^{74}Ge(^{18}O,4nγ) 1985Wa09

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. A. Mccutchan and A. A. Sonzogni	NDS 115, 135 (2014)	1-Nov-2013

E=40 MeV to 80 MeV. Measured Eγ, Iγ, $\gamma\gamma$, excitation functions, $\gamma(\theta)$, $\gamma(\theta)$ (lin pol) using three Ge(Li) detectors (FWHM=1.9 keV to 2.1 keV at 1.33 MeV), an intrinsic Ge low-energy photon spectrometer (FWHM=600 eV at 122 keV) and a Si detector (FWHM=210 eV at 6.4 keV); deduced $T_{1/2}$ using Recoil distance Doppler shift method and Doppler Shift Attenuation method (DSAM).

^{88}Zr Levels

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	E(level)[†]	J$^\pi$[‡]	$T_{1/2}$
0	0^+		5950.76 *17*	$(13)^+$	<0.10[@] ps
1056.98 *5*	2^+		6000.8? *4*	$(13)^-$	<0.7[@] ps
2139.49 *7*	4^+		6032.48?[&] *12*	(12^-)	
2538.91 *8*	5^-		6192.90 *12*	13^-	1.70[#] ps *14*
2800.64 *13*	5^-		6238.80 *17*	$(14)^+$	1.0[@] ps *3*
2810.71 *8*	6^+		6501.33 *25*	$(14)^+$	0.16[@] ps *3*
2887.71 *8*	8^+		6578.3 *6*		
3390.62 *9*	8^+	21[#] ps *1*	6765.29 *24*	$(14)^-$	≤0.49[@] ps
3483.54 *14*	(7^-)		6826.67 *24*	$(15)^+$	0.10[@] ps *2*
4413.04 *12*	10^+	<1.4[#] ps	7228.1 *3*	$(15)^-$	≤0.8[@] ps
4486.22 *12*	(9^-)		7431.9 *4*	(16)	0.10[@] ps *3*
4612.25 *10*	9^+	<0.17[#] ns	7536.5 *4*	(15^-)	≤0.33[@] ps
4713.03 *10*	10^-	2.25[#] ns *17*	7878.9 *4*	(16^-)	≤0.50[@] ps
4797.58 *11*	11^-	50[#] ps *4*	8200.2 *5*	(17^-)	0.3[@] ps *+4−1*
5166.2? *5*	(10,11,12)	0.66[@] ps *14*	8925.1 *5*	(18^-)	<0.3[@] ps
5229.44 *14*	12^+	10[#] ps *1*	9912.6? *5*	(19^-)	>0.7[@] ps
5583.81 *12*	12^-	<0.7[@] ps	10557.3? *9*	(20)	≤0.1[@] ps
5665.90 *15*	12^+	0.28[@] ps *10*	11199.7? *11*	(21)	0.22[@] ps *14*

[†] From a least-squares fit to Eγ by evaluators.
[‡] From the Adopted Levels.
[#] From Recoil distance Doppler shift measurements.
[@] From Doppler Shift Attenuation Method (DSAM).
[&] E=4958.0 if the order of the 1235γ-160γ cascade is interchanged.

$\gamma(^{88}Zr)$

Eγ	Iγ	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.[‡]	δ[‡]	Comments
76.993 *10*	64.5 *19*	2887.71	8^+	2810.71	6^+	E2		Mult.: A_2=+0.14 *2*, A_4=0.
84.550 *25*	49[#] *4*	4797.58	11^-	4713.03	10^-	M1(+E2)	−0.02 *6*	Mult.: A_2=−0.25 *6*, A_4=0, POL=−0.29 *4*.
100.787 *20*	52.8 *16*	4713.03	10^-	4612.25	9^+	E1(+M2)	−0.02 *4*	Mult.: A_2=−0.27 *5*, A_4=0, POL=+0.31 *3*.
160.42 *3*	3.1 *3*	6192.90	13^-	6032.48?	(12^-)	M1(+E2)	−0.08 *8*	Mult.: A_2=−0.37 *4*, A_4=0.
199.19[@] *10*	1.1 *3*	4612.25	9^+	4413.04	10^+	M1(+E2)	−0.2 *+3−9*	Mult.: A_2=−0.6 *3*, A_4=0, POL=−0.19 *19*.
226.82[†]	12.1 *15*	4713.03	10^-	4486.22	(9^-)	M1(+E2)	−0.09 *5*	Mult.: A_2=−0.36 *4*, A_4=0, POL=−0.13 *6*.
261.73 *10*	5.2 *5*	2800.64	5^-	2538.91	5^-	M1		Mult.: A_2=+0.10 *7*, A_4=0, POL=+0.4 *4*.
271.805 *20*	87 *4*	2810.71	6^+	2538.91	5^-	E1		Mult.: A_2=−0.13 *3*, A_4=0.0, POL=+0.14 *4*.
285.19 *20*	2.7 *3*	5950.76	$(13)^+$	5665.90	12^+	M1(+E2)	<0.14	Mult.: A_2=−0.33 *6*, A_4=0, POL=−0.18 *13*.
288.05 *4*	35.0 *10*	6238.80	$(14)^+$	5950.76	$(13)^+$	M1(+E2)	<0.11	Mult.: A_2=−0.28 *2*, A_4=0, POL=−0.27 *2*.
299.92 *15*	4.9 *5*	4713.03	10^-	4413.04	10^+	E1(+M2)	+0.2 *5*	Mult.: A_2=+0.39 *8*, A_4=0, POL=−0.34 *17*.

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^{74}Ge(^{18}O,4nγ) 1985Wa09 (continued)

$\gamma(^{88}Zr)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	δ‡	Comments
321.30 *20*	18.7 *8*	8200.2	(17^-)	7878.9	(16^-)	M1(+E2)	0.00 *3*	Mult.: A_2=−0.22 *2*, A_4=+0.02 *2*, POL=−0.31 *4*.
325.34 *10*	11.8 *5*	6826.67	$(15)^+$	6501.33	$(14)^+$	M1(+E2)	<0.09	Mult.: A_2=−0.25 *2*, A_4=0, POL=−0.28 *6*.
342.2 *4*	10.7 *20*	7878.9	(16^-)	7536.5	(15^-)	M1(+E2)	−0.05 *9*	Mult.: A_2=−0.36 *10*, A_4=0, POL=−0.27 *8*.
354.36†	<0.5	5583.81	12^-	5229.44	12^+			
368.6@ *4*	4.0 *20*	5166.2?	(10,11,12)	4797.58	11^-			A_2=−0.09 *4*, A_4=0, POL=−0.18 *5*.
384.54 *9*	8.8 *5*	4797.58	11^-	4413.04	10^+	E1(+M2)	−0.03 *4*	Mult.: A_2=−0.32 *4*, A_4=0, POL=+0.35 *4*.
399.41 *4*	98 *5*	2538.91	5^-	2139.49	4^+	E1		Mult.: A_2=−0.11 *2*, A_4=0.0 *4*, POL=+0.17 *3*.
417.0@ *3*	9.3 *8*	6000.8?	$(13)^-$	5583.81	12^-	M1(+E2)	−0.07 *12*	Mult.: A_2=−0.33 *6*, A_4=0, POL=−0.19 *16*.
431.86†	<2.5	5229.44	12^+	4797.58	11^-			
436.49 *7*	18.9 *11*	5665.90	12^+	5229.44	12^+	M1(+E2)	<0.16	Mult.: A_2=−0.02 *5*, A_4=−0.01 *6*, POL=+0.27 *11*.
462.87 *20*	19.0 *15*	7228.1	$(15)^-$	6765.29	$(14)^-$	M1(+E2)	+0.01 *5*	Mult.: A_2=+0.0 *3*, A_4=0, POL=−0.15 *16*.
502.92 *4*	200 *5*	3390.62	8^+	2887.71	8^+	M1+E2	−0.15 *7*	Mult.: A_2=+0.34 *2*, A_4=0.0 *2*, POL=+0.61 *5*.
516.41†	<0.9	5229.44	12^+	4713.03	10^-			
550.6 *3*	26.3 *13*	6501.33	$(14)^+$	5950.76	$(13)^+$	M1(+E2)	0.00 *5*	Mult.: A_2=−0.27 *4*, A_4=0, POL=−0.46 *6*.
572.39 *20*	31.4 *10*	6765.29	$(14)^-$	6192.90	13^-	(M1+E2)	−0.16 *7*	Mult.: A_2=−0.43 *3*, A_4=+0.02 *3*, POL=−0.13 *8*.
587.85 *20*	35.3 *20*	6826.67	$(15)^+$	6238.80	$(14)^+$	M1(+E2)	<0.22	
605.2 *3*	15.4 *20*	7431.9	(16)	6826.67	$(15)^+$	D(+Q)	<0.21	Mult.: A_2=−0.22 *12*, A_4=0.
608.90 *10*	10.9 *6*	6192.90	13^-	5583.81	12^-	M1(+E2)	−0.05 *14*	Mult.: A_2=−0.33 *10*, A_4=0, POL=−0.34 *24*.
627.5 *5*	5.0 *20*	6578.3		5950.76	$(13)^+$			POL=+0.18 *5*.
642.4@ *7*	5.5 *20*	11199.7?	(21)	10557.3?	(20)	D(+Q)	−0.3 *+4−9*	Mult.: A_2=−0.40 *25*, A_4=0, POL=−0.12 *12*.
644.7@ *7*	8 *3*	10557.3?	(20)	9912.6?	(19^-)	D(+Q)	<0.25	Mult.: POL=−0.11 *12*.
650.9 *4*	9.2 *20*	7878.9	(16^-)	7228.1	$(15)^-$	M1(+E2)	−0.14 *+20−40*	Mult.: A_2=−0.50 *20*, A_4=0, POL=−0.23 *16*.
671.22 *5*	165 *5*	2810.71	6^+	2139.49	4^+	E2		Mult.: A_2=+0.137 *12*, A_4=−0.24 *12*, POL=+0.20 *3*.
672.82†	5.0 *20*	3483.54	(7^-)	2810.71	6^+			
721.23 *15*	71.0 *24*	5950.76	$(13)^+$	5229.44	12^+	(M1+E2)	−0.07 *4*	Mult.: A_2=−0.33 *2*, A_4=+0.01 *2*, POL=−0.21 *4*.
724.85 *20*	18 *6*	8925.1	(18^-)	8200.2	(17^-)	M1(+E2)	−0.09 *14*	Mult.: A_2=−0.33 *10*, A_4=0, POL=−0.20 *7*.
771.1 *3*	13.0 *15*	7536.5	(15^-)	6765.29	$(14)^-$	M1(+E2)	0.00 *12*	Mult.: A_2=−0.21 *8*, A_4=0, POL=−0.2 *3*.
786.13 *7*	30.0 *10*	5583.81	12^-	4797.58	11^-	M1(+E2)	0.00 *4*	Mult.: A_2=−0.22 *4*, A_4=0, POL=−0.09 *13*.
816.40 *7*	99.2 *25*	5229.44	12^+	4413.04	10^+	E2		Mult.: A_2=+0.32 *3*, A_4=−0.12 *3*, POL=+0.51 *4*.
944.62†	6.8 *7*	3483.54	(7^-)	2538.91	5^-	(E2)		Mult.: A_2=+0.04 *4*, A_4=0, POL=+0.41 *9*.
987.35 *20*	5.5 *10*	9912.6?	(19^-)	8925.1	(18^-)	M1(+E2)	−0.11 *16*	Mult.: A_2=−0.34 *12*, A_4=0, POL=−0.04 *20*.

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^{74}Ge(^{18}O,4nγ) 1985Wa09 (continued)

$\gamma(^{88}Zr)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	δ‡	Comments
1002.67 *7*	7.2 *3*	4486.22	(9^-)	3483.54	(7^-)	(E2)		Mult.: A_2=+0.35 *4*, A_4=−0.04 *4*, POL=+0.1 *3*.
1009.25 *15*	7.6 *4*	6238.80	$(14)^+$	5229.44	12^+	(E2)		Mult.: A_2>0.
1022.42†	122 *4*	4413.04	10^+	3390.62	8^+	E2		Mult.: A_2=+0.31 *3*, A_4=−0.09 *3*, POL=+0.47 *4*.
1056.97 *5*	284 *7*	1056.98	2^+	0	0^+	E2		Mult.: A_2=+0.145 *11*, A_4=−0.028 *12*, POL=+0.22 *2*.
1082.51 *5*	274 *7*	2139.49	4^+	1056.98	2^+	E2		Mult.: A_2=+0.15 *1*, A_4=−0.035 *11*, POL=+0.23 *2*.
1095.59 *7*	4.80 *20*	4486.22	(9^-)	3390.62	8^+	(E1)		Mult.: A_2=−0.29 *3*, A_4=0, POL=+0.2 *4*.
1170.76†	<0.44	5583.81	12^-	4413.04	10^+			
1221.63 *5*	58.7 *18*	4612.25	9^+	3390.62	8^+	(M1+E2)	−0.7 *3*	Mult.: A_2=−0.94 *3*, A_4=+0.09 *4*, POL=+0.15 *5*.
1234.92@ *15*	3.2 *3*	6032.48?	(12^-)	4797.58	11^-	(M1+E2)	<+0.09	Mult.: A_2=−0.68 *24*, A_4=0.
1297.6†	<1.2	7536.5	(15^-)	6238.80	$(14)^+$			
1395.39 *7*	20.0 *10*	6192.90	13^-	4797.58	11^-	E2		Mult.: A_2=+0.27 *2*, A_4=−0.09 *2*, POL=+0.62 *9*.
1525.14@ *20*	2.2 *3*	4413.04	10^+	2887.71	8^+	(E2)		Mult.: A_2=+0.37 *8*, A_4=0.
1712.50 *20*	5.9 *4*	9912.6?	(19^-)	8200.2	(17^-)	E2		Mult.: A_2=+0.22 *6*, A_4=−0.08 *6*, POL=+0.4 *3*.
1724.49@ *20*	2.4 *5*	4612.25	9^+	2887.71	8^+	M1(+E2)	+0.05 *8*	Mult.: A_2=−0.17 *6*, A_4=0, POL=−0.4 *4*.

† Eγ from level energy difference.
‡ From $\gamma(\theta)$, $\gamma(\theta)$ (lin pol). Rose-Brink convention for δ given in 1985Wa09 has been converted to Krane-Steffan convention.
# Contamination x-ray from Pb subtracted.
@ Placement of transition in the level scheme is uncertain.

^{74}Ge(^{18}O,4nγ) 1985Wa09

Level Scheme

Intensities: Type not specified

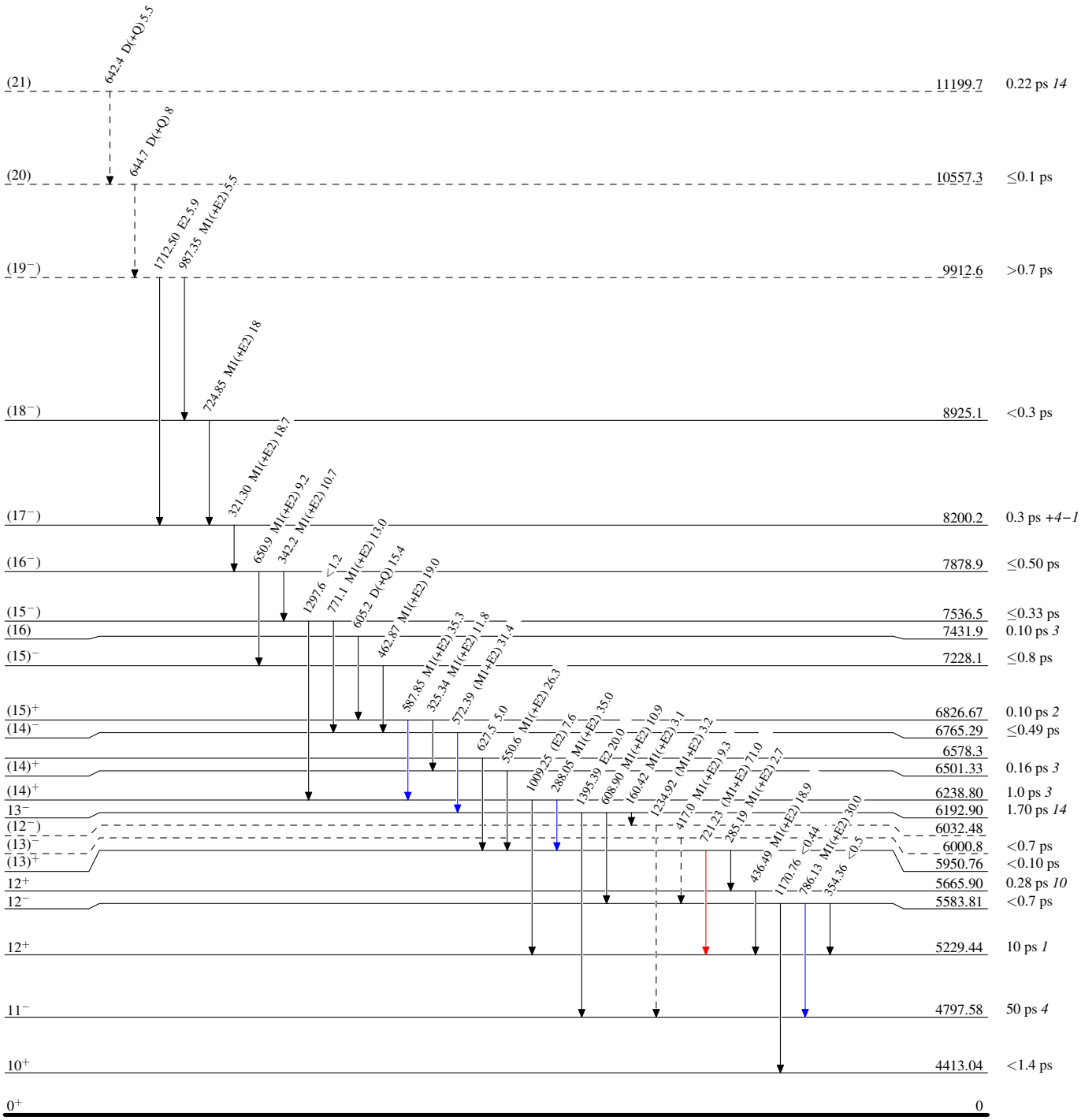
Legend

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

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

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

γ Decay (Uncertain)



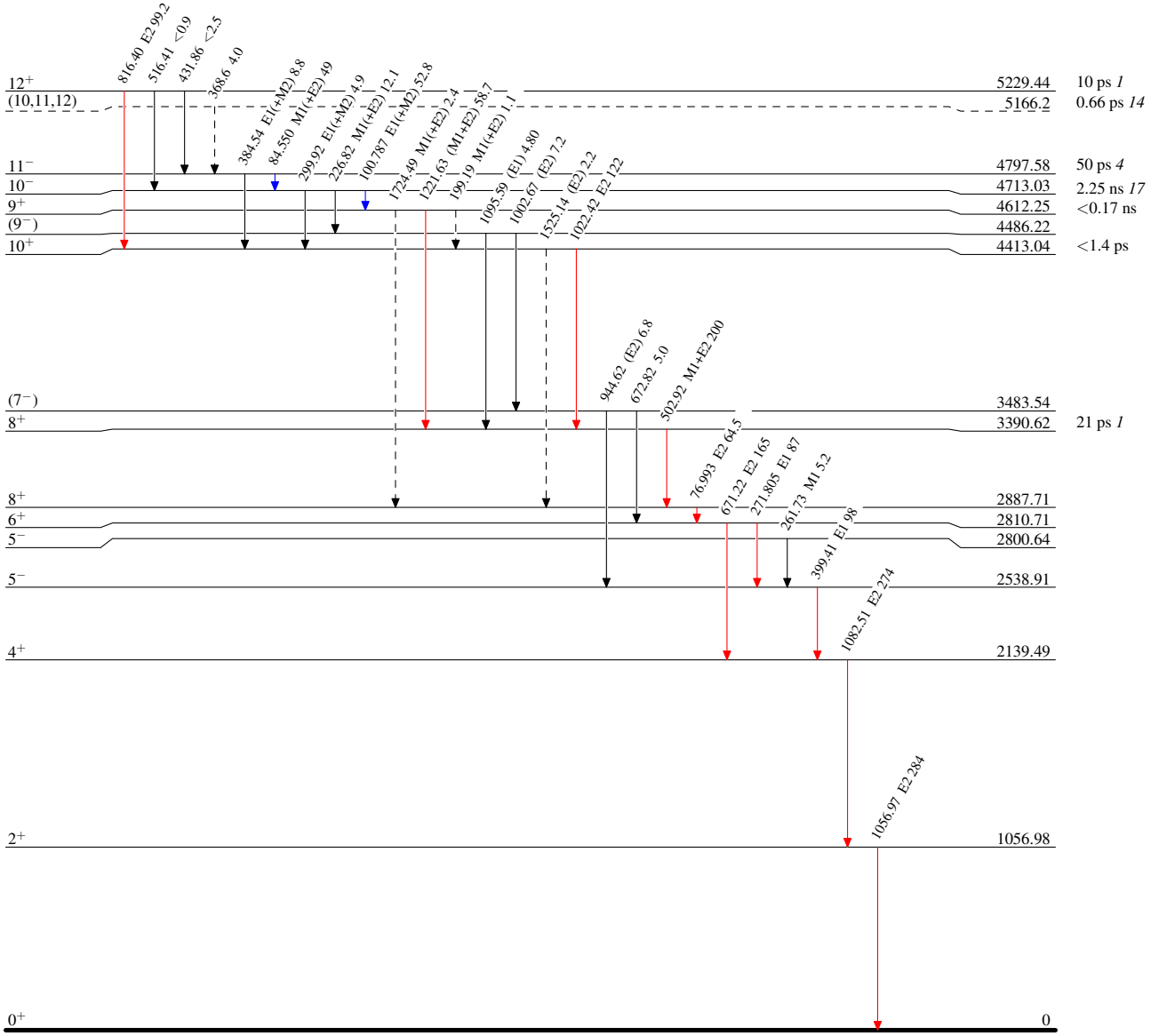
$^{88}_{40}Zr_{48}$

^{74}Ge(^{18}O,4nγ) 1985Wa09

Level Scheme (continued)

Intensities: Type not specified

Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)



$^{88}_{40}Zr_{48}$