$^{12}C(^{54}Fe,2p\gamma)$ 1994Cr05

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen	NDS 178, 41 (2021).	12-Nov-2021

1994Cr05 (also 1992En03,1991En01): E(^{54}Fe)=155 MeV. Measured Eγ, Iγ, $\gamma(\theta)$, $\gamma\gamma$- and (recoil)γ-coin, $\gamma\gamma(\theta)$(DCO). Cranked Nilsson-Strutinsky calculations.

1994Cr05 conclude that the low-spin states (J<8) are well reproduced by conventional shell-model calculations. The high-spin states are treated under the approximate methods of cranked Strutinsky approach. These calculations predict a well defined minimum in the potential energy surface but the absence of a well defined rotational band above 8^+ contradicts this theoretical result.

Other: 1990LiZS: E(^{54}Fe)=165 MeV. Recoil-$\gamma\gamma$ data. No details available.

^{64}Zn Levels

E(level)[†]	J$^\pi$[‡]	Comments
0.0[&]	0^+	
991.6[&] *2*	2^+	
1799.3[a] *2*	2^+	
2307.1[&] *2*	4^+	
2737.1[a] *2*	4^+	
2999.2[b] *3*	3^-	
3078.1 *3*	4^+	
3926.6[b] *2*	5^-	
3994.4[&] *3*	6^+	
4078.6 *2*	5^+	
4158.5 *3*	5^-	
4237.9[a] *3*	6^+	
4636.1 *3*	7^-	
4670.8 *3*	6^-	
4983.1[b] *4*	7^-	
5153.4 *3*	7^-	
5625.6 *4*	8^-	
5683.3[#] *6*	9^-	
5701.2 *3*	(8^-)	J$^\pi$: from the Adopted Levels.
5938.5 *4*	(8^+)	
6033.7 *4*	(8^+)	
6124.9[a] *4*	(8^+)	
6127.5[b] *4*	(9^-)	
6263.3 *7*		
6965.5 *4*	(8)	
7121.9 *4*	(10^+)	
7265.0[@] *7*		
7335.6 *5*	(10^+)	
7581.9[b] *4*	(11^-)	
7808.5 *8*	(10^+)	
7904.5 *11*		
7948.7 *21*	(10^+)	
8159.6 *21*	(10^+)	
8585.7 *5*	(12^+)	
8997.9 *9*	(12^+)	

[†] From a least-squares fit to Eγ data.

[‡] As proposed by 1994Cr05 based on $\gamma\gamma(\theta)$ data and band assignments, unless otherwise indicated. Most assignments are

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$^{12}C(^{54}Fe,2p\gamma)$ 1994Cr05 (continued)

^{64}Zn Levels (continued)

consistent with the levels included in the Adopted Levels, except that some are placed in parentheses in the Adopted Levels, when strong arguments are lacking.

[#] With the reordering of 1314-1046 cascade in the Adopted dataset based on the results of 2004Ka18, this level corresponds to 5952, (9^-) in the Adopted Levels and 1047γ deexcites a 6998, (11^-) level.

[@] With the reordering of 1314-1046-1583 cascade in the Adopted dataset based on the results of 2004Ka18, this level corresponds to 8581, (12^+) level (or 8586 in this dataset) in the Adopted Levels.

[&] Band(A): g.s. band.

[a] Band(B): Band based on 2^+, even spins.

[b] Band(C): Band based on 3^-, odd spins.

$\gamma(^{64}Zn)$

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
[x]327							E_γ: from recoil-γ coin. (from figure 6 of 1991En01) in $^{12}C(^{54}Fe,2p\gamma)$ E=165 MeV.
340.8 *4*	0.50[#] *5*	3078.1	4^+	2737.1	4^+		Iγ=0.50 *1* (1994Cr05).
397.8 *2*	4.21[#] *42*	4636.1	7^-	4237.9	6^+	D[&]	DCO=0.64 *2* Iγ=4.21 *1* (1994Cr05).
429.9 *4*	1.4 *2*	2737.1	4^+	2307.1	4^+		E_γ: from figure 3 of 1994Cr05. Eγ=429.4 in table 2. Iγ=1.4 *1* (1994Cr05).
512.2 *2*	4.5 *7*	4670.8	6^-	4158.5	5^-	D[&]	DCO=0.36 *2* Iγ=4.5 *5* (1994Cr05).
516.8 *1*	0.8 *1*	5153.4	7^-	4636.1	7^-		Iγ=0.8 *1* (1994Cr05).
547.8 *1*	0.08 *2*	5701.2	(8^-)	5153.4	7^-		Iγ=0.08 *2* (1994Cr05).
592.4 *1*	2.47[#] *25*	4670.8	6^-	4078.6	5^+	D[&]	DCO=0.63 *2* Iγ=2.47 *2* (1994Cr05).
641.4 *1*	18.4 *19*	4636.1	7^-	3994.4	6^+	D[&]	DCO=0.66 *2*; A_2=−0.163 *5* E_γ: rounded off value. Eγ=641.36 *4* quoted (1994Cr05) in table 2 and 641.3 in figure 3. Iγ=18.4 *1* (1994Cr05).
744.1 *1*	4.39[#] *44*	4670.8	6^-	3926.6	5^-	D[&]	DCO=0.75 *3* Iγ=4.39 *2* (1994Cr05).
770.8 *1*	4.46[#] *45*	3078.1	4^+	2307.1	4^+		Iγ=4.46 *2* (1994Cr05).
807.7 *1*	18.1[#] *18*	1799.3	2^+	991.6	2^+		E_γ: rounded off value. Eγ=807.67 *1* quoted (1994Cr05) in table 2 and 808.0 in figure 3. Iγ=18.10 *3* (1994Cr05).
824.7 *1*	8.2 *12*	4983.1	7^-	4158.5	5^-		Iγ=8.2 *8* (1994Cr05).
838.3 *3*	0.28[#] *3*	6965.5	(8)	6127.5	(9^-)		Iγ=0.28 *2* (1994Cr05).
927.6 *1*	1.98[#] *20*	3926.6	5^-	2999.2	3^-		Iγ=1.98 *2* (1994Cr05).
937.3 *3*	16.9[#] *17*	2737.1	4^+	1799.3	2^+		E_γ: 937.6 in figure 3 (1994Cr05). Iγ=16.9 *4* (1994Cr05).
954.8 *1*	2.39[#] *24*	5625.6	8^-	4670.8	6^-	Q[@]	DCO=0.92 *3* Iγ=2.39 *2* (1994Cr05).
991.8 *1*	100	991.6	2^+	0.0	0^+	Q[@]	DCO=0.90 *1*; A_2=+0.124 *2*
997.6	0.8 *1*	7121.9	(10^+)	6124.9	(8^+)		Iγ=0.8 *1* (1994Cr05). E_γ,I_γ: doublet. Energy from level energy difference and intensity from $\gamma\gamma$ coin.
1000.7 *5*	1.60 *16*	4078.6	5^+	3078.1	4^+		Iγ=1.60 *4* (1994Cr05).
1030.4 *1*	1.19[#] *12*	5701.2	(8^-)	4670.8	6^-		Iγ=1.19 *2* (1994Cr05).
1047.2[a] *5*	4.3[#] *4*	5683.3	9^-	4636.1	7^-		Iγ=4.3 *1* (1994Cr05).

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$^{12}C(^{54}Fe,2p\gamma)$ 1994Cr05 (continued)

$\gamma(^{64}Zn)$ (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
1056.6 *7*	8.1 *10*	4983.1	7^-	3926.6	5^-	Q[@]	DCO=0.91 *1* Iγ=8.1 *5* (1994Cr05).
1064.5 *5*	1.2 *2*	5701.2	(8^-)	4636.1	7^-		DCO=0.9 *2* Iγ=1.2 *1* (1994Cr05).
1079.4 *6*	0.66 *7*	4158.5	5^-	3078.1	4^+		Iγ=0.66 *2* (1994Cr05).
1088.4 *2*	3.2[#] *3*	7121.9	(10^+)	6033.7	(8^+)	Q[@]	DCO=0.96 *7*; A_2=+0.45 *2* Iγ=3.2 *1* (1994Cr05).
1144.6 *1*	4.0 *5*	6127.5	(9^-)	4983.1	7^-	Q[@]	DCO=0.91 *1* Iγ=4.0 *3* (1994Cr05).
1183.0 *3*	0.93 *9*	7121.9	(10^+)	5938.5	(8^+)	Q[@]	DCO=0.92 *6* Iγ=0.93 *4* (1994Cr05).
1189.4 *3*	0.09 *1*	8997.9	(12^+)	7808.5	(10^+)	Q[@]	DCO=0.9 *1* Iγ=0.9 *1* (1994Cr05).
1210.7 *3*	0.35 *5*	7335.6	(10^+)	6124.9	(8^+)	Q[@]	DCO=1.2 *2* Iγ=0.35 *3* (1994Cr05).
1227.3 *2*	1.4 *2*	5153.4	7^-	3926.6	5^-	Q[@]	DCO=0.92 *2* Iγ=1.4 *2* (1994Cr05).
1263.4 *5*	0.10 *2*	6965.5	(8)	5701.2	(8^-)	D[&]	DCO=0.52 *6* Iγ=0.10 *2* (1994Cr05).
1315.3 *1*	77[#] *7*	2307.1	4^+	991.6	2^+	Q[@]	DCO=0.88 *1*; A_2=+0.235 *3* Iγ=76.7 *2* (1994Cr05).
1341.5 *1*	4.9[#] *5*	4078.6	5^+	2737.1	4^+		Iγ=4.89 *5* (1994Cr05).
1454.3 *2*	0.6 *1*	7581.9	(11^-)	6127.5	(9^-)	Q[@]	DCO=0.98 *3* Iγ=0.6 *1* (1994Cr05).
1463.7 *3*	0.57 *6*	8585.7	(12^+)	7121.9	(10^+)	Q[@]	DCO=0.86 *6* Iγ=0.57 *2* (1994Cr05).
1500.6 *1*	10.0[#] *10*	4237.9	6^+	2737.1	4^+		Iγ=9.95 *4* (1994Cr05).
1581.7[a] *4*	1.45[#] *15*	7265.0		5683.3	9^-		Iγ=1.45 *3* (1994Cr05).
1619.8 *1*	15.3[#] *15*	3926.6	5^-	2307.1	4^+	D[&]	DCO=0.67 *1* Iγ=15.25 *5* (1994Cr05).
1627.2 *6*	1.8 *2*	6263.3		4636.1	7^-		Iγ=1.8 *1* (1994Cr05).
1686.8 *1*	34.3[#] *34*	3994.4	6^+	2307.1	4^+	Q[@]	DCO=0.89 *1*; A_2=+0.250 *5* Iγ=34.3 *2* (1994Cr05). E_γ: 1686.7 in figure 3.
1746.4 *5*	0.92 *10*	2737.1	4^+	991.6	2^+		Iγ=0.92 *5* (1994Cr05).
1771.5 *2*	1.4 *2*	4078.6	5^+	2307.1	4^+		Iγ=1.4 *2* (1994Cr05).
1776.9		7904.5		6127.5	(9^-)		E_γ: from figure 3 of 1994Cr05.
1796.2 *3*	1.2 *2*	6033.7	(8^+)	4237.9	6^+		Iγ=1.2 *1* (1994Cr05).
1799.1 *1*	5.9[#] *6*	1799.3	2^+	0.0	0^+		
1851.6 *3*	2.0 *3*	4158.5	5^-	2307.1	4^+		Iγ=2.0 *2* (1994Cr05).
1869.9 *7*	0.35 *4*	7808.5	(10^+)	5938.5	(8^+)	Q[@]	DCO=1.0 *2* Iγ=0.35 *2* (1994Cr05).
1887.0 *4*	0.5 *1*	6124.9	(8^+)	4237.9	6^+	Q[@]	DCO=2.1 *6* Iγ=0.5 *1* (1994Cr05).
1915 *2*	0.09 *2*	7948.7	(10^+)	6033.7	(8^+)	Q[@]	DCO=1.3 *3* Iγ=0.09 *2* (1994Cr05).
1943.7 *3*	3.7[#] *4*	5938.5	(8^+)	3994.4	6^+	(Q)	A_2=+0.21 *2* Iγ=3.7 *1* (1994Cr05). A_2 consistent with ΔJ=2, quadrupole.
2007.9 *3*	3.50[#] *35*	2999.2	3^-	991.6	2^+	D[&]	DCO=0.63 *3*; A_2=−0.24 *2* Iγ=3.50 *3* (1994Cr05).

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$^{12}C(^{54}Fe,2p\gamma)$ 1994Cr05 (continued)

$\gamma(^{64}Zn)$ (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
2038.9 *5*	1.8[#] *2*	6033.7	(8^+)	3994.4	6^+	Q[@]	DCO=0.88 *6*; A_2=+0.30 *4* Iγ=1.8 *1* (1994Cr05). E_γ: 2038.1 in figure 3 (1994Cr05).
2087.8 *7*	3.49[#] *35*	3078.1	4^+	991.6	2^+	Q[@]	DCO=0.89 *3* Iγ=3.49 *3* (1994Cr05). E_γ: poor fit. Level energy difference=2086.3.
2130.6 *6*	2.6[#] *3*	6124.9	(8^+)	3994.4	6^+	Q[@]	DCO=0.91 *6*; A_2=+0.19 *3* Iγ=2.6 *1* (1994Cr05).
2221 *2*	0.14 *3*	8159.6	(10^+)	5938.5	(8^+)	(Q)[@]	DCO=0.8 *2* Iγ=0.14 *3* (1994Cr05).

[†] Comparison of energies with those known from other studies shows that uncertainty of 0.1 or less for prominent γ rays as quoted by 1994Cr05 is underestimated. For the purpose of least-squares fit, the the evaluators assigned a minimum uncertainty of 0.2 keV.
[‡] Systematic uncertainty of ≈10% is not included in the quoted values by 1994Cr05. Evaluators have added this uncertainty in quadrature.
[#] From recoil-γ coin data.
[@] DCO ratio indicates ΔJ=2, quadrupole transition. 1994Cr05 assign E2.
[&] DCO ratio indicates ΔJ=1, dipole or D+Q transition. 1994Cr05 assign E1 or M1+E2.
[a] Different placement in the Adopted dataset.
[x] γ ray not placed in level scheme.

$^{12}C(^{54}Fe,2p\gamma)$ 1994Cr05

Level Scheme

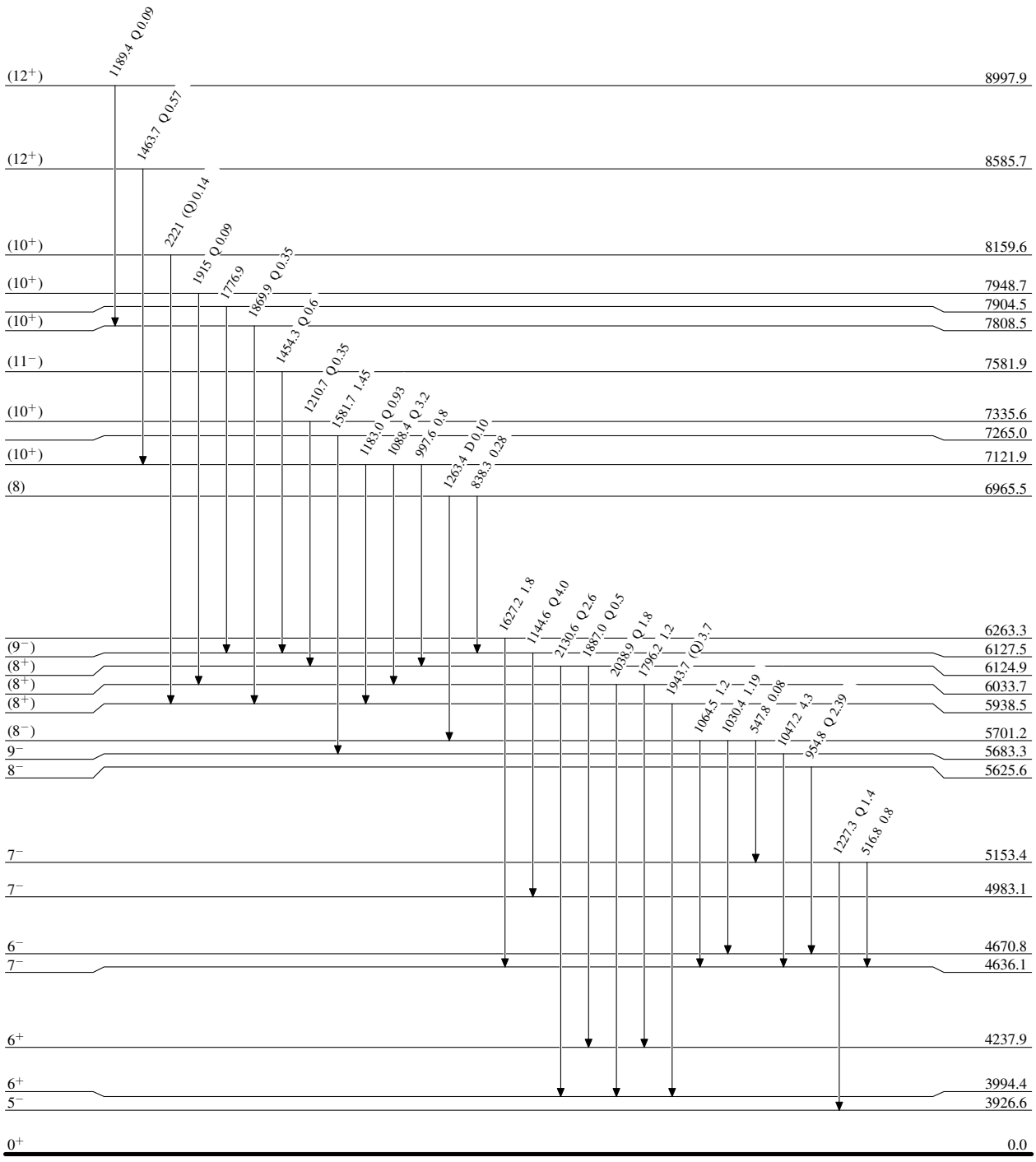
Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$

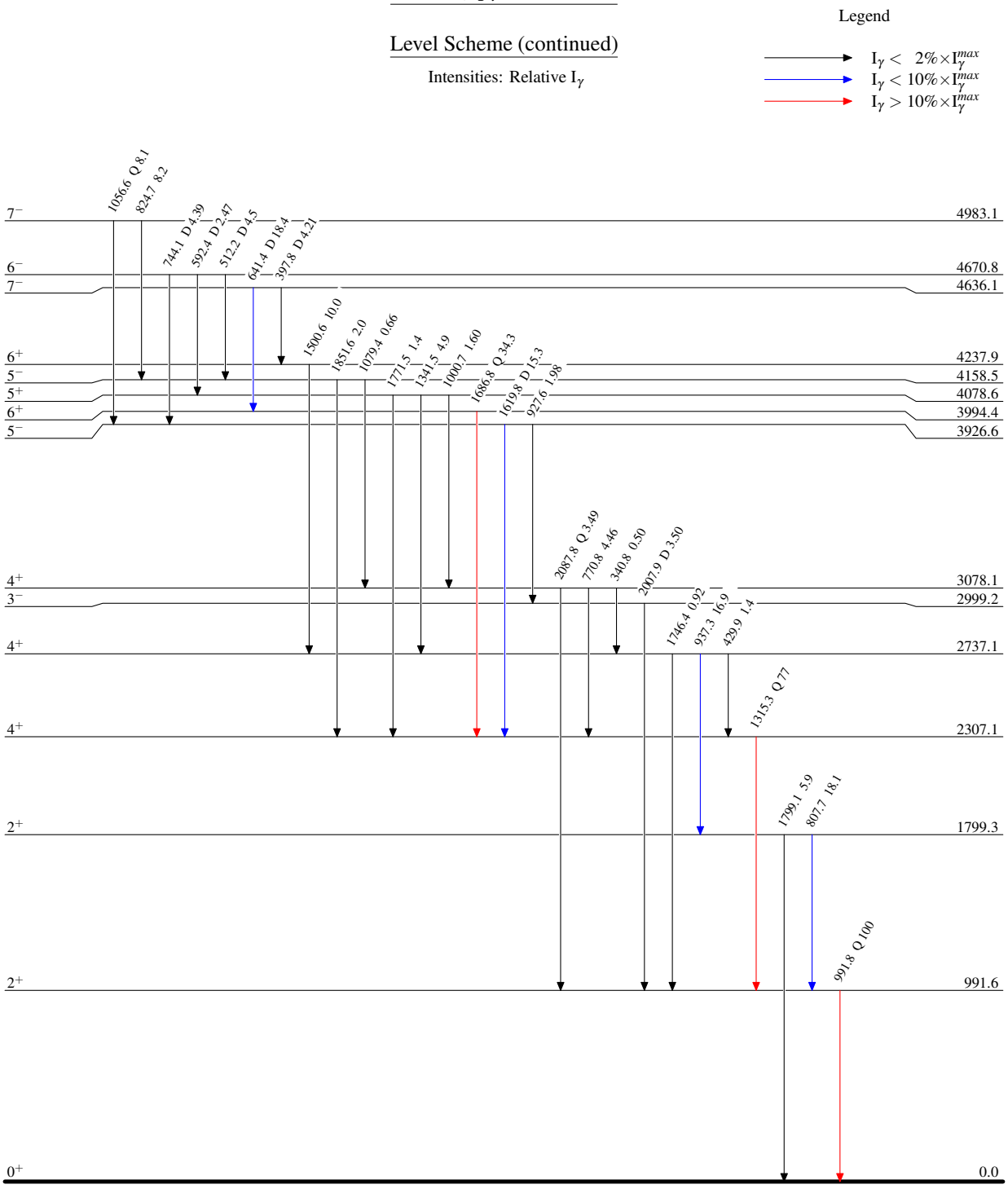


$^{64}_{30}Zn_{34}$

$^{12}C(^{54}Fe,2p\gamma)$ 1994Cr05

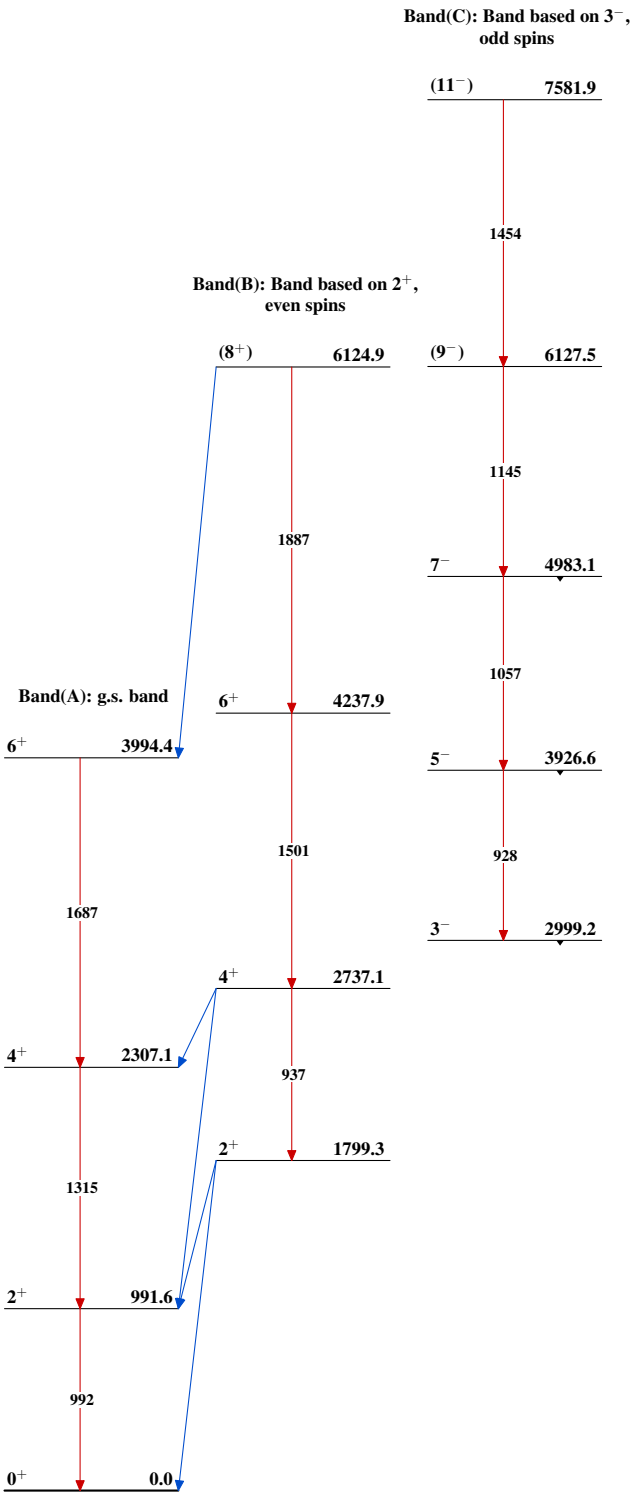
Level Scheme (continued)

Intensities: Relative I_γ



$^{64}_{30}Zn_{34}$

$^{12}C(^{54}Fe,2p\gamma)$ 1994Cr05



$^{64}_{30}Zn_{34}$