^{98}Mo(α,3nγ) 1999Mr04,1981Du06

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	E. Browne, J. K. Tuli	NDS 145, 25 (2017)	1-Jul-2017

1999Mr04: E=38 MeV. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma(\theta)$, and lifetimes by DSA using a Ge(Li) and a HPGe detector.
1981Du06: E=35 MeV to 55 MeV.
Measured: γ with Eγ<2.8 MeV, excit, $\gamma\gamma$, $\gamma(\theta)$, $\alpha\gamma$(t), ce, ce(t); α(K)exp were normalized to α(K)(E2) for 502γ.
A detailed description of the half-life measurement is published in 1978Du17.
1971Le20: E=24 MeV, 30 MeV, 40 MeV.
Measured: γ, $\gamma\gamma$, $\alpha\gamma(\theta)$, $\alpha\gamma$(t). The results, though less precise, agree with 1981Du06.

^{99}Ru Levels

E(level)[#]	J$^\pi$	T$_{1/2}$[†]	Comments
0.0	5/2$^+$		
89.53[a] *11*	3/2$^+$		
320.5?[‡] *2*	3/2$^+$		
340.90[&] *7*	7/2$^+$		
617.89[a] *8*	7/2$^+$		
719.87 *7*	9/2$^+$		
1048.50[&] *8*	11/2$^+$		
1069.88[@] *7*	11/2$^-$	2.8 ns *2*	T$_{1/2}$: From 1981Du06.
1277.87 *11*	9/2$^+$		
1319.65[a] *9*	11/2$^+$		
1497.06 *9*	13/2$^+$		
1571.94[@] *12*	15/2$^-$		
1861.76 *14*	13/2$^-$		
1975.67[‡] *25*			
2020.33[&] *11*	15/2$^+$		
2223.92[a] *12*	(13/2,15/2)$^+$		
2254.2?[‡] *2*	(19/2$^-$)		
2268.29[@] *14*	19/2$^-$		
2330.05 *15*	(13/2,15/2)$^-$		
2392.76 *13*	(15/2,17/2)$^-$		
2400.90 *10*	(15/2,17/2)$^+$		
2653.6 *4*			
2752.17 *11*	(15/2,17/2)$^+$		
2822.29 *13*	(17/2,19/2,21/2)$^+$		
2851.97 *14*	(17/2,19/2)		J$^\pi$: parity is odd in the level scheme, figure 3 of 1999Mr04, but even in table 1 for 521.9γ.
2874.56 *11*	(17/2,19/2)$^+$		
2997.52 *12*	(17/2,19/2)$^+$		
3020.00 *14*	(19/2,21/2)$^+$		
3036.50 *15*	(17/2,19/2,21/2)$^-$	0.35 ps *+14−7*	
3094.47[&] *15*	(17/2,19/2)$^+$	0.42 ps *+35−17*	
3200.19[@] *18*	23/2$^-$	0.42 ps *+14−7*	
3207.4?[‡] *3*	(23/2$^-$)		
3324.27[a] *16*	(15/2,17/2,19/2)$^+$		
3459.6 *4*	(17/2,19/2,21/2)$^+$		
3466.06 *25*	(19/2,21/2,23/2)$^-$	0.56 ps *+28−14*	
3484.0?[‡] *3*	(21/2$^+$)		
3534.20 *17*	(21/2$^-$)		J$^\pi$: J^π=(21/2,23/2)$^-$ in figure 3 of 1999Mr04.
3536.32 *19*	(17/2,19/2,21/2)		

Continued on next page (footnotes at end of table)

^{98}Mo(α,3nγ) 1999Mr04,1981Du06 (continued)

^{99}Ru Levels (continued)

E(level)[#]	J$^{\pi}$	T$_{1/2}$[†]	Comments
3638.25 *15*	(19/2,21/2,23/2)$^{+}$		
3982.7 *4*	(21/2,23/2,25/2)$^{-}$	>0.9 ps	T$_{1/2}$: From Doppler Shift Attenuation in (α,3nγ) (1999Mr04).
4046.83 *20*	(23/2,25/2)$^{-}$		
4102.57 *17*	(21/2,23/2,25/2)$^{+}$	0.70 ps *14*	T$_{1/2}$: From Doppler Shift Attenuation in (α,3nγ) (1999Mr04).
4222.8[@] *3*	27/2^{-}	0.59 ps *7*	T$_{1/2}$: From Doppler Shift Attenuation in (α,3nγ) (1999Mr04).
4232.97[&] *18*	(21/2,23/2)$^{+}$	0.7 ps *+21−4*	T$_{1/2}$: From Doppler Shift Attenuation in (α,3nγ) (1999Mr04).
4323.7?[‡] *4*			
4380.95 *18*	(21/2,23/2,25/2)$^{+}$		
4487.07 *20*	(25/2,27/2)$^{-}$	0.42 ps *14*	T$_{1/2}$: From Doppler Shift Attenuation in (α,3nγ) (1999Mr04).
4518.3 *5*			
5005.3 *3*	(27/2,29/2)$^{-}$		
5168.0 *4*	(27/2,29/2)$^{-}$	0.21 ps *+14−7*	T$_{1/2}$: From Doppler Shift Attenuation in (α,3nγ) (1999Mr04).
5357.4[@] *3*	31/2^{-}	0.28 ps *+14−7*	
5603.4 *3*	(29/2,31/2)$^{-}$	0.21 ps *7*	

[†] From centroid-shift in $\alpha\gamma$(t) (1981Du06), unless otherwise specified.
[‡] From 1981Du06.
[#] Deduced by evaluators from least-squares fit to Eγ's.
[@] Band(A): Band based on 11/2^{-}.
[&] Band(B): Band based on 7/2^{+}.
[a] Band(C): Band based on 3/2^{+}.

$\gamma(^{99}Ru)$

Mixing ratios given under comments correspond to M1+E2 admixtures (1999Mr04).

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	α[&]	Comments
89.50 *20*	2.03 *7*	89.53	$3/2^+$	0.0	$5/2^+$			δ: −0.8 *+5−9*. A_2=+0.105 *22*, A_4=+0.02 *5*.
102.00 *20*	1.24 *6*	719.87	$9/2^+$	617.89	$7/2^+$			δ: −4.2 *+7−9* or −0.06 *4*. A_2=−0.25 *4*, A_4=−0.04 *11*.
122.44 *10*	2.70 *11*	2874.56	$(17/2,19/2)^+$	2752.17	$(15/2,17/2)^+$			δ: +0.5 *3* for 19/2 to 17/2 and −1.25 *+17−20* or +3.8 *+16−8* for 17/2 to 17/2. A_2=−0.14 *4*, A_4=+0.06 *9*.
145.45 *10*	8.5 *4*	3020.00	$(19/2,21/2)^+$	2874.56	$(17/2,19/2)^+$			δ: −7.3 *+15−25* or −0.04 *4* for 21/2 to 19/2 and <−2, >+13 for 19/2 to 19/2. A_2=−0.28 *5*, A_4=+0.08 *10*.
175.12 *10*	1.02 *6*	2997.52	$(17/2,19/2)^+$	2822.29	$(17/2,19/2,21/2)^+$			δ: +0.01 *6* or <−15 for 19/2 to 21/2; −1.4 *+4−8* or >+2.5 for 19/2 to 19/2 and <−8 or +0.04 *6* for 19/2 to 17/2. A_2=−0.16 *8*, A_4=−0.07 *15*.
177.32 *10*	0.87 *4*	1497.06	$13/2^+$	1319.65	$11/2^+$			δ: +0.06 *+5−4* or <−9. A_2=−0.12 *5*, A_4=+0.02 *11*.
245.31 *10*	2.89 *18*	2997.52	$(17/2,19/2)^+$	2752.17	$(15/2,17/2)^+$			δ: +7 *+2−4* or −0.04 *5* for 19/2 to 17/2 and <−1.6 and >+7 for 17/2 to 17/2. A_2=−0.26 *7*, A_4=−0.08 *16*.
271.07 *10*	0.99 *12*	1319.65	$11/2^+$	1048.50	$11/2^+$			δ: −0.5 +5 −8 or >+0.75. A_2=+0.05 *22*, A_4=+0.2 *4*.
277.01 *10*	1.39 *5*	617.89	$7/2^+$	340.90	$7/2^+$			δ: −0.28 *9* or +2.0 *+5−4*. A_2=+0.10 *4*, A_4=+0.07 *7*.
320.5[#b] *2*		320.5?	$3/2^+$	0.0	$5/2^+$	M1,E2	0.018 *4*	α(K)=0.015 *4*; α(L)=0.00194 *52*; α(M)=3.56×10^{-4} *96* α(N)=5.7×10^{-5} *15*; α(O)=2.7×10^{-6} *5*
328.57 *10*	2.05 *12*	1048.50	$11/2^+$	719.87	$9/2^+$	M1,E2	0.016 *4*	α(K)=0.014 *3*; α(L)=0.00179 *46*; α(M)=3.30×10^{-4} *86* α(N)=5.3×10^{-5} *13*; α(O)=2.5×10^{-6} *4* δ: <0.07 or −6.7 *+20−50*. A_2=−0.19 *8*, A_4=+0.04 *17*. Mult.: α(K)exp=0.0020 *8* (1981Du06).
340.81 *10*	36.2 *17*	340.90	$7/2^+$	0.0	$5/2^+$	E2(+M1)	0.015 *3*	α(K)=0.0128 *24*; α(L)=0.0016 *4*; α(M)=0.00029 *8* α(N)=4.7×10^{-5} *11*; α(O)=2.2×10^{-6} *4* δ: −0.10 *6* or −3.2 *6*. A_2=−0.27 *4*. Mult.: α(K)exp=0.013 *3* (1981Du06).
350.01 *10*	65 *4*	1069.88	$11/2^-$	719.87	$9/2^+$	E1	0.00411	α(K)=0.00361 *5*; α(L)=0.000414 *6*; α(M)=7.56×10^{-5} *11* α(N)=1.217×10^{-5} *17*; α(O)=6.24×10^{-7} *9* δ: −0.04 *6* or −5.7 *15*. A_2=−0.24 *6*, A_4=+0.09 *12*. Mult.: α(K)exp=0.0057 *20* (1981Du06).

$^{99}_{44}Ru_{55}$-3

^{98}Mo(α,3nγ) 1999Mr04,1981Du06 (continued)

$\gamma(^{99}Ru)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	α[&]	Comments
351.48 *20*	4.7 *10*	2752.17	(15/2,17/2)$^+$	2400.90	(15/2,17/2)$^+$			δ: −1 or +2.5 for 17/2 to 17/2 and +0.1 *3* or >3 for 17/2 to 15/2. A_2=−0.1 *4*.
379.07 *10*	2.88 *11*	719.87	9/2$^+$	340.90	7/2$^+$	M1,E2	0.0108 *17*	α(K)=0.0094 *15*; α(L)=0.00116 *23*; α(M)=0.00021 *5* α(N)=3.4×10^{-5} *7*; α(O)=1.65×10^{-6} *20* A_2=+0.18 *4*, A_4=+0.02 *7*.
380.81 *10*	1.37 *13*	2400.90	(15/2,17/2)$^+$	2020.33	15/2$^+$			δ: >10 or +0.1 *1* for 17/2 to 15/2 and −0.9 *+4−7* or +2.6 *+80−11* for 15/2 to 15/2. A_2=−0.06 *14*, A_4=−0.06 *26*.
421.27 *10*	1.85 *6*	2822.29	(17/2,19/2,21/2)$^+$	2400.90	(15/2,17/2)$^+$			δ: +0.32 *+4−3* or +4.7 *+8−6* for 19/2 to 17/2 and −0.29 *7* for 17/2 to 17/2. A_2=+0.23 *4*, A_4=−0.02 *6*.
448.59 *10*	1.53 *9*	1497.06	13/2$^+$	1048.50	11/2$^+$	(M1,E2)	0.0067 *7*	α(K)=0.0059 *6*; α(L)=0.00071 *10*; α(M)=0.000130 *18* α(N)=2.1×10^{-5} *3*; α(O)=1.04×10^{-6} *8* δ: +0.26 *7* or >+5.2. A_2=+0.13 *8*, A_4=+0.02 *15*. Mult.: α(K)exp=0.007 *3* (1981Du06).
459.26 *10*	2.89 *13*	2851.97	(17/2,19/2)	2392.76	(15/2,17/2)$^-$			δ: +0.22 *45* or +9 *+5−3* for 19/2 to 17/2 and −0.57 *12* or +1.4 *3* for 17/2 to 17/2. A_2=+0.09 *6*, A_4=0.00 *11*.
468.26 *10*	1.35 *7*	2330.05	(13/2,15/2)$^-$	1861.76	13/2$^-$			δ: −0.54 *16* or +1.6 *+6−4* for 13/2 to 13/2 and +0.2 *+7−6* or >+7 for 15/2 to 13/2. A_2=+0.07 *7*, A_4=−0.25 *11*.
473.67 *10*	10.8 *4*	2874.56	(17/2,19/2)$^+$	2400.90	(15/2,17/2)$^+$	M1,E2	0.0058 *5*	α(K)=0.0050 *4*; α(L)=0.00061 *7*; α(M)=0.000111 *13* α(N)=1.79×10^{-5} *20*; α(O)=9.0×10^{-7} *5* δ: −6 *1* or −0.07 *3* for 19/2 to 17/2 and −5.4 *+6−8* or −0.08 *25* for 17/2 to 15/2. A_2=−0.311 *28*, A_4=+0.01 *6*. Mult.: α(K)exp=0.0071 *20* (1981Du06).
502.07 *10*	56.5 *16*	1571.94	15/2$^-$	1069.88	11/2$^-$	E2[‡]	0.00528	α(K)=0.00459 *7*; α(L)=0.000566 *8*; α(M)=0.0001039 *15* α(N)=1.661×10^{-5} *24*; α(O)=7.99×10^{-7} *12* A_2=+0.312 *18*, A_4=−0.05 *3*. Mult.: α(K)exp=0.0047 *10* (1981Du06).
521.90 *10*	1.55 *17*	2851.97	(17/2,19/2)	2330.05	(13/2,15/2)$^-$			δ: +0.32 *+20−15* or +4.8 *+100−23* for 17/2 to 15/2. A_2=+0.22 *18*.
528.36 *10*	1.41 *8*	617.89	7/2$^+$	89.53	3/2$^+$	[‡]		A_2=+0.10 *7*, A_4=−0.14 *14*.
531.01 *10*	0.32 *3*	2392.76	(15/2,17/2)$^-$	1861.76	13/2$^-$			δ: +0.47 *+23−15* or +3 *1* for 15/2 to 13/2. A_2=+0.36 *14*, A_4=−0.01 *25*.
596.95 *15*	2.1 *4*	2997.52	(17/2,19/2)$^+$	2400.90	(15/2,17/2)$^+$			δ: −4.5 *+26−100* or −0.12 *+23−29* for 19/2 to 17/2 and <−1 and >+2.5 for 17/2 to 17/2. A_2=−0.4 *3*.
599.84 *10*	4.9 *10*	1319.65	11/2$^+$	719.87	9/2$^+$			δ: −0.3 *+3−5* or −2.2 *+14−50*. A_2=−0.5 *3*, A_4=+0.2 *7*.

$^{99}_{44}Ru_{55}$-4

^{98}Mo(α,3nγ) 1999Mr04,1981Du06 (continued)

$\gamma(^{99}Ru)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	α[&]	Comments
617.89 *15*	7 *3*	617.89	7/2$^+$	0.0	5/2$^+$	M1,E2	0.00288 *7*	α(K)=0.00252 *6*; α(L)=0.000296 *13*; α(M)=5.43×10^{-5} *24* α(N)=8.8×10^{-6} *4*; α(O)=4.51×10^{-7} *7* Mult.: α(K)exp=0.0025 *8* (1981Du06).
617.94 *25*	2.5 *15*	3638.25	(19/2,21/2,23/2)$^+$	3020.00	(19/2,21/2)$^+$			
618.75 *25*	3.0 *20*	3020.00	(19/2,21/2)$^+$	2400.90	(15/2,17/2)$^+$			
643.76 *10*	3.42 *16*	3036.50	(17/2,19/2,21/2)$^-$	2392.76	(15/2,17/2)$^-$			δ: +0.53 *+11−9* or +2.5 *+6−5* for 19/2 to 17/2 and +0.22 *15* for 17/2 to 17/2. A$_2$=+0.43 *7*, A$_4$=−0.08 *11*.
650.91[†b] *25*	2.01 *14*	2874.56	(17/2,19/2)$^+$	2223.92	(13/2,15/2)$^+$			δ: 0.23 *+10−8* or >+5 for 17/2 to 15/2. A$_2$=+0.11 *11*.
660.01 *15*	0.54 *5*	1277.87	9/2$^+$	617.89	7/2$^+$			δ: +0.11 *14* or <−5. A$_2$=−0.06 *15*.
661.76[b] *15*	1.26 *10*	3536.32	(17/2,19/2,21/2)	2874.56	(17/2,19/2)$^+$			δ: <−7 or +0.04 *9* for 21/2 to 19/2 and −1.4 *+5−200* or +3.9 *+60−19* for 19/2 to 19/2. A$_2$=−0.15 *13*.
682.22 *10*	5.5 *3*	3534.20	(21/2$^-$)	2851.97	(17/2,19/2)	E2[‡]	0.00225	α(K)=0.00197 *3*; α(L)=0.000234 *4*; α(M)=4.30×10^{-5} *6* α(N)=6.90×10^{-6} *10*; α(O)=3.47×10^{-7} *5* A$_2$=+0.30 *8*, A$_4$=−0.15 *14*.
682.3[#b] *2*		2254.2?	(19/2$^-$)	1571.94	15/2$^-$	(E2)	0.00225	α(K)=0.00196 *3*; α(L)=0.000234 *4*; α(M)=4.29×10^{-5} *6* α(N)=6.90×10^{-6} *10*; α(O)=3.47×10^{-7} *5* Mult.: α(K)exp=0.0049 *25* (1981Du06).
696.33 *10*	37.9 *10*	2268.29	19/2$^-$	1571.94	15/2$^-$	(E2)[‡]	0.00213	α(K)=0.00186 *3*; α(L)=0.000222 *4*; α(M)=4.06×10^{-5} *6* α(N)=6.53×10^{-6} *10*; α(O)=3.29×10^{-7} *5* A$_2$=+0.279 *14*, A$_4$=−0.044 *26*. Mult.: α(K)exp=0.0019 *4* (1981Du06).
701.0[b] *3*	1.6 *4*	2020.33	15/2$^+$	1319.65	11/2$^+$			
701.70 *20*	5.3 *7*	1319.65	11/2$^+$	617.89	7/2$^+$			A$_2$=+0.17 *8*, A$_4$=+0.02 *14* for 701.70+701.0.
707.56 *10*	21.5 *6*	1048.50	11/2$^+$	340.90	7/2$^+$	(E2)[‡]	0.00205	α(K)=0.00179 *3*; α(L)=0.000212 *3*; α(M)=3.89×10^{-5} *6* α(N)=6.26×10^{-6} *9*; α(O)=3.16×10^{-7} *5* A$_2$=+0.276 *17*, A$_4$=−0.08 *3*. Mult.: α(K)exp=0.0023 *4* (1981Du06).
719.81 *10*	100 *3*	719.87	9/2$^+$	0.0	5/2$^+$	E2	0.00196	α(K)=0.001711 *24*; α(L)=0.000203 *3*; α(M)=3.72×10^{-5} *6* α(N)=5.98×10^{-6} *9*; α(O)=3.02×10^{-7} *5* δ: +0.35 *5* or 6.5 *15*. A$_2$=+0.260 *14*, A$_4$=−0.062 *26*. Mult.: α(K)exp=0.0016 *3* (1981Du06).
728.82 *10*	3.8 *5*	1069.88	11/2$^-$	340.90	7/2$^+$	M2	0.00526	α(K)=0.00460 *7*; α(L)=0.000549 *8*; α(M)=0.0001011 *15* α(N)=1.637×10^{-5} *23*; α(O)=8.62×10^{-7} *12* A$_2$=+0.38 *23*, A$_4$=+0.1 *5*.

$^{99}_{44}Ru_{55}$-5

^{98}Mo(α,3nγ) 1999Mr04,1981Du06 (continued)

$\gamma(^{99}Ru)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	α[&]	Comments
731.7[b] *3*	0.5 *3*	2752.17	(15/2,17/2)$^+$	2020.33	15/2$^+$			
742.70 *10*	1.46 *13*	4380.95	(21/2,23/2,25/2)$^+$	3638.25	(19/2,21/2,23/2)$^+$			δ: −0.09 *9* or −5.6 *+20−50* for 23/2 to 21/2 and <−2 or >+8 for 21/2 to 21/2. A_2=−0.35 *12*.
763.73 *10*	6.4 *3*	3638.25	(19/2,21/2,23/2)$^+$	2874.56	(17/2,19/2)$^+$			δ: +0.42 *+8−6* or +3.2 *+8−6* for 21/2 to 19/2 and +0.2 *5* for 19/2 to 19/2. A_2=+0.34 *7*, A_4=−0.21 *11*.
768.19 *10*	8.8 *4*	3036.50	(17/2,19/2,21/2)$^-$	2268.29	19/2$^-$			δ: +0.6 *+2−1* or +2.0 *5* for 21/2 to 19/2 and −1.0 *4* for 17/2 to 19/2. A_2=+0.50 *7*, A_4=+0.15 *11*.
777.25 *10*	34.0 *14*	1497.06	13/2$^+$	719.87	9/2$^+$	(E2)[‡]	1.61×10^{-3}	α(K)=0.001409 *20*; α(L)=0.0001660 *24*; α(M)=3.04×10^{-5} *5* α(N)=4.90×10^{-6} *7*; α(O)=2.50×10^{-7} *4* A_2=+0.24 *4*, A_4=−0.08 *8*. Mult.: α(K)exp=0.0010 *4* (1981Du06).
782.48 *10*	2.17 *13*	5005.3	(27/2,29/2)$^-$	4222.8	27/2$^-$			δ: +0.13 *10* or >+7 for 29/2 to 27/2 and −0.9 *+3−5* or +1.6 *+13−6* for 27/2 to 27/2. A_2=−0.01 *14*, A_4=+0.01 *12*.
791.8[b] *3*	0.8 *5*	2653.6		1861.76	13/2$^-$			
791.83 *20*	3.6 *7*	1861.76	13/2$^-$	1069.88	11/2$^-$			δ: +0.41 *4* or +3.9 *6*. A_2=+0.28 *4*, A_4=+0.08 *6* for 791.83+791.8.
820.86 *10*	8.23 *24*	2392.76	(15/2,17/2)$^-$	1571.94	15/2$^-$			δ: +0.045 *30* for 17/2 to 15/2 and +0.04 *+20−8* or +0.45 *+10−20* for 15/2 to 15/2. A_2=+0.348 *20*, A_4=+0.07 *4*.
846.63 *10*	2.53 *9*	4046.83	(23/2,25/2)$^-$	3200.19	23/2$^-$			δ: +0.35 *4* or 4.0 *5* for 25/2 to 23/2 and −0.28 *+9−8* or +0.67 *12* for 23/2 to 23/2. A_2=+0.28 *3*, A_4=−0.02 *6*.
854.18 *10*	4.61 *14*	2874.56	(17/2,19/2)$^+$	2020.33	15/2$^+$			δ: +0.40 *3* or +3.6 *3* for 17/2 to 15/2. A_2=+0.302 *21*, A_4=−0.14 *4*.
903.91 *15*	24.0 *20*	2400.90	(15/2,17/2)$^+$	1497.06	13/2$^+$	(E2)	1.12×10^{-3}	α(K)=0.000978 *14*; α(L)=0.0001139 *16*; α(M)=2.09×10^{-5} *3* α(N)=3.37×10^{-6} *5*; α(O)=1.738×10^{-7} *25* δ: +0.34 *+4−3* or +4.6 *+7−6* for 15/2 to 13/2. A_2=+0.23 *3*, A_4=−0.01 *6* for 903.9+904.3.
904.30 *25*	2.5 *10*	2223.92	(13/2,15/2)$^+$	1319.65	11/2$^+$			
931.89 *10*	21.0 *10*	3200.19	23/2$^-$	2268.29	19/2$^-$	(E2)[‡]	1.04×10^{-3}	α(K)=0.000911 *13*; α(L)=0.0001059 *15*; α(M)=1.94×10^{-5} *3* α(N)=3.13×10^{-6} *5*; α(O)=1.620×10^{-7} *23* A_2=+0.36 *7*, A_4=−0.10 *11*. Mult.: α(K)exp=0.0009 *2* (1981Du06).
936.95 *10*	2.3 *6*	1277.87	9/2$^+$	340.90	7/2$^+$			A_2=+0.0 *6*.
945.2 *3*	1.89 *16*	5168.0	(27/2,29/2)$^-$	4222.8	27/2$^-$			δ: +0.51 *+40−17* or +2.4 *+15−11* for 29/2 to 27/2 and +0.1

$^{99}_{44}Ru_{55}$-6

^{98}Mo(α,3nγ) 1999Mr04,1981Du06 (continued)

$\gamma(^{99}Ru)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	α[&]	Comments
								5 for 27/2 to 27/2. A_2=+0.45 *16*, A_4=−0.18 *25*.
946.2 *3*	4.06 *13*	3982.7	(21/2,23/2,25/2)$^-$	3036.50	(17/2,19/2,21/2)$^-$			δ: +0.48 *5* or +2.7 *+4−3* for 23/2 to 21/2 and +0.18 *22* for 21/2 to 21/2. A_2=+0.40 *3*, A_4=−0.16 *5*.
952.87 *10*	6.7 *3*	4487.07	(25/2,27/2)$^-$	3534.20	(21/2$^-$)	‡		A_2=+0.41 *7*, A_4=−0.07 *11*.
953.2[#b] *2*		3207.4?	(23/2$^-$)	2254.2?	(19/2$^-$)	(E2)	9.87×10^{-4}	α(K)=0.000865 *13*; α(L)=0.0001003 *14*; α(M)=1.84×10^{-5} *3* α(N)=2.97×10^{-6} *5*; α(O)=1.538×10^{-7} *22*
971.95 *10*	12.3 *3*	2020.33	15/2$^+$	1048.50	11/2$^+$	(E2)‡	9.43×10^{-4}	α(K)=0.000827 *12*; α(L)=9.58×10^{-5} *14*; α(M)=1.754×10^{-5} *25* α(N)=2.83×10^{-6} *4*; α(O)=1.471×10^{-7} *21* A_2=+0.308 *17*, A_4=−0.05 *3*. Mult.: α(K)exp=0.0017 *8* (1981Du06).
1022.62[†] *20*	11.7 *6*	4222.8	27/2$^-$	3200.19	23/2$^-$	(E2)	8.40×10^{-4}	α(K)=0.000737 *11*; α(L)=8.51×10^{-5} *12*; α(M)=1.558×10^{-5} *22* α(N)=2.52×10^{-6} *4*; α(O)=1.312×10^{-7} *19* Mult.: α(K)exp=0.0006 *2* (1981Du06). A_2=+0.27 *6*, A_4=−0.14 *11*.
1058.7[a] *3*	4.4[a] *7*	3459.6	(17/2,19/2,21/2)$^+$	2400.90	(15/2,17/2)$^+$	M1,E2	0.00081 *4*	α(K)=0.00071 *3*; α(L)=8.1×10^{-5} *3*; α(M)=1.49×10^{-5} *6* α(N)=2.41×10^{-6} *9*; α(O)=1.28×10^{-7} *7* A_2=+0.11 *7*, A_4=+0.03 *10* for doublet.
1058.7[ab] *3*	0.8[a] *5*	4518.3		3459.6	(17/2,19/2,21/2)$^+$			
1070.03 *10*	0.5 *3*	1069.88	11/2$^-$	0.0	5/2$^+$	[E3]	1.55×10^{-3}	α(K)=0.001349 *19*; α(L)=0.0001635 *23*; α(M)=3.01×10^{-5} *5* α(N)=4.83×10^{-6} *7*; α(O)=2.43×10^{-7} *4* A_2=−0.2 *12*.
1074.14 *10*	2.82 *21*	3094.47	(17/2,19/2)$^+$	2020.33	15/2$^+$			δ: +0.4 *+2−1* or +3.6 *+26−13* for 17/2 to 15/2. A_2=+0.30 *13*, A_4=−0.06 *22*.
1082.56[†] *10*	6.0 *3*	4102.57	(21/2,23/2,25/2)$^+$	3020.00	(19/2,21/2)$^+$			δ: +0.4 *1* or +3.3 *+8−6* for 23/2 to 21/2 and −0.15 *+30−15* or +0.6 *+2−4* for 21/2 to 21/2. A_2=+0.33 *6*, A_4=−0.20 *11*.
1083.0[#] *2*		3484.0?	(21/2$^+$)	2400.90	(15/2,17/2)$^+$	(E2)	7.40×10^{-4}	α(K)=0.000649 *9*; α(L)=7.47×10^{-5} *11*; α(M)=1.367×10^{-5} *20* α(N)=2.21×10^{-6} *3*; α(O)=1.156×10^{-7} *17* Mult.: α(K)exp=0.005 *3* (1981Du06).
1100.34 *10*	1.56 *14*	3324.27	(15/2,17/2,19/2)$^+$	2223.92	(13/2,15/2)$^+$			δ: +0.27 *+16−13* or +6 *+20−3* for 17/2 to 15/2. A_2=+0.16 *16*, A_4=−0.19 *29*.
1116.3[#b] *2*		4323.7?		3207.4?	(23/2$^-$)			Mult.: α(K)exp=0.0010 *5* (1981Du06).

$^{99}_{44}Ru_{55}$-7

^{98}Mo(α,3nγ) 1999Mr04,1981Du06 (continued)

$\gamma(^{99}Ru)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[@]	Comments
1116.30[†] *20*	4.3 *10*	5603.4	(29/2,31/2)$^-$	4487.07	(25/2,27/2)$^-$		A_2=+0.2 *5*, A_4=0.0 *9*.
1134.55 *10*	2.32 *11*	5357.4	31/2$^-$	4222.8	27/2$^-$	[‡]	A_2=+0.31 *6*, A_4=−0.42 *11*.
1138.49 *10*	1.05 *13*	4232.97	(21/2,23/2)$^+$	3094.47	(17/2,19/2)$^+$		δ: +0.36 *+40−20* or +4 *+20−2* for 21/2 to 19/2. A_2=+0.28 *26*.
1175.45 *10*	2.49 *9*	2223.92	(13/2,15/2)$^+$	1048.50	11/2$^+$		δ: +0.4 *+5−4* for 13/2 to 11/2. A_2=+0.25 *3*, A_4=−0.03 *6*.
1197.76 *20*	1.87 *9*	3466.06	(19/2,21/2,23/2)$^-$	2268.29	19/2$^-$		δ: +0.63 *+20−11* or +2.0 *5* for 21/2 to 19/2. A_2=+0.51 *7*, A_4=+0.07 *11*.
1255.08 *10*	4.3 *3*	2752.17	(15/2,17/2)$^+$	1497.06	13/2$^+$		δ: +0.35 *+15−12* or 4.5 *+40−17* for 15/2 to 13/2. A_2=+0.24 *13*, A_4=−0.28 *23*.
1255.8[#] *2*		1975.67		719.87	9/2$^+$		
1280.00 *10*	5.0 *4*	2851.97	(17/2,19/2)	1571.94	15/2$^-$		δ: +0.46 *+18−13* or +3 *+2−1* for 17/2 to 15/2. A_2=+0.36 *12*, A_4=+0.06 *20*.
1352.18 *10*	1.57 *11*	2400.90	(15/2,17/2)$^+$	1048.50	11/2$^+$		A_2=+0.18 *12*, A_4=+0.15 *21*.

[†] Possible doublet (1999Mr04).
[‡] ΔJ=2, stretched quadrupole from $\gamma(\theta)$ data (1999Mr04).
[#] From 1981Du06.
[@] From $\alpha\gamma(\theta)$ and α(K)exp. α(K)exp alone does not allow to distinguish between M1 and E2. Quadrupole γ's are E2 for $T_{1/2}$<0.5 ns as determined by 1981Du06.
[&] Additional information 1.
[a] Multiply placed with intensity suitably divided.
[b] Placement of transition in the level scheme is uncertain.

$^{99}_{44}Ru_{55}$-8

^{98}Mo(α,3nγ) 1999Mr04,1981Du06

Level Scheme

Intensities: Relative I_γ

@ Multiply placed: intensity suitably divided

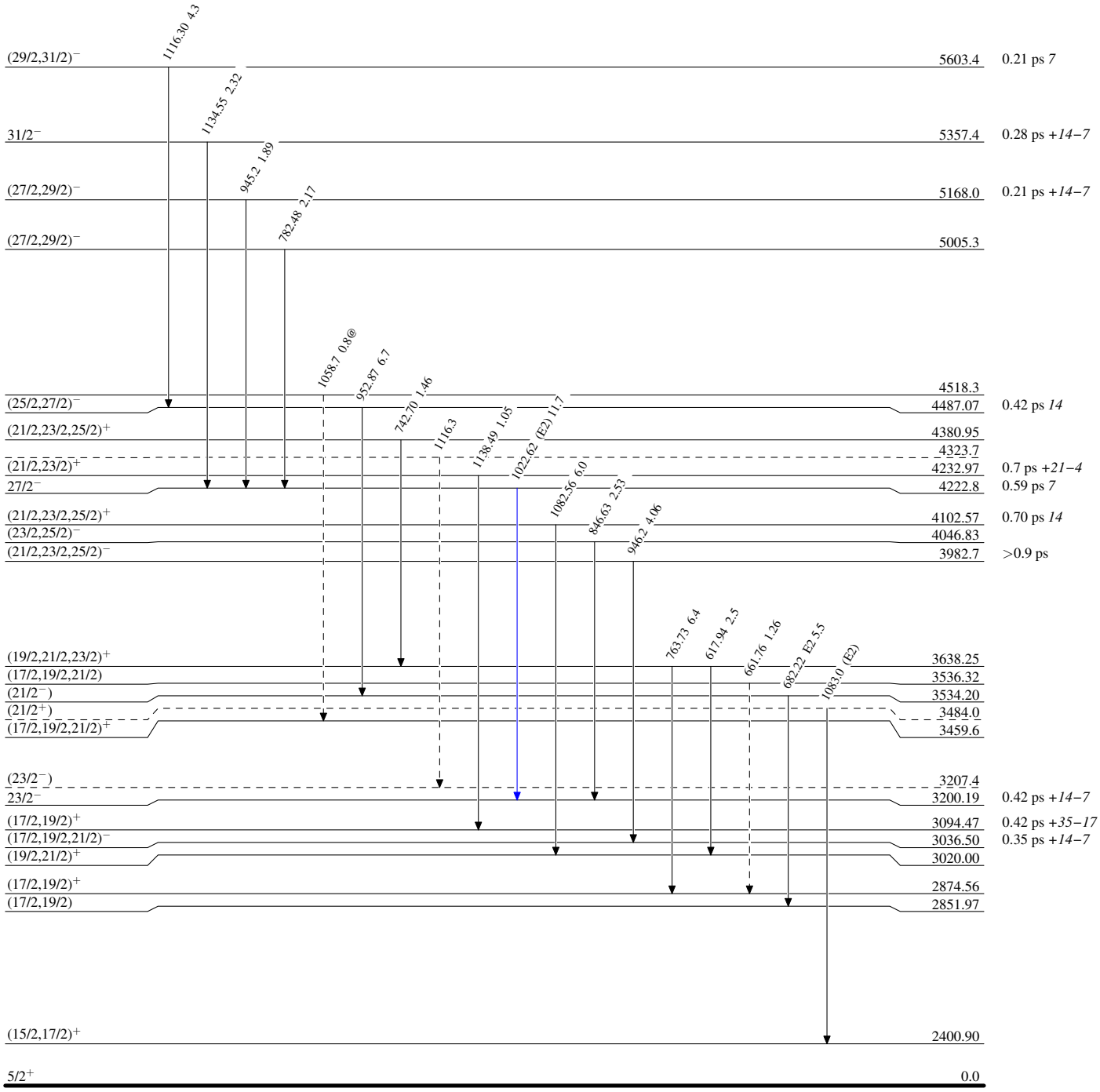
Legend

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

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

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

γ Decay (Uncertain)



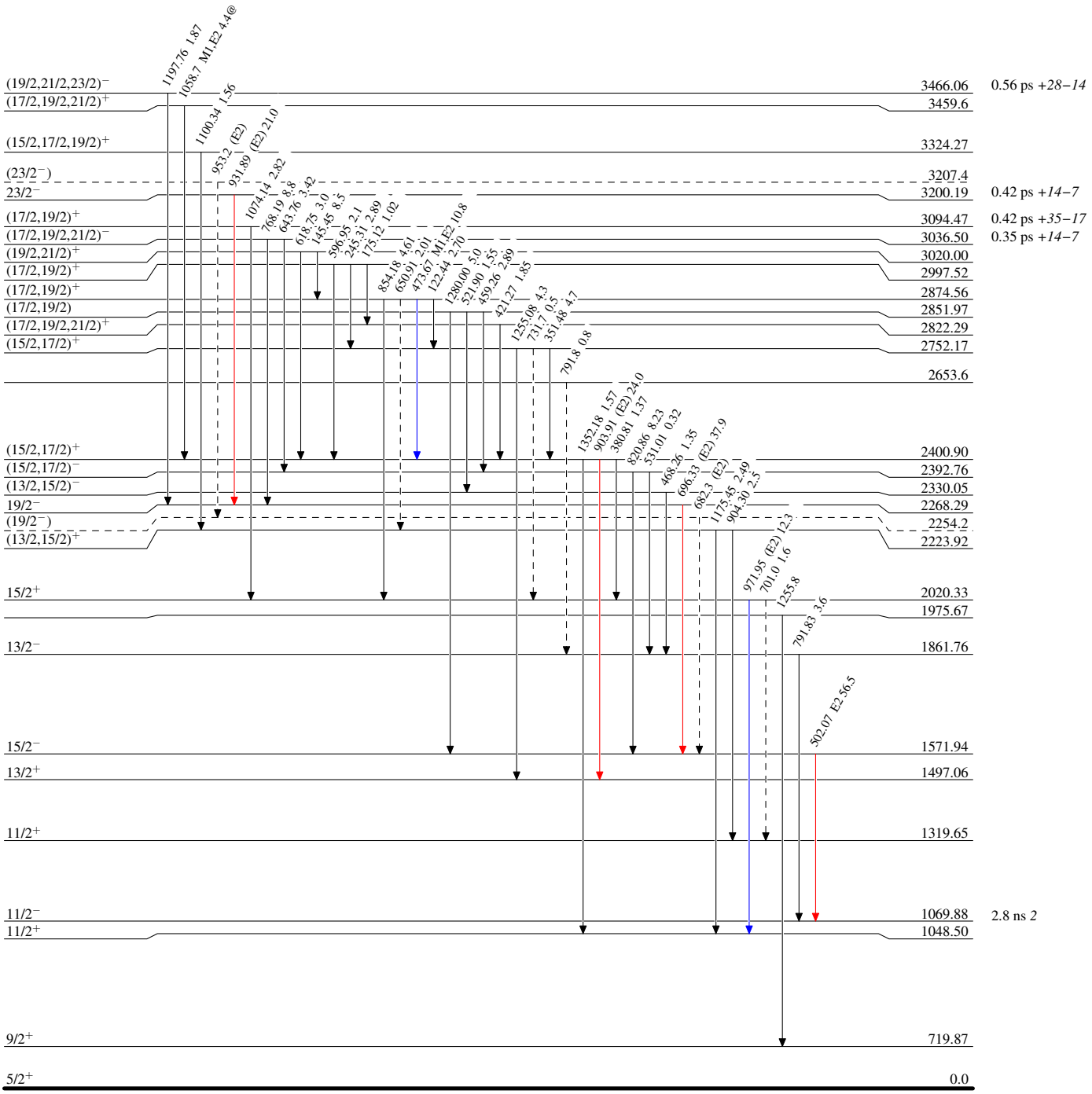
$^{99}_{44}Ru_{55}$

^{98}Mo(α,3nγ) 1999Mr04,1981Du06

Level Scheme (continued)

Intensities: Relative I_γ
@ Multiply placed: intensity suitably divided

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)

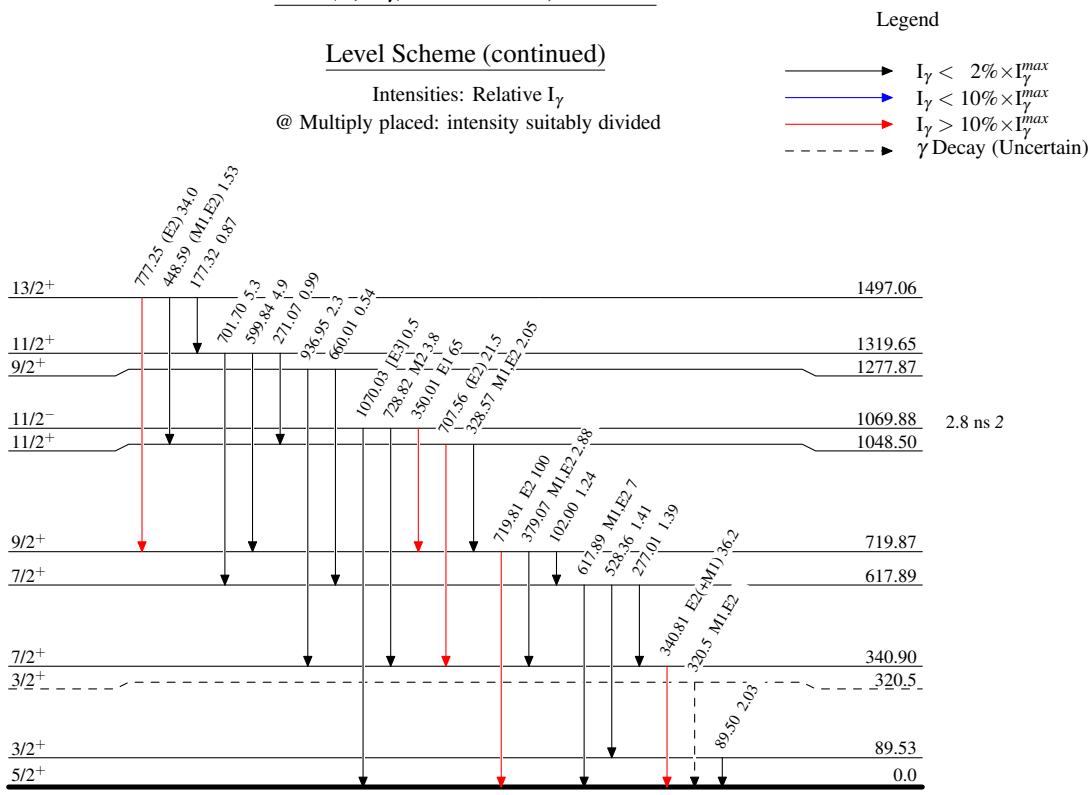


$^{99}_{44}Ru_{55}$

^{98}Mo(α,3nγ) 1999Mr04,1981Du06

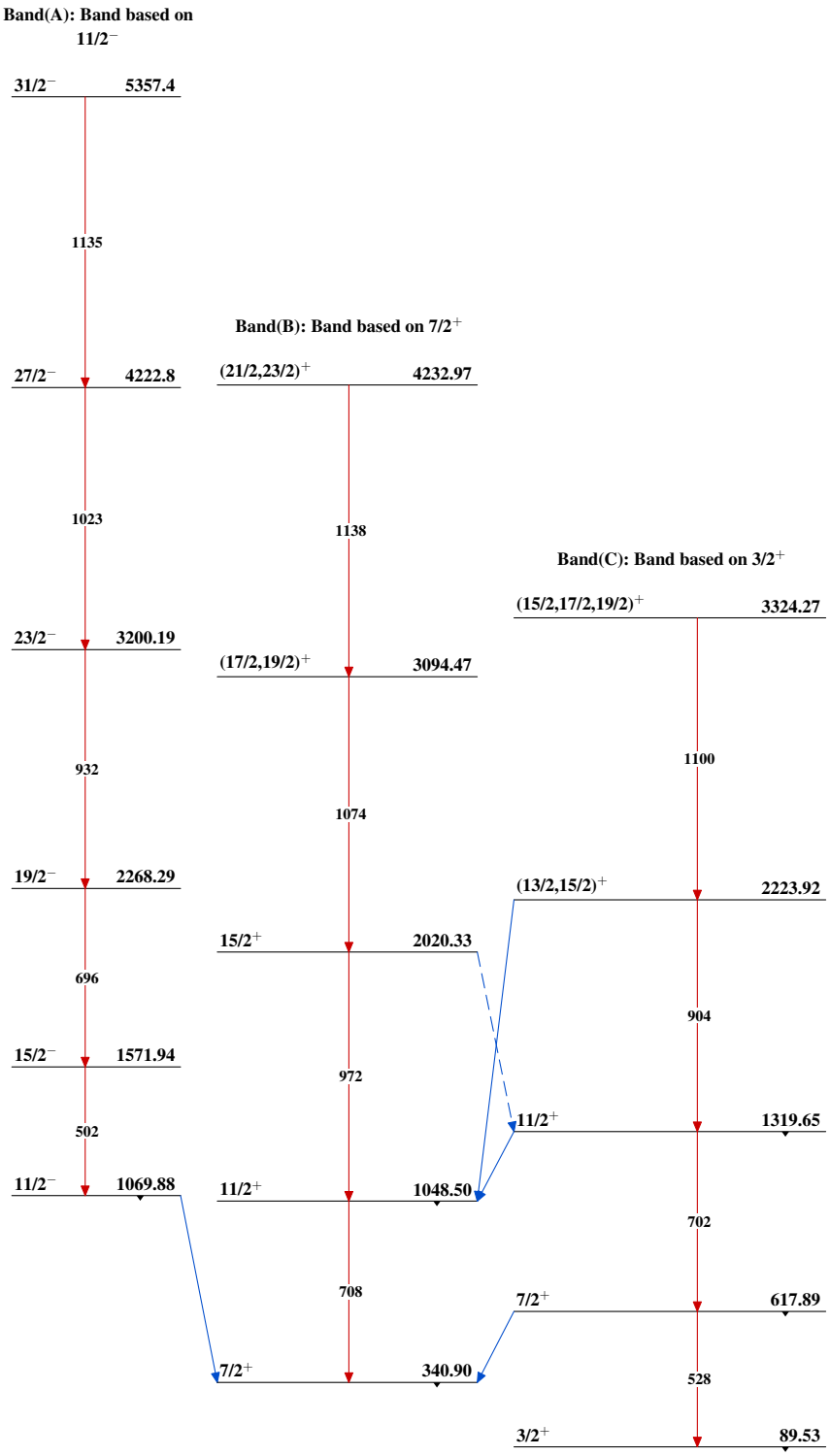
Level Scheme (continued)

Intensities: Relative I_γ
@ Multiply placed: intensity suitably divided



$^{99}_{44}Ru_{55}$

^{98}Mo(α,3nγ) 1999Mr04,1981Du06



$^{99}_{44}Ru_{55}$