^{60}Ni(γ,γ'),(pol γ,γ'):XUNDL-6 2013Sc20

Compiled (unevaluated) dataset form 2013Sc20: Phys Rev C 88, 044304 (2013) Compiled by F.G. Kondev (ANL) and B. Singh (McMaster); Nov 2, 2013.

Edited by B. Singh (McMaster) Nov 13, 2013; e-mail reply of Nov 13, 2013 from M. Scheck incorporated; level energies changed to those listed in the paper, rather than from least-squares fit.

Edited by B. Singh (McMaster) Nov 27, 2013; e-mail reply of Nov 14, 2013 from M. Scheck, supplied numerical data for figure 3 in paper; numerical values of angular correlation included.

Bremsstrahlung measurements using the S-DALINAC accelerator in Darmstadt at Eγ (max)=6.0, 8.0 and 9.9 MeV. Target=99.8% enriched in ^{60}Ni. Three HPGe detectors, embedded in a lead shielding, each equipped with BGO anti-Compton shielding. Relative γ-ray efficiency, up to 10 MeV, was simulated using the GEANT4 toolkit. Second experiment utilized the High Intensity γ-ray Source (HIγS) (100% linearly polarized photons) at TUNL. Measured Eγ, $\gamma\gamma(\theta)$, polarization, (γ,γ') cross sections and branching ratios. Deduced levels, J, π, $T_{1/2}$, partial widths.

B(L x ray)up and $I_{s,f}$ cross-section values are from 2013Sc20.

^{60}Ni Levels

B(E1)(↑) values here are in e^2b, and B(E2)(↑) values in e^2b^2; 2013Sc20 list these in units of e^2fm^2 and e^2fm^4, respectively. B(M1)(↑) values are in μ_N^2.

E(level)[†]	J^π[‡]	$T_{1/2}$[@]	Γ_0 (eV)[&]	Comments
0.0	0^+[#]			
1332.7[a] *2*	2^+[#]	>347 fs	<1.32×10^{-3}	$T_{1/2}$: >347 fs *12*. B(E2)↑<0.195 *6*. Γ_0<0.00132 eV *4*.
2157.7[b] *10*	2^+[#]	>6.7 fs	<0.0010	$T_{1/2}$: >6.7 fs *33*. B(E2)↑<0.137 *52*. Γ_0<0.0010 eV *4*.
2284.87 *14*	0^+	>1.5 ps		E(level),J^π,$T_{1/2}$: from Adopted Levels for ^{60}Ni in ENSDF database.
3123.4[b] *8*	2^+[#]	>3.6 fs	<0.011	$T_{1/2}$: >3.6 fs *28*. B(E2)↑<0.024 *17*. Γ_0<0.011 eV *8*.
3193.6 *7*	1^+	>3.1 fs	0.024×10^{-3} *8*	$T_{1/2}$: >3.1 fs *12*. B(M1)↑<0.190 *67*. E(level): level not observed in the 6.0-MeV data.
3268.9[b] *11*	2^+[#]	>7.42 fs	<0.009	$T_{1/2}$: >7.42 fs *21*. B(E2)↑<0.0157 *53*. Γ_0<0.009 eV *2*.
3393.3 *10*	2^+[#]	>2.4 fs	<0.0010	$T_{1/2}$: >2.4 fs *42*. B(E2)↑<0.014 *19*. Γ_0<0.0010 eV *14*.
3797.9 *10*	1	118 fs *15*	0.0039 *10*	B(E1)↑=0.203×10^{-5} *26* or B(M1)↑=0.018 *3*.
3908 *3*	1	27 fs *5*	0.017 *1*	E(level): 3908.1 *3* in table IV of 2013Sc20 seems a misprint. B(E1)↑=0.82×10^{-5} *15* or B(M1)↑=0.074 *14*.
4006.7[a] *8*	2^+[#]	22 fs *4*	0.0078 *15*	B(E2)↑=0.0047 *7*.
4020.6 *3*	1^+	13 fs *6*	0.020 *8*	B(M1)↑=0.079 *18*.
4844.5[a] *7*	2^+	6.9 fs *21*	0.226 *71*	B(E2)↑=0.0052 *12*.
5064.5 *6*	1	2.98 fs *28*	0.124 *10*	B(E1)↑=2.7×10^{-5} *3* or B(M1)↑=0.247 *18*.
5931.4 *11*	1	21 fs *6*	0.021 *5*	B(E1)↑=0.285×10^{-5} *70* or B(M1)↑=0.0258 *63*.
6180.6 *6*	1^-	1.80 fs *28*	0.234 *34*	B(E1)↑=2.84×10^{-5} *41*.
6229.0 *11*	(2^+)	20 fs *4*	0.023 *5*	B(E2)↑=0.0015 *3*. J^π: assignment is tentative.
6382.2 *10*	1	12 fs *3*	0.037 *10*	B(E1)↑=0.40×10^{-5} *11* or B(M1)↑=0.037 *10*.
6465.2 *6*	1^-	1.7 fs *5*	0.167 *39*	B(E1)↑=1.77×10^{-5} *42*.
6514.6 *9*	1^+	3.0 fs *5*	0.150 *23*	B(M1)↑=0.140 *21*.
6587.6 *6*	1^-	1.25 fs *28*	0.248 *43*	B(E1)↑=2.48×10^{-5} *43*.

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^{60}Ni(γ,γ′),(pol γ,γ′):XUNDL-6 2013Sc20 (continued)

^{60}Ni Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$[@]	Γ_0 (eV)[&]	Comments
6718.1 *10*	1⁻	6.7 fs *13*	0.069 *14*	B(E1)↑=0.65×10^{-5} *13*.
6736.8 *10*	(1)	6 fs *3*	0.036 *21*	E(level),J$^{\pi}$: level seen only in 8.0-MeV data; spin assignment is tentative. B(E1)↑=0.34×10^{-5} *20* or B(M1)↑=0.031 *18*.
6913.7 *7*	1⁺	1.46 fs *28*	0.288 *47*	B(M1)↑=0.226 *37*.
7038.7 *7*	1⁻	1.3 fs *4*	0.212 *54*	B(E1)↑=1.75×10^{-5} *44*.
7473.7 *9*	1⁺	2.1 fs *3*	0.214 *36*	B(M1)↑=0.133 *23*. Additional information 1.
7559.0 *8*	1⁻	6.5 fs *22*	0.070 *24*	B(E1)↑=0.47×10^{-5} *16*.
7646.9 *7*	1⁻	0.27 fs *3*	1.67 *20*	B(E1)↑=10.7×10^{-5} *13*.
7657.1 *8*	1⁺	0.97 fs *14*	0.475 *70*	B(M1)↑=0.274 *40*.
7690.9 *6*	1⁻	0.208 fs *28*	2.13 *26*	B(E1)↑=13.4×10^{-5} *16*.
7746.9 *5*	1⁻	0.55 fs *21*	0.46 *12*	B(E1)↑=2.83×10^{-5} *75*.
7761.6 *8*	1⁺	1.7 fs *4*	0.276 *69*	B(M1)↑=0.153 *38*.
7849.7 *10*	1⁺	1.66 fs *28*	0.280 *46*	B(M1)↑=0.150 *25*.
7879.8 *12*	1⁺	2.6 fs *6*	0.176 *36*	B(M1)↑=0.093 *19*.
7926.1 *17*	1⁺	8.2 fs *36*	0.055 *24*	B(M1)↑=0.029 *13*.
7951.2 *8*	1⁺	0.76 fs *14*	0.590 *86*	E(level): uncertainty of 0.2 keV in table III of 2013Sc20 seems a misprint. B(M1)↑=0.304 *44*.
8042.0 *16*	1⁺	7.7 fs *28*	0.059 *21*	B(M1)↑=0.029 *11*.
8085.5 *5*	1⁻	0.201 fs *35*	1.85 *27*	B(E1)↑=10.0×10^{-5} *15*.
8111.2 *12*	1⁺	3.0 fs *7*	0.154 *35*	B(M1)↑=0.075 *17*.
8126.0 *7*	1⁻	0.45 fs *6*	1.02 *13*	B(E1)↑=5.45×10^{-5} *70*.
8188.5 *8*	1	1.04 fs *21*	0.436 *68*	$T_{1/2}$,Γ_0 (eV): for J^{π}=1⁻. For J^{π}=1⁺, values are: $T_{1/2}$=1.66 fs *35*, Γ_0=0.273 eV *51*. B(E1)↑=2.27×10^{-5} *36* or B(M1)↑=0.129 *24*.
8260.9 *8*	1⁻	0.40 fs *6*	1.13 *15*	B(E1)↑=5.75×10^{-5} *77*.
8293.7 *7*	1⁻	0.76 fs *28*	0.384 *95*	B(E1)↑=1.93×10^{-5} *48*.
8351.2 *13*	1⁺	2.4 fs *6*	0.192 *45*	B(M1)↑=0.085 *20*.
8358.7 *15*	1⁺	3.4 fs *11*	0.135 *43*	B(M1)↑=0.060 *19*.
8406[c] *4*	1⁻	6.3 fs *37*	0.072 *43*	B(E1)↑=0.35×10^{-5} *21*.
8450.9 *16*	1	2.3 fs *6*	0.203 *45*	$T_{1/2}$,Γ_0 (eV): for J^{π}=1⁻. For J^{π}=1⁺, values are: $T_{1/2}$=4.6 fs *16*, Γ_0=0.100 eV *35*. B(E1)↑=0.96×10^{-5} *22* or B(M1)↑=0.043 *15*.
8463.4 *13*	1⁻	2.7 fs *7*	0.169 *42*	B(E1)↑=0.80×10^{-5} *20*.
8514.6 *9*	1⁻	0.69 fs *14*	0.64 *10*	B(E1)↑=2.96×10^{-5} *48*.
8654.7 *9*	1⁻	1.32 fs *28*	0.348 *69*	B(E1)↑=1.54×10^{-5} *31*.
8655.9 *7*	1⁺	0.7 fs *6*	0.36 *23*	B(M1)↑=0.145 *92*.
8687.7 *13*	1⁺	2.6 fs *7*	0.176 *44*	B(M1)↑=0.069 *17*.
8746.3 *12*	1⁻	0.90 fs *21*	0.49 *11*	B(E1)↑=2.11×10^{-5} *46*.
8767 *4*	1⁺	8 fs *8*	0.059 *59*	B(M1)↑=0.023 *23*.
8777.9 *10*	1⁺	1.25 fs *35*	0.361 *93*	B(M1)↑=0.138 *36*.
8780.9 *10*	1⁻	1.25 fs *35*	0.367 *94*	B(E1)↑=1.55×10^{-5} *40*.
8795.2 *9*	1⁺	1.11 fs *35*	0.71 *44*	B(M1)↑=0.27 *17*.
8845.8 *14*	1⁺	1.5 fs *4*	0.308 *76*	B(M1)↑=0.115 *29*.
8871.0 *16*	1⁺	1.6 fs *4*	0.290 *76*	B(M1)↑=0.108 *28*.
8889.8 *12*	1⁺	0.83 fs *21*	0.56 *11*	B(M1)↑=0.207 *41*.
8923.4 *10*	1⁻	0.36 fs *6*	1.28 *23*	B(E1)↑=5.14×10^{-5} *94*.
9009.8 *19*	1⁻	2.1 fs *7*	0.210 *67*	B(E1)↑=0.82×10^{-5} *26*.
9052.6 *24*	1⁻	2.9 fs *12*	0.158 *65*	B(E1)↑=0.61×10^{-5} *25*.
9068.2 *13*	1⁺	1.04 fs *28*	0.43 *10*	B(M1)↑=0.150 *36*.
9092.7 *8*	1⁻	0.132 fs *28*	2.74 *47*	B(E1)↑=10.4×10^{-5} *18*.
9131.5 *15*	1⁻	0.90 fs *21*	0.52 *11*	B(E1)↑=1.95×10^{-5} *42*.
9148.7 *30*	1⁻	0.69 fs *35*	0.63 *28*	B(E1)↑=2.4×10^{-5} *11*.
9255.2 *25*	1⁻	1.5 fs *7*	0.29 *13*	B(E1)↑=1.06×10^{-5} *47*.
9265.7 *24*	1⁻	1.4 fs *7*	0.33 *16*	B(E1)↑=1.19×10^{-5} *56*.

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^{60}Ni(γ,γ'),(pol γ,γ'):XUNDL-6 2013Sc20 (continued)

^{60}Ni Levels (continued)

E(level)[†]	J^π[‡]	$T_{1/2}$[@]	Γ_0 (eV)[&]	Comments
9273.9 *15*	1	2.6 fs *19*	0.17 *13*	$T_{1/2}$,Γ_0 (eV): for $J^\pi=1^-$. For $J^\pi=1^+$, values are: $T_{1/2}$=1.2 fs *6*, Γ_0=0.38 eV *17*. B(E1)↑=0.63×10^{-5} *45* or B(M1)↑=0.124 *55*.
9300.4 *15*	1$^+$	0.55 fs *21*	0.84 *34*	B(M1)↑=0.27 *11*.
9307.5 *14*	1$^-$	0.49 fs *21*	0.96 *36*	B(E1)↑=3.4×10^{-5} *13*.
9351.8 *21*	1$^-$	1.9 fs *8*	0.24 *11*	B(E1)↑=0.85×10^{-5} *39*.
9394.7 *15*	1$^-$	0.83 fs *35*	0.56 *21*	B(E1)↑=1.93×10^{-5} *73*.
9409.9 *17*	1$^-$	1.2 fs *5*	0.39 *16*	B(E1)↑=1.34×10^{-5} *56*.
9452.3 *16*	1$^+$	1.0 fs *4*	0.47 *18*	B(M1)↑=0.143 *54*.
9464.5 *11*	1$^-$	0.21 fs *21*	0.80 *64*	B(E1)↑=2.7×10^{-5} *22*.
9466.8 *35*	1$^+$	1.9 fs *12*	0.23 *15*	B(M1)↑=0.071 *46*.
9504.1 *17*	1$^-$	10 fs *4*	0.48 *20*	B(E1)↑=1.60×10^{-5} *66*.
9598.2 *15*	1$^-$	0.62 fs *28*	0.71 *26*	B(E1)↑=2.31×10^{-5} *85*.
9639.4[c] *21*	1$^-$	3.0 fs *26*	0.15 *13*	E(level): from Eγ. E(level)=9640.0 *21* listed in table II of 2013Sc20. B(E1)↑=0.48×10^{-5} *40*.
9658.5 *8*	1$^-$	0.049 fs *14*	8.7 *24*	B(E1)↑=27.6×10^{-5} *76*.
9700.6[c] *15*	1$^-$	0.8 fs *5*	0.54 *30*	B(E1)↑=1.69×10^{-5} *94*.
9720.2[c] *18*	1$^-$	1.2 fs *8*	0.36 *22*	B(E1)↑=1.11×10^{-5} *68*.
9750.6[c] *23*	1$^-$	4.2 fs *35*	0.111 *95*	B(E1)↑=0.34×10^{-5} *29*.
9773.9[c] *20*	1$^-$	1.9 fs *14*	0.24 *17*	B(E1)↑=0.73×10^{-5} *52*.
9806.6[c] *19*	1$^-$	1.6 fs *10*	0.29 *19*	B(E1)↑=0.87×10^{-5} *58*.
9830[c] *4*	1$^+$	1.3 fs *6*	0.35 *16*	B(M1)↑=0.097 *44*.
9831.1[c] *21*	1$^-$	1.3 fs *6*	0.35 *16*	B(E1)↑=1.07×10^{-5} *49*.
9870.4[c] *20*	1$^-$	0.8 fs *6*	0.61 *43*	B(E1)↑=1.8×10^{-5} *13*.
9892.6[c] *17*	1$^-$	0.49 fs *28*	0.97 *60*	B(E1)↑=2.9×10^{-5} *18*.

[†] From 2013Sc20, unless otherwise stated.
[‡] From 2013Sc20, based on the deduced transition multipolarities, unless otherwise stated.
[#] From Adopted Levels of ^{60}Ni in ENSDF database.
[@] From 2013Sc20, based on the partial γ-ray width to the ground state, Γ_0, and the corresponding branching ratios, unless otherwise stated.
[&] Partial γ-ray width to the ground state.
[a] Level observed only in the 6.0-MeV data.
[b] Level observed only in the 10.0-MeV data.
[c] Level observed only in the HIγS experiment.

γ(^{60}Ni)

Expected W(90°)/W(130°) ratios from $\gamma\gamma(\theta)$ are: 0.708 for 0$^+$ -> 1 -> 0$^+$ cascade, 0.85-0.92 for 0$^+$ -> 1 -> 2$^+$, 2.25 for 0$^+$ -> 2$^+$ -> 0$^+$, 0.85 for 0$^+$ -> 2$^+$ -> 2$^+$, M1 for 2$^+$ to 2$^+$, and 1.36 for 0$^+$ -> 2$^+$ -> 2$^+$, E2 for 2$^+$ to 2$^+$.

E_i(level)	J^π_i	E_γ[†]	I_γ[‡]	E_f	J^π_f	Mult.[#]	Comments
1332.7	2$^+$	1332.7 *2*	100	0.0	0$^+$	E2	$I_{s,f}$<8.6 eVb 8. W(90°)/W(130°)=1.03 *6*.
2157.7	2$^+$	2157.7 *10*	15[&] *2*	0.0	0$^+$	E2	$I_{s,f}$<6.4 eVb 17. W(90°)/W(130°)=1.08 *45*.
2284.87	0$^+$	952.4[a] *2*		1332.7	2$^+$		
		2284.87[a]		0.0	0$^+$	E0	

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^{60}Ni(γ,γ′),(pol γ,γ′):XUNDL-6 2013Sc20 (continued)

γ(^{60}Ni) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[‡]	E_f	J^π_f	Mult.[#]	Comments
3123.4	2+	1790.9 *9*	86[&] *4*	1332.7	2+		$I_{s,f}$<19.4 eV b 43. W(90°)/W(130°)=1.05 *30*.
		3124.1[a] *3*	9[&] *1*	0.0	0+	[E2]	
3193.6	1+	1861.2 *11*	38[&] *1*	1332.7	2+		$I_{s,f}$<11.1 eV b 36. W(90°)/W(130°)=1.04 *63*.
		3193.3 *10*	16[&] *1*	0.0	0+	M1	$I_{s,f}$<4.4 eV b 14. W(90°)/W(130°)=0.60 *33*.
3268.9	2+	1936.4 *11*	43[&] *2*	1332.7	2+		$I_{s,f}$<7.4 eV b 27. W(90°)/W(130°)=1.10 *74*.
		3269.4[a] *3*	15[&] *1*	0.0	0+	[E2]	
3393.3	2+	2059.8 *10*	84[&] *6*	1332.7	2+		$I_{s,f}$<14.5 eV b 37. W(90°)/W(130°)=1.03 *40*.
		3393.4[a] *8*	6[&] *2*	0.0	0+	[E2]	
3797.9	1	3797.9 *10*	100	0.0	0+		$I_{s,f}$=3.1 eV b 4. W(90°)/W(130°)=0.79 *6*.
3908	1	3908 *3*	100	0.0	0+		$I_{s,f}$=12.9 eV b 8. W(90°)/W(130°)=0.93 *8*.
4006.7	2+	4006.7 *11*	38[&] *2*	0.0	0+	E2	$I_{s,f}$=4.2 eV b 4. W(90°)/W(130°)=2.18 *40*.
4020.6	1+	4020.6 *3*	55 *3*	0.0	0+	M1	E_γ,I_γ: from Adopted Gammas of ^{60}Ni in ENSDF database. $I_{s,f}$=8.2 eV b 7. W(90°)/W(130°)=0.76 *6*.
4844.5	2+	4844.5 *7*	33[&] *2*	0.0	0+	E2	$I_{s,f}$=6.1 eV b 8. W(90°)/W(130°)=2.31 *96*.
5064.5	1	3732.1 *9*	19 *3*	1332.7	2+		$I_{s,f}$=9.2 eV b 21. W(90°)/W(130°)=0.79 *10*.
		5065.4 *7*	81 *2*	0.0	0+		$I_{s,f}$=43.5 eV b 25. W(90°)/W(130°)=0.71 *7*.
5931.4	1	5930.8 *11*	100	0.0	0+		E_γ: contaminated by a transition in ^{11}B. $I_{s,f}$=6.8 eV b 17. W(90°)/W(130°)=0.84 *44*.
6180.6	1−	4848.4 *14*	9 *4*	1332.7	2+		$I_{s,f}$=6.5 eV b 27. W(90°)/W(130°)=1.00 *65*.
		6180.6 *7*	91 *1*	0.0	0+	E1	$I_{s,f}$=64.1 eV b 84. W(90°)/W(130°)=0.70 *40*.
6229.0	(2+)	6229.0 *11*	100	0.0	0+	(E2)	$I_{s,f}$=11.4 eV b 24. W(90°)/W(130°)=2.16 *68*.
6382.2	1	6382.2[@] *10*	100	0.0	0+		$I_{s,f}$=10.4 eV b 27. W(90°)/W(130°)=0.63 *20*.
6465.2	1−	4180.5 *14*	23 *7*	2284.87	0+		$I_{s,f}$=10.4 eV b 38. W(90°)/W(130°)=0.91 *50*.
		5131.6 *10*	17 *4*	1332.7	2+		$I_{s,f}$=7.8 eV b 22. W(90°)/W(130°)=0.74 *21*. E_γ: alternatively, 5131.6γ can be placed from a 7415-keV level to 2285, 0+ level.
		6465.2 *9*	60 *4*	0.0	0+	E1	$I_{s,f}$=27.8 eV b 46. W(90°)/W(130°)=0.63 *8*.
6514.6	1+	6514.6 *9*	100	0.0	0+	M1	$I_{s,f}$=40.6 eV b 62. W(90°)/W(130°)=0.59 *6*.
6587.6	1−	4302.0 *11*	20 *4*	2284.87	0+		$I_{s,f}$=13.1 eV b 28. W(90°)/W(130°)=0.64 *24*. E_γ: seen only at 8.0-MeV measurement.
		5254.7 *10*	13 *4*	1332.7	2+		$I_{s,f}$=8.8 eV b 21. W(90°)/W(130°)=0.77 *17*.

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^{60}Ni(γ,γ′),(pol γ,γ′):XUNDL-6 2013Sc20 (continued)

γ(^{60}Ni) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[‡]	E_f	J^π_f	Mult.[#]	Comments
6587.6	1⁻	6587.6 *8*	67 *2*	0.0	0⁺	E1	$I_{s,f}$=43.8 eVb 63. W(90°)/W(130°)=0.68 *5*.
6718.1	1⁻	6718.1 *10*	100	0.0	0⁺	E1	$I_{s,f}$=17.6 eVb 35. W(90°)/W(130°)=0.56 *11*.
6736.8	(1)	4577.7 *13*	54 *11*	2157.7	2⁺		$I_{s,f}$=5.0 eVb 19. W(90°)/W(130°)=1.3 *11*.
		6736.1 *16*	46 *11*	0.0	0⁺		$I_{s,f}$=4.2 eVb 15. W(90°)/W(130°)=1.03 *62*.
6913.7	1⁺	5581.0 *18*	7 *3*	1332.7	2⁺		$I_{s,f}$=5.1 eVb 21. W(90°)/W(130°)=0.77 *30*.
		6913.7 *8*	93 *1*	0.0	0⁺	M1	$I_{s,f}$=64.4 eVb 97. W(90°)/W(130°)=0.80 *8*.
7038.7	1⁻	5705.6 *9*	39 *5*	1332.7	2⁺		$I_{s,f}$=19.5 eVb 36. W(90°)/W(130°)=0.72 *15*.
		7038.7 *10*	61 *4*	0.0	0⁺	E1	$I_{s,f}$=30.0 eVb 54. W(90°)/W(130°)=0.71 *11*.
7473.7	1⁺	7473.7 *9*	100	0.0	0⁺	M1	$I_{s,f}$=44.2 eVb 75. W(90°)/W(130°)=0.60 *9*.
7559.0	1⁻	7559.0 *8*	100	0.0	0⁺	E1	$I_{s,f}$=14.2 eVb 48. W(90°)/W(130°)=0.57 *35*.
7646.9	1⁻	7646.9 *7*	100	0.0	0⁺	E1	$I_{s,f}$=330 eVb 39. W(90°)/W(130°)=0.70 *3*.
7657.1	1⁺	7657.1 *8*	100	0.0	0⁺	M1	$I_{s,f}$=93 eVb 14. W(90°)/W(130°)=0.89 *9*.
7690.9	1⁻	6358.8 *16*	2 *1*	1332.7	2⁺		$I_{s,f}$=9.7 eVb 30. W(90°)/W(130°)=0.77 *39*.
		7690.9 *7*	98 *1*	0.0	0⁺	E1	$I_{s,f}$=406 eVb 48. W(90°)/W(130°)=0.71 *3*.
7746.9	1⁻	5461.9 *11*	11 *2*	2284.87	0⁺		$I_{s,f}$=9.5 eVb 21. W(90°)/W(130°)=0.61 *17*.
		5590.1[b] *10*	9 *1*	2157.7	2⁺		$I_{s,f}$=7.5 eVb 20. W(90°)/W(130°)=0.93 *40*.
		6413.8 *9*	27 *3*	1332.7	2⁺		$I_{s,f}$=23.4 eVb 44. W(90°)/W(130°)=0.83 *12*.
		7747.3[b] *8*	54 *4*	0.0	0⁺	E1	$I_{s,f}$=47.9 eVb 91. W(90°)/W(130°)=0.71 *11*.
7761.6	1⁺	7761.6 *8*	100	0.0	0⁺	M1	E_γ: doublet. $I_{s,f}$=53 eVb 13. W(90°)/W(130°)=0.81 *19*.
7849.7	1⁺	7849.7 *10*	100	0.0	0⁺	M1	$I_{s,f}$=52.4 eVb 87. W(90°)/W(130°)=0.59 *9*.
7879.8	1⁺	7879.8 *12*	100	0.0	0⁺	M1	$I_{s,f}$=32.7 eVb 67. W(90°)/W(130°)=0.61 *15*.
7926.1	1⁺	7926.1 *17*	100	0.0	0⁺	M1	$I_{s,f}$=10.1 eVb 45. W(90°)/W(130°)=0.45 *37*.
7951.2	1⁺	7951.2 *8*	100	0.0	0⁺	M1	$I_{s,f}$=108 eVb 16. W(90°)/W(130°)=0.73 *8*.
8042.0	1⁺	8042.0 *16*	100	0.0	0⁺	M1	$I_{s,f}$=10.5 eVb 38. W(90°)/W(130°)=0.26 *23*.
8085.5	1⁻	5800.8 *8*	13 *2*	2284.87	0⁺		$I_{s,f}$=43.6 eVb 74. W(90°)/W(130°)=0.57 *10*.
		6752.3 *13*	6 *2*	1332.7	2⁺		$I_{s,f}$=19.4 eVb 52. W(90°)/W(130°)=0.98 *40*.
		8085.7 *7*	81 *2*	0.0	0⁺	E1	$I_{s,f}$=263 eVb 32. W(90°)/W(130°)=0.71 *3*.

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^{60}Ni(γ,γ′),(pol γ,γ′):XUNDL-6 2013Sc20 (continued)

γ(^{60}Ni) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[‡]	E_f	J^π_f	Mult.[#]	Comments
8111.2	1+	8111.2 *12*	100	0.0	0+	M1	$I_{s,f}$=27.0 eVb 61. W(90°)/W(130°)=0.72 *22*.
8126.0	1−	8126.0 *7*	100	0.0	0+	E1	$I_{s,f}$=178 eVb 23. W(90°)/W(130°)=0.71 *4*.
8188.5	1	8188.5[@] *7*	100	0.0	0+		$I_{s,f}$=75 eVb 12 for E1, 46.9 eVb 88 for M1. W(90°)/W(130°)=0.72 *15*.
8260.9	1−	8260.9 *8*	100	0.0	0+	E1	$I_{s,f}$=191 eVb 25. W(90°)/W(130°)=0.65 *6*.
8293.7	1−	6135.5 *11*	35 *5*	2157.7	2+		$I_{s,f}$=22.8 eVb 49. W(90°)/W(130°)=0.70 *19*.
		8293.0 *10*	65 *4*	0.0	0+	E1	$I_{s,f}$=41.6 eVb 76. W(90°)/W(130°)=0.75 *15*.
8351.2	1+	8351.2 *13*	100	0.0	0+	M1	$I_{s,f}$=31.7 eVb 74. W(90°)/W(130°)=0.64 *21*.
8358.7	1+	8358.7 *15*	100	0.0	0+	M1	$I_{s,f}$=22.3 eVb 71. W(90°)/W(130°)=0.35 *22*.
8406	1−	8406 *4*	100	0.0	0+	E1	$I_{s,f}$=24 eVb 14.
8450.9	1	8450.9[@] *16*	100	0.0	0+		$I_{s,f}$=32.7 eVb 73 for E1, 16.1 eVb 57 for M1. W(90°)/W(130°)=0.71 *44*.
8463.4	1−	8463.4 *13*	100	0.0	0+	E1	$I_{s,f}$=27.3 eVb 67. W(90°)/W(130°)=0.70 *28*.
8514.6	1−	8514.6 *9*	100	0.0	0+	E1	$I_{s,f}$=101 eVb 16. W(90°)/W(130°)=0.75 *11*.
8654.7	1−	8654.7[@] *9*	100	0.0	0+		$I_{s,f}$=54 eVb 11.
8655.9	1+	7324.2 *14*	43 *7*	1332.7	2+		$I_{s,f}$=24.2 eVb 66. W(90°)/W(130°)=0.60 *25*.
		8655.9[@] *9*	57 *11*	0.0	0+		$I_{s,f}$=32 eVb 14. W(90°)/W(130°)=0.62 *54*.
8687.7	1+	8687.7 *13*	100	0.0	0+	M1	$I_{s,f}$=26.8 eVb 67. W(90°)/W(130°)=0.49 *18*.
8746.3	1−	8746.3 *12*	100	0.0	0+	E1	$I_{s,f}$=74 eVb 16. W(90°)/W(130°)=0.30 *20*.
8767	1+	8767 *4*	100	0.0	0+	M1	$I_{s,f}$=8.8 eVb 88. E_γ,I_γ: from HIγS experiment.
8777.9	1+	8777.9[@] *10*	100	0.0	0+	M1	$I_{s,f}$=54 eVb 14. W(90°)/W(130°)=0.61 *23*.
8780.9	1−	8780.9[@] *10*	100	0.0	0+	E1	$I_{s,f}$=55 eVb 14.
8795.2	1+	7459.5 *11*	55 *11*	1332.7	2+		$I_{s,f}$=58 eVb 12. W(90°)/W(130°)=0.80 *19*.
		8795.2[b] *16*	45 *10*	0.0	0+	M1	$I_{s,f}$=48 eVb 19. W(90°)/W(130°)=0.51 *27*.
8845.8	1+	8845.8 *14*	100	0.0	0+	M1	$I_{s,f}$=45 eVb 12. W(90°)/W(130°)=0.68 *24*.
8871.0	1+	8871.0 *16*	100	0.0	0+	M1	$I_{s,f}$=43 eVb 11. W(90°)/W(130°)=0.71 *27*.
8889.8	1+	8889.8 *12*	100	0.0	0+	M1	$I_{s,f}$=82 eVb 16. W(90°)/W(130°)=0.80 *19*.
8923.4	1−	8923.4 *10*	100	0.0	0+	E1	$I_{s,f}$=185 eVb 34. W(90°)/W(130°)=0.52 *19*.
9009.8	1−	9009.8 *19*	100	0.0	0+	E1	$I_{s,f}$=29.8 eVb 96. W(90°)/W(130°)=0.62 *34*.
9052.6	1−	9052.6 *24*	100	0.0	0+	E1	$I_{s,f}$=22.2 eVb 92. W(90°)/W(130°)=0.89 *72*.
9068.2	1+	9068.2 *13*	100	0.0	0+	M1	$I_{s,f}$=61 eVb 15. W(90°)/W(130°)=0.75*25*.

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^{60}Ni(γ,γ′),(pol γ,γ′):XUNDL-6 2013Sc20 (continued)

γ(^{60}Ni) (continued)

E_i(level)	J^π_i	E_γ[†]	I_γ[‡]	E_f	J^π_f	Mult.[#]	Comments
9092.7	1⁻	7761.2 *19*	20 *6*	1332.7	2⁺	E1	$I_{s,f}$=76 eVb 25. W(90°)/W(130°)=0.94 *52*. E_γ: doublet.
		9091.2 *8*	80 *2*	0.0	0⁺	E1	$I_{s,f}$=306 eVb 44. W(90°)/W(130°)=0.68 *7*.
9131.5	1⁻	9131.5 *15*	100	0.0	0⁺	E1	$I_{s,f}$=72 eVb 16. W(90°)/W(130°)=0.48 *20*.
9148.7	1⁻	9148.7[b] *30*	100	0.0	0⁺	E1	$I_{s,f}$=87 eVb 38. W(90°)/W(130°)=0.68 *40*.
9255.2	1⁻	9255.2 *25*	100	0.0	0⁺	E1	$I_{s,f}$=40 eVb 18. W(90°)/W(130°)=0.58 *45*.
9265.7	1⁻	9265.7 *24*	100	0.0	0⁺	E1	$I_{s,f}$=44 eVb 21. W(90°)/W(130°)=0.71 *57*.
9273.9	1	9273.9[@] *15*	100	0.0	0⁺		$I_{s,f}$=23 eVb 17 for J^π=1⁻, 51 eVb 23 for J^π=1⁺. W(90°)/W(130°)=0.63 *80*.
9300.4	1⁺	9300.4 *15*	100	0.0	0⁺	M1	$I_{s,f}$=111 eVb 45. W(90°)/W(130°)=0.83 *42*.
9307.5	1⁻	9307.5 *14*	100	0.0	0⁺	E1	$I_{s,f}$=128 eVb 48. W(90°)/W(130°)=0.77 *34*.
9351.8	1⁻	9351.8 *21*	100	0.0	0⁺	E1	$I_{s,f}$=32 eVb 15. W(90°)/W(130°)=0.54 *34*.
9394.7	1⁻	9394.7 *15*	100	0.0	0⁺	E1	$I_{s,f}$=73 eVb 28. W(90°)/W(130°)=0.65 *28*.
9409.9	1⁻	9409.9 *17*	100	0.0	0⁺	E1	$I_{s,f}$=51 eVb 21. W(90°)/W(130°)=0.69 *37*.
9452.3	1⁺	9452.3 *16*	100	0.0	0⁺	M1	$I_{s,f}$=60 eVb 23. W(90°)/W(130°)=0.58 *25*.
9464.5	1⁻	7303.2 *16*	62 *18*	2157.7	2⁺		$I_{s,f}$=64 eVb 19. W(90°)/W(130°)=1.04 *50*. E_γ: assignment to this level is tentative and it is based on better energy-difference agreement.
		9464.5[@] *15*	38 *12*	0.0	0⁺	E1	$I_{s,f}$=39 eVb 19.
9466.8	1⁺	9466.8[@] *35*	100	0.0	0⁺	M1	$I_{s,f}$=30 eVb 19. W(90°)/W(130°)=0.9 *10*.
9504.1	1⁻	9504.1 *17*	100	0.0	0⁺	E1	$I_{s,f}$=61 eVb 25. W(90°)/W(130°)=1.06 *76*.
9598.2	1⁻	9598.2 *15*	100	0.0	0⁺	E1	$I_{s,f}$=89 eVb 33. W(90°)/W(130°)=0.86 *34*.
9639.4	1⁻	9639.4 *21*	100	0.0	0⁺	E1	E_γ: uncertainty of 0.2 keV in table II of 2013Sc20 seems a misprint. $I_{s,f}$=18 eVb 16.
9658.5	1⁻	8326.0 *16*	10 *3*	1332.7	2⁺		$I_{s,f}$=111 eVb 33. W(90°)/W(130°)=0.78 *38*.
		9658.5 *9*	90 *2*	0.0	0⁺	E1	$I_{s,f}$=963 eVb 240. W(90°)/W(130°)=0.70 *8*.
9700.6	1⁻	9700.6 *15*	100	0.0	0⁺	E1	$I_{s,f}$=66 eVb 37.
9720.2	1⁻	9720.2 *18*	100	0.0	0⁺	E1	$I_{s,f}$=44 eVb 27.
9750.6	1⁻	9750.6 *23*	100	0.0	0⁺	E1	$I_{s,f}$=13 eVb 12.
9773.9	1⁻	9773.9 *20*	100	0.0	0⁺	E1	$I_{s,f}$=29 eVb 20.
9806.6	1⁻	9806.6 *19*	100	0.0	0⁺	E1	$I_{s,f}$=35 eVb 23.
9830	1⁺	9830 *4*	100	0.0	0⁺	M1	$I_{s,f}$=42 eVb 19. E_γ,I_γ: from HIγS experiment.
9831.1	1⁻	9831.1 *21*	100	0.0	0⁺	E1	$I_{s,f}$=42 eVb 19.
9870.4	1⁻	9870.4 *20*	100	0.0	0⁺	E1	$I_{s,f}$=72 eVb 51.
9892.6	1⁻	9892.6 *17*	100	0.0	0⁺	E1	$I_{s,f}$=114 eVb 71.

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^{60}Ni(γ,γ'),(pol γ,γ'):XUNDL-6 2013Sc20 (continued)

γ(^{60}Ni) (continued)

† From 2013Sc20. Gamma-ray energies listed in 2013Sc20 are mostly recoil corrected, according to e-mail reply of Nov 13, 2013 from M. Scheck which states "Concerning the recoils I corrected them for the levels which I had in the Darmstadt spectra. There I had fixed the calibration to the ^{11}B lines and needed to recalculate the energies. For the lines only seen in the Duke Spectra it shouldn't matter there I assumed quite large errors of 4 keV, since I've made an internal calibration to the peaks from Darmstadt which by themselves have already large errors".

‡ Intensities are branching ratios from Γ_f/Γ values given in 2013Sc20, normalized to 100.

Multipolarity are deduced using the gamma-ray polarization and angular-correlation analyses. Angular asymmetry ratios for 90° and 130° are plotted in Figure 3 of 2013Sc20, but not tabulated in the paper.

@ HIγS experiment indicates a M1/E1 doublet.

& From Adopted Gammas for ^{60}Ni in ENSDF database.

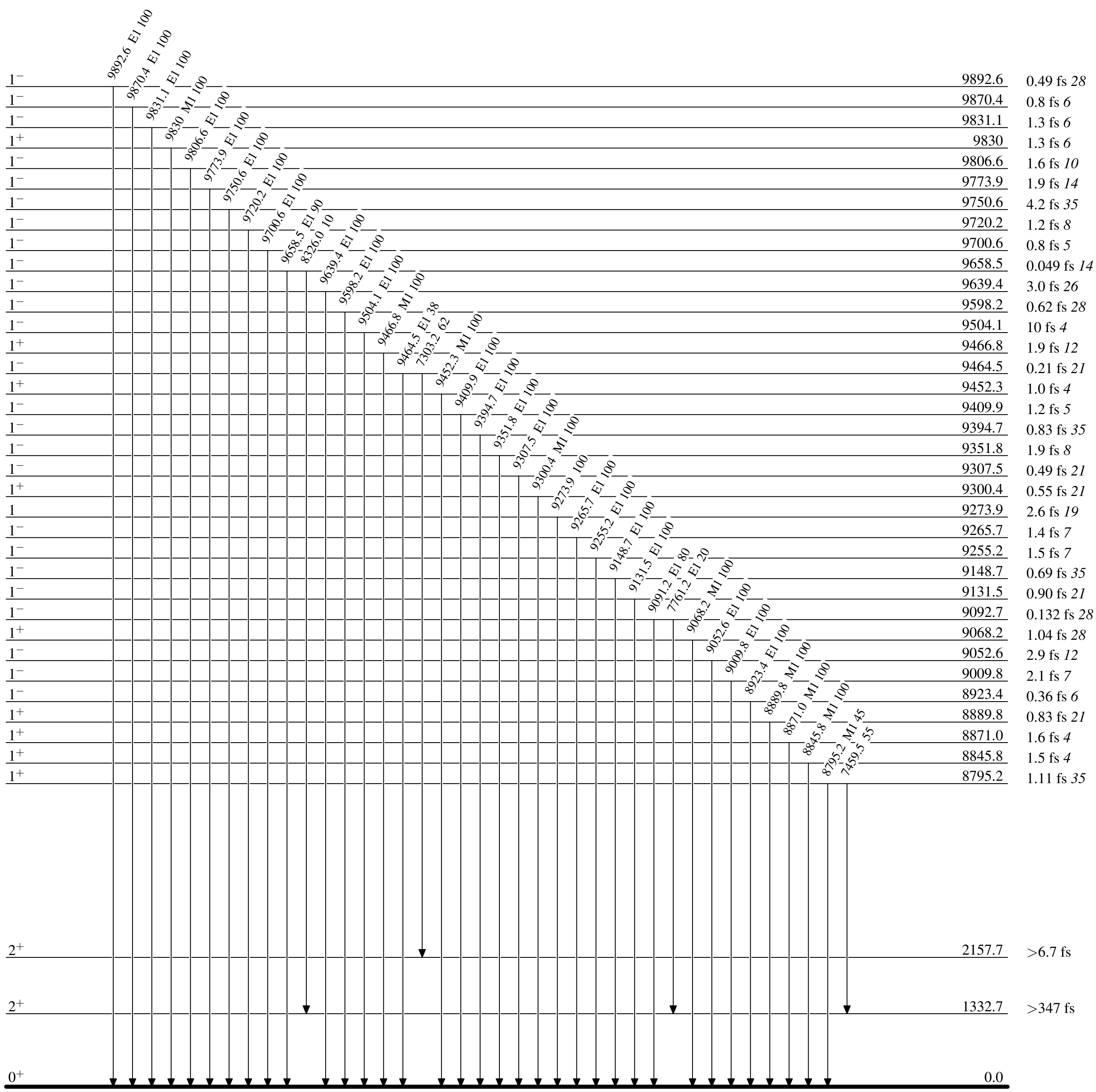
[a] From Adopted Gammas for ^{60}Ni in ENSDF database; not observed in the present data.

[b] Contaminated by a single-escape peak.

$^{60}Ni(\gamma,\gamma'),(pol\ \gamma,\gamma')$:XUNDL-6 2013Sc20

Level Scheme

Intensities: % photon branching from each level

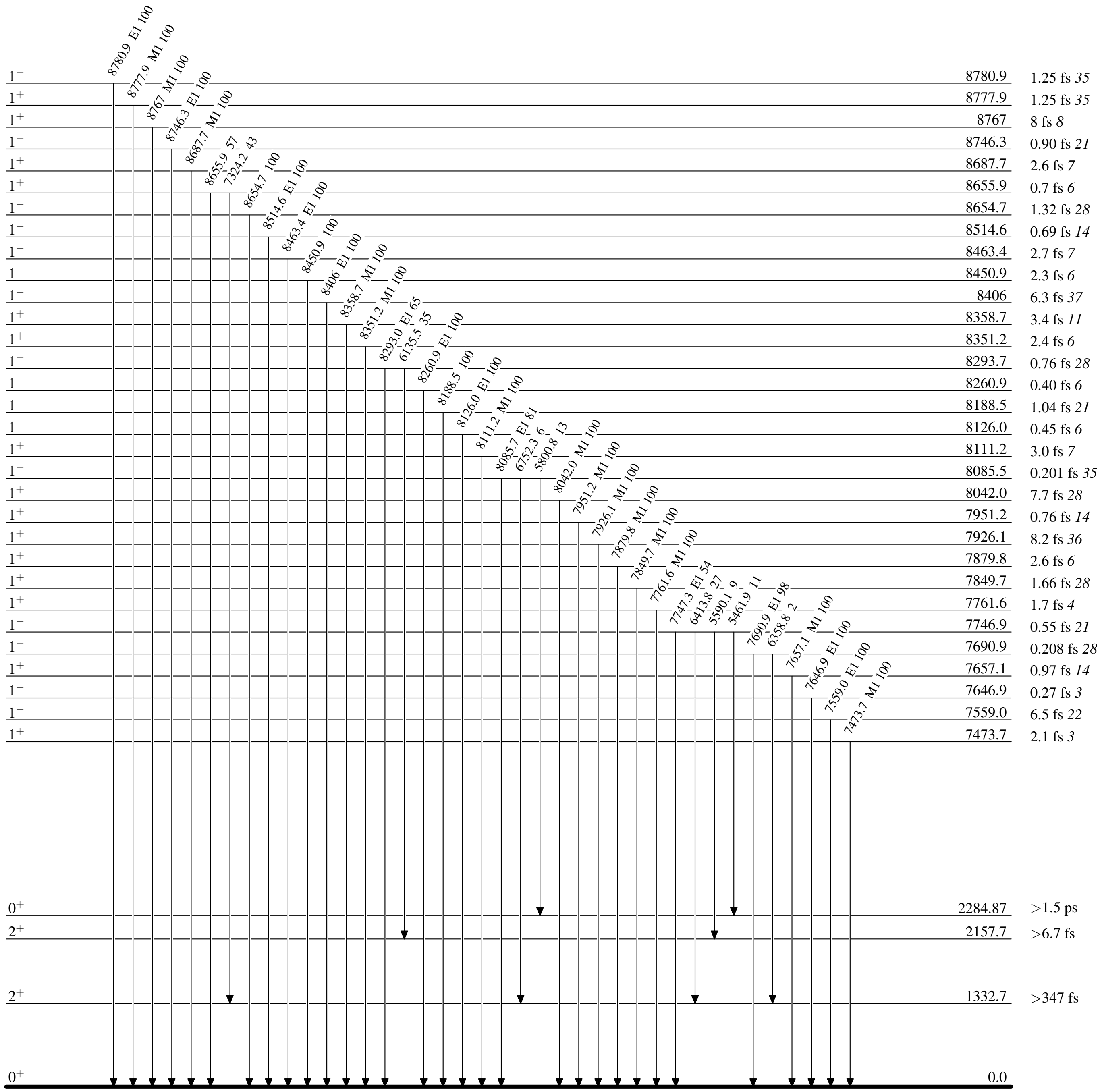


$^{60}_{28}Ni_{32}$

$^{60}Ni(\gamma,\gamma')$,(pol γ,γ'):XUNDL-6 2013Sc20

Level Scheme (continued)

Intensities: % photon branching from each level



$^{60}_{28}Ni_{32}$

^{60}Ni(γ,γ′),(pol γ,γ′):XUNDL-6 2013Sc20

Level Scheme (continued)

Intensities: % photon branching from each level