonon states), energy systematics, J^π and comparison with shell-model calculations (2006Or09).
@ Interpreted in (p,2nγ) as symmetric one-phonon state with configuration of (π $p^{-1}_{1/2}$)⊗(first 2$^+$ state in ^{94}Mo) (2006Or09).
& From Zr(p,p′), (pol p,p) IAR.
a From partial wave analysis of analyzing power in ^{92}Zr(pol p,p) IAR.

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Adopted Levels, Gammas (continued)

^{93}Nb Levels (continued)

[b] From statistical analysis in (n,n′γ).

[c] Two levels at essentially the same energy are proposed in (n,n′γ) near 1950 keV and 1968 keV because, in each case, the authors were unable to fit experimental data for all the attributed γ rays (based on γγ coin) by means of a statistical theory excitation function for a single level.

[d] From DSAM in (n,n′γ).

[e] Band(B): K=37/2 oblate M1 band? Possible M1 band. β=−0.14 is calculated using independent particle model for the $\nu(d_{5/2})(h_{11/2})\ \pi(g_{9/2})^3$ configuration suggested by 2007Wa45. No cross-over transitions observed; possibly they are suppressed as a result of the high K.

[f] Based on value suggested in (^{16}O,p4nγ) but, in some cases, the evaluator shows the resulting J^{π} values in parentheses here.

[g] Isovector excitation is proposed by 2010Or01 for this state in (p,2nγ).

[h] Isoscalar excitation is proposed by 2010Or01 for this state in (p,2nγ).

[i] Band(C): π=− 2-phonon IS states. Interpreted by 2010Or01 as 2-phonon isoscalar excitations, expected based on particle-core weak-coupling model.

[j] Band(D): π=+ 1−phonon IV states. π=+ first−order isovector excitations. Large B(M1) to isoscalar states.

[k] Band(E): π $1g_{9/2}\otimes(2^+,^{92}$Zr). First-order isoscalar π=+ excitations, forming a J=5/2 through 13/2 quintet of states. Shell−model calculations indicate strongly collective E2 transition rates to $9/2^+$ g.s. with predominantly isoscalar character.

$\gamma(^{93}Nb)$

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	δ‡	α[e]	Comments
30.77	1/2⁻	30.77 *2*	100	0.0	9/2⁺	M4		1.693×10^5	B(M4)(W.u.)=11.49 *20* E_γ: from IT decay. Mult.: from α(K)exp and subshell ratios in IT decay.
686.79	3/2⁻	655.9[&] *2*	100[&]	30.77	1/2⁻	(M1+E2)	−0.13 *+9−14*	0.00187	B(M1)(W.u.)=0.27 *+14−27*; B(E2)(W.u.)=11 *+16−11* Mult.: D+Q from (α,pγ); $\Delta\pi$=no from level scheme. δ: from (α,pγ).
743.95	7/2⁺	744.06 *12*	100	0.0	9/2⁺	M1+E2	+0.236 *18*	1.41×10^{-3}	B(M1)(W.u.)=0.099 *8*; B(E2)(W.u.)=10.2 *17* B(E2)(W.u.)=8.74 *25* from measured B(E2)↑=0.0175 *5* in Coulomb excitation. E_γ: weighted average of 743.82 *17* from (n,n′γ), 743.92 *16* from from Coulomb excitation and 744.2 *1* from (p,2nγ). Mult.: from $\gamma(\theta)$ in Coulomb excitation and RUL. δ: abs(δ) from Coul. ex.; sign from δ=+0.25 *+9−6* from (α,pγ), +0.25 *+13−11* from (n,n′γ), +0.30 *+10−8* and +0.21 *4* from $\gamma(\theta)$ in Coulomb excitation, +0.26 *8* from (p,2nγ).
808.82	5/2⁺	64.88 *18*	1.25 *8*	743.95	7/2⁺	(M1)		0.767 *13*	B(M1)(W.u.)=0.160 *12* E_γ: weighted average of 65.0 *2* from (p,2nγ) and 64.6 *3* from Coulomb excitation. I_γ: from Coulomb excitation. Other: <1.0 from (p,2nγ). Mult.: D from RUL; $\Delta\pi$=no from level scheme.
		808.53 *12*	100.00 *8*	0.0	9/2⁺	E2		1.20×10^{-3}	B(E2)(W.u.)=10.4 *4* B(E2)(W.u.) from measured B(E2)↑=0.0157 *5*. E_γ: weighted average of 808.42 *22* from (n,n′γ) and 808.58 *15* from Coulomb excitation. I_γ: from Coulomb excitation. Mult.: Q from (^{16}O,p2nγ); not M2 from RUL. δ(Q,O)=−0.03 *+6−8* from (α,pγ).
810.32	5/2⁻	123.3[&] *2*	<1[&]	686.79	3/2⁻				
		779.53 *22*	100	30.77	1/2⁻	(E2)		1.31×10^{-3}	B(E2)(W.u.)<78 Mult.=Q, δ(Q,O)=−0.15 *20* from (α,pγ); adopted $\Delta\pi$=no.
949.80	13/2⁺	949.81 *3*	100	0.0	9/2⁺	E2		8.12×10^{-4}	B(E2)(W.u.)=6.70 *23* B(E2)(W.u.) from measured B(E2)↑=0.0241 *8*. E_γ: from ε decay (6.85 h). Mult.: Q from (^{16}O,p2nγ); not M2 from RUL. δ(Q,O)=−0.18 *18* from (α,pγ).
978.91	11/2⁺	978.94 *14*	100	0.0	9/2⁺	M1+E2	−0.255 *8*	7.69×10^{-4}	B(M1)(W.u.)=0.085 *6*; B(E2)(W.u.)=5.96 *20*

$^{93}_{41}Nb_{52}$-11

Adopted Levels, Gammas (continued)

$\gamma(^{93}Nb)$ (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α[e]	Comments
									B(E2)(W.u.) from measured B(E2)↑=0.0179 *6*. E_γ: weighted average of 978.83 *22* from (n,n′γ) and 979.01 *18* from Coulomb excitation. Other Eγ: 979.3 *1* from (p,2nγ). Mult.: D+Q from γ(θ) in Coulomb excitation; not E1+M2 from RUL. δ: from $T_{1/2}$ and B(E2), sign from γ(θ) in Coulomb excitation and γγ(θ) in (p,2nγ). Other δ: −0.40 *+18−47* from (n,n′γ); −0.251 *11*, abs(δ)<0.5 and δ=−0.4 *3* or +2.1 *3* from γ(θ) in Coulomb excitation; −0.27 *+9−13* from (α,pγ); −0.13 *7* from γγ(θ) in (p,2nγ).
1082.68	9/2$^+$	103.80 *11*	9 *3*	978.91	11/2$^+$				E_γ: weighted average of 103.7 *2* from (p,2nγ), 103.94 *15* from (n,n′γ) and 103.5 *3* from Coulomb excitation. I_γ: unweighted average of 10.9 *9* from Coulomb excitation, 3 *2* from (p,2nγ) and 14.4 *24* from (n,n′γ). The weighted average from (n,n′γ) and Coulomb excitation is 10.1 *22*.
		338.73 *7*	100.0 *17*	743.95	7/2$^+$	(E2+M1)	−0.09 *2*	0.00911 *16*	B(M1)(W.u.)<0.14; B(E2)(W.u.)<14 E_γ: weighted average of 338.67 *17* from (n,n′γ), 338.77 *9* from Coulomb excitation and 338.6 *2* from (p,2nγ). I_γ: weighted average from (p,2nγ) and Coulomb excitation. Mult.: D+Q from (p,2nγ); Δπ=no from level scheme. δ: from (p,2nγ). Other δ: −0.12 *+7−9* from (α,pγ), 0.00 *16* from (n,n′γ), −0.14 *7* and +0.13 *11* from Coulomb excitation.
		1082.53 *15*	35 *3*	0.0	9/2$^+$	M1+E2	>1.8	6.08×10^{-4}	B(M1)(W.u.)<0.00035; B(E2)(W.u.)=1.03 *9* B(E2)(W.u.) from measured B(E2)↑=0.00257 *23*. E_γ: weighted average of 1082.3 *3* from (n,n′γ), 1082.6 *3* from Coulomb excitation and 1082.6 *2* from (p,2nγ). I_γ: unweighted average of 29 *4*, 30.9 *15* and 40.0 *23* from Coulomb excitation, 38 *2* from (p,2nγ). Others: 51.5 *15*, 37, 33, and 18 *6* from (n,n′γ). The weighted average of all data is 39 *4*. Mult.: D(+Q) from (n,n′γ); not E1+M2 from RUL. δ: >1.8 from B(E2)↑=0.00257 *23* in Coulomb excitation and adopted γ properties if $T_{1/2}$>2.8 ps. Other δ: −0.4 to +1.8 from (n,n′γ); −2.47 from γ(θ) in Coulomb excitation (2002Ka05), but uncertainty is unstated and the sign is inconsistent with δ from (n,n′γ).

γ(^{93}Nb) (continued)

E_i(level)	J^π_i	E_γ †	I_γ †	E_f	J^π_f	Mult. ‡	δ ‡	α e	Comments
1127.09	3/2,5/2,7/2	318.3 *2*	100	808.82	5/2$^+$	D+Q	−0.20 *6*	0.01053	E_γ: from (p,2nγ). 318.27 *17* from (n,n′γ) for triplet, 318.16 *20* from Coulomb excitation for doublet. Mult.,δ: from (p,2nγ).
1284.26	(5/2)$^-$	473.9& *2*	5& *4*	810.32	5/2$^-$				
		597.3b *2*	25b *4*	686.79	3/2$^-$	M1+E2	+0.14b *4*		B(M1)(W.u.)=0.11 *+4−5*; B(E2)(W.u.)=6 *+4−5* Mult.: D+Q from $\gamma\gamma(\theta)$ in (p,2nγ); $\Delta\pi$=no from RUL.
		1253.5& *2*	100& *4*	30.77	1/2$^-$				Mult.: not M2 from RUL.
1297.22	9/2$^+$	318.3 *1*	44 *8*	978.91	11/2$^+$	(M1)		0.01053	B(M1)(W.u.)=0.73 *18* E_γ: from (p,2nγ). 318.27 *17* from (n,n′γ) for triplet, 318.16 *20* from Coulomb excitation for doublet. I_γ: unweighted average of 32.1 *19* and 61 *3* from Coulomb excitation, 53 *2* from (n,n′γ), 31 *5* from (p,2nγ). The weighted average is 44 *7*. Mult.: D(+Q) from (n,n′γ) and Coulomb excitation; adopted $\Delta\pi$=no. δ(D,Q)=−0.04 *9* or −10 *+5−80* from (n,n′γ), >+0.07 from Coulomb excitation.
		553.10 *9*	52.2 *20*	743.95	7/2$^+$	(M1(+E2))	+0.02 *3*	0.00282 *24*	B(M1)(W.u.)=0.16 *3*; B(E2)(W.u.)=0.2 *+7−2* E_γ: weighted average of 553.07 *25* from (n,n′γ), 553.3 *4* from Coulomb excitation and 553.1 *1* from (p,2nγ). I_γ: weighted average of 49 *4* and 57 *6* from Coulomb excitation, 51 *2* from (n,n′γ), 61 *5* from (p,2nγ). Mult.: D(+Q) from (n,n′γ); adopted $\Delta\pi$=no. δ: from $\gamma\gamma(\theta)$ in (p,2nγ). Other δ: −0.3 *+3−7* from (n,n′γ), −0.03 *5* from (p,2nγ).
		1297.38 *9*	100.0 *25*	0.0	9/2$^+$	M1+E2	+0.355 *25*	4.45×10^{-4}	B(E2)(W.u.)=1.52 *10*; B(M1)(W.u.)=0.022 *4* B(E2)(W.u.) from measured B(E2)↑=0.00381 *24*. E_γ: weighted average of 1297.2 *4* from (n,n′γ), 1297.3 *3* from Coulomb excitation and 1297.4 *1* from (p,2nγ). I_γ: weighted average of 100 *6* and 100 *6* from Coulomb excitation, 100 *4* from (n,n′γ), 100 *5* from (p,2nγ). Mult.: D+Q from (p,2nγ); not E1+M2 from RUL. δ: 0.355 *25* from B(E2)↑=0.00381 *24* in

$^{93}_{41}Nb_{52}$-13

Adopted Levels, Gammas (continued)

$\gamma(^{93}Nb)$ (continued)

E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f	Mult.‡	δ‡	α[e]	Comments
									Coulomb excitation and adopted branching and $T_{1/2}$; sign from δ=+0.31 *9* from $\gamma\gamma(\theta)$ in (p,2nγ). Other: 0.33 *+17−6* from Coulomb excitation.
1315.50	5/2+	506.7 *2*	23.5 *12*	808.82	5/2+	M1+E2	−1.4 *8*		B(M1)(W.u.)=0.029 *+25−29*; B(E2)(W.u.)=2.3×10^2 *+12−22* E_γ,δ: from (p,2nγ). Mult.: D+Q from $\gamma\gamma(\theta)$ in (p,2nγ); $\Delta\pi$=no from RUL.
		571.5 *2*	100.0 *25*	743.95	7/2+	M1+E2	+0.14 *4*		B(M1)(W.u.)=0.25 *+9−22*; B(E2)(W.u.)=16 *+11−16* E_γ,δ: from (p,2nγ). Other δ: +0.10 *+18−15* from $\gamma(\theta)$ in (n,n′γ) if J(1315)=5/2. Mult.: D+Q from (p,2nγ); $\Delta\pi$=(no) from level scheme.
1335.04	17/2+	385.224 *23*	100	949.80	13/2+	E2		0.01002	B(E2)(W.u.)>0.19 E_γ: weighted average of 385.22 *2*, 385.38 *9* from ε decay (6.85 h), 385.07 *17* from (n,n′γ) and 385.1 *2* from (p,2nγ). Mult.: Q from (^{16}O,p2nγ); not M2 from RUL.
1369.86	5/2−	559.4[b] *2*	100[b] *4*	810.32	5/2−	D+Q	−0.32[b] *7*		
		683.2[b] *2*	30[b] *4*	686.79	3/2−	D+Q	−0.34[b] *5*		
		1338.9	14	30.77	1/2−				
1395.42	(7/2−)	584.97 *22*	100 *4*	810.32	5/2−	D+Q	−0.10 *2*		Other Eγ: 585.1 *2* from (p,2nγ). I_γ: from (p,2nγ). Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ) and $\gamma\gamma(\theta)$ in (p,2nγ). δ: from $\gamma\gamma(\theta)$ in (p,2nγ). Other δ: −0.55 *+17−25* from $\gamma(\theta)$ in (n,n′γ), but that assumes J(1395 level)=5/2.
		708.6[&] *2*	9[&] *4*	686.79	3/2−	[E2]			B(E2)(W.u.)<19 I_γ: from (p,2nγ). However, values of 54 and 43 are reported in (n,n′γ).
1455.0	(1/2+,3/2+)	646.2 *8*	100	808.82	5/2+				
1483.58	7/2(+)	400.8[&] *1*	8.2[&] *18*	1082.68	9/2+				I_γ: weighted average of 7 *2* from (p,2nγ) and 11 *3* from (n,n′γ).
		674.8 *1*	24.4 *15*	808.82	5/2+	(M1+E2)	−0.11 *8*		B(M1)(W.u.)=0.285 *25*; B(E2)(W.u.)=8 *+12−8* E_γ: from (p,2nγ). I_γ: weighted average of 23.5 *12* from (n,n′γ) and 27 *2* from (p,2nγ). Mult.,δ: D+Q from $\gamma\gamma(\theta)$ in (p,2nγ), $\Delta\pi$=(no) from level scheme.
		1483.46 *16*	100.0 *16*	0.0	9/2+	(M1+E2)	−0.13 *7*		B(M1)(W.u.)=0.109 *7*; B(E2)(W.u.)=0.9 *+10−9* E_γ: weighted average of 1482.8 *4* from (n,n′γ) and 1483.5 *1* from (p,2nγ). Other: 1483.8 *2* from 2010Or01

$^{93}_{41}Nb_{52}$-14

γ(^{93}Nb) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	δ[‡]	α[e]	Comments
									in (p,2nγ). I_γ: weighted average from (n,n′γ) and (p,2nγ). Mult.,δ: D+Q from γγ(θ) in (p,2nγ), Δπ=(no) from level scheme.
1490.99	15/2$^+$	155.94 *3*	22 *5*	1335.04	17/2$^+$	[M1,E2]		0.15 *9*	E_γ: from ε decay (6.85 h). I_γ: average of 22.3 *20* from ε decay (6.85 h), 30.2 *21* from ^{82}Se(^{16}O,p4nγ) and 14 *2* from (p,2nγ).
		541.29 *7*	100.0 *16*	949.80	13/2$^+$	M1+E2	−0.104 *17*		B(M1)(W.u.)>7.8×10^{-6}; B(E2)(W.u.)>0.00020 E_γ,I_γ: from ε decay (6.85 h). Mult.: D+Q from (p,2nγ); M1 from ^{82}Se(^{16}O,p4nγ). δ: weighted average of −0.09 *3* from (n,n′γ) and −0.11 *2* from (p,2nγ).
1499.94	(9/2$^-$)	520.9[&] *1*	2[&] *2*	978.91	11/2$^+$	[E1]			B(E1)(W.u.)=4.E−5 *+5−4* E_γ,I_γ: from (p,2nγ).
		689.6[&] *1*	18[&] *3*	810.32	5/2$^-$	[E2]			B(E2)(W.u.)=24 *8* E_γ,I_γ: from (p,2nγ). Eγ=689.1 *5* for doubly-placed γ and Iγ=11 from suitably divided intensity in (n,n′γ). Mult.: not M2 from RUL.
		756.1 *1*	6.9 *10*	743.95	7/2$^+$	[E1]			B(E1)(W.u.)=4.9×10^{-5} *15* E_γ: from (p,2nγ). I_γ: weighted average of 8 *2* from (p,nγ) and 6.5 *12* from (n,n′γ).
		1499.9[&] *1*	100[&] *2*	0.0	9/2$^+$	(E1(+M2))	−0.02 *16*		B(E1)(W.u.)=9.2×10^{-5} *25*; B(M2)(W.u.)=0.07 *+120−7* Mult.: D(+Q) from γ(θ) in (n,n′γ); Δπ=yes from level scheme. δ: from (n,n′γ).
1571.82	3/2$^-$	287.4[&] *2*	20[&] *5*	1284.26	(5/2)$^-$				
		761.4[b] *2*	100[b] *5*	810.32	5/2$^-$	M1+E2	−0.28[b] *3*		B(M1)(W.u.)=0.16 *+6−13*; B(E2)(W.u.)=22 *+10−18* Mult.: D+Q from (p,2nγ); not E1+M2 from RUL.
		885.1[b] *2*	37[b] *5*	686.79	3/2$^-$	M1+E2	−1.60[b] *14*		B(M1)(W.u.)=0.011 *+5−9*; B(E2)(W.u.)=37 *+15−30* Mult.: D+Q from (p,2nγ); not E1+M2 from RUL.
1588.06	3/2$^{(-)}$,5/2$^{(-)}$	777.8[b] *2*	18[b] *8*	810.32	5/2$^-$	(M1+E2)	−4.0[b] *+13−35*		B(M1)(W.u.)<0.00078; B(E2)(W.u.)<14 Mult.: D+Q from γγ(θ) in (p,2nγ); large δ favors Δπ=no.
		901.2[b] *2*	100[b] *8*	686.79	3/2$^-$	(M1+E2)	−0.53[b] *6*		B(M1)(W.u.)<0.024; B(E2)(W.u.)<9.6 Mult.: D+Q from γγ(θ) in (p,2nγ); Δπ=(no) from level scheme.
1603.24?	(9/2$^-$)	520.5[f] *4*	37 *5*	1082.68	9/2$^+$				Other Iγ: 70, also from (n,n′γ).
		624.5[f] *3*	100 *5*	978.91	11/2$^+$				
		859.1[f] *3*	63	743.95	7/2$^+$				Other Iγ: 40, also from (n,n′γ).

From ENSDF

$^{93}_{41}Nb_{52}$-15

Adopted Levels, Gammas (continued)

$\gamma(^{93}Nb)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	Comments
1603.44	11/2+	520.9[b] *2*	13[b] *3*	1082.68	9/2+	(M1(+E2))	−0.07[b] *9*	B(M1)(W.u.)=0.032 *+12−19*; B(E2)(W.u.)=0.6 *+16−6* Mult.: D(+Q) from $\gamma\gamma(\theta)$ in (p,2nγ); $\Delta\pi$=(no) from level scheme.
		624.4 *2*	33.0 *15*	978.91	11/2+	(M1+E2)	+0.11 *6*	B(M1)(W.u.)=0.047 *+14−26*; B(E2)(W.u.)=1.5 *+17−15* E_γ,δ: from (p,2nγ). Other Eγ: 626.1 *6* from (n,n′γ). I_γ: weighted average of 33.3 *18* from (n,n′γ) and 32 *3* from (p,2nγ). Mult.: from $\gamma\gamma(\theta)$ in (p,2nγ); $\Delta\pi$=(no) from level scheme.
		653.6 *2*	100 *3*	949.80	13/2+	M1+E2	+0.17 *3*	B(M1)(W.u.)=0.13 *+4−7*; B(E2)(W.u.)=9 *+4−6* Mult.: D+Q from $\gamma\gamma(\theta)$ in (p,2nγ); not E1+M2 from RUL.
		859.5 *2*	26 *4*	743.95	7/2+	[E2]		B(E2)(W.u.)=20 *+7−12* E_γ: from (p,2nγ). I_γ: unweighted average of 29.8 *18* from (n,n′γ) and 22 *3* from (p,2nγ). Mult.: not M2 from RUL.
		1603.5[&] *2*	23[&] *3*	0.0	9/2+			
1665.66	5/2+	856.9[&] *2*	<1[&]	808.82	5/2+			
		921.6[b] *2*	100[b] *2*	743.95	7/2+	M1+E2	+1.4[b] *2*	B(M1)(W.u.)=0.039 *+11−14*; B(E2)(W.u.)=92 *+22−29* Mult.: D+Q from (p,2nγ) and (n,n′γ); $\Delta\pi$=no from RUL. δ: other δ: −0.40 *5* or −1.60 *15* from (n,n′γ).
		1665.7[&] *2*	2[&] *2*	0.0	9/2+			
1679.50	5/2(+),7/2	364.1[b] *2*	60[b] *3*	1315.50	5/2+	D+Q	−0.17[b] *9*	Mult.: from (p,2nγ).
		382.4[&] *2*	16[&] *3*	1297.22	9/2+			Other Eγ (Iγ): 381.5 *3* (36) from (n,n′γ).
		870.1[&] *2*	7[&] *3*	808.82	5/2+			
		935.7[b] *2*	100[b] *3*	743.95	7/2+	D(+Q)	+0.09[b] *9*	Mult.: from (p,2nγ).
		1679.58 *24*	37.4 *17*	0.0	9/2+			E_γ: weighted average of 1679.7 *2* from (p,2nγ) and 1679.1 *4* from (n,n′γ). I_γ: weighted average of 38 *2* from 1973Va09 in (n,n′γ) and 36 *3* from (p,nγ).
1683.36	9/2+	600.7[&] *2*	17[&] *4*	1082.68	9/2+			
		704.2[b] *2*	42[b] *4*	978.91	11/2+	M1+E2	+0.21[b] *4*	B(M1)(W.u.)=0.113 *+19−22*; B(E2)(W.u.)=10 *5* Mult.: D+Q from $\gamma\gamma(\theta)$ in (p,2nγ); not E1+M2 from RUL.
		939.3 *2*	100 *3*	743.95	7/2+	M1+E2	−0.20 *4*	B(M1)(W.u.)=0.114 *+17−20*; B(E2)(W.u.)=5.3 *+22−23* E_γ,δ: from (p,2nγ). I_γ: weighted average from (n,n′γ) and (p,2nγ). Mult.: D+Q from $\gamma\gamma(\theta)$ in (p,2nγ); not E1+M2 from RUL.
		1683.2 *2*	57.4 *19*	0.0	9/2+	(M1+E2)	−0.34 *25*	B(M1)(W.u.)=0.0106 *+22−24*; B(E2)(W.u.)=0.4 *+6−4* E_γ,δ: from (p,2nγ). Other Eγ: 1682.1 *6* from (n,n′γ). I_γ: weighted average of 58.3 *21* (1973Va09) in (n,n′γ) and 54 *4* from (p,2nγ). Mult.: D+Q from (p,2nγ); $\Delta\pi$=no from level scheme.

γ(^{93}Nb) (continued)

E_i(level)	J^{π}_i	E_{γ}[†]	I_{γ}[†]	E_f	J^{π}_f	Mult.[‡]	δ[‡]	Comments
1686.34	13/2$^+$	707.4[b] *2*	88[b] *4*	978.91	11/2$^+$	M1+E2	−0.09[b] *3*	B(M1)(W.u.)=0.115 *+22−28*; B(E2)(W.u.)=1.9 *14* Mult.: D+Q from $\gamma\gamma(\theta)$ in (p,2nγ); not E1+M2 from RUL.
		736.5[b] *2*	90[b] *4*	949.80	13/2$^+$	D+Q	−0.27[b] *13*	Other δ: $-0.25<\delta$(D,Q)$<+1.0$ in (n,n′γ).
		1686.3[&] *2*	100[&] *4*	0.0	9/2$^+$	[E2]		B(E2)(W.u.)=3.5 *+7−9* Other Eγ: 1685.3 *5* from (n,n′γ). Other I(737γ):I(1686γ): 100 *5*:63.4 *24* (1973Va09), 100:69 (1992De08) and 100:88 (1982Av05) in (n,n′γ). Mult.: not M2 from RUL.
1694.0?		950[f]	100	743.95	7/2$^+$			E$_{\gamma}$: order of 744γ and 950γ not known from (n,n′γ).
1703.51	3/2$^+$,5/2$^+$	387.9[b] *2*	100[b] *4*	1315.50	5/2$^+$	(M1(+E2))	−0.02[b] *6*	B(M1)(W.u.)=1.3 *+6−13*; B(E2)(W.u.)=4 *+22−4* Mult.: D(+Q) from (p,2nγ); $\Delta\pi$=no from level scheme.
		894.8[b] *2*	87[b] *4*	808.82	5/2$^+$	(M1+E2)	−0.3[b] *1*	B(M1)(W.u.)=0.09 *+4−9*; B(E2)(W.u.)=10 *+8−10* Mult.: D+Q from (p,2nγ); $\Delta\pi$=no from level scheme.
1772.96	($\leq$7/2)	318.27[f] *17*	25	1455.0	(1/2$^+$,3/2$^+$)			E$_{\gamma}$,I$_{\gamma}$: for multiplet; branching is from suitably divided Iγ in (n,n′γ). This branch is not reported in (p,2nγ), so placement is indicated as tentative here. See comment on 646γ also.
		646.0[&] *2*	86[&] *4*	1127.09	3/2,5/2,7/2			Placement from (p,2nγ); note, however, that a 646.2γ deexcites the 1454 level (fed by 318γ from 1773 level in (n,n′γ)) but not in (p,2nγ)), so assumed order of 318γ and 646γ may differ in the two reaction studies. Mult.: M2 and higher-order multipolarity excluded by RUL.
		964.0[&] *2*	100[&] *4*	808.82	5/2$^+$			Mult.: M2 and higher-order multipolarity excluded by RUL.
1779.27	(5/2$^-$)	969.0[b] *2*	100[b] *5*	810.32	5/2$^-$	(M1(+E2))	+0.04[b] *6*	B(M1)(W.u.)=0.31 *+9−13*; B(E2)(W.u.)=0.5 *+17−5* Mult.: D(+Q) from (p,2nγ); $\Delta\pi$=(no) from level scheme.
		1092.4[b] *2*	8[b] *5*	686.79	3/2$^-$	(M1(+E2))	+0.05[b] *9*	B(M1)(W.u.)=0.017 *+12−13*; B(E2)(W.u.)=0.04 *+14−4* Mult.: D(+Q) from (p,2nγ); $\Delta\pi$=(no) from level scheme.
1784.40	(5/2$^+$)	701.71 *24*	100	1082.68	9/2$^+$			
1812.34	(19/2)	477.3[&] *2*	100[&]	1335.04	17/2$^+$			E$_{\gamma}$: for doubly-placed γ.
1840.07	3/2$^-$,5/2$^-$	1029.6[&] *2*	20[&] *4*	810.32	5/2$^-$	(M1+E2)		B(M1)(W.u.)=0.043 *9*, B(E2)(W.u.)=4.4 *10* or B(M1)(W.u.)=0.046 *10*, B(E2)(W.u.)=1.3 *12*. Mult.: D+Q from (p,2nγ); $\Delta\pi$=(no) from level scheme. δ: +0.32 *6* or +0.17 *8* from $\gamma\gamma(\theta)$ in (p,2nγ).
		1153.4[&] *2*	100[&] *4*	686.79	3/2$^-$	M1+E2		B(M1)(W.u.)=0.164 *+11−12*, B(E2)(W.u.)=2.5 *14* or B(M1)(W.u.)=0.157 *12*, B(E2)(W.u.)=8 *4*. Mult.: D+Q from $\gamma\gamma(\theta)$ in (p,2nγ); not E1+M2 from RUL for either possible value of δ. δ: +0.14 *4* or +0.26 *6* from $\gamma\gamma(\theta)$ in (p,2nγ).
1908.1	(5/2)	1908.1 *11*	100	0.0	9/2$^+$			

$^{93}_{41}Nb_{52}$-17

Adopted Levels, Gammas (continued)

γ(^{93}Nb) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α[e]	Comments
1910.68	7/2$^+$,9/2$^+$,11/2$^+$	613.4[b] *1*	10[b] *3*	1297.22	9/2$^+$	(M1+E2)	−0.20[b] *12*		B(M1)(W.u.)=0.048 *16*; B(E2)(W.u.)=5 *+7−5* Mult.: D+Q from $\gamma\gamma(\theta)$ in (p,2nγ); $\Delta\pi$=(no) from level scheme.
		828.1[b] *1*	7[b] *3*	1082.68	9/2$^+$	M1+E2	−0.61[b] *17*		B(M1)(W.u.)=0.010 *5*; B(E2)(W.u.)=6 *4* Mult.: D+Q from $\gamma\gamma(\theta)$ in (p,2nγ); not E1+M2 from RUL.
		1910.6[&] *1*	100[&] *3*	0.0	9/2$^+$	M1+E2	+3.9 *36*	4.52×10^{-4} *23*	B(M1)(W.u.)=0.0010 *+18−10*; B(E2)(W.u.)=4.4 *7* Mult.: D+Q from $\gamma(\theta)$ in (n,n′γ); not E1+M2 from RUL. δ: from +0.25<δ(D,Q)<+7.5 in (n,n′γ).
1915.92	7/2	600.4[b] *2*	36[b] *4*	1315.50	5/2$^+$	D+Q	+0.06[b] *4*		
		833.4[b] *2*	100[b] *4*	1082.68	9/2$^+$	D(+Q)	−0.01[b] *2*		
		1107.2[&] *2*	4[&] *4*	808.82	5/2$^+$				
		1172.1[&] *2*	12[&] *4*	743.95	7/2$^+$				
		1915.5[&] *2*	5[&] *4*	0.0	9/2$^+$				
1947.73	3/2,5/2,7/2	1137.4[b] *2*	100[b]	810.32	5/2$^-$	D(+Q)	+0.05[b] *4*		Mult.: from (p,2nγ).
1949.72	(7/2$^+$)	270.1[&] *2*	100[&] *5*	1679.50	5/2$^{(+)}$,7/2				
		866.8[&] *2*	9[&] *5*	1082.68	9/2$^+$				
		971.1[&] *2*	<2[&]	978.91	11/2$^+$	[E2]			B(E2)(W.u.)=0.18 *+19−18*
		1140.8[b] *2*	100[b] *5*	808.82	5/2$^+$	(M1+E2)	+0.21[b] *5*		B(M1)(W.u.)=0.010 *+4−10*; B(E2)(W.u.)=0.33 *+21−33* Mult.: D+Q from (p,2nγ); $\Delta\pi$=(no) from level scheme.
		1205.9 *2*	89 *4*	743.95	7/2$^+$				E_γ: from (p,2nγ). I_γ: weighted average of 85 *6* from (n,n′γ) and 92 *5* from (p,2nγ).
1949.81	(11/2)	266.4[&] *2*	32[&] *5*	1683.36	9/2$^+$				
		346.4[&] *2*	50[&] *5*	1603.44	11/2$^+$				
		1949.8[&] *2*	100[&] *5*	0.0	9/2$^+$				
1968.27	(13/2$^-$)	365.0[&] *2*	45[&] *3*	1603.24?	(9/2$^-$)				
		477.3[&] *2*	100[&] *3*	1490.99	15/2$^+$				E_γ: for doubly-placed γ.
1968.87	11/2$^+$	282.5 *1*	23 *5*	1686.34	13/2$^+$	[M1,E2]		0.021 *7*	E_γ: from (p,2nγ). I_γ: weighted average of 18 *5* from (n,n′γ) and 27 *5* from (p,2nγ).
		285.4 *1*	29 *6*	1683.36	9/2$^+$	[M1,E2]		0.021 *7*	E_γ: from (p,2nγ). I_γ: weighted average of 21 *6* from (n,n′γ) and 34 *5* from (p,2nγ).

$^{93}_{41}$Nb$_{52}$-18

γ(^{93}Nb) (continued)

E$_i$(level)	J$^\pi_i$	E$_\gamma$[†]	I$_\gamma$[†]	E$_f$	J$^\pi_f$	Mult.[‡]	δ[‡]	α[e]	Comments
1968.87	11/2$^+$	990.0[b] *1*	64[b] *5*	978.91	11/2$^+$	M1+E2	−0.83[b] *16*		B(M1)(W.u.)=0.030 *8*; B(E2)(W.u.)=21 *7* I$_\gamma$: note that branching from (n,n′γ) varies widely (34 *6* (1973Va09), 127 (1992De08), 48 (1983Av05)). Mult.: D+Q from γγ(θ) in (p,2nγ); not E1+M2 from RUL.
		1019.0 *1*	31 *4*	949.80	13/2$^+$	M1+E2	−0.28 *7*		B(M1)(W.u.)=0.021 *5*; B(E2)(W.u.)=1.6 *9* E$_\gamma$,δ: from (p,2nγ). I$_\gamma$: weighted average of 28 *3* from (n,n′γ) and 38 *5* from (p,2nγ). Mult.: D+Q from γγ(θ) in (p,2nγ); not E1+M2 from RUL.
		1225.0[&] *1*	12[&] *5*	743.95	7/2$^+$	[E2]			B(E2)(W.u.)=3.4 *16* Mult.: M2 and higher-order multipolarity excluded by RUL.
		1968.9 *1*	100 *3*	0.0	9/2$^+$				E$_\gamma$: from (p,2nγ). I$_\gamma$: weighted average of 100 *6* from (n,n′γ) and 100 *5* from (p,2nγ).
1997.12	3/2$^-$,5/2$^-$	1186.9[b] *2*	100[b] *5*	810.32	5/2$^-$	M1+E2	−0.31[b] *11*		B(M1)(W.u.)=0.17 *+4−5*; B(E2)(W.u.)=12 *+8−9* Mult.: D+Q from γγ(θ) in (p,2nγ); not E1+M2 from RUL.
		1310.2[b] *2*	12[b] *5*	686.79	3/2$^-$	(M1+E2)	−0.29[b] *12*		B(M1)(W.u.)=0.015 *+7−8*; B(E2)(W.u.)=0.8 *7* Mult.: D+Q from γγ(θ) in (n,n′γ); Δπ=no from level scheme.
2002.52	(11/2$^+$)	399.1[&] *2*	20[&] *2*	1603.44	11/2$^+$				
		502.4[&] *2*	12[&] *2*	1499.94	(9/2$^-$)	[E1]			B(E1)(W.u.)<0.00040
		511.5[&] *2*	<2[&]	1490.99	15/2$^+$				
		1023.7[&] *2*	10[&] *2*	978.91	11/2$^+$	[E2]			B(E2)(W.u.)<2.6
		1052.8[b] *2*	100[b] *2*	949.80	13/2$^+$	(M1+E2)	−0.63[b] *7*	6.50×10^{-4} *13*	B(M1)(W.u.)<0.018; B(E2)(W.u.)<7.3 Mult.: D+Q from γ(θ) in (n,n′γ); large δ favors Δπ=no. Other δ: +0.40 *+4−8* or +4.5 *5* from (n,n′γ) if J=15/2.
2012.41	(≤5/2)$^-$	440.4[&] *2*	6[&] *5*	1571.82	3/2$^-$				
		1325.8[b] *2*	100[b] *5*	686.79	3/2$^-$	M1+E2	+4.5[b] *+15−9*		B(M1)(W.u.)=0.020 *+15−20*; B(E2)(W.u.)=2.4×10^2 *+10−23* Mult.: D+Q from γγ(θ) in (p,2nγ); not E1+M2 from RUL. δ: from 2010Or01; supersedes δ=−0.14 *5* (2005Mc13) in (p,2nγ), reported prior to correction of a data analysis problem in that study.

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$\gamma(^{93}Nb)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	δ[‡]	α[e]	Comments
2019.7	(7/2⁻,9/2⁻)	1209.4 *4*	100	810.32	5/2⁻				
2023.91	(≤5/2)⁻	452.1[&] *2*	3[&] *3*	1571.82	3/2⁻				
		1337.1[b] *2*	100[b] *3*	686.79	3/2⁻	M1+E2	−4.7[b] *+8−13*		B(M1)(W.u.)=0.007 *+4−5*; B(E2)(W.u.)=9.E+1 *+3−5* Mult.: D+Q from γγ(θ) in (p,2nγ); not E1+M2 from RUL.
2037.2	(9/2⁺,11/2⁺)	537.2 *3*	100	1499.94	(9/2⁻)				
		1087.4 *6*	28	949.80	13/2⁺				
2099.23	(3/2⁻,5/2,7/2)	703.8[&] *2*	100[&] *7*	1395.42	(7/2⁻)				
		1288.9[b] *2*	46[b] *7*	810.32	5/2⁻	D(+Q)	−0.05[b] *5*		Other Iγ: 13 *5* in (n,n′γ).
2122.67	9/2⁺	639.0[&] *1*	36[&] *3*	1483.58	7/2⁽⁺⁾				
		1143.7[b] *1*	71[b] *3*	978.91	11/2⁺	M1+E2	+3.8[b] *+19−10*		B(M1)(W.u.)=0.003 *3*; B(E2)(W.u.)=34 *7* Mult.: D+Q from γγ(θ) in (p,2nγ); not E1+M2 from RUL.
		1378.9[b] *1*	29[b] *3*	743.95	7/2⁺	M1+E2	−0.19[b] *8*		B(M1)(W.u.)=0.0103 *21*; B(E2)(W.u.)=0.20 *17* Mult.: D+Q from γγ(θ) in (p,2nγ); not E1+M2 from RUL.
		2122.6[&] *1*	100[&] *3*	0.0	9/2⁺				Mult.: D+Q from (p,2nγ); Δπ=no from level scheme.
2126.89	(5/2⁻,7/2,9/2⁻)	626.9[&] *2*	100[&] *4*	1499.94	(9/2⁻)				
		731.3[&] *2*	18[&] *4*	1395.42	(7/2⁻)				
		1316.61[&] *20*	10[&] *4*	810.32	5/2⁻				
		1383.1[&] *2*	13[&] *4*	743.95	7/2⁺				
2132.6	(≥7/2)	1153.7 *5*	100	978.91	11/2⁺				
2153.60	(1/2,3/2,5/2⁻)	2122.8[&] *2*	100[&]	30.77	1/2⁻				
2162.64	(11/2⁺,13/2,15/2⁺)	671.7 *2*	24 *3*	1490.99	15/2⁺				Eγ: from (p,2nγ). Iγ: weighted average of 25 *4* from (p,2nγ) and 22 *6* from (n,n′γ).
		1183.7[&] *2*	100[&] *4*	978.91	11/2⁺				
		1212.8[&] *2*	61[&] *4*	949.80	13/2⁺				
2170.65	9/2⁺	1087.6[&] *2*	10[&] *3*	1082.68	9/2⁺				
		1192.5[&] *2*	100[&] *3*	978.91	11/2⁺				
		1221.6[&] *2*	60[&] *3*	949.80	13/2⁺				Other Iγ: 82 *4* from (n,n′γ). Mult.: M2 and higher-order multipolarity excluded by RUL.
		1361.1[&] *2*	31[&] *3*	808.82	5/2⁺				Other Iγ: 63 from (n,n′γ). Mult.: M2 and higher-order multipolarity excluded by RUL.
		1426.1[&] *2*	27[&] *3*	743.95	7/2⁺				

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γ(^{93}Nb) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[†]	E_f	J^π_f	Mult.[‡]	Comments
2170.65	9/2$^+$	2171.4 *5*	14 *2*	0.0	9/2$^+$		This branch is absent in (p,2nγ).
2180.04	(17/2)$^-$	689.053 *19*	100.0 *25*	1490.99	15/2$^+$	E1[c]	E_γ,I_γ: from ^{93}Mo ε decay (6.85 h). Doubly placed in (n,n′γ) and differently placed in (p,2nγ), but the much stronger 1500γ accompanying the 689γ in those alternative placements is absent in ^{93}Mo ε decay (6.85 h). Mult.: from (^{16}O,p4nγ).
		844.96 *6*	37.5 *25*	1335.04	17/2$^+$		E_γ,I_γ: from ^{93}Mo ε decay (6.85 h). Other: 133 from ^{82}Se(^{16}O,p4nγ); γ not reported in (n,n′γ).
2184.14		849.1[&] *2*	100[&]	1335.04	17/2$^+$		
2203.5	(9/2$^+$)	600.4[f] *3*	24	1603.24?	(9/2$^-$)		
		808.3 *4*	100	1395.42	(7/2$^-$)		E_γ: for doublet in (n,n′γ).
		2203.2 *4*	33	0.0	9/2$^+$		
2280.7	(7/2$^-$)	1536.7 *7*	100	743.95	7/2$^+$		
2310.9		976[d]	100[d]	1335.04	17/2$^+$		
2330.0		1351.1 *5*	100	978.91	11/2$^+$		
2367.5	9/2,13/2$^{(+)}$	2367.3 *10*	100	0.0	9/2$^+$		
2506.88		1527.9 *1*		978.91	11/2$^+$		E_γ: from (p,2nγ).
		2506.9 *1*		0.0	9/2$^+$		E_γ: from (p,2nγ).
2584.2	3/2$^+$,5/2$^+$	1775.4 *7*	100	808.82	5/2$^+$		
2752.84	(19/2)$^+$	572.796 *19*	100 *4*	2180.04	(17/2)$^-$		E_γ,I_γ: from ε decay (6.85 h).
		1261.91 *14*	59 *4*	1490.99	15/2$^+$		E_γ,I_γ: from ε decay (6.85 h).
		1417.75 *10*	55 *4*	1335.04	17/2$^+$		E_γ,I_γ: from ε decay (6.85 h).
2832.8	21/2$^+$	522[d]	4.9[d] *7*	2310.9			
		1497.6	100 *7*	1335.04	17/2$^+$	E2[c]	E_γ: from (^{16}O,p2nγ). I_γ: from (^{16}O,p4nγ).
3086.0	(21/2)	906[d]	100[d]	2180.04	(17/2)$^-$	Q[c]	
3667.8		835[d]	100[d]	2832.8	21/2$^+$		
3674.0	(25/2)	588[d]	100[d]	3086.0	(21/2)		
3684.8		852[d]	100[d]	2832.8	21/2$^+$		
4104.7	25/2$^{(+)}$	420[d]	9.7[d] *7*	3684.8		D+Q[c]	
		1271.9	100 *5*	2832.8	21/2$^+$	Q[c]	E_γ: from (^{16}O,p2nγ). I_γ: from (^{16}O,p4nγ).
4403.0	(29/2)	729[d]	100[d]	3674.0	(25/2)		
4864.6	29/2$^{(+)}$	759.9[#]	100[#]	4104.7	25/2$^{(+)}$	E2[c]	
5155.1		1481[d]	100[d]	3674.0	(25/2)		
5904.3	33/2$^{(+)}$	1039.7[#]	100[#]	4864.6	29/2$^{(+)}$	E2[c]	
6464.3	11/2$^{(+)}$	3626 *3*	29 *9*	2838	11/2	D	E_γ,I_γ,Mult.: from (γ,γ') E=6465 keV.
		4095 *3*	29 *9*	2367.5	9/2,13/2$^{(+)}$	D	E_γ,I_γ,Mult.: from (γ,γ') E=6465 keV.

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Adopted Levels, Gammas (continued)

$\gamma(^{93}Nb)$ (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[‡]	α[e]	Comments
6464.3	11/2$^{(+)}$	4514 *3*	11.4 *11*	1949.81	(11/2)	D		E_γ,I_γ,Mult.: from (γ,γ') E=6465 keV.
		4783 *3*	11.1 *4*	1679.50	5/2$^{(+)}$,7/2			May feed 1679 and/or 1683 and/or 1686 level. E_γ,I_γ: from (γ,γ') E=6465 keV.
		4971 *3*	9.3 *4*	1490.99	15/2$^+$			E_γ,I_γ: from (γ,γ') E=6465 keV.
		4979 *3*	4.3 *11*	1483.58	7/2$^{(+)}$			E_γ,I_γ: from (γ,γ') E=6465 keV.
		5168 *3*	10.7 *7*	1297.22	9/2$^+$	D		E_γ,I_γ,Mult.: from (γ,γ') E=6465 keV.
		5384 *3*	16.8 *7*	1082.68	9/2$^+$	D		E_γ,I_γ,Mult.: from (γ,γ') E=6465 keV.
		5486 *3*	0.7 *7*	978.91	11/2$^+$			E_γ,I_γ: from (γ,γ') E=6465 keV.
		5516 *3*	100.0 *18*	949.80	13/2$^+$	(M1)[@]	1.62×10^{-3}	E_γ,I_γ,Mult.: from (γ,γ') E=6465 keV.
		6465 *3*	35.7 *7*	0.0	9/2$^+$	(M1)[@]		E_γ,I_γ,Mult.: from (γ,γ') E=6465 keV.
7372.3	(35/2$^-$)	1468[d]	100[d]	5904.3	33/2$^{(+)}$	D+Q[c]		
7435.3	37/2$^{(-)}$	1531[d]	100[d]	5904.3	33/2$^{(+)}$	Q[c]		
7828.3	39/2$^{(-)}$	393[da]	100[d]	7435.3	37/2$^{(-)}$	M1[c]		
8325.4	41/2$^{(-)}$	497[da]	100[d]	7828.3	39/2$^{(-)}$	D[c]		
8377.4	(37/2)	942[d]	100[d] *10*	7435.3	37/2$^{(-)}$	D+Q[c]		
		1005[d]	59[d] *6*	7372.3	(35/2$^-$)	D[c]		
8940	(43/2$^-$)	615[da]	100[d]	8325.4	41/2$^{(-)}$	M1[c]		
9134.4	(41/2$^-$)	1699[d]	100[d]	7435.3	37/2$^{(-)}$	(E2)[c]		
9425	(45/2$^+$)	485[d]	100[d]	8940	(43/2$^-$)	E1[c]		
9699.4	(39/2$^-$,41/2$^-$)	2264[d]	100[d]	7435.3	37/2$^{(-)}$			
9782.4?		1405[df]	100[d]	8377.4	(37/2)			
9922.4	(43/2$^-$)	223[d]	70[d] *10*	9699.4	(39/2$^-$,41/2$^-$)			
		788[d]	100[d] *13*	9134.4	(41/2$^-$)	M1[c]		
10955.4		1033[d]	100[d]	9922.4	(43/2$^-$)			

† From (n,n′γ), except as noted.
‡ From (n,n′γ), if not indicated otherwise.
\# From $^{80}Se(^{16}O,p2n\gamma)$. Uncertainty in Eγ unstated by authors.
@ Mult=D (probably M1), from (γ,γ') E=6465 keV.
& From (p,2nγ).
[a] γ emitted within 1.3 ps of formation of parent state (2007Wa45).
[b] From (p,2nγ).
[c] From $\gamma(\theta)$, DCO ratio and/or linear polarization in $^{82}Se(^{16}O,p4n\gamma)$.
[d] From $^{82}Se(^{16}O,p4n\gamma)$; uncertainty in Eγ unstated by authors.

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$\gamma(^{93}Nb)$ (continued)

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

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

$^{93}_{41}Nb_{52}$-23

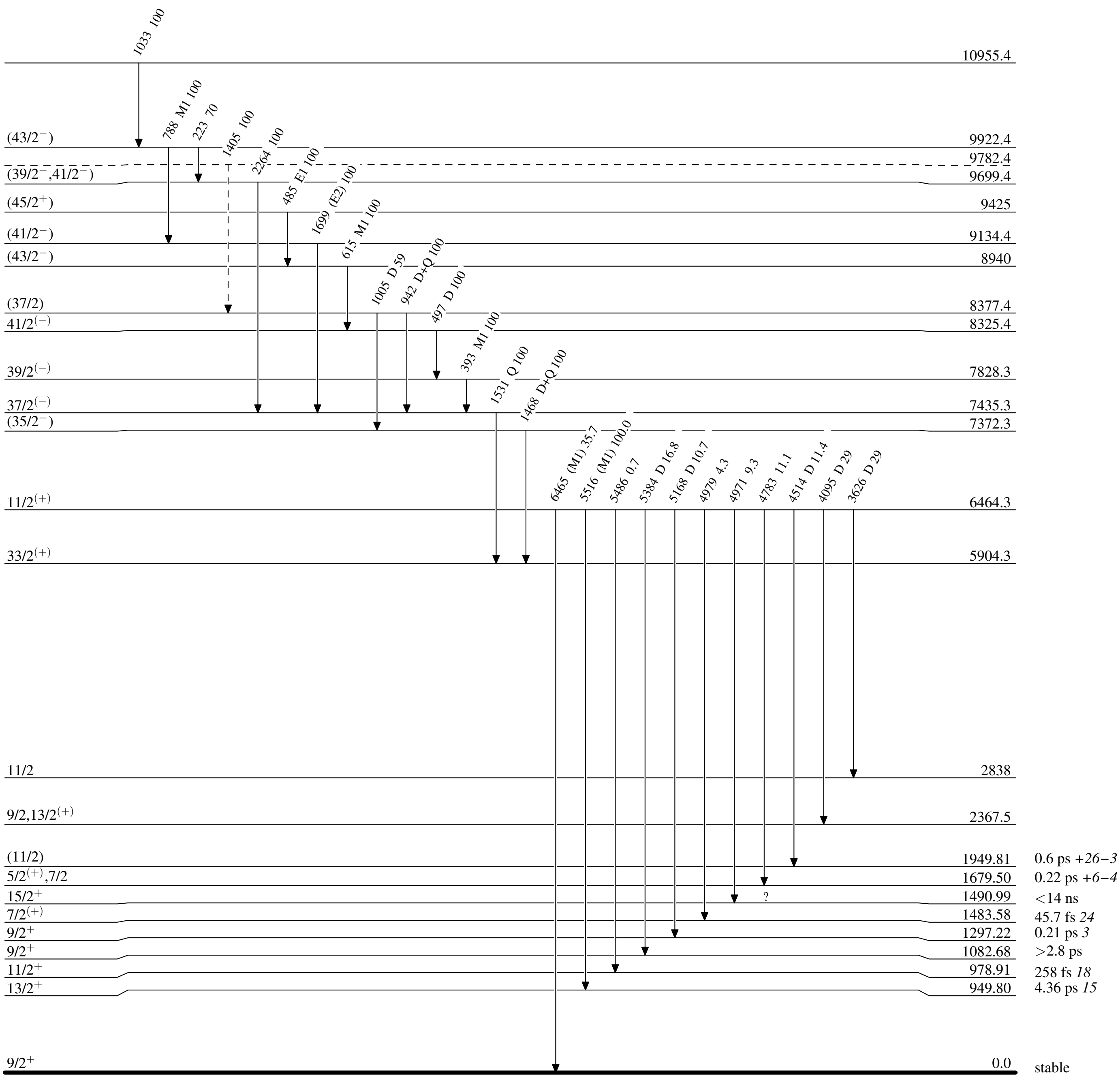
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

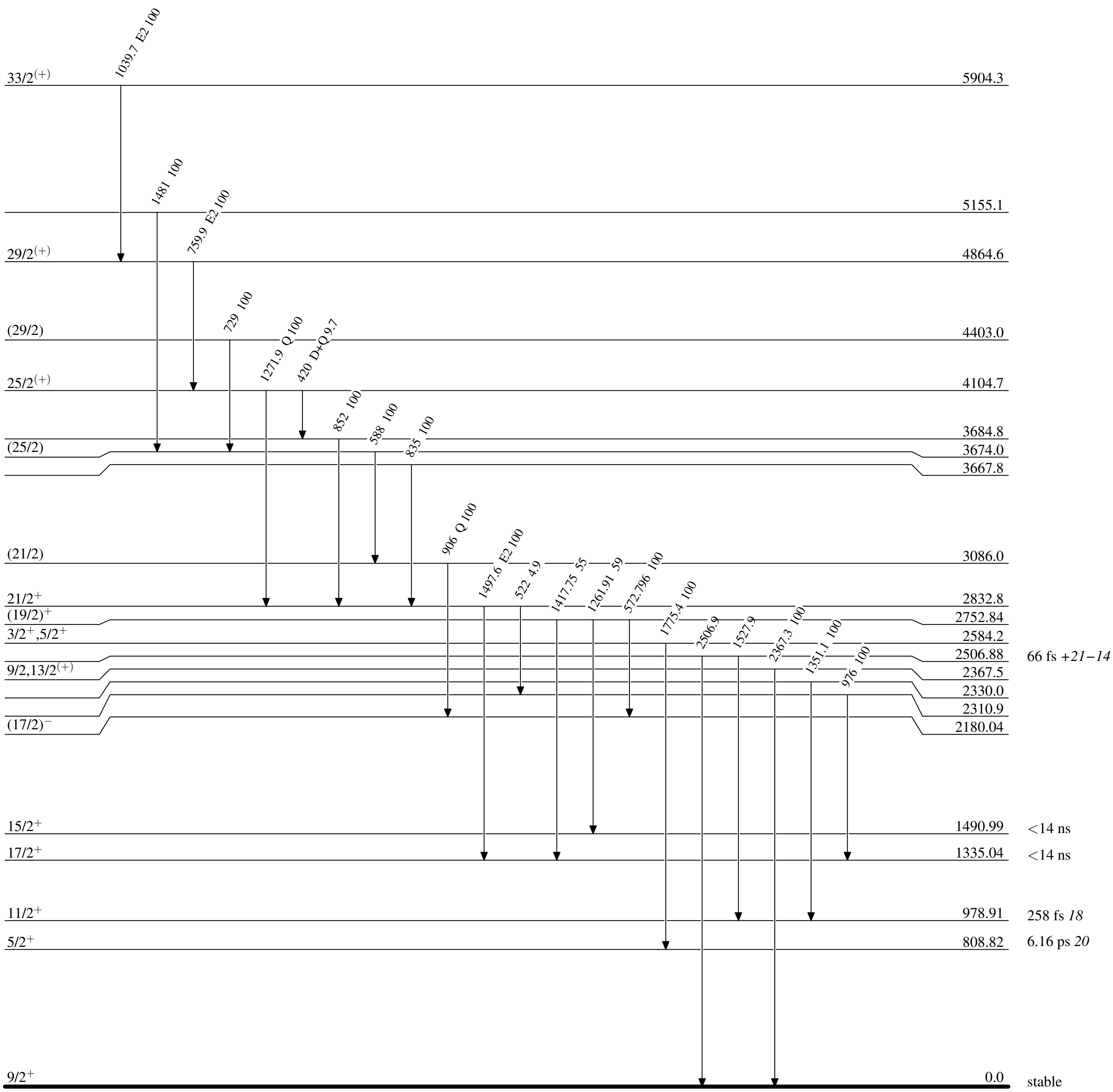


$^{93}_{41}Nb_{52}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{93}_{41}Nb_{52}$

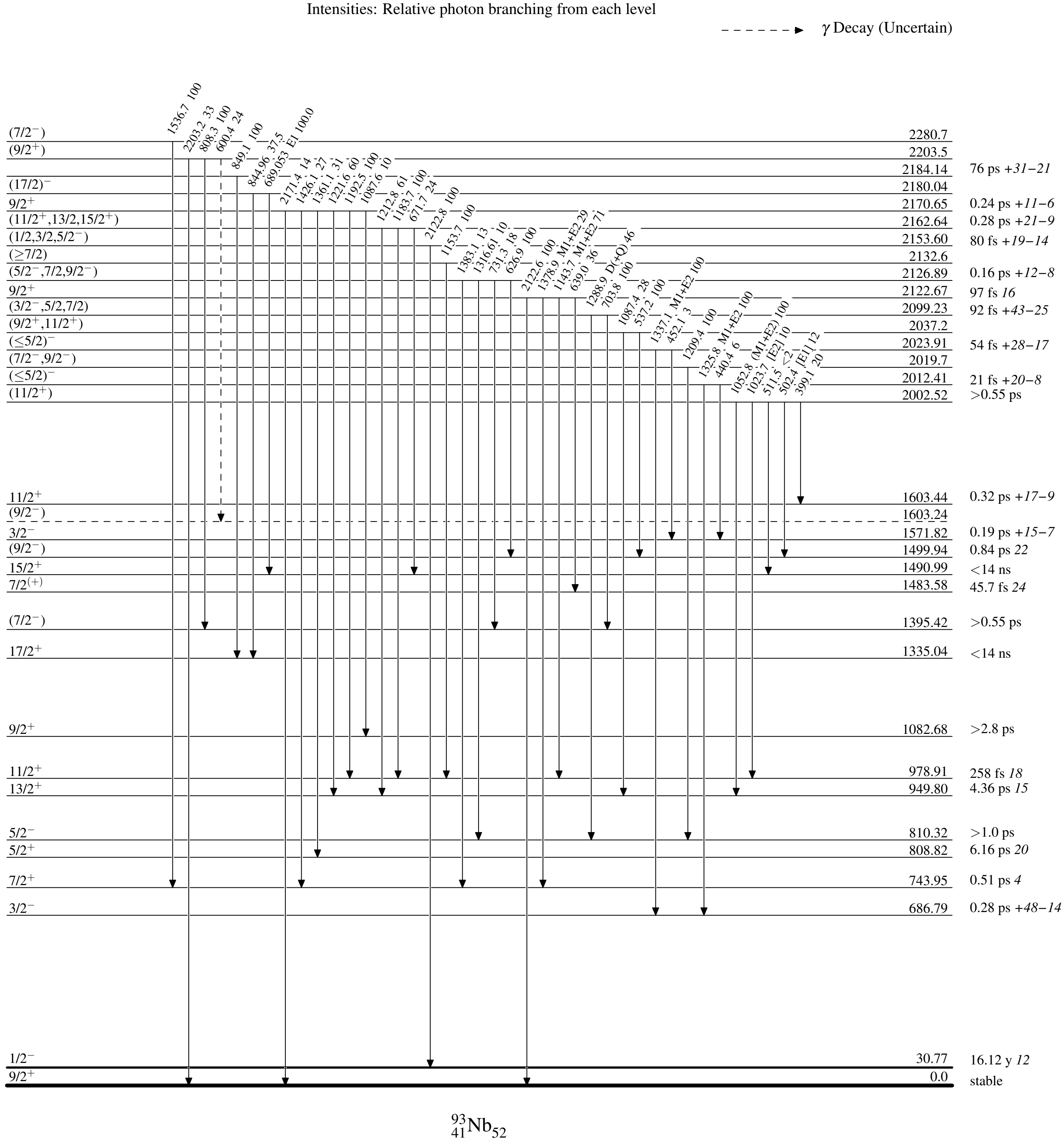
Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level

Legend

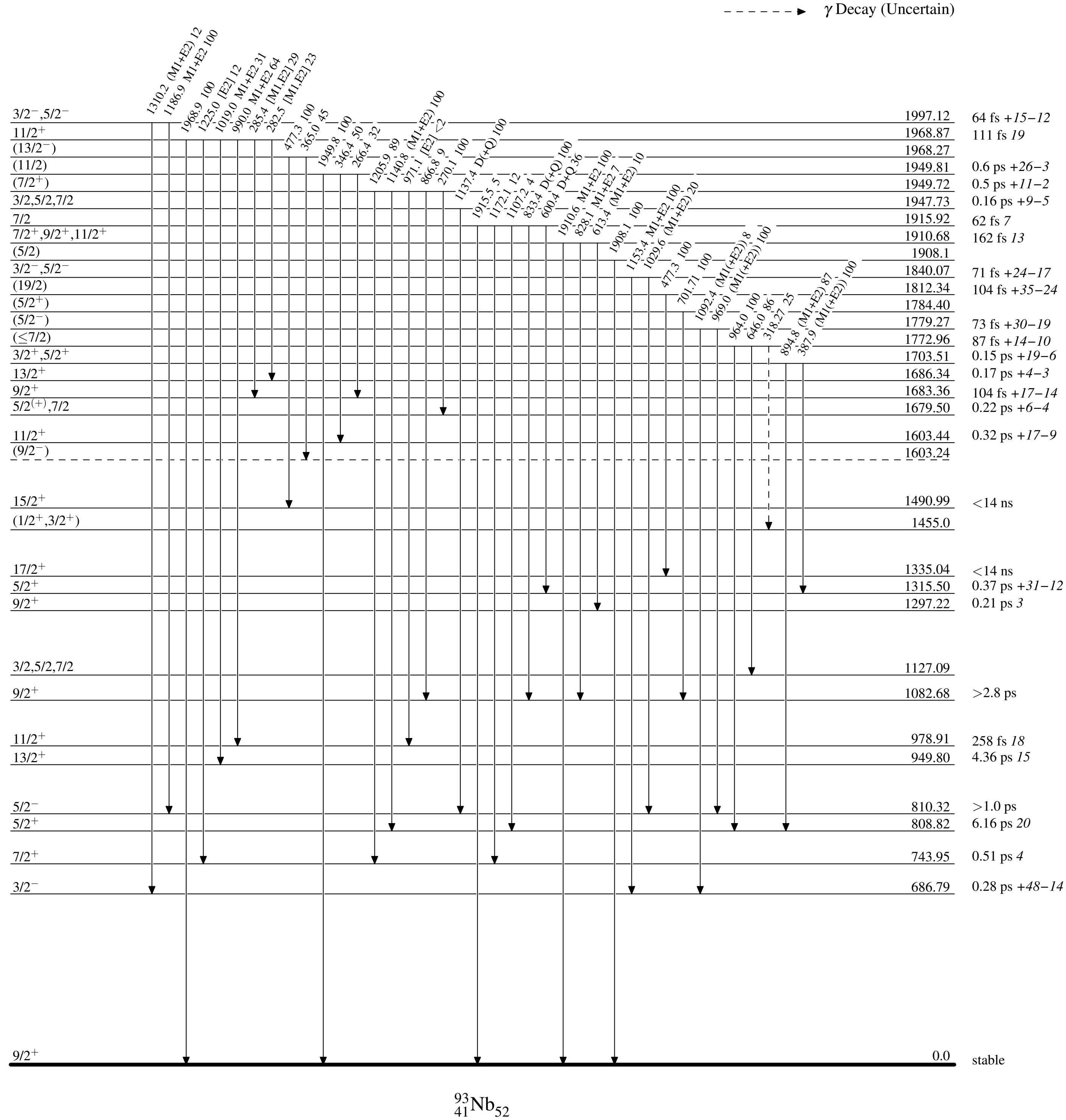
γ Decay (Uncertain)



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



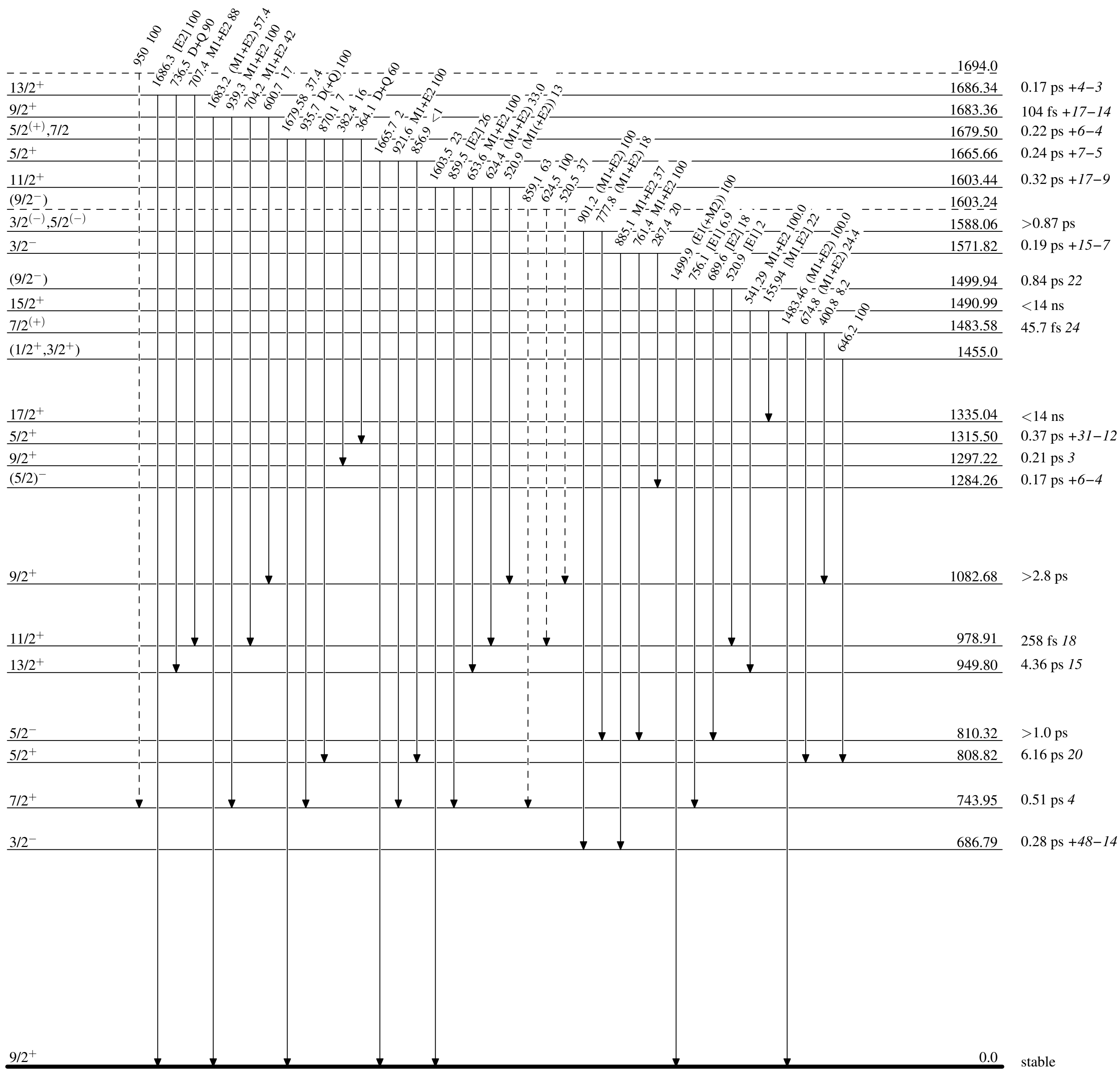
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

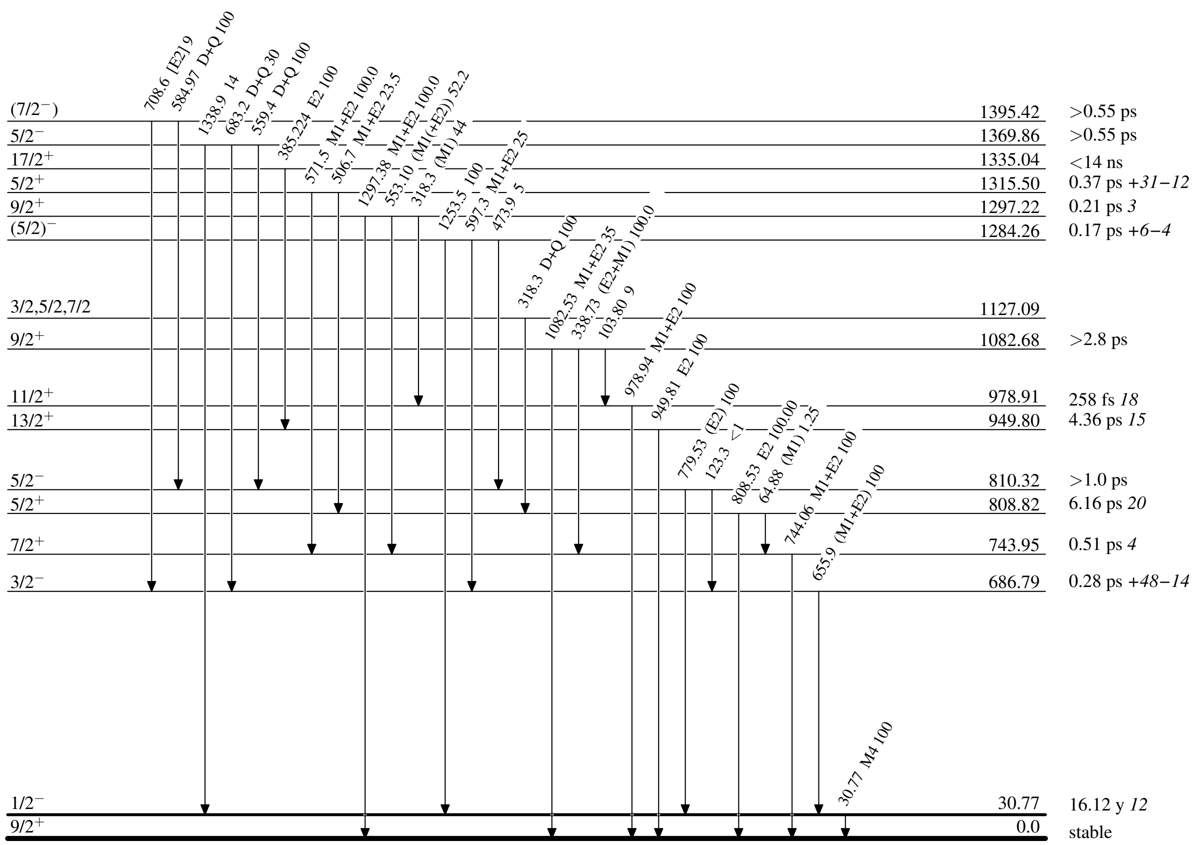


$^{93}_{41}Nb_{52}$

Adopted Levels, Gammas

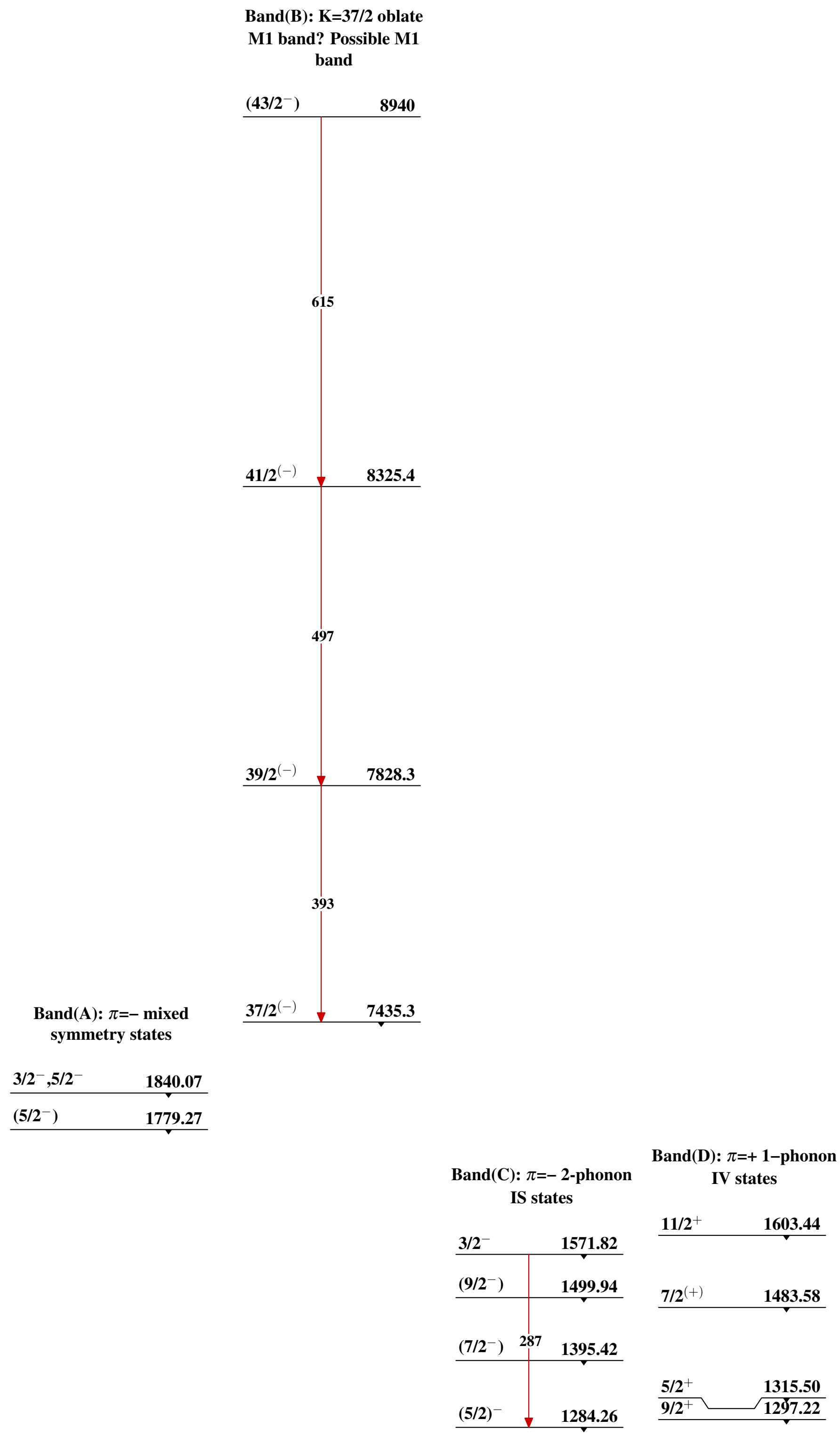
Level Scheme (continued)

Intensities: Relative photon branching from each level



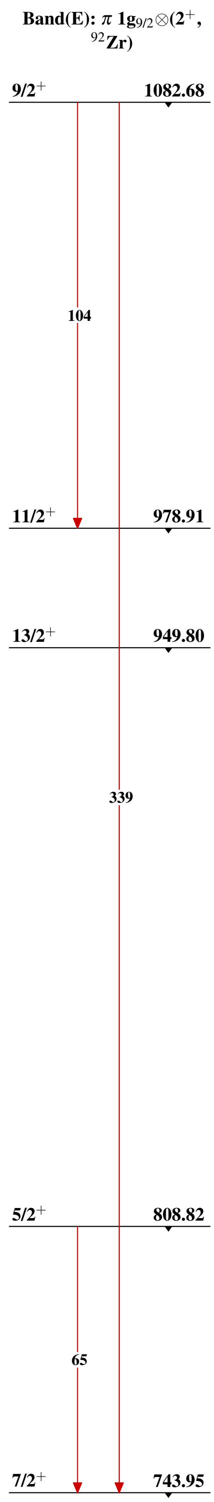
$^{93}_{41}Nb_{52}$

Adopted Levels, Gammas



$^{93}_{41}Nb_{52}$

Adopted Levels, Gammas (continued)



$^{93}_{41}Nb_{52}$