^{58}Fe(p,γ) 1975Br29

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	M. Shamsuzzoha Basunia	NDS 151, 1 (2018)	1-Apr-2018

Others: 1972Pe23, 1973PeYY, 1974Ke14, 1977Ri14, 1979PiZO, 1982Ni05, 1993Ti06, 2000Ra27, 2001Fe06.

2000Ra27: E(p)=1.5-3.0 MeV, 90.7% ^{58}Fe target, pair spectrometer at 55°, NaI detector; measured primary γ spectra, yield of γ's directly populating g.s.; deduced radiative strength function from summed primary γ spectra for a sequence of E(p) values (energy steps equal to energy loss in target). See also 2001Fe06.

1993Ti06: E(p)=0.785-4.65 MeV, natural Fe target; measured σ(E).

1977Ri14: E(p)=2227; measured absolute resonance strength.

1975Br29: E(p)=2150-2270 in steps of 0.7 keV. Enriched targets (82% ^{58}Fe + 16% ^{56}Fe), Ge(Li) and NaI detectors, θ=55°; measured excit (Eγ>5 MeV), Eγ, Iγ.

1974Ke14: E(p)=2200-2250. Ge(Li) detector; measured Eγ(θ=90°), primary γ ray branching (from Iγ(θ=55°)), excit (Eγ>1 MeV), DSAM at θ=0°, 90°, 135°. 14 resonances (or clusters of levels) observed, E(level)=9526-9566; E(p)(res) consistently 3-5 keV higher than in 1975Br29, 7-10 keV higher than in (p,p′) of 1971Li14.

For average resonance spectroscopy, see 1982Ni05.

For γ and inelastic p widths of the eight most intense probable fragments of the $p_{3/2}$ ^{59}Fe(g.s.) analogue resonance, see 1975Br29.

For additional resonances, see 1972Pe23, 1974Ke14.

^{59}Co Levels

E(level)[†]	$T_{1/2}$[‡]	Comments
0.0		
1098.62 *4*		E(level): 1098.9 *4* from 1974Ke14.
1189.78 *5*	≤111 fs	E(level): 1190.2 *4* from 1974Ke14.
1290.79 *5*		E(level): 1291.3 *4* from 1974Ke14.
1433.24 *8*		
1459.19 *17*		
1480.97 *4*	≤173 fs	E(level): 1481.8 *4* from 1974Ke14.
1743.73 *5*	≤173 fs	E(level): 1744.5 *4* from 1974Ke14.
2060.71 *7*	≤97 fs	E(level): 2064.5 *6* from 1974Ke14.
2086.24 *7*	≤173 fs	E(level): 2087.6 *6* from 1974Ke14.
2154[&]		
2203.68 *7*		
2395[&]		
2478.04 *11*	≤13 fs	E(level): 2479.1 *6* from 1974Ke14.
2540[&]		
2581.82 *10*	0.21 ps *+10−6*	E(level): 2582.8 *6* from 1974Ke14.
2711.74 *8*		
2769.01 *10*		
2781.74 *22*		
2816.7 *5*		
2828.23 *8*		
2912[&]		
2955.16 *11*		
2963.17 *21*		
2973.0 *3*		
3015[&]		
3063[&]		
3086.6 *5*		
3121.94 *12*		
3141.17 *14*		
3162.50 *19*		
3193.9 *5*		

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^{58}Fe(p,γ) 1975Br29 (continued)

^{59}Co Levels (continued)

E(level)†	Jπ	$T_{1/2}$‡	Comments
3220&			
3240.86 *16*			
3319.93 *14*			
3487.55 *16*			
3562.03 *19*			
3570.1 *3*			
3621.4 *3*			
3649.46 *20*			
4009.3 *3*			
4406.88 *21*			
4412.1 *3*			
4508.38 *13*			
9524.51 *9*			E(level): 9524.4 from E(p)(lab)=2198 keV (1975Br29) and S(p)=7363.6 *4* (2017Wa10).
9541.31# *13*	(3/2$^-$)	≈15.5 eV	E(level): 9542.0 from E(p)(lab)=2216 keV (1975Br29) and S(p)=7363.6 *4* (2017Wa10). Jπ: if fragment of ^{59}Fe(g.s.) analogue. Γ_γ=0.81 eV (1975Br29), if $\Gamma\approx\Gamma_{p0}$; 1.0 eV (1972Pe23).
9549.71# *11*	(3/2$^-$)	≈102 eV	E(level): 9549.9 from E(p)(lab)=2224 keV (1975Br29) and S(p)=7363.6 *4* (2017Wa10). Jπ: if fragment of ^{59}Fe(g.s.) analogue. Γ_γ=0.62 eV (1975Br29), if $\Gamma\approx\Gamma_{p0}$; 0.92 eV (1972Pe23).
9553.02#@ *8*	(3/2$^-$)	≈57 eV	E(level): 9552.85 from E(p)(lab)=2227 keV (1975Br29) and S(p)=7363.6 *4* (2017Wa10). Jπ: if fragment of ^{59}Fe(g.s.) analogue. Γ=1.06 eV (1975Br29), if $\Gamma\approx\Gamma_{p0}$; 1.40 eV (1972Pe23); 1.25 eV *20* (1977Ri14), if $\Gamma=\Gamma_{p0}$.
11197	(5/2$^-$)		E(level): from E(p)(lab)=3900 keV (1993Ti06) and S(p)=7363.6 *4* (2017Wa10). Jπ: analogue of 5/2$^-$ ^{59}Fe(1570 level).

† From least-squares fit to γ-ray energies. Uncertainty for all γ rays were doubled during the fit, differing from least squares adjustment by at least 3σ or more (identified by footnote), except 1098.5γ 6055.4γ, and 7467.0γ from 1098.5, 9541.3, and 9553.0 keV levels, respectively.

‡ From 1974Ke14, DSAM at E(p)=2233 keV if E(level)<9500; from $\Gamma_\gamma+\Gamma_{p0}+\Gamma_{p1}$ from fig.2 of 1972Pe23 otherwise.

Probable fragment of ^{59}Fe(g.s.) analogue. In addition to the 3 whose decays are detailed here, 1975Br29 report g.s. analogue fragments at E(p)=2213, 2220, 2223, 2231, and 2234 keV with $\Gamma_\gamma\leq$0.31 eV.

@ Resonance strength $[(2J+1)\Gamma_p\Gamma_\gamma/\Gamma]$=5.0 eV *8* (1977Ri14).

& 2000Ra27 report population of this level by primary γ for E(p)=2.8 MeV, Δ(E(p))=220 keV; uncertainty unstated by authors.

γ(^{59}Co)

Unplaced Iγ≈5% of total observed intensity (1975Br29).

E_i(level)	E_γ†	E_f	E_i(level)	E_γ†	E_f	E_i(level)	E_γ†	E_f
1098.62	1098.50‡ *5*	0.0	2060.71	579.68 *6*	1480.97	2711.74	1613.03 *7*	1098.62
1189.78	1189.70 *5*	0.0		2061.7 *5*	0.0	2769.01	1335.70 *7*	1433.24
1290.79	1290.74 *6*	0.0	2086.24	795.43 *6*	1290.79	2781.74	2781.96 *25*	0.0
1433.24	334.56 *7*	1098.62		2086.65‡ *10*	0.0	2816.7	2816.7 *9*	0.0
1459.19	1459.00 *21*	0.0	2203.68	722.77 *7*	1480.97	2828.23	1729.56 *7*	1098.62
1480.97	382.25 *7*	1098.62		913.05 *20*	1290.79		2826 *1*	0.0
	1481.03 *5*	0.0		2203.51 *22*	0.0	2955.16	1856.47 *11*	1098.62
1743.73	553.88 *5*	1189.78	2478.04	2478.10 *11*	0.0	2963.17	1219.3 *4*	1743.73
	1743.85 *7*	0.0	2581.82	2581.62 *12*	0.0		1774.1 *6*	1189.78

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^{58}Fe(p,γ) 1975Br29 (continued)

$\gamma(^{59}Co)$ (continued)

E_i(level)	E_γ †	I_γ &	E_f	E_i(level)	J_i^π	E_γ †	I_γ &	E_f
2963.17	2963.5 *5*		0.0	9524.51		9524.1 *3*	8	0.0
2973.0	1230.8 *9*		1743.73	9541.31	(3/2$^-$)	5034.5# *4*	3	4508.38
3121.94	2023.31 *11*		1098.62			5128.5 *7*	1	4412.1
3141.17	1397.45 *14*		1743.73			5134.5 *5*	2	4406.88
	1681.73 *24*		1459.19			5532.0 *6*	2	4009.3
3162.50	2064.4 *3*		1098.62			5892.0 *6*	1	3649.46
3240.86	2142.34 *17*		1098.62			5920.2 *9*	2	3621.4
3319.93	1839.05 *15*		1480.97			6055.4‡ *5*	4	3487.55
	2220.7 *4*		1098.62			6221.7 *5*	2	3319.93
3487.55	2006.6 *2*		1480.97			6300.6 *7*	2	3240.86
	2198.4 *12*		1290.79			6346.8 *8*	1	3193.9
	2388.7 *4*		1098.62			6420.0 *7*	1	3121.94
3562.03	1475.95 *21*		2086.24			6585 *2*	3	2955.16
	2083.0# *4*		1480.97			6712.2 *4*	5	2828.23
	2269.6# *4*		1290.79			6770.2‡ *5*	3	2769.01
3621.4	3621.7 *6*		0.0			6958.8 *4*	12	2581.82
3649.46	2550.7 *3*		1098.62			7454.1 *6*	3	2086.24
4009.3	2576.5 *5*		1433.24			7479.5 *6*	4	2060.71
4406.88	2345.0 *5*		2060.71			8058.9 *5*	8	1480.97
	4408.6‡ *5*		0.0			8106.7 *7*	3	1433.24
4412.1	1456.9 *4*		2955.16			8249.2 *5*	7	1290.79
	2930.4 *5*		1480.97			8441.6 *4*	11	1098.62
	2980 *1*		1433.24			9540.3 *4*	18	0.0
4508.38	1345.7 *3*		3162.50	9549.71	(3/2$^-$)	5038‡ *1*	1	4508.38
	1796.49 *17*		2711.74			5137.5 *9*	2	4412.1
	2306.4 *6*		2203.68			5142.3 *3*	5	4406.88
9524.51	5015.4 *4*	2	4508.38			5541.0 *6*	1	4009.3
	5874.9 *3*	3	3649.46			5898.9 *5*	2	3649.46
	5902.7 *3*	2	3621.4			5930.4‡ *7*	2	3621.4
	5953.2 *6*	2	3570.1			5979.5 *3*	2	3570.1
	5962.9 *4*	3	3562.03			6061.1 *5*	5	3487.55
	6037 *1*	2	3487.55			6229 *1*	1	3319.93
	6204.1 *5*	2	3319.93			6309.1 *7*	2	3240.86
	6284.3 *6*	1	3240.86			6387.8 *4*	2	3162.50
	6330.3 *5*	1	3193.9			6463.0 *8*	1	3086.6
	6381 *1*	2	3141.17			6576.3 *8*	5	2973.0
	6437.4 *5*	2	3086.6			6586.1 *4*	5	2963.17
	6552 *2*	<1	2973.0			6731.6 *6*	2	2816.7
	6561.4 *8*	1	2963.17			6767.3 *9*	2	2781.74
	6568.5 *4*	3	2955.16			6779.3 *6*	2	2769.01
	6695.0 *5*	3	2828.23			6834.9@ *5*	2	2711.74
	6708.7 *7*	3	2816.7			6967.7 *3*	14	2581.82
	6743.6 *5*	2	2781.74			7072.0 *4*	4	2478.04
	6753.9 *7*	2	2769.01			7465.0‡ *6*	2	2086.24
	6808.3@ *6*	2	2711.74			8067.5 *5*	2	1480.97
	6942.3 *9*	3	2581.82			8115.9 *4*	9	1433.24
	7047.7‡ *4*	<1	2478.04			8258.3 *3*	18	1290.79
	7320.8 *2*	7	2203.68			8450.6 *5*	3	1098.62
	7436.7 *4*	2	2086.24			9548.7 *4*	5	0.0
	7462.5 *5*	3	2060.71	9553.02	(3/2$^-$)	5044.4 *2*	3	4508.38
	7780.0 *3*	6	1743.73			5140.4 *7*	1	4412.1
	8044.4 *5*	2	1480.97			5145.8 *4*	2	4406.88
	8089.3 *6*	2	1433.24			5543.0 *5*	2	4009.3
	8233.0 *2*	21	1290.79			6063.2 *7*	2	3487.55
	8424.9 *3*	7	1098.62			6390.9 *6*	2	3162.50

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^{58}Fe(p,γ) 1975Br29 (continued)

$\gamma(^{59}Co)$ (continued)

E_i(level)	E_γ[†]	I_γ[&]	E_f	E_i(level)	E_γ[†]	I_γ[&]	E_f
9553.02	6411 *1*	2	3141.17	9553.02	7075.1 *6*	2	2478.04
	6579.8 *3*	3	2973.0		7467.0[‡] *3*	3	2086.24
	6590.4 *6*	4	2963.17		8071.5 *2*	5	1480.97
	6724.5 *4*	2	2828.23		8119.2 *2*	19	1433.24
	6781.8[@] *3*	2	2769.01		8261.6 *2*	17	1290.79
	6838.9[#] *4*	2	2711.74		8454.0 *2*	5	1098.62
	6970.3 *2*	20	2581.82		9552.8 *5*	1	0.0

[†] γ ray data are from 1975Br29 except as noted. Eγ shown for secondary γ rays is weighted average of data from all four resonances (if available), doublets excluded. Note, however, that Eγ appears to be consistently lower than data from other reactions, and a least squares analysis suggests that ΔE_γ is grossly underestimated. Eγ differing from least squares adjusted value by at least 3σ are indicated.

[‡] Eγ differs from least-squares adjusted value between 3 to 4σ.

[#] Eγ differs from least-squares adjusted value between 4 to 5σ.

[@] Eγ differs from least-squares adjusted value between 5 to 6σ.

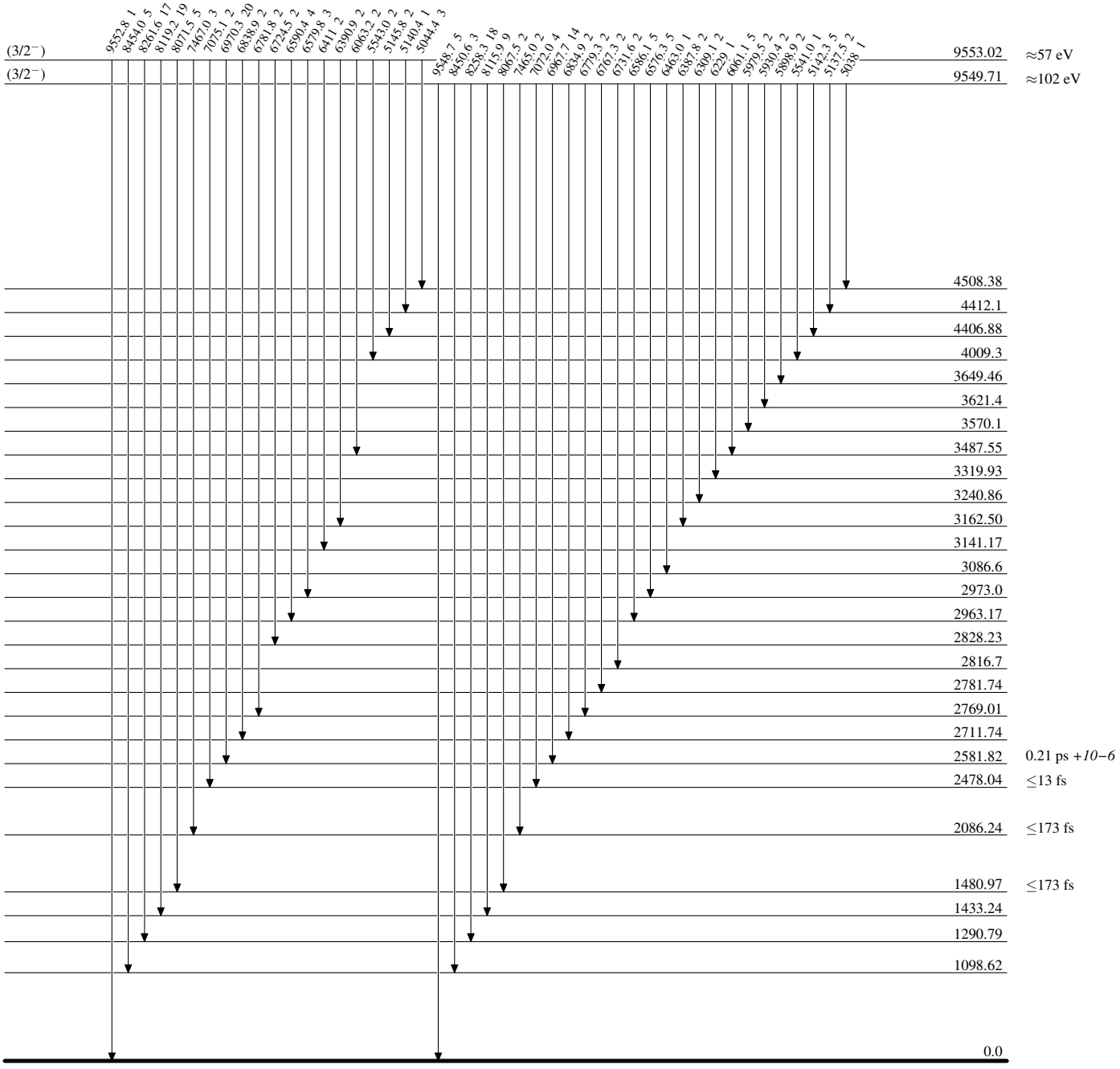
[&] % photon branching from resonance; 10-20% uncertainty for the most prominent lines; from 1975Br29 unless indicated otherwise. Iγ from 1975Br29 and 1974Ke14 are in qualitative agreement.

[x] γ ray not placed in level scheme.

^{58}Fe(p,γ) 1975Br29

Level Scheme

Intensities: % photon branching from each level

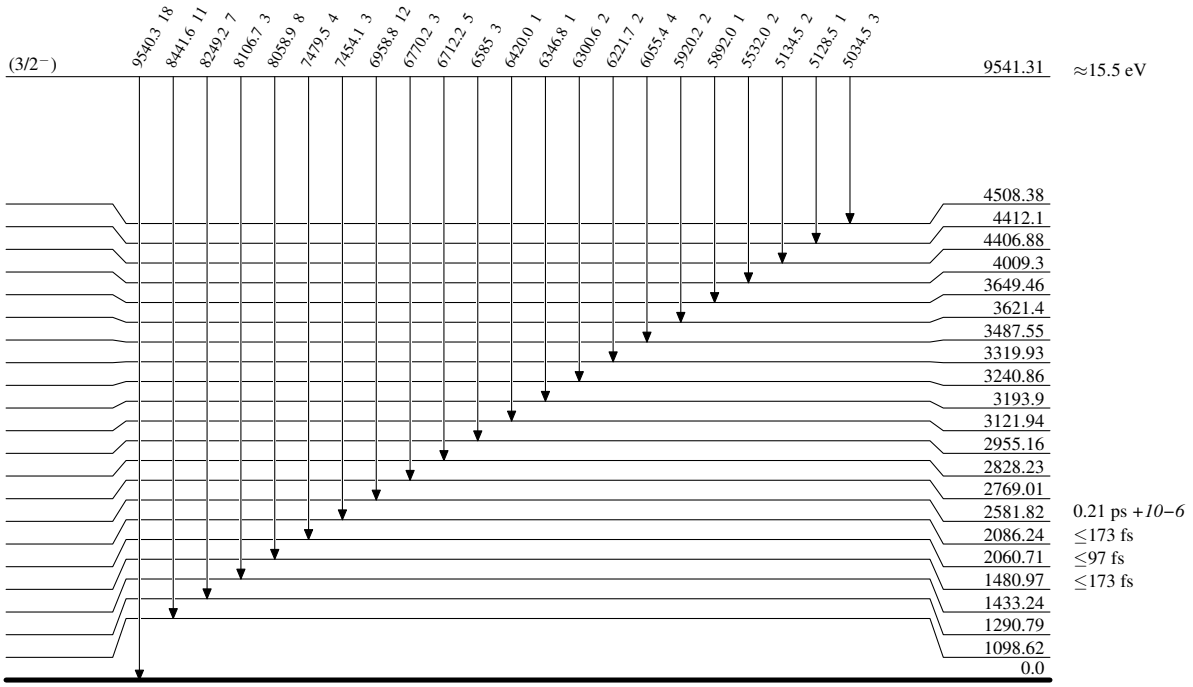


$^{59}_{27}Co_{32}$

^{58}Fe(p,γ) 1975Br29

Level Scheme (continued)

Intensities: % photon branching from each level

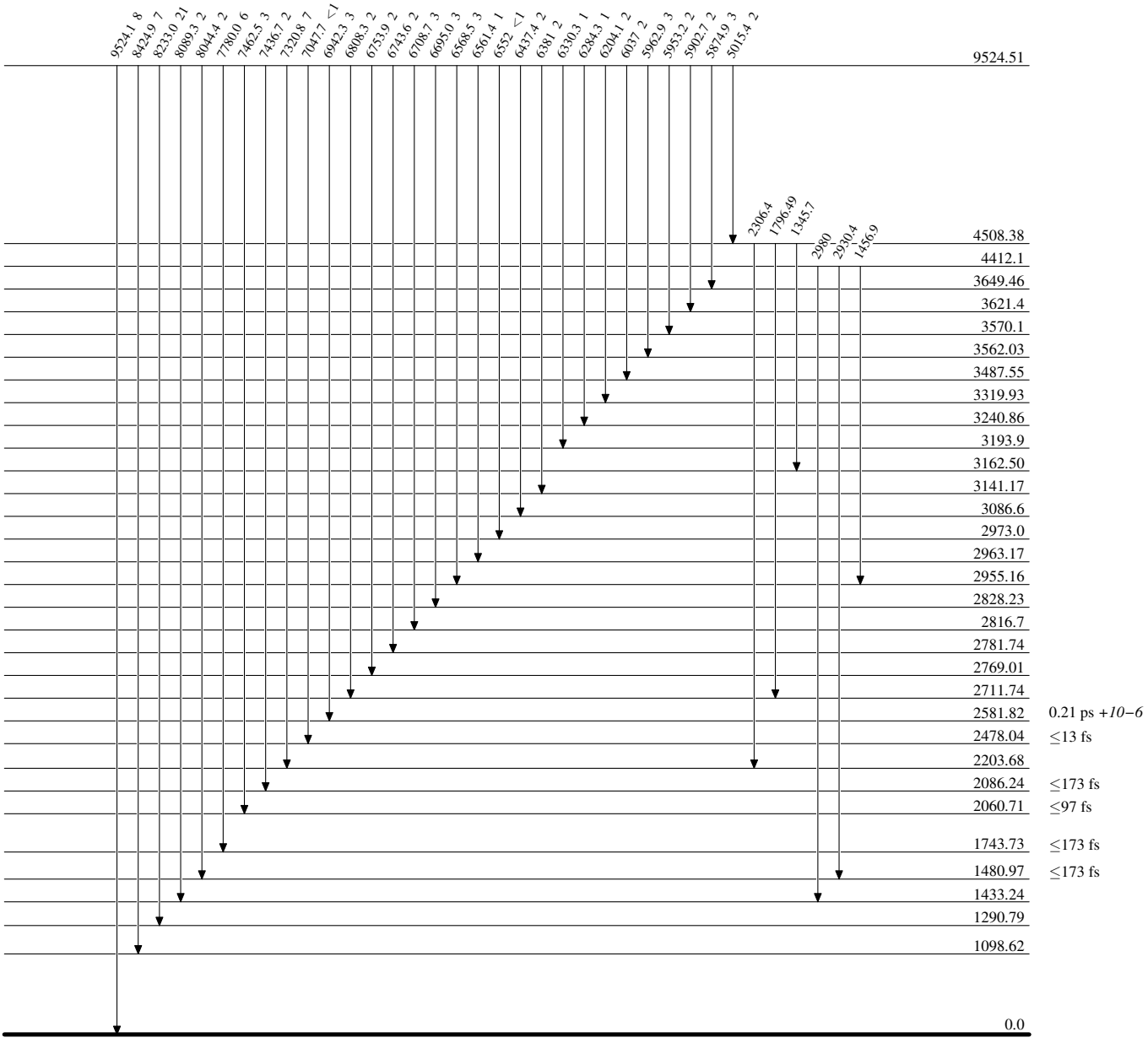


$^{59}_{27}Co_{32}$

^{58}Fe(p,γ) 1975Br29

Level Scheme (continued)

Intensities: % photon branching from each level

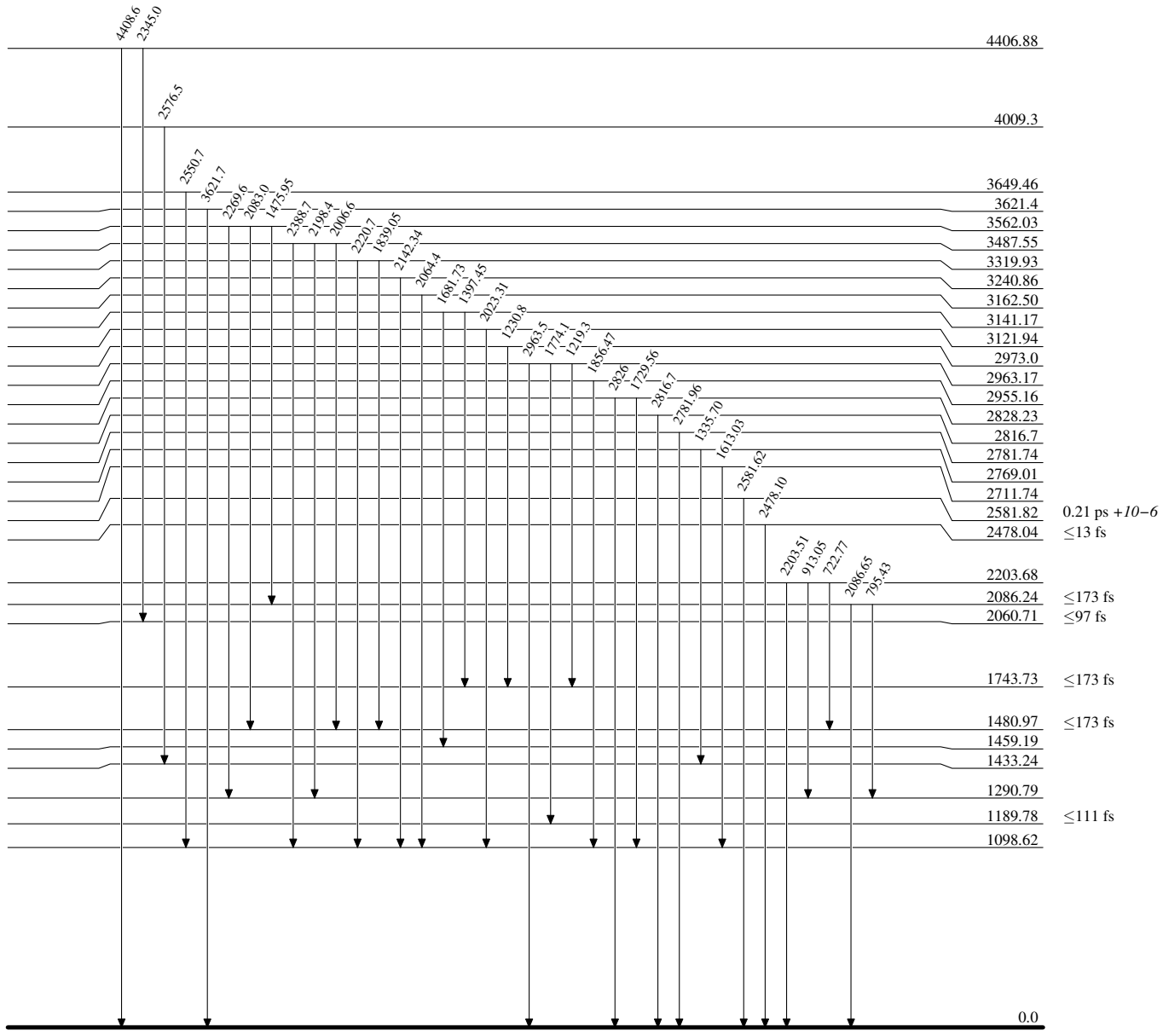


$^{59}_{27}Co_{32}$

^{58}Fe(p,γ) 1975Br29

Level Scheme (continued)

Intensities: % photon branching from each level

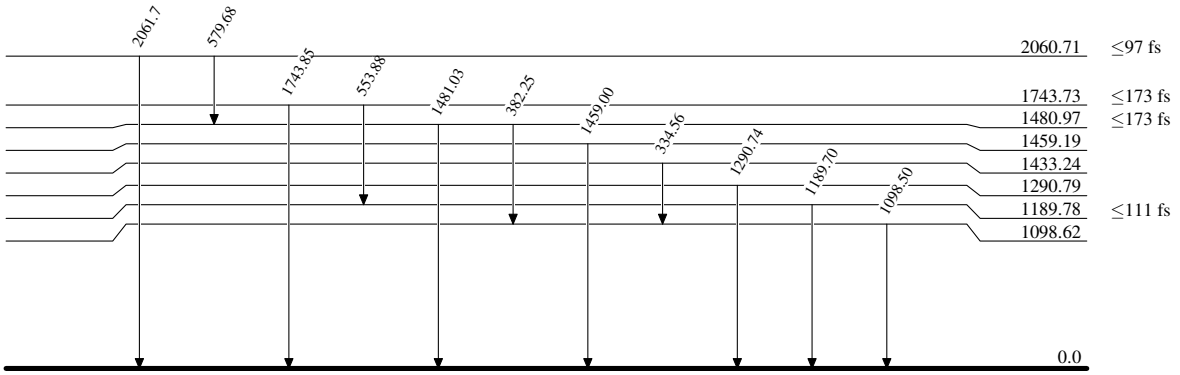


$^{59}_{27}Co_{32}$

^{58}Fe(p,γ) 1975Br29

Level Scheme (continued)

Intensities: % photon branching from each level



$^{59}_{27}Co_{32}$