Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jun Chen	NDS 196,17 (2024)	30-Sep-2023

Q(β^-)=66.977 *15*; S(n)=6837.77 *6*; S(p)=11377 *19*; Q(α)=−7272.8 *4* 2021Wa16
S(2n)=17433.5 *3*, S(2p)=21170.3 *26* (2021Wa16).

^{63}Ni Levels

Band assignments are from (^{48}Ca,2α3nγ).

Cross Reference (XREF) Flags

A	^{63}Co β^- decay	E	^{62}Ni(n,γ),(pol n,γ) E=th	I	^{64}Ni(p,d)
B	^{26}Mg(^{48}Ca,2α3nγ)	F	^{62}Ni(d,p),(pol d,p)	J	^{64}Ni(d,t),(pol d,t)
C	^{48}Ca(^{18}O,3nγ)	G	^{62}Ni(d,pγ)	K	^{64}Ni(^{3}He,α)
D	^{62}Ni(n,γ):resonances	H	^{62}Ni(α,^{3}He)	L	^{65}Cu(d,α)

E(level)†	J$^\pi$‡	T$_{1/2}$#	XREF	Comments
0.0	1/2$^-$	100.8 y *15*	A C EFGHIJKL	%β^-=100 μ=+0.496 *5* (2017Dy01,2019StZV) J$^\pi$: L(pol d,p)=L(pol d,t)=1 from 0$^+$; L-1/2 transfer from analyzing powers. T$_{1/2}$: weighted average of 101.2 y *15* (2008Co01) and 100.1 y *20* (1971Ba89). Others: 125 y *6* (1956Mc95) and 91.6 y *31* (1962Ho05) seems discrepant; 101.1 y *14* (1996Co25; superseded by 101.2 y *15* in 2008Co01 from the same lab, as stated in 2008Co01). μ: from laser resonant photoionization spectroscopy, using μ(^{61}Ni)=−0.74868 *4* as a reference (2017Dy01). See also 2019StZV evaluation. δ<r^2>(^{60}Ni,^{63}Ni)=0.277 fm^2 *8*. Total charge radius R$_c$=3.842 fm *2* (2022Ma04). isotope shift $\delta\nu$(^{60}Ni,^{63}Ni)=784.9 MHz *26*(stat) *27*(syst) (2022Ma04).
87.220 *28*	5/2$^-$	1.69 μs *4*	ABC EFGHIJKL	%IT=100 μ=+0.752 *3* (1970Bl06,2020StZV) J$^\pi$: L(pol d,p)=L(pol d,t)=3 from 0$^+$; L-1/2 transfer from analyzing powers. T$_{1/2}$: weighted average of 1.61 μs *7* from 1975Ro25 in ^{63}Co β^- decay, and 1.71 μs *3* from ^{62}Ni(d,pγ). μ: from 1970Bl06 by TDPAD. See also 2020StZV evaluation.
155.510 *18*	3/2$^-$		A EF HIJKL	J$^\pi$: L(pol d,p)=L(pol d,t)=1 from 0$^+$; L+1/2 transfer from analyzing powers.
517.897 *30*	3/2$^-$		A EF HIJKL	J$^\pi$: L(pol d,p)=L(pol d,t)=1 from 0$^+$; L+1/2 transfer from analyzing powers.
1001.253 *22*	1/2$^-$	0.29 ps *+22−11*	EF HIJKL	J$^\pi$: L(pol d,p)=L(pol d,t)=1 from 0$^+$; L-1/2 transfer from analyzing powers. T$_{1/2}$: from 1991Ul01 in (n,γ):E=th based on γ-ray induced Doppler broadening method (GRID).
1069.02 *22*	(5/2$^-$)		A F	J$^\pi$: probable allowed β^- feeding from 7/2$^-$ parent; 1069.1γ to 1/2$^-$.
1251.11 *31*	(5/2,7/2$^-$)		A F L	J$^\pi$: β^- feeding from 7/2$^-$ parent; 1095.7γ to 3/2$^-$.
1291.93@ *11*	9/2$^+$	3.33 ns *21*	BC F HIJK	μ=−1.211 *13* (1989Mu27,2020StZV) J$^\pi$: L(d,p)=L(d,t)=4 from 0$^+$.

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Adopted Levels, Gammas (continued)

^{63}Ni Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	XREF	Comments
				$T_{1/2}$: other: 10 ns *2* (1997Is13) from γ(t) using ^{198}Pt(Ge,Xγ) reaction. μ: from 1989Mu27 by TDPAD. See also 2020StZV evaluation.
1323.704 *25*	3/2⁻		EF H J	Jπ: L(pol d,p)=1 from 0⁺; L+1/2 transfer from analyzing powers.
1451.74 *30*	(5/2⁻,7/2⁻,9/2⁻)		A F L	Jπ: probable allowed β⁻ feeding from 7/2⁻ parent.
1657 *10*			F l	XREF: l(1673).
1677 *10*			F H l	XREF: l(1673).
1788 *10*	5/2⁻,7/2⁻		F J L	XREF: J(1770). E(level): weighted average of 1787 *10* from (d,p) and 1790 *15* from (d,α). Jπ: L(d,t)=3 from 0⁺ for a level at 1770.
1902 *10*	5/2⁻,7/2⁻		F J L	XREF: J(1910)L(1910). E(level): weighted average of 1899 *10* from (d,p) and 1910 *15* from (d,α). Jπ: L(d,t)=3 from 0⁺ for a level at 1910. However, L(d,p)=(1) for level at 1899 *10* giving (1/2⁻,3/2⁻).
2149 *10*	3/2⁻		F IJKl	XREF: l(2165). E(level): from (d,p). Jπ: L(pol d,t)=1 from 0⁺; L+1/2 transfer from analyzing powers.
2183.53[@] *14*	11/2[(+)]	3.6 ps *6*	BC l	XREF: l(2165). Jπ: 891.56γ D+Q to 9/2⁺; 630.5γ D+Q from 2815, 13/2⁺; parity=(+) from band assignment. See comments for Jπ(2815).
2261.7 *5*	(5/2⁻,7/2⁻)		A F L	XREF: L(2249). Jπ: probable allowed β⁻ feeding from 7/2⁻ parent; 2106γ to 3/2⁻;
2297 *10*	5/2⁺		F HIJK	E(level): from (d,p). Jπ: L(pol d,p)=L(pol d,t)=2 from 0⁺; L+1/2 transfer from analyzing powers.
2352.95 *5*	(1/2⁻,3/2)		EF L	XREF: L(2339). Jπ: 225.66γ to 5/2⁻, 2352.92γ to 1/2⁻; primary 4485.2γ from 1/2⁺ in (n,γ) E=th.
2519 *10*	(9/2)⁺		F HIJKl	XREF: l(2532). E(level): from (d,p). Jπ: L(pol d,p)=L(pol d,t)=4 from 0⁺; 9/2⁺ favored by analyzing powers.
2573 *10*	(7/2⁺,9/2⁺)		F l	XREF: l(2532). Jπ: L(d,p)=(4) from 0⁺.
2675 *10*	(3/2⁺,5/2⁺)		F	Jπ: L(d,p)=(2) from 0⁺.
2695.96 *4*	1/2⁻		EF L	XREF: L(2724). Jπ: L(pol d,p)=1from 0⁺; L-1/2 transfer from analyzing powers.
2814.18[@] *22*	13/2⁺	0.49 ps *21*	BC	Jπ: 1522.48γ E2, ΔJ=2 to 9/2⁺ gives 5/2⁺ or 13/2⁺; 5/2⁺ assignment would require J(2183)=7/2 (based on 630.5γ D+Q from 2815 to 2183 level and 891.7γ D+Q from 2183 to 1292, 9/2⁺ level), which is inconsistent with J(2183)=(11/2,13/2) from γ(θ) in (^{18}O,3nγ). This argument here also determines J(2183)=11/2.
2822 *10*	(1/2⁻,3/2⁻)		F	Jπ: L(d,p)=(1) from 0⁺.
2898 *25*			L	
2953 *10*	1/2⁺		F I K	Jπ: L(pol d,p)=0 from 0⁺.
2980			J	
3013 *10*			F l	XREF: l(3034).
3022 *10*			F l	XREF: l(3034).
3075 *10*			F	
3104 *10*	3/2⁺,5/2⁺		F	Jπ: L(pol d,p)=2 from 0⁺.
3179 *10*	5/2⁻,7/2⁻		F L	XREF: L(3150). Jπ: L(pol d,p)=3 from 0⁺.

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Adopted Levels, Gammas (continued)

^{63}Ni Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	XREF	Comments
3236.63? *7*		E l	XREF: E(?)l(3222).
3254 *10*		F l	XREF: l(3222).
3283.53 *5*	(1/2,3/2,5/2$^+$)	E	J$^{\pi}$: primary 3283.53γ from 1/2$^+$ in (n,γ) E=th.
3292 *10*	5/2$^+$	F	J$^{\pi}$: L(pol d,p)=2 from 0$^+$; L+1/2 transfer from analyzing powers.
3338 *10*	3/2$^+$,5/2$^+$	F L	XREF: L(3358). E(level): weighted average of 3336 *10* from (d,p) and 3358 *30* from (d,α). J$^{\pi}$: L(pol d,p)=2 from 0$^+$.
3427 *10*	(1/2$^-$,3/2$^-$)	F l	XREF: l(3460). J$^{\pi}$: L(pol d,p)=(1) from 0$^+$.
3471 *10*		F l	XREF: l(3460).
3522 *10*	3/2$^+$,5/2$^+$	F	J$^{\pi}$: L(pol d,p)=2 from 0$^+$.
3551 *10*	3/2$^+$,5/2$^+$	F	J$^{\pi}$: L(pol d,p)=2 from 0$^+$.
3594 *10*	(5/2$^-$,7/2$^-$)	F JKL	XREF: J(3580)K(3550)L(3578). J$^{\pi}$: L(d,t)=(3) from 0$^+$. 3550 *40* with L=3 from (^{3}He,α) could be the same level.
3608 *10*		F	
3633.67 *7*	(3/2$^+$,5/2$^+$)	EF	J$^{\pi}$: L(d,t)=(2) from 0$^+$ for a level at 3638 *10*.
3651.00[@] *22*	15/2$^{(+)}$	B	J$^{\pi}$: 1467.6γ Q, ΔJ=2 to 11/2$^{(+)}$, 836.8γ D+Q to 13/2$^+$.
3680 *10*		F l	XREF: l(3683).
3694 *10*		F l	XREF: l(3683).
3723 *10*	3/2$^+$,5/2$^+$	F l	XREF: l(3683). J$^{\pi}$: L(d,t)=2 from 0$^+$.
3739.04 *4*	(1/2$^-$,3/2)	E	J$^{\pi}$: 3739.6γ to 1/2$^-$, 3651.69γ to 5/2$^-$; primary 3098.98γ from 1/2$^+$ in (n,γ) E=th.
3769 *10*		F l	XREF: l(3780).
3780 *10*		F l	XREF: l(3780).
3792 *10*		F l	XREF: l(3780).
3804 *10*		F l	XREF: l(3780).
3836 *10*		F	
3889 *10*		F	
3932 *10*	5/2$^+$	F l	XREF: l(3938). J$^{\pi}$: L(pol d,p)=2 from 0$^+$; L+1/2 transfer from analyzing powers.
3951 *10*	5/2$^+$	F l	XREF: l(3938). J$^{\pi}$: L(pol d,p)=2 from 0$^+$; L+1/2 transfer from analyzing powers.
4022 *10*		F l	XREF: l(4018).
4033 *10*	(1/2$^-$,3/2$^-$)	F l	XREF: l(4018). J$^{\pi}$: L(pol d,p)=(1) from 0$^+$.
4054.61 *5*	(1/2$^+$)	EF	J$^{\pi}$: L(pol d,p)=(0) from 0$^+$ for a level at 4063 *10*.
4074 *10*	(1/2$^+$)	F	J$^{\pi}$: L(pol d,p)=(0) from 0$^+$.
4106 *10*	3/2$^+$,5/2$^+$	F	J$^{\pi}$: L(pol d,p)=2 from 0$^+$.
4267 *10*	1/2$^+$	F	J$^{\pi}$: L(d,p)=0.
4312.38 *6*	(1/2$^-$,3/2$^-$)	Ef	XREF: f(4313). J$^{\pi}$: L(pol d,p)=(1) from 0$^+$.
4323.98[@] *24*	17/2$^{(+)}$	B	J$^{\pi}$: 1510.8γ Q, ΔJ=2 to 13/2$^+$, 672.8γ to 15/2$^{(+)}$.
4332.0? *8*		E	XREF: E(?).
4359 *10*	5/2$^-$,7/2$^-$	F K	XREF: K(4370). E(level): weighted average of 4358 *10* from (d,p) and 4370 *40* from (^{3}He,α). J$^{\pi}$: L(^{3}He,α)=3 for a level at 4370 *40*.
4387 *10*	5/2$^+$	F	J$^{\pi}$: L(pol d,p)=2 from 0$^+$; L+1/2 transfer from analyzing powers.
4449 *10*	3/2$^+$,5/2$^+$	F	J$^{\pi}$: L(pol d,p)=2 from 0.
4459.15 *6*	(1/2,3/2)	E	J$^{\pi}$: primary 2378.88γ from 1/2$^+$ in (n,γ) E=th; 4458.98γ to 1/2$^-$.
4488 *10*	(1/2$^-$,3/2$^-$)	F	J$^{\pi}$: L(pol d,p)=(1) from 0$^+$.
4570.19 *24*	15/2$^{(+)}$	B	J$^{\pi}$: 2385.7γ Q, ΔJ=2 to 11/2$^{(+)}$, 919.9γ D+Q to 15/2$^{(+)}$.
4555 *10*		F	
4586 *10*	3/2$^+$,5/2$^+$	F	J$^{\pi}$: L(pol d,p)=2 from 0$^+$.

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Adopted Levels, Gammas (continued)

^{63}Ni Levels (continued)

E(level)[†]	Jπ[‡]	XREF	Comments
4622 *10*	3/2+,5/2+	F	Jπ: L(pol d,p)=2 from 0+.
4692 *10*	1/2+	F	Jπ: L(pol d,p)=0 from 0+.
4722 *10*		F	
4799 *10*		F	
4812 *10*		F	
4828 *10*	3/2+,5/2+	F	Jπ: L(pol d,p)=2 from 0+.
4871.6[&] *4*	(17/2+)	B	Jπ: 2058.3γ Q, ΔJ=2 to 13/2+; band assignment.
4876 *10*	1/2+	F	Jπ: L(pol d,p)=0 from 0+.
4919 *10*	(3/2+,5/2+)	F	Jπ: L(pol d,p)=(2) from 0+.
4957 *10*	1/2+	F	Jπ: L(pol d,p)=0 from 0+.
5026 *10*		F	
5060 *10*	(3/2+,5/2+)	F	Jπ: L(pol d,p)=(2) from 0+.
5093 *10*		F	
5123 *10*	3/2+,5/2+	F	Jπ: L(pol d,p)=2 from 0+.
5142 *10*	(5/2−,7/2−)	F	Jπ: L(pol d,p)=(3) from 0+.
5178.59 *6*	1/2+	EF	Jπ: L(pol d,p)=0 from 0+ for a level at 5178 *10*.
5240	3/2+,5/2+	F	Jπ: L(pol d,p)=2 from 0+.
5291.08[a] *31*	(17/2+)	B	Jπ: tentative assignment in (^{48}Ca,2α3nγ) from the comparison with cranked Nilsson-Strutinsky model calculations.
5363.92 *8*	(3/2)+	EF	Jπ: L(pol d,p)=2 from 0+ for a level at 5372; 4362.4γ to 1/2−.
5445	3/2+,5/2+	F	Jπ: L(pol d,p)=2 from 0+.
5539.92 *28*	(19/2+)	B	Jπ: 969.7γ Q, ΔJ=2 to 15/2(+).
5595	3/2+,5/2+	F	Jπ: L(pol d,p)=2 from 0+.
5711	3/2+,5/2+	F	Jπ: L(pol d,p)=2 from 0+.
5863		F	
5930	3/2+,5/2+	F	Jπ: L(pol d,p)=2 from 0+.
6000		F	
6070	3/2+,5/2+	F	Jπ: L(pol d,p)=2 from 0+.
6160		F	
6280	3/2+,5/2+	F	Jπ: L(pol d,p)=2 from 0+.
6299.22 *29*	(21/2−)	B	Jπ: proposed in (^{48}Ca,2α3nγ), with no explicit argument given for the negative parity; 759.3γ D, ΔJ=1 to (19/2+).
6320		F	
6440	1/2+	F	Jπ: L(pol d,p)=0 from 0+.
6500	3/2+,5/2+	F	Jπ: L(pol d,p)=2 from 0+.
6502.6[a] *4*	(21/2+)	B	Jπ: 1211.5γ Q, ΔJ=2 to (17/2+); band assignment.
6574.16[&] *30*	(21/2+)	B	Jπ: 1703.5γ Q, ΔJ=2 to (17/2+); band assignment.
(6838.073 *35*)	1/2+	DE	Jπ: s-wave neutron capture from 0+. S(n)=6837.77 *6* (2021Wa16).
6842.24 *8*	1/2	D	
6846.07 *6*	(1/2)	D	
6847.16 *6*		D	
6849.80 *6*	(1/2)	D	
6855.28 *6*	(1/2)	D	
6858.04 *6*	(1/2)	D	
6862.00 *6*	(1/2)	D	
6865.74 *6*		D	
6866.8 *6*	(3/2)	D	
6867.25 *6*	(1/2)	D	
6871.69 *6*	(3/2)	D	
6875.44 *6*		D	
6877.67 *6*		D	
6878.35 *6*		D	
6880.10 *6*	1/2	D	
6882.18 *6*		D	

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Adopted Levels, Gammas (continued)

^{63}Ni Levels (continued)

E(level)[†]	J$^{\pi}$[‡]	XREF
6890.32 *6*	(1/2)	D
6893.88 *7*		D
6894.48 *7*	(1/2)	D
6900.2 *4*	(1/2)	D
6904.59 *7*	(1/2)	D
6907.53 *7*		D
6911.00 *6*		D
6913.99 *7*	1/2	D
6915.03 *6*		D
6917.93 *6*		D
6930.21 *6*		D
6930.95 *6*	1/2	D
6940.27 *6*		D
6942.61 *7*	1/2	D
6949.16 *6*		D
6955.91 *8*		D
6967.58 *7*		D
6974.55 *8*		D
6979.65 *8*		D
6983.11 *8*		D
6985.24 *9*		D
6996.93 *8*		D
7015.77 *8*		D
7021.95 *8*		D
7049.03 *21*	1/2	D
7063.59 *7*	1/2	D
7076.09 *10*	1/2	D
7093.1		D
7105.9		D
7113.8	1/2	D
7119	1/2	D
7130		D
7132.5		D
7137	1/2	D
7148.2		D
7152		D
7156		D
7160	1/2	D
7176.5	1/2	D
7184		D
7188.3	1/2	D
7196		D
7206.3	1/2	D
7214.1	1/2	D
7220.0	1/2	D
7232.8	1/2	D
7234.6		D
7251.3		D
7254	1/2	D
7264	1/2	D
7275	1/2	D
7280.4		D
7281		D
7288	1/2	D
7292.2		D
7305	1/2	D
7310		D

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Adopted Levels, Gammas (continued)

^{63}Ni Levels (continued)

E(level)†	Jπ‡	XREF	Comments
7318.5	1/2	D	
7323.4	1/2	D	
7328	1/2	D	
7345.0		D	
7351		D	
7358		D	
7364.7	1/2	D	
7368	1/2	D	
7383		D	
7397.2		D	
7400.4	1/2	D	
7409	1/2	D	
7411.9	1/2	D	
7418.8	1/2	D	
7427.7	1/2	D	
7488.2 *4*	(25/2$^-$)	B	Jπ: 1189.0γ Q, ΔJ=2 to (21/2$^-$).
8019.8[a] *4*	(25/2$^+$)	B	Jπ: 1517.2γ Q, ΔJ=2 to (21/2$^+$); band assignment.
8265.1[&] *4*	(25/2$^+$)	B	Jπ: 1690.9γ Q, ΔJ=2 to (21/2$^+$); band assignment.
9844.2[a] *5*	(29/2$^+$)	B	Jπ: 1824.4γ Q, ΔJ=2 to (25/2$^+$); band assignment.
10045.9[&] *4*	29/2$^+$	B	Jπ: 1780.8γ Q, ΔJ=2 to (25/2$^+$); band assignment.
11850 *15*	7/2$^-$	I	Jπ: IAS (^{63}Co g.s.), assigned in ^{64}Ni(p,d); also supported by coupled-channel analysis of measured σ(θ) data in (p,d) IAS.
11945.7[a] *5*	(33/2$^+$)	B	Jπ: 2101.4γ Q, ΔJ=2 to (29/2$^+$); band assignment.
11963.8[&] *5*	(33/2$^+$)	B	Jπ: 1917.9γ Q, ΔJ=2 to (29/2$^+$); band assignment.
14051.5[&] *6*	(37/2$^+$)	B	Jπ: 2087.6γ Q, ΔJ=2 to (33/2$^+$); band assignment.
14170.1[a] *6*	(37/2$^+$)	B	Jπ: 2224.4γ Q, ΔJ=2 to (33/2$^+$); band assignment.
16197.5[a] *6*	(41/2$^+$)	B	Jπ: 2027.3γ Q, ΔJ=2 to (37/2$^+$); band assignment.
16293.4[&] *8*	(41/2$^+$)	B	Jπ: 2241.9γ Q, ΔJ=2 to (37/2$^+$); band assignment.
18337.0[a] *7*	(45/2$^+$)	B	Jπ: 2139.5γ Q, ΔJ=2 to (41/2$^+$); band assignment.
18772.3[&] *22*	(45/2$^+$)	B	Jπ: 2478.8γ Q, ΔJ=2 to (41/2$^+$); band assignment.
20942.5[a] *8*	(49/2$^+$)	B	Jπ: 2605.4γ Q, ΔJ=2 to (45/2$^+$); band assignment.
21408.5[&] *25*	(49/2$^+$)	B	Jπ: 2636.2γ Q, ΔJ=2 to (45/2$^+$); band assignment.
23886.1[a] *15*	(53/2$^+$)	B	Jπ: 2943.6γ Q, ΔJ=2 to (49/2$^+$); band assignment.
24500.0[&] *31*	(53/2$^+$)	B	Jπ: 3091.4γ Q, ΔJ=2 to (49/2$^+$); band assignment.
27223.6[a] *20*	(57/2$^+$)	B	Jπ: 3337.4γ Q, ΔJ=2 to (53/2$^+$); band assignment.
x[b]	J≈(25/2$^-$)	B	Additional information 1. E(level),Jπ: x≈12.7 MeV and $J^\pi \approx 25/2^-$ from comparison of energies and spins of observed bands (Fig. 6 in 2013Al19) in (^{48}Ca,2α3nγ).
621.6+x[b] *4*	J+2	B	
1600.4+x[b] *5*	J+4	B	
2901.9+x[b] *6*	J+6	B	
4541.2+x[b] *8*	J+8	B	
6478.8+x[b] *9*	J+10	B	
8766.9+x[b] *13*	J+12	B	
11475.0+x[b] *19*	J+14	B	
14550.6+x[b] *24*	J+16	B	

† From a least-squares fit to γ-ray energies with uncertainties for levels connected with those γ rays and others are from transfer reactions for E(level)<S(n)=6837.8 and (n,γ):resonances for E(level)>S(n), unless otherwise noted.

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Adopted Levels, Gammas (continued)

^{63}Ni Levels (continued)

‡ For yrast levels in (^{48}Ca,2α3nγ), it is assumed spin ascends as excitation energy increases; assignments for levels in (n,γ):res are from analysis of neutron resonance data.

From RDM in (^{18}O,3nγ), unless otherwise noted.

@ Band(A): Band based on 1292, 9/2$^+$ level.

& Band(B): Band based on 4871, (17/2$^+$) level. Q(transition)=2.4 *+17−12* (deduced β_2=0.43 *+25−20*). Proposed configuration=[31,0$^{(-)}$2].

a Band(C): Band based on 5291, (17/2$^+$) level. Q(transition)=1.9 *+13−12* (deduced β_2=0.35 *+20−21*). Proposed configuration=[31,0$^{(+)}$2]. Band crossing at $\hbar\omega\approx$1.1 MeV by configuration=[2(−1)1,0$^{(+)}$2] which results in backbending.

b Band(D): Band based on J (25/2$^-$). Band feeds mostly (21/2$^-$) state at 6299 level. Direct transition to (21/2$^-$) and thus yrast character of the band is in contradiction with measured relative intensities of three bands.

Adopted Levels, Gammas (continued)

γ(^{63}Ni)

Additional information 2.

E_i(level)	J_i^π	E_γ[‡]	I_γ[‡]	E_f	J_f^π	Mult.[#]	α[†]	Comments
87.220	5/2$^-$	87.13[@] *11*	100	0.0	1/2$^-$	[E2]	0.969 *14*	B(E2)(W.u.)=2.274 *+60−58* α(K)=0.854 *13*; α(L)=0.1002 *15*; α(M)=0.01388 *21* α(N)=0.000458 *7* E_γ: other: 87.2 *4* from (d,pγ).
155.510	3/2$^-$	155.505 *22*	100	0.0	1/2$^-$			E_γ: other: 155.6 *2* from ^{63}Co β$^-$ decay.
517.897	3/2$^-$	362.40 *8*	100	155.510	3/2$^-$			E_γ: other: 362.3 *5* from ^{63}Co β$^-$ decay.
		430.71 *5*	2.4	87.220	5/2$^-$			
		517.61 *31*	30 *6*	0.0	1/2$^-$			
1001.253	1/2$^-$	483.38 *5*	91 *19*	517.897	3/2$^-$	[M1]	0.000941 *13*	α(K)=0.000845 *12*; α(L)=8.31×10^{-5} *12*; α(M)=1.171×10^{-5} *16* α(N)=5.04×10^{-7} *7* B(M1)(W.u.)=0.31 *+19−13*
		845.739 *32*	100 *19*	155.510	3/2$^-$	[M1,E2]	0.00032 *4*	α(K)=0.00029 *4*; α(L)=2.8×10^{-5} *4*; α(M)=4.0×10^{-6} *5* α(N)=1.72×10^{-7} *22* B(M1)(W.u.)=0.063 *+39−27* if M1, B(E2)(W.u.)=152 *+94−66* if E2.
		913.96 *4*	2.3 *5*	87.220	5/2$^-$	[E2]	0.000301 *4*	α(K)=0.000271 *4*; α(L)=2.65×10^{-5} *4*; α(M)=3.74×10^{-6} *5* α(N)=1.600×10^{-7} *22* B(E2)(W.u.)=2.4 *+16−11*
		1001.259 *33*	6.0 *12*	0.0	1/2$^-$	[M1]	0.000220 *21*	α(K)=0.000198 *19*; α(L)=1.93×10^{-5} *19*; α(M)=2.72×10^{-6} *27* α(N)=1.17×10^{-7} *11* B(M1)(W.u.)=0.0023 *+16−10*
1069.02	(5/2$^-$)	913.6[@] *5*	25[@] *3*	155.510	3/2$^-$			
		981.7[@] *3*	100[@] *6*	87.220	5/2$^-$			
		1069.1[@] *4*	51[@] *6*	0.0	1/2$^-$			
1251.11	(5/2,7/2$^-$)	1095.7[@] *5*	42[@] *9*	155.510	3/2$^-$			
		1163.8[@] *4*	100[@] *18*	87.220	5/2$^-$			
1291.93	9/2$^+$	1204.7[&] *1*	100	87.220	5/2$^-$	(M2)	0.000290 *4*	B(M2)(W.u.)=0.232 *+16−14* α(K)=0.000259 *4*; α(L)=2.54×10^{-5} *4*; α(M)=3.59×10^{-6} *5* α(N)=1.552×10^{-7} *22*; α(IPF)=1.297×10^{-6} *18* E_γ: from (^{48}Ca,2α3nγ). Other: 1204.66 *18* from (^{18}O,3nγ). Mult.: O+Q from γγ(θ) in (^{48}Ca,2α3nγ); M3 and E3 components ruled out by RUL; Δπ=yes based on L(d,p)=L(d,t)=4.
1323.704	3/2$^-$	322.36 *24*		1001.253	1/2$^-$			
		805.84 *5*	4.7 *10*	517.897	3/2$^-$			
		1168.152 *30*	100 *20*	155.510	3/2$^-$			
		1236.51 *4*	34 *7*	87.220	5/2$^-$			

Adopted Levels, Gammas (continued)

γ(^{63}Ni) (continued)

E_i(level)	J_i^π	E_γ[‡]	I_γ[‡]	E_f	J_f^π	Mult.[#]	α[†]	Comments
1323.704	3/2$^-$	1323.66 *5*	44 *9*	0.0	1/2$^-$			
1451.74	(5/2$^-$,7/2$^-$,9/2$^-$)	1364.5[@] *3*	100	87.220	5/2$^-$			
2183.53	11/2$^{(+)}$	891.56 *10*	100	1291.93	9/2$^+$	(M1+E2)	0.000286 *35*	α(K)=0.000257 *31*; α(L)=2.52×10^{-5} *31*; α(M)=3.5×10^{-6} *4* α(N)=1.52×10^{-7} *18* E_γ: weighted average of 891.5 *1* from (^{48}Ca,2α3nγ) and 891.70 *16* from (^{18}O,3nγ). Mult.: D+Q from γγ(θ) in (^{48}Ca,2α3nγ); Δπ=(no) from level scheme. B(M1)(W.u.)=0.0086 *+18−12* if M1, B(E2)(W.u.)=18.7 *+38−26* if E2.
2261.7	(5/2$^-$,7/2$^-$)	2106[@] *1*	63[@] *13*	155.510	3/2$^-$			
		2174.5[@] *5*	100[@] *15*	87.220	5/2$^-$			
2352.95	(1/2$^-$,3/2)	2265.66 *7*	24.2 *25*	87.220	5/2$^-$			
		2352.92 *6*	100 *9*	0.0	1/2$^-$			
2695.96	1/2$^-$	1694.60 *12*	9.2 *20*	1001.253	1/2$^-$			
		2177.94 *8*	18.5 *20*	517.897	3/2$^-$			
		2540.45 *6*	100 *11*	155.510	3/2$^-$			
		2695.92 *6*	56 *12*	0.0	1/2$^-$			
2814.18	13/2$^+$	630.5 *4*	100.0 *34*	2183.53	11/2$^{(+)}$	(M1+E2)	0.00067 *15*	α(K)=0.00060 *13*; α(L)=5.9×10^{-5} *13*; α(M)=8.4×10^{-6} *19* α(N)=3.6×10^{-7} *8* E_γ: unweighted average of 630.1 *1* from (^{48}Ca,2α3nγ) and 630.9 *3* from (^{18}O,3nγ). I_γ: from (^{48}Ca,2α3nγ). Mult.: D+Q from γγ(θ) in (^{48}Ca,2α3nγ); Δπ=(no) from level scheme. B(M1)(W.u.)=0.128 *+96−39* if M1. B(E2)(W.u.)=5.6×10^2 *+42−17* exceeds RUL=300 if E2.
		1522.48 *29*	40.0 *23*	1291.93	9/2$^+$	E2	0.0001914 *27*	α(K)=8.63×10^{-5} *12*; α(L)=8.39×10^{-6} *12*; α(M)=1.182×10^{-6} *17* α(N)=5.11×10^{-8} *7*; α(IPF)=9.55×10^{-5} *13* B(E2)(W.u.)=2.7 *+20−8* E_γ: weighted average of 1521.9 *4* from (^{48}Ca,2α3nγ) and 1522.63 *20* from (^{18}O,3nγ). I_γ: from (^{48}Ca,2α3nγ). Mult.: Q from γγ(θ) in (^{48}Ca,2α3nγ); M2 ruled out by RUL.
3236.63?		3236.57[a] *9*	100	0.0	1/2$^-$			
3283.53	(1/2,3/2,5/2$^+$)	3127.91 *6*	100	155.510	3/2$^-$			
3633.67	(3/2$^+$,5/2$^+$)	3115.82 *7*	42.4 *17*	517.897	3/2$^-$			

$^{63}_{28}Ni_{35}$-9

Adopted Levels, Gammas (continued)

γ(^{63}Ni) (continued)

E_i(level)	J_i^π	E_γ[‡]	I_γ[‡]	E_f	J_f^π	Mult.[#]	Comments
3633.67	$(3/2^+,5/2^+)$	3476.4 *5*	100 *6*	155.510	$3/2^-$		
3651.00	$15/2^{(+)}$	836.8 *1*	100 *4*	2814.18	$13/2^+$	D+Q	
		1467.6 *3*	33 *4*	2183.53	$11/2^{(+)}$	Q	
3739.04	$(1/2^-,3/2)$	3221.05 *8*	20.6 *8*	517.897	$3/2^-$		
		3583.50 *10*	100 *5*	155.510	$3/2^-$		
		3651.69 *7*	82 *5*	87.220	$5/2^-$		
		3739.6 *7*	81 *4*	0.0	$1/2^-$		
4054.61	$(1/2^+)$	3899.06 *9*	60 *2*	155.510	$3/2^-$		
		4054.46 *8*	100 *20*	0.0	$1/2^-$		
4312.38	$(1/2^-,3/2^-)$	3794.19 *12*	100 *8*	517.897	$3/2^-$		
		4225.08 *13*	85 *8*	87.220	$5/2^-$		
4323.98	$17/2^{(+)}$	672.8 *1*	100 *4*	3651.00	$15/2^{(+)}$	D+Q	E_γ,I_γ: from (^{48}Ca,2α3nγ).
		1510.8 *3*	41 *3*	2814.18	$13/2^+$	Q	E_γ,I_γ: from (^{48}Ca,2α3nγ).
4332.0?		4176.1[a] *32*	33 *33*	155.510	$3/2^-$		
		4331.9[a] *8*	100 *33*	0.0	$1/2^-$		
4459.15	(1/2,3/2)	4458.98 *14*	100	0.0	$1/2^-$		
4570.19	$15/2^{(+)}$	919.9 *2*	70.1 *32*	3651.00	$15/2^{(+)}$	D+Q	E_γ,I_γ: from (^{48}Ca,2α3nγ).
		1755.4 *2*	100.0 *32*	2814.18	$13/2^+$	D+Q	E_γ,I_γ: from (^{48}Ca,2α3nγ).
		2385.7 *5*	11.7 *32*	2183.53	$11/2^{(+)}$	Q	E_γ,I_γ: from (^{48}Ca,2α3nγ).
4871.6	$(17/2^+)$	2058.3 *4*	100	2814.18	$13/2^+$	Q	E_γ,I_γ: from (^{48}Ca,2α3nγ).
5178.59	$1/2^+$	4660.17 *16*	73 *7*	517.897	$3/2^-$		
		5022.72 *13*	100 *7*	155.510	$3/2^-$		
5291.08	$(17/2^+)$	967.1 *2*	100	4323.98	$17/2^{(+)}$		E_γ,I_γ: from (^{48}Ca,2α3nγ).
5363.92	$(3/2)^+$	4362.41 *11*	100 *6*	1001.253	$1/2^-$		
		5209.0 *5*	63 *6*	155.510	$3/2^-$		
5539.92	$(19/2^+)$	969.7 *3*	52 *5*	4570.19	$15/2^{(+)}$	Q	E_γ,I_γ: from (^{48}Ca,2α3nγ).
		1888.9 *2*	100 *4*	3651.00	$15/2^{(+)}$	Q	E_γ,I_γ: from (^{48}Ca,2α3nγ).
6299.22	$(21/2^-)$	759.3 *1*	100	5539.92	$(19/2^+)$	D	E_γ,I_γ: from (^{48}Ca,2α3nγ).
6502.6	$(21/2^+)$	1211.5 *2*	100	5291.08	$(17/2^+)$	Q	E_γ,I_γ: from (^{48}Ca,2α3nγ).
6574.16	$(21/2^+)$	1703.5 *4*	44 *9*	4871.6	$(17/2^+)$	Q	
		2249.9 *2*	100 *19*	4323.98	$17/2^{(+)}$	Q	
(6838.073)	$1/2^+$	1474.09 *10*	0.066 *13*	5363.92	$(3/2)^+$		
		1659.38 *6*	0.072 *14*	5178.59	$1/2^+$		
		2378.88 *6*	0.145 *14*	4459.15	(1/2,3/2)		
		2525.61 *7*	0.054 *6*	4312.38	$(1/2^-,3/2^-)$		
		2783.43 *5*	0.146 *15*	4054.61	$(1/2^+)$		
		3098.98 *6*	0.582 *30*	3739.04	$(1/2^-,3/2)$		
		3205.60 *25*	0.306 *24*	3633.67	$(3/2^+,5/2^+)$		
		3554.40 *7*	0.118 *24*	3283.53	$(1/2,3/2,5/2^+)$		
		3601.39 *12*	0.0471 *24*	3236.63?			

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Adopted Levels, Gammas (continued)

γ(^{63}Ni) (continued)

E_i(level)	J_i^π	E_γ[‡]	I_γ[‡]	E_f	J_f^π	Mult.[#]
(6838.073)	$1/2^+$	4141.96 *10*	0.593 *31*	2695.96	$1/2^-$	
		4485.2 *5*	0.427 *21*	2352.95	$(1/2^-,3/2)$	
		5513.95 *14*	1.95 *10*	1323.704	$3/2^-$	
		5836.45 *29*	7.79 *27*	1001.253	$1/2^-$	
		6319.81 *27*	4.77 *24*	517.897	$3/2^-$	
		6682.40 *26*	1.72 *7*	155.510	$3/2^-$	
		6837.92 *26*	100 *5*	0.0	$1/2^-$	
7488.2	$(25/2^-)$	1189.0 *2*	100	6299.22	$(21/2^-)$	Q
8019.8	$(25/2^+)$	1517.2 *2*	100	6502.6	$(21/2^+)$	Q
8265.1	$(25/2^+)$	1690.9 *2*	100	6574.16	$(21/2^+)$	Q
9844.2	$(29/2^+)$	1824.4 *2*	100	8019.8	$(25/2^+)$	Q
10045.9	$29/2^+$	1780.8 *2*	100	8265.1	$(25/2^+)$	Q
11945.7	$(33/2^+)$	2101.4 *2*	100	9844.2	$(29/2^+)$	Q
11963.8	$(33/2^+)$	1917.9 *2*	100	10045.9	$29/2^+$	Q
14051.5	$(37/2^+)$	2087.6 *3*	100	11963.8	$(33/2^+)$	Q
14170.1	$(37/2^+)$	2224.4 *3*	100	11945.7	$(33/2^+)$	Q
16197.5	$(41/2^+)$	2027.3 *2*	100	14170.1	$(37/2^+)$	Q
16293.4	$(41/2^+)$	2241.9 *5*	100	14051.5	$(37/2^+)$	Q
18337.0	$(45/2^+)$	2139.5 *3*	100	16197.5	$(41/2^+)$	Q
18772.3	$(45/2^+)$	2478.8 *21*	100	16293.4	$(41/2^+)$	Q
20942.5	$(49/2^+)$	2605.4 *4*	100	18337.0	$(45/2^+)$	Q
21408.5	$(49/2^+)$	2636.2 *12*	100	18772.3	$(45/2^+)$	Q
23886.1	$(53/2^+)$	2943.6 *12*	100	20942.5	$(49/2^+)$	Q
24500.0	$(53/2^+)$	3091.4 *18*	100	21408.5	$(49/2^+)$	
27223.6	$(57/2^+)$	3337.4 *13*	100	23886.1	$(53/2^+)$	
621.6+x	J+2	621.6 *4*	100	x	$J\approx(25/2^-)$	Q
1600.4+x	J+4	978.8 *3*	100	621.6+x	J+2	Q
2901.9+x	J+6	1301.5 *3*	100	1600.4+x	J+4	Q
4541.2+x	J+8	1639.2 *5*	100	2901.9+x	J+6	Q
6478.8+x	J+10	1937.6 *5*	100	4541.2+x	J+8	Q
8766.9+x	J+12	2288.1 *9*	100	6478.8+x	J+10	Q
11475.0+x	J+14	2708.0 *14*	100	8766.9+x	J+12	Q
14550.6+x	J+16	3075.5 *14*	100	11475.0+x	J+14	

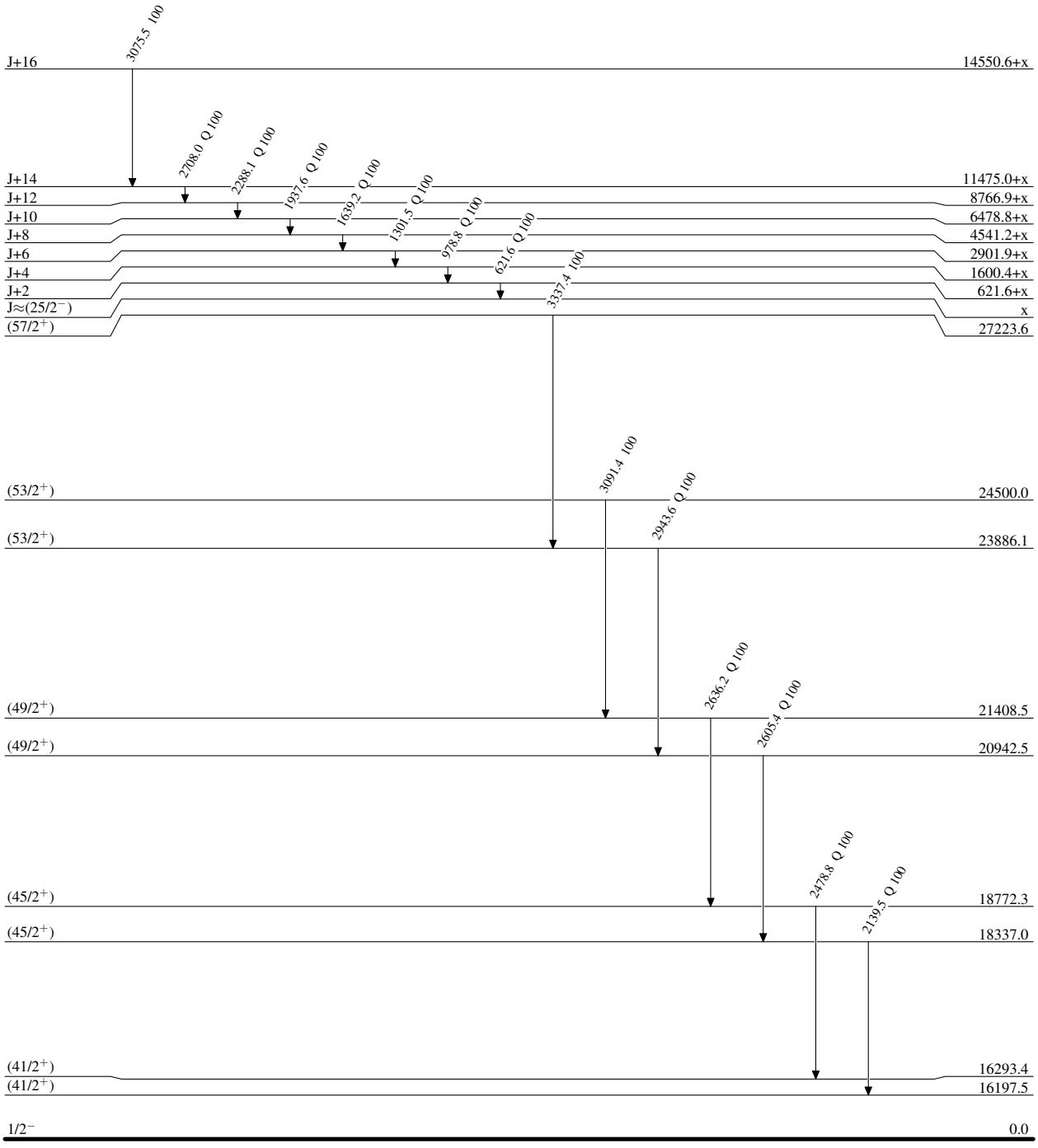
† Additional information 3.
‡ From (n,γ) E=thermal up to 6838 level and from (^{48}Ca,2α2nγ) above that, unless otherwise noted.
# From γ(θ) and γγ(θ) in (^{48}Ca,2α3nγ), unless otherwise noted.
@ From ^{63}Co β^- decay.
& From ^{48}Ca(^{18}O,3nγ).
a Placement of transition in the level scheme is uncertain.

$^{63}_{28}Ni_{35}$-11

Adopted Levels, Gammas

Level Scheme

Intensities: Relative photon branching from each level

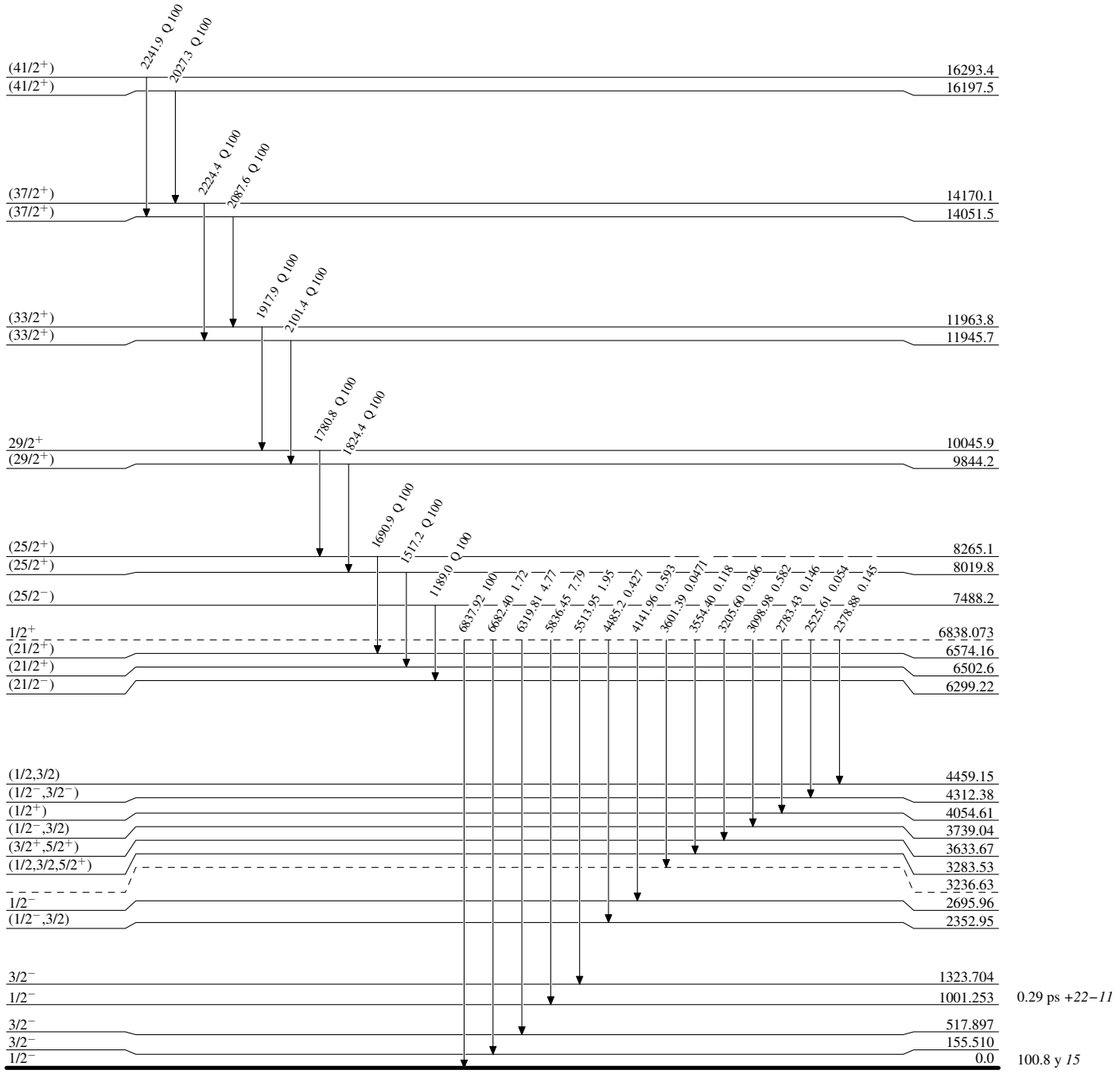


$^{63}_{28}Ni_{35}$

Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{63}_{28}Ni_{35}$

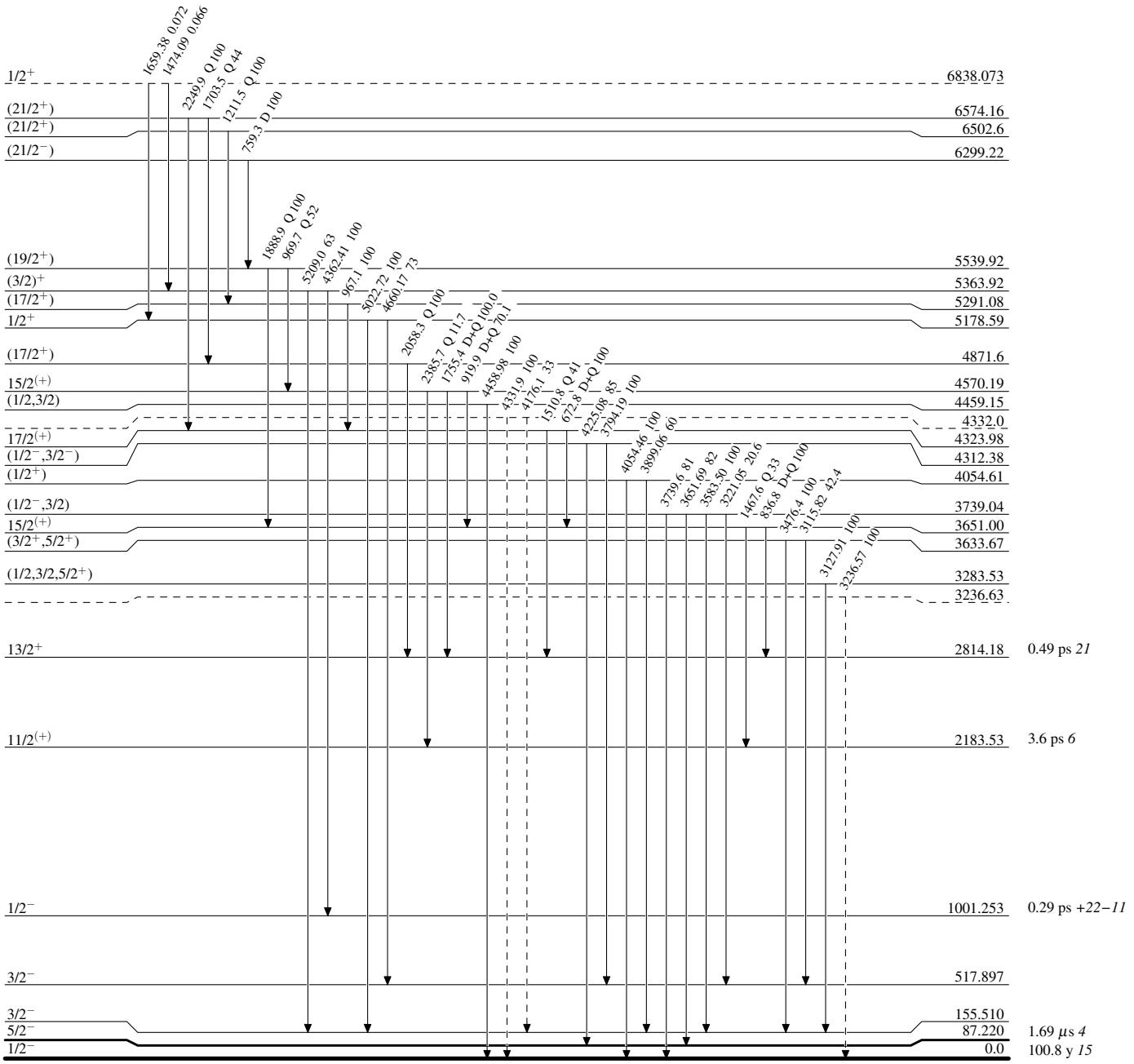
Adopted Levels, Gammas

Legend

Level Scheme (continued)

Intensities: Relative photon branching from each level

γ Decay (Uncertain)

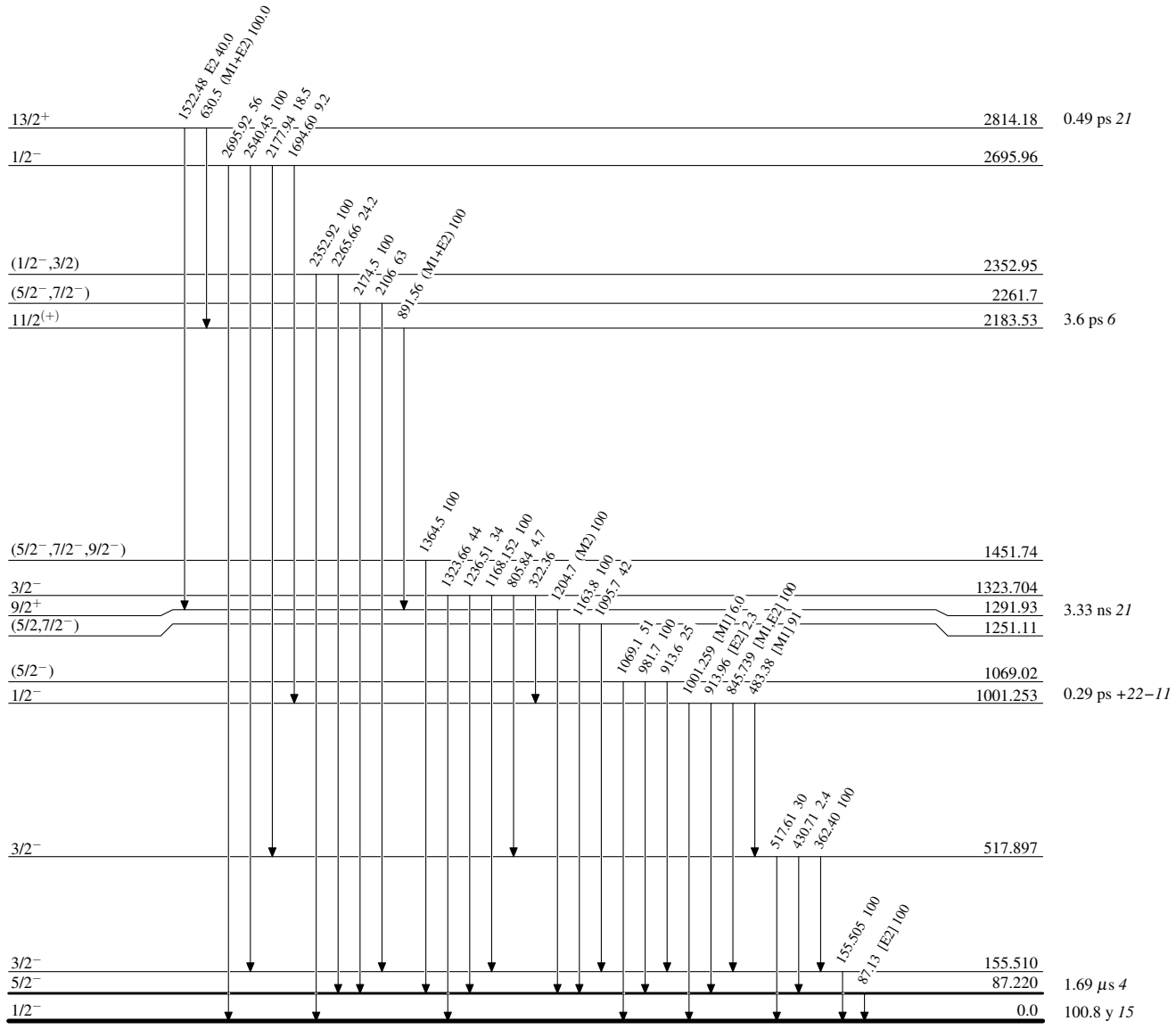


$^{63}_{28}Ni_{35}$

Adopted Levels, Gammas

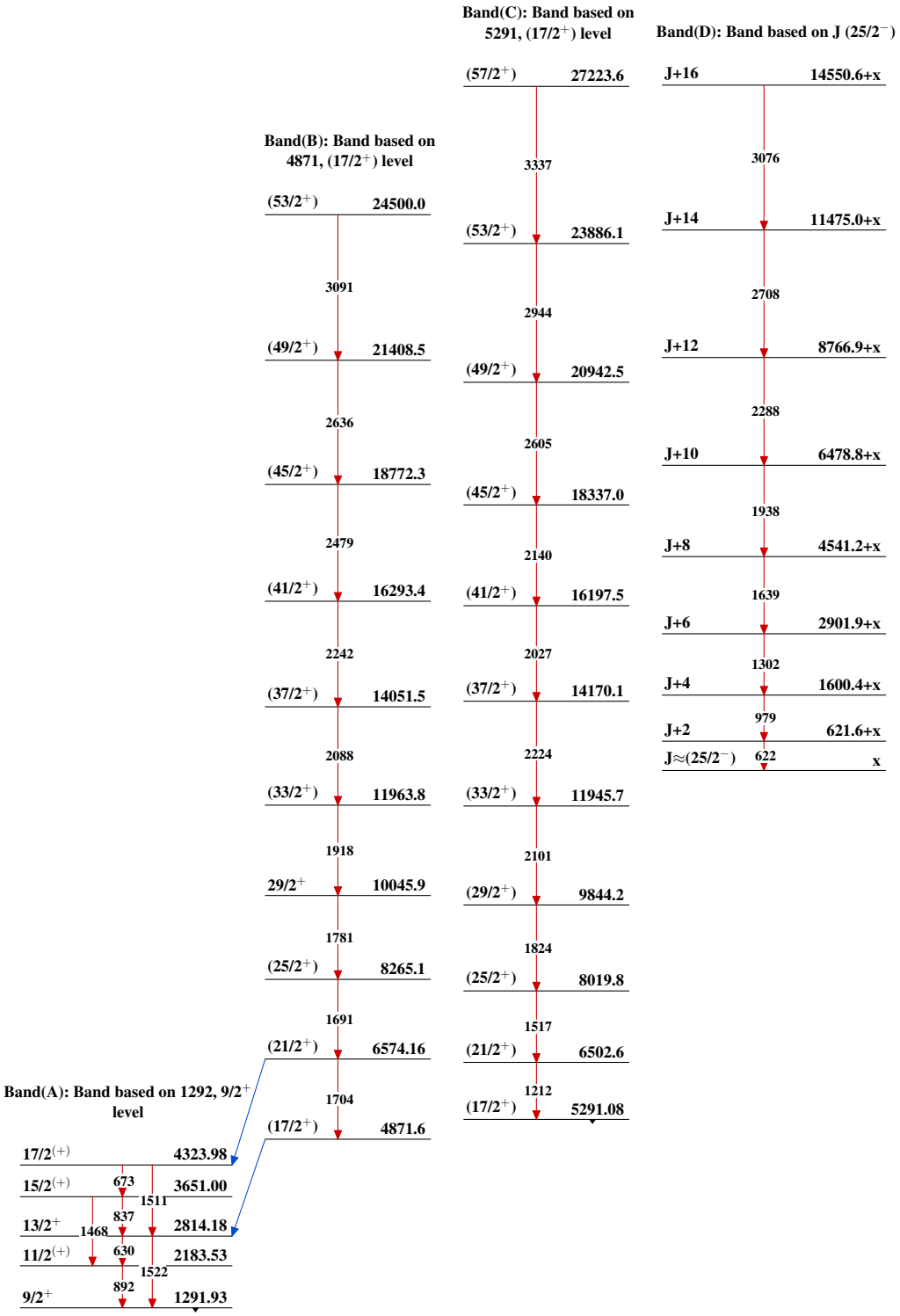
Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{63}_{28}Ni_{35}$

Adopted Levels, Gammas



$^{63}_{28}Ni_{35}$