^{98}Mo(p,nγ) 1982Ar12,1977Mi06,1976Fi04

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen, Balraj Singh	NDS 164, 1 (2020)	15-Feb-2020

1982Ar12: E=2.4-4.0 MeV proton beams were produced from the 5-MV Van de Graaff accelerator of the Institute of Nuclear Research, Debrecen. Targets were self-supporting molybdenum power (91% enriched in ^{98}Mo) with thickness of 105 mg/cm^2 for γ-spectra and 0.1-0.5 mg/cm^2 for conversion electrons. γ rays were detected with Ge(Li) detectors (FWHM=0.6 keV at 122 keV; 2.2 and 3.3 keV at 1332 keV) and conversion electrons were detected with a superconducting solenoid transporter Si(Li) spectrometer (FWHM=2.9 keV at 320 keV). Measured Eγ, Iγ, E(ce), I(ce), γ(excitation function), γ anisotropy (at 55° and 90°). Deduced levels, J, π, conversion coefficients, γ-ray multipolarities. Comparisons with available data and theoretical calculations. Most measurements are at 4 MeV.

1977Mi06: E=2.513-3.620 MeV proton beams were produced from the University of Kentucky model CN Van de Graaff accelerator. Target was a 0.95 mg/cm^2 foil of Mo (98.3% enriched in ^{98}Mo). γ rays were detected with Ge(Li) (FWHM=0.5 keV at 50 keV; 1 keV at 166 keV) and Si(Li) (FWHM=0.3 keV at 21 keV) detectors. Measured Eγ, Iγ, γγ-coin, γ(excitation function), γ(t). Deduced levels, γ branching ratios.

1979Mi08, 1978MiZO (from the same group as 1977Mi06): E=6.14 MeV (on d5/2 IAR), 4.6 and 6.0 MeV (off d5/2 resonance) beams from the University of Kentucky 6.5-MV Van de Graaff. Target was self-supporting 0.95 mg/cm^2 thick rolled metallic foil of 98.3% enriched ^{98}Mo. γ rays were detected with a Ge(Li) crystal (FWHM=0.5 keV at 50 keV) and conversion electrons were focused with a "mini-orange" magnetic filer and detected with a Si(Li) crystal (FWHM=3.3 keV at 320 keV). Measured Eγ, Iγ, E(ce), I(ce). Deduced levels, J, π, conversion coefficients, γ-ray multipolarities.

1976FI04: E=2.58-3.2 MeV proton beams were produced from the Ohio University Tandem Van de Graaff. Targets were enriched ^{98}Mo (98.27%) with thicknesses of 0.47 mg/cm^2. γ-rays were detected with a low-energy-photon spectrometer (LEPS) and a Ge(Li) detector; neutrons were detected with two liquid scintillators. Measured Eγ, Iγ, γγ-coin, nγ-coin, γ(excitation function). Deduced levels. 1976Fi04 also investigate the 106,7$^+$ state with the ^{97}Mo(d,nγ) reaction at E=4 MeV and also report data on (p,n) and (^{3}He,d).

Lifetime measurements (γ(t) data):
2001Sm12: E=5 MeV.
1978Bi09: E=4-5 MeV.
1976We06: E=4 MeV.
1973HoZG: E=12 MeV.
1961Sc11: E=2.4-3.2 MeV.

^{98}Tc Levels

Levels at 148, 208, 540 and 658 proposed by 1976Fi04 are discarded due to different placements of associated γ transitions in later studies (1977Mi06,1982Ar12).

E(level)[†]	Jπ[‡]	$T_{1/2}$[#]	Comments
0.0	(6)$^+$		
21.80 *10*	(5)$^+$	2.4 ns *6*	$T_{1/2}$: from γ(t) (2001Sm12).
65.50 *13*	(4)$^+$	<1.4 ns	
73.07 *18*	(2 to 5)$^-$		$T_{1/2}$: see comment for 91 level.
81.62 *14*	(4)$^+$	<1.4 ns	$T_{1/2}$: other: <0.7 ns (1978MiZO).
90.50 *19*	(2,3)$^-$	15.0 μs *7*	$T_{1/2}$: from 43.6γ(t). Weighted average of 15.5 μs *8* (1961Sc11) and 14.6 μs *7* (1976We06). It is assumed that this half-life corresponds to the 90.8 level. The present data, however, do not exclude for it to belong to the 73.3 level.
106.4 *5*	(7)$^+$		E(level): from ^{97}Mo(d,nγ) (1976Fi04).
138.32 *17*	(3)$^-$	8.2 ns *3*	$T_{1/2}$: weighted average of 8.0 ns *2* (1978Bi09) and 8.6 ns *3* (2001Sm12).
152.16 *14*	(3,4,5)$^+$	<1.4 ns	$T_{1/2}$: other: <0.7 ns (1978MiZO).
190.00 *18*	(3,4)$^-$	<1.4 ns	
203.94 *15*	(4)$^+$	<1.4 ns	
268.20 *16*	4$^+$,5$^+$		
306.20? *16*	(3,4,5)$^+$		

Continued on next page (footnotes at end of table)

^{98}Mo(p,nγ) 1982Ar12,1977Mi06,1976Fi04 (continued)

^{98}Tc Levels (continued)

E(level)[†]	Jπ[‡]	Comments
321.64 *18*	$(2,3,4)^-$	
328.56 *14*	$(3,4,5)^+$	
350.94 *19*	$(3)^-$	
375.09? *18*	$(3,4,5)^+$	
390.33 *17*	$(3)^+$	
423.84 *23*	$4^+,5^+$	
447.0? *4*	$^+$	Level proposed by 1977Mi06 only.
457.57 *19*	$(2,3,4)^-$	
484.08 *20*	$(2\text{ to }5)^-$	
502.22 *25*		Level from (350γ)(87γ) (1977Mi06,1976Fi04).
543.17 *20*	$(1\text{ to }5)^-$	
622.03 *22*	$(2,3,4)^-$	
652.71? *16*		
666.00 *20*	$(2,3,4)^+$	
688.0 *8*	$(4,5)^+$	Level from 1977Mi06.
713.36 *20*	$(4,5)^+$	

[†] From a least-squares fit to γ-ray energies.
[‡] From the Adopted Levels.
[#] From γγ(t) (1978Bi09), unless stated otherwise.

$\gamma(^{98}Tc)$

Relative intensities with gate on and off $d_{5/2}$IAR (1978MiZO)
(uncertainty=10-20%)

Eγ(keV)	Iγ(gate on)	Iγ(gate off)
43.7	100	100
47.9	69	59
51.8	15	12
57	2.9	3.2
60.0	2.1	2.7
65.3	1.6	1.6
86.7	24	25
99.7	5.7	4.4
106.9	3.3	3.1
117.0	2.0	1.7
122.5	25	29
131.7	4.5	3.2
138.7	14	15
183.5	28	26
186.6	8.0	8.2
203.0	7.4	7.1
212.7	21	18
222.2	4.3	2.6
234.1	7.0	7.1
263.2	13	15
267.7	10	10
276.0	5.0	5.9
278.4	4.3	4.7
294.6	5.9	4.6
309.7	6.4	5.3
319.1	14	10

Relative photon branching ratios %Iγ[a]

Level	Eγ	1982Ar12@	1977Mi06	1978MiZO#	1978MiZO*	others
138	47		94	93.9 *14*	92.5 *17*	
	56		3	3.9 *11*	5.0 *13*	
	65		3	2.2 *6*	2.5 *7*	
190	52		77	72 *6*	73 *6*	
	99		23	28 *6*	27 *6*	
204	65		8			
	122	46 *3*&	44	64 *7*	66 *7*	
	138	54 *3*&	48	36 *7*	34 *7*	

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322	131	9 *1*	8	14 *4*	11 *3*	
	183	91 *1*	92	86 *4*	89 *3*	
328	246	6 *2*				9 *3&*
	262	50 *2*				80 *4&*
	306	44 *2*				10 *3&*
351	148	7 *2?*				
	213	93 *2*				
424	73	39 *4?*				
	233	61 *4*				
458	107	8 *1*	9	12 *3*	13 *3*	
	268	28 *1*	24	37 *6*	43 *6*	
	319	64 *1*	67	51 *7*	43 *6*	
484	294	93 *1*				
	345	7 *1*				
543	221	63 *8*				56 *7&*
	404	37 *8*				44 *7&*
622	432	50 *2*	50 *10*			
	483	50 *2?*	50 *10*			
653	324	68 *3?*				
	384	32 *3*				
665	278	59 *2*				
	583	41 *2*				
688	366		25 *20*			
	497		75 *20*			
713	255	26 *2*				
	523	56 *4?*				
	692	18 *5?*				

a Values are for relative % photon branching from each level without including contributions from conversion electrons.
@ From Fig.3 of 1982Ar12, unless otherwise noted. Some values from Fig.3 of 1982Ar12 are inconsistent with the corresponding relative Iγ in Table I of 1982Ar12 and thus are not considered by evaluators.
& Deduced from relative Iγ in Table I of 1982Ar12.
# Deduced from relative Iγ on $d_{5/2}$IAR in 1978MiZO assuming 20% uncertainty
* Deduced from relative Iγ off $d_{5/2}$IAR in 1978MiZO assuming 20% uncertainty
? Relative intensities of these transitions in Table I of 1982Ar12 are given as limits.

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	α[c]	Comments
21.8[#] *1*		21.80	$(5)^+$	0.0	$(6)^+$	(M1+E2)[a]		E_γ: from 1976We06. Other: 21.8 *2* from 1977Mi06.
43.62[#] *10*	371[@]	65.50	$(4)^+$	21.80	$(5)^+$	(M1)[a]	3.01	α(K)=2.62 *4*; α(L)=0.319 *5*; α(M)=0.0579 *9* α(N)=0.00917 *15*; α(O)=0.000594 *10* E_γ: weighted average 43.55 *10* (1982Ar12), 43.7 *1* (1977Mi06), 43.5 *5* (1976Fi04), 43.5 *5* (1976We06). I_γ: Strong γ but Iγ not available in 1982Ar12.

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^{98}Mo(p,nγ) 1982Ar12,1977Mi06,1976Fi04 (continued)

γ(^{98}Tc) (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	δ[b]	α[c]	Comments
47.86 *10*	237[@]	138.32	(3)$^-$	90.50	(2,3)$^-$				E_γ: weighted average 47.82 *10* (1982Ar12), 47.9 *1* (1977Mi06), 47.8 *5* (1976Fi04). I_γ: Strong γ but Iγ not available in 1982Ar12.
51.79 *10*	55	190.00	(3,4)$^-$	138.32	(3)$^-$				α(K)=0.267 *20*; α(L)=0.034 *5*; α(M)=0.0062 *9* α(N)=0.00098 *13*; α(O)=5.9×10^{-5} *4* E_γ: others: 51.8 *1* (1977Mi06), 51.7 *5* (1976Fi04). I_γ: deduced from average of Iγ(52γ)/Iγ(99γ)=15/5.7 and 12/4.4 in 1978MiZO for gate on and off $d_{5/2}$IAR, respectively.
56.70 *10*	11[@]	138.32	(3)$^-$	81.62	(4)$^+$				I_γ: part of the intensity may be with 447 level.
57.5[e] *3*		447.0?	$^+$	390.33	(3)$^+$				E_γ: from 1977Mi06. Other: 57 *1* in 1979Mi08.
59.84 *10*	9[@]	81.62	(4)$^+$	21.80	(5)$^+$				E_γ: weighted average of 59.80 *10* (1982Ar12) and 60.0 *2* (1977Mi06). other: 59.7 *5*, placed from a 208 level in 1976Fi04.
65.17[d] *10*	6[d@]	138.32	(3)$^-$	73.07	(2 to 5)$^-$				E_γ: other: 65.3 *3* (1977Mi06). γ(t) data (1978Bi09) supports placement from 138 level, and not from 204 level, as suggested by 1977Mi06.
65.17[de] *10*	6[d@]	203.94	(4)$^+$	138.32	(3)$^-$				
[x]70.18[‡] *6*	23[‡] *5*								other: 69 in 1976Fi04, placed with a 138 level and a 208 level.
73.1[‡e] *4*	≤11[‡]	423.84	4$^+$,5$^+$	350.94	(3)$^-$				α(K)=0.021 *3*; α(L)=0.0026 *4*; α(M)=0.00048 *7* α(N)=7.6×10^{-5} *11*; α(O)=4.8×10^{-6} *7*
86.66 *3*	79 *7*	152.16	(3,4,5)$^+$	65.50	(4)$^+$	M1(+E2)	<0.16	0.438 *22*	α(L)exp+α(M)exp=0.045 *14* (1982Ar12) α(K)=0.380 *17*; α(L)=0.048 *5*; α(M)=0.0087 *8* α(N)=0.00137 *12*; α(O)=8.5×10^{-5} *3* E_γ: weighted average of 86.66 *3* (1982Ar12) and 86.7 *1* (1977Mi06). Other: 86.6 *5*, placed from the 190 level in 1976Fi04. I_γ: other: 91 (1978MiZO).
99.48 *8*	20.5 *17*	190.00	(3,4)$^-$	90.50	(2,3)$^-$	M1(+E2)	<0.15	0.294 *12*	α(K)exp=0.277 *71* (1982Ar12); α(L)exp+α(M)exp=0.0357 *35* (1982Ar12) α(K)=0.256 *10*; α(L)=0.0316 *21*; α(M)=0.0058 *4* α(N)=0.00091 *6*; α(O)=5.74×10^{-5} *17* E_γ: weighted average of 99.44 *8* (1982Ar12), 99.7 *2* (1977Mi06), and 99.5 *5* (1976Fi04). I_γ: other: 19 (1978MiZO).
106.4 *5*		106.4	(7)$^+$	0.0	(6)$^+$				E_γ: from ^{97}Mo(d,nγ) (1976Fi04). 1982Ar12 tentatively assign 106.66γ to the 106 level.
106.68 *9*	4.3 *5*	457.57	(2,3,4)$^-$	350.94	(3)$^-$	M1+E2	0.8 *3*	0.53 *15*	α(K)exp=0.43 *17* (1982Ar12); α(L)exp+α(M)exp=0.090 *32* (1982Ar12) α(K)=0.44 *12*; α(L)=0.08 *3*; α(M)=0.014 *5*

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^{98}Mo(p,nγ) 1982Ar12,1977Mi06,1976Fi04 (continued)

γ(^{98}Tc) (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [&]	δ [b]	α [c]	Comments
									α(N)=0.0021 *7*; α(O)=8.5×10^{-5} *19* E_γ: weighted average of 106.66 *9* (1982Ar12) and 106.9 *3* (1977Mi06). Other: 106.6 *5* (1976Fi04). I_γ: other: 12 (1978MiZO).
116.95 *5*	10.2 *10*	190.00	(3,4)$^-$	73.07	(2 to 5)$^-$	M1+E2	1.2 *+15−6*	0.49 *18*	α(K)exp=0.40 *13* (1982Ar12) α(K)=0.41 *14*; α(L)=0.07 *3*; α(M)=0.013 *6* α(N)=0.0020 *8*; α(O)=7.8×10^{-5} *24* E_γ: others: 117.0 *2* (1977Mi06), 116.9 *5* (1976Fi04, placed from a 208 level). γ(t) data in 1978Bi09 support placement from 190 level only, and not from 138 level, as suggested by 1977Mi06. I_γ: other: 7 (1978MiZO).
122.36 *15*	42 *4*	203.94	(4)$^+$	81.62	(4)$^+$	M1+E2	0.33 *7*	0.203 *18*	α(K)exp=0.203 *14* (1982Ar12); α(L)exp+α(M)exp=0.0381 *50* (1982Ar12) α(K)exp=0.120 *15* (1979Mi08) α(K)=0.174 *15*; α(L)=0.024 *3*; α(M)=0.0043 *6* α(N)=0.00067 *8*; α(O)=3.75×10^{-5} *25* E_γ: weighted average of 122.28 *15* (1982Ar12) and 122.5 *2* (1977Mi06). I_γ: other: 100 (1978MiZO).
131.66 *5*	9.2 *10*	321.64	(2,3,4)$^-$	190.00	(3,4)$^-$				E_γ: others: 131.7 *3* (1977Mi06), 131.6 *5* (1976Fi04). I_γ: other: 14 (1978MiZO).
138.42 *11*	50 *4*	203.94	(4)$^+$	65.50	(4)$^+$	M1		0.1137	α(N)=0.000341 *5*; α(O)=2.25×10^{-5} *4* α(K)exp=0.098 *6* (1982Ar12); α(L)exp+α(M)exp=0.013 *4* (1982Ar12) α(K)exp=0.077 *13* (1979Mi08); α(L)exp+α(M)exp=0.0115 *20* (1979Mi08) α(K)=0.0994 *14*; α(L)=0.01182 *17*; α(M)=0.00215 *3* E_γ: weighted average of 138.33 *11* (1982Ar12), 138.7 *2* (1977Mi06), and 138.4 *5* (1976Fi04, placed from a 208 level). I_γ: other: 54 (1978MiZO).
147.95[‡e] *13*	≤2.4[‡]	350.94	(3)$^-$	203.94	(4)$^+$	E1(+M2)	<0.27	0.065 *23*	α(K)exp=0.054 *22* (1982Ar12) α(K)=0.057 *20*; α(L)=0.007 *3*; α(M)=0.0013 *6* α(N)=0.00021 *9*; α(O)=1.3×10^{-5} *5*
183.33 *11*	100 *8*	321.64	(2,3,4)$^-$	138.32	(3)$^-$	M1		0.0534	α(K)exp=0.0443 *32* (1982Ar12); α(L)exp+α(M)exp=0.0065 *6* (1982Ar12) α(K)exp=0.0449 *49* (1979Mi08) α(K)=0.0467 *7*; α(L)=0.00551 *8*; α(M)=0.000999 *14* α(N)=0.0001589 *23*; α(O)=1.053×10^{-5} *15* E_γ: weighted average of 183.28 *11* (1982Ar12), 183.5 *2* (1977Mi06), and 183.3 *5* (1976Fi04).
186.39 *7*	43 *4*	390.33	(3)$^+$	203.94	(4)$^+$	M1(+E2)	<0.35	0.056 *5*	α(K)exp=0.0494 *46* (1982Ar12); α(K)exp=0.0451 *67*

^{98}Mo(p,nγ) 1982Ar12,1977Mi06,1976Fi04 (continued)

γ(^{98}Tc) (continued)

E_γ[†]	I_γ[†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	δ[b]	α[c]	Comments
									(1979Mi08) α(K)=0.048 *4*; α(L)=0.0059 *7*; α(M)=0.00107 *12* α(N)=0.000169 *18*; α(O)=1.07×10^{-5} *7* E_γ: others: 186.6 *3* (1977Mi06), 186.5 *5* (1976Fi04). I_γ: others: 30 (1978MiZO).
202.70 *8*	≤18	268.20	4$^+$,5$^+$	65.50	(4)$^+$	M1(+E2)	<0.43	0.045 *5*	α(K)exp=0.0433 *52* (1982Ar12); α(L)exp+α(M)exp=0.0052 *7* (1982Ar12) α(K)exp=0.042 *13* (1979Mi08) α(K)=0.040 *4*; α(L)=0.0048 *7*; α(M)=0.00088 *12* α(N)=0.000139 *18*; α(O)=8.7×10^{-6} *7* E_γ: weighted average of 202.69 *8*, 203.0 *4* (1977Mi06), and 202.8 *5* (1976Fi04, placed from the 351 level). I_γ: other: 27 (1978MiZO).
[x]210.25[‡] *21*	2.5[‡] *6*								
212.67 *9*	25.2 *23*	350.94	(3)$^-$	138.32	(3)$^-$	M1(+E2)	0.24 *+11−20*	0.039 *3*	α(K)=0.0337 *23*; α(L)=0.0041 *4*; α(M)=0.00074 *7* α(N)=0.000117 *10*; α(O)=7.5×10^{-6} *4* α(K)exp=0.0332 *24* (1982Ar12); α(K)exp=0.0349 *38* (1979Mi08) E_γ: others: 212.7 *3* (1977Mi06), 212.8 *5* (1976Fi04). I_γ: other: 72 (1978MiZO).
221.64 *11*	4.4 *10*	543.17	(1 to 5)$^-$	321.64	(2,3,4)$^-$	M1(+E2)	<0.8	0.040 *8*	α(K)=0.035 *7*; α(L)=0.0044 *11*; α(M)=0.00080 *20* α(N)=0.00012 *3*; α(O)=7.5×10^{-6} *12* α(K)exp=0.031 *10* (1982Ar12) E_γ: others: 222.2 *10* (1977Mi06), 221.4 *5* (1976Fi04). I_γ: other: 13 (1978MiZO).
233.84 *15*	19.7 *17*	423.84	4$^+$,5$^+$	190.00	(3,4)$^-$	E1(+M2)	<0.14	0.0129 *14*	α(K)exp=0.0207 *30* (1982Ar12); α(K)exp=0.0109 *14* (1979Mi08) α(K)=0.0113 *12*; α(L)=0.00132 *16*; α(M)=0.00024 *3* α(N)=3.8×10^{-5} *5*; α(O)=2.4×10^{-6} *3* E_γ: weighted average of 233.78 *15* (1982Ar12) and 234.1 *3* (1977Mi06). I_γ: other: 26 (1978MiZO). δ: from α(K) in 1979Mi08. α(K)exp in 1982Ar12 gives δ(E1/M2)=0.31 *5* but it would require an unrealistic large $T_{1/2}$ (>150 ns) for B(M2)(W.u.) not to exceed RUL. α(K)exp in 1982Ar12 is also in marginal agreement with M1, however, α(K)exp from 1979Mi08 is consistent only with E1(+M2), δ(M2/E1)<0.14.
240.77[e] *9*	7.9 *8*	306.20?	(3,4,5)$^+$	65.50	(4)$^+$	M1		0.0261	α(K)=0.0229 *4*; α(L)=0.00267 *4*; α(M)=0.000485 *7* α(N)=7.72×10^{-5} *11*; α(O)=5.14×10^{-6} *8*

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^{98}Mo(p,nγ) 1982Ar12,1977Mi06,1976Fi04 (continued)

γ(^{98}Tc) (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	δ[b]	α[c]	Comments
									α(K)exp=0.0180 *45* (1982Ar12) E_γ: other: 240.9 *5* (1976Fi04).
246.86[‡e] *23*	3.3[‡] *12*	328.56	$(3,4,5)^+$	81.62	$(4)^+$				
[x]247.86[‡] *9*	8.3[‡] *10*								
255.76 *10*	4.8 *6*	713.36	$(4,5)^+$	457.57	$(2,3,4)^-$	(M2(+E1))	>1.0	0.08 *3*	α(K)exp=0.074 *22* (1982Ar12) α(K)=0.073 *22*; α(L)=0.010 *3*; α(M)=0.0018 *6* α(N)=0.00028 *9*; α(O)=1.8×10^{-5} *6* Mult.: evaluators consider the multipolarity uncertain, as with δ(M2/E1)>1, and with a branching ratio of ≈20% and B(M2)(W.u.)=1 from RUL, the level half-life should be ≈250 ns, but no such isomer has been detected in γγ-coin data in (p,nγ).
262.96 *13*	29.1 *23*	328.56	$(3,4,5)^+$	65.50	$(4)^+$	M1		0.0208	α(K)exp=0.0186 *14* (1982Ar12); α(L)exp+α(M)exp=0.0020 *6* (1982Ar12) α(K)exp=0.0152 *30* (1979Mi08) α(N)=6.13×10^{-5} *9*; α(O)=4.09×10^{-6} *6* α(K)=0.0182 *3*; α(L)=0.00213 *3*; α(M)=0.000386 *6* E_γ: weighted average of 262.86 *11* (1982Ar12), 263.3 *2* (1977Mi06), and 262.8 *5* (1976Fi04). I_γ: other: 52 (1978MiZO). Mult.: M1(+E2),δ<0.35 from α(K)exp in 1982Ar12, but M1 from α(K)exp in 1979Mi08.
267.64 *11*	16.1 *14*	457.57	$(2,3,4)^-$	190.00	$(3,4)^-$	M1(+E2)	<0.4	0.0211 *13*	α(K)exp=0.0197 *19* (1982Ar12); α(K)exp=0.0132 *30* (1979Mi08) α(K)=0.0184 *11*; α(L)=0.00219 *17*; α(M)=0.00040 *3* α(N)=6.3×10^{-5} *5*; α(O)=4.10×10^{-6} *20* E_γ: others: 267.7 *3* (1977Mi06), 267.9 *5* (1976Fi04). I_γ: other: 37 (1978MiZO).
275.67 *11*	23.1 *19*	666.00	$(2,3,4)^+$	390.33	$(3)^+$	M1+E2	0.41 *+20−27*	0.0207 *20*	α(K)exp=0.0249 *28* (1982Ar12); α(K)exp=0.0145 *20* (1979Mi08) α(K)=0.0180 *17*; α(L)=0.0022 *3*; α(M)=0.00039 *5* α(N)=6.2×10^{-5} *8*; α(O)=4.0×10^{-6} *3* E_γ: weighted average of 275.62 *11* (1982Ar12), 276.0 *3* (1977Mi06), and 275.8 *5* (1976Fi04). I_γ: other: 20 (1978MiZO).
[x]278.06 *19*	4.6 *6*								E_γ: other: 278 placed with 484 level by 1976Fi04 but energy agreement is poor. I_γ: other: 17 (1978MiZO).
[x]286.29[‡] *13*	3.4[‡] *13*								
294.08 *12*	36 *5*	484.08	(2 to 5)$^-$	190.00	$(3,4)^-$	M1(+E2)	<0.45	0.0166 *10*	α(K)exp=0.0142 *11* (1982Ar12); α(K)exp=0.0150

$^{98}_{43}Tc_{55}$-8

^{98}Mo(p,nγ) 1982Ar12,1977Mi06,1976Fi04 (continued)

γ(^{98}Tc) (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[&]	δ[b]	α[c]	Comments
									30 (1979Mi08) α(K)=0.0145 *9*; α(L)=0.00172 *13*; α(M)=0.000312 *24* α(N)=4.9×10^{-5} *4*; α(O)=3.22×10^{-6} *16* E_γ: weighted average of 294.00 *12* (1982Ar12), 294.5 *3* (1977Mi06), and 294.3 *5* (1976Fi04). I_γ: other: 19 (1978MiZO).
306.85[‡] *12*	3.8[‡] *9*	328.56	(3,4,5)$^+$	21.80	(5)$^+$				
309.66[e] *12*	26.4 *23*	375.09?	(3,4,5)$^+$	65.50	(4)$^+$	M1		0.01373	α(K)=0.01204 *17*; α(L)=0.001397 *20*; α(M)=0.000253 *4* α(N)=4.03×10^{-5} *6*; α(O)=2.70×10^{-6} *4* α(K)exp=0.0102 *13* (1982Ar12); α(K)exp=0.0103 *16* (1979Mi08) E_γ: others: 309.7 *3* (1977Mi06), 309.7 *5* (1976Fi04, placed from the 458 level). I_γ: other: 22 (1978MiZO).
319.01 *13*	37 *4*	457.57	(2,3,4)$^-$	138.32	(3)$^-$	M1		0.01274	α(K)=0.01117 *16*; α(L)=0.001295 *19*; α(M)=0.000235 *4* α(N)=3.74×10^{-5} *6*; α(O)=2.50×10^{-6} *4* α(K)exp=0.0097 *8* (1982Ar12); α(L)exp+α(M)exp=0.0015 *7* (1982Ar12) α(K)exp=0.0123 *16* (1979Mi08) E_γ: others: 319.1 *3* (1977Mi06), 319.5 *5* (1976Fi04). I_γ: other: 44 (1978MiZO).
324.32[‡e] *13*	≤5.3[‡]	652.71?		328.56	(3,4,5)$^+$				
345.75 *17*	2.4 *5*	484.08	(2 to 5)$^-$	138.32	(3)$^-$				E_γ: weighted average of 345.73 *17* (1982Ar12) and 345.9 *5* (1976Fi04).
350.06 *21*	6.4 *7*	502.22		152.16	(3,4,5)$^+$				E_γ: weighted average of 350.00 *14* (1982Ar12) and 350.8 *5* (1977Mi06). Other: 350 placed from a 541 level in 1976Fi04.
[x]358.02[‡] *13*	7.4[‡] *8*								
366.5 *10*		688.0	(4,5)$^+$	321.64	(2,3,4)$^-$				E_γ: from 1977Mi06.
[x]370.73[‡] *15*	3.3[‡] *6*								
[x]380.14[‡] *15*	≤3.8[‡]								
384.49[‡e] *15*	2.0[‡] *4*	652.71?		268.20	4$^+$,5$^+$				
[x]394.66 *16*	≤6.7								Placed with 543 level (1976Fi04).
404.63 *16*	3.5 *6*	543.17	(1 to 5)$^-$	138.32	(3)$^-$				E_γ: weighted average of 404.59 *16* (1982Ar12) and 405.0 *5* (1976Fi04).
[x]422.6[#] *10*						*a*			
432.04 *17*	24.0 *23*	622.03	(2,3,4)$^-$	190.00	(3,4)$^-$	M1(+E2)	<1.2	0.0066 *6*	α(K)exp=0.0053 *9* (1982Ar12) α(K)=0.0058 *5*; α(L)=0.00068 *7*; α(M)=0.000124 *13* α(N)=1.96×10^{-5} *20*; α(O)=1.27×10^{-6} *8* E_γ: weighted average of 431.97 *17* (1982Ar12), 432.6 *10* (1977Mi06), and 432.5 *5* (1976Fi04).
[x]450.25 *18*	17.0 *15*								other: 450.8 *5*, placed with a 658 level by 1976Fi04.

$^{98}_{43}Tc_{55}$-9

^{98}Mo(p,nγ) 1982Ar12,1977Mi06,1976Fi04 (continued)

γ(^{98}Tc) (continued)

E_γ [†]	I_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [&]	δ [b]	α [c]	Comments
[x]468.2									γ from 1976Fi04 placed with a 658 level but not seen in 1977Mi06 and 1982Ar12.
472 [e] *2*		622.03	$(2,3,4)^-$	152.16	$(3,4,5)^+$				E_γ: from γγ (1977Mi06).
483.7 *2*	≤24	622.03	$(2,3,4)^-$	138.32	$(3)^-$	M1(+E2)	<1.8	0.0050 *4*	α(K)exp=0.0038 *8* (1982Ar12) α(K)=0.0043 *4*; α(L)=0.00051 *5*; α(M)=9.3×10^{-5} *10* α(N)=1.47×10^{-5} *14*; α(O)=9.5×10^{-7} *6* E_γ: weighted average of 483.6 *2* (1982Ar12), 484.5 *10* (1977Mi06), and 484.0 *5* (1976Fi04).
497.8 *10*		688.0	$(4,5)^+$	190.00	$(3,4)^-$				E_γ: from 1977Mi06.
523.45‡ *20*	≤12‡	713.36	$(4,5)^+$	190.00	$(3,4)^-$				
[x]560.83‡ *22*	≤15‡								
583.68‡ [e] *23*	16‡ *3*	666.00	$(2,3,4)^+$	81.62	$(4)^+$				
[x]596.04‡ [e] *23*	10.8‡ *11*								
[x]614.47‡ [e] *25*	4.4‡ *6*								
[x]647.2‡ *3*	12.2‡ *12*								
[x]656.7‡ [e] *3*	4.3‡ *5*								
[x]667.5‡ [e] *3*	13.7‡ *13*								
[x]678.5‡ [e] *3*	≤3.9‡								
692.1‡ [e] *5*	≤4.7‡	713.36	$(4,5)^+$	21.80	$(5)^+$				
[x]695.1‡ *3*	7.8‡ *23*								
[x]715.9‡ [e] *3*	4.0‡ *5*								

† From 1982Ar12 (at E_p=4 MeV), unless otherwise stated. Values of intensities deduced by evaluators from relative Iγ values on and off $d_{5/2}$IAR in 1978MiZO are given under comments if available. γγ-coin data are from 1977Mi06 and 1976Fi04.

‡ γ reported by 1982Ar12 only.

γ reported by 1977Mi06 (or 1978MiZO) only.

@ Deduced by evaluators from average of relative Iγ values on and off $d_{5/2}$ IAR in 1978MiZO, normalized to Iγ(183.3γ)=100.

& From ce data (1982Ar12,1979Mi08) and RUL. Values of α(exp) were deduced by 1979Mi08 from absolute I(ce) and Iγ data. See details in 1978MiZO. Values of α(exp) determined by 1982Ar12 are based on normalization to strong transitions (183,186,213,263,294,319) treated as M1 from the work of 1977Mi06.

a From I(K x ray)/Iγ (1976We06).

b Deduced by evaluators from ce data in 1982Ar12 and 1979Mi08 using the BrIccMixing code.

c Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

d Multiply placed with undivided intensity.

e Placement of transition in the level scheme is uncertain.

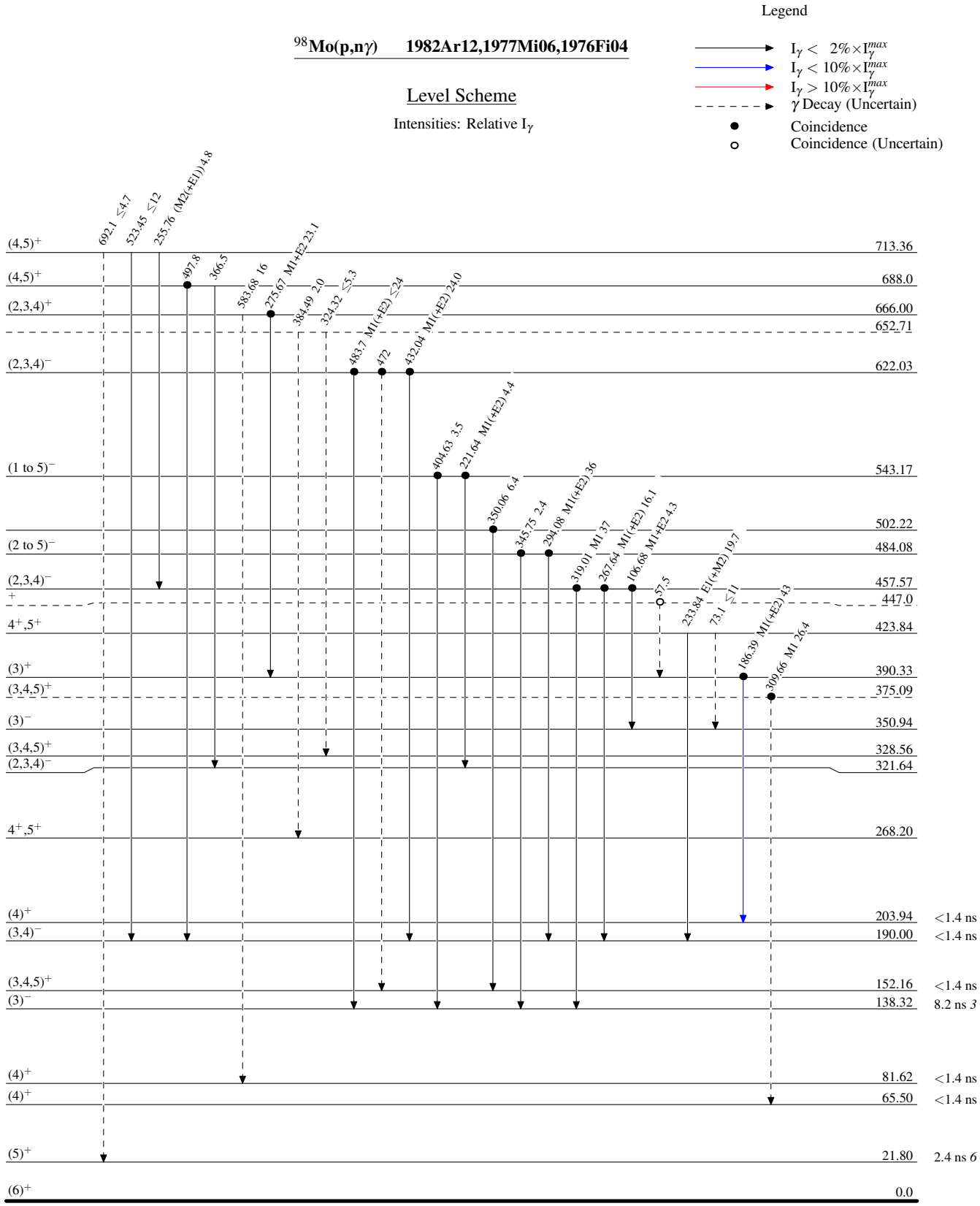
x γ ray not placed in level scheme.

$^{98}_{43}Tc_{55}$-10

^{98}**Mo(p,nγ)** **1982Ar12,1977Mi06,1976Fi04**

Level Scheme

Intensities: Relative I_γ



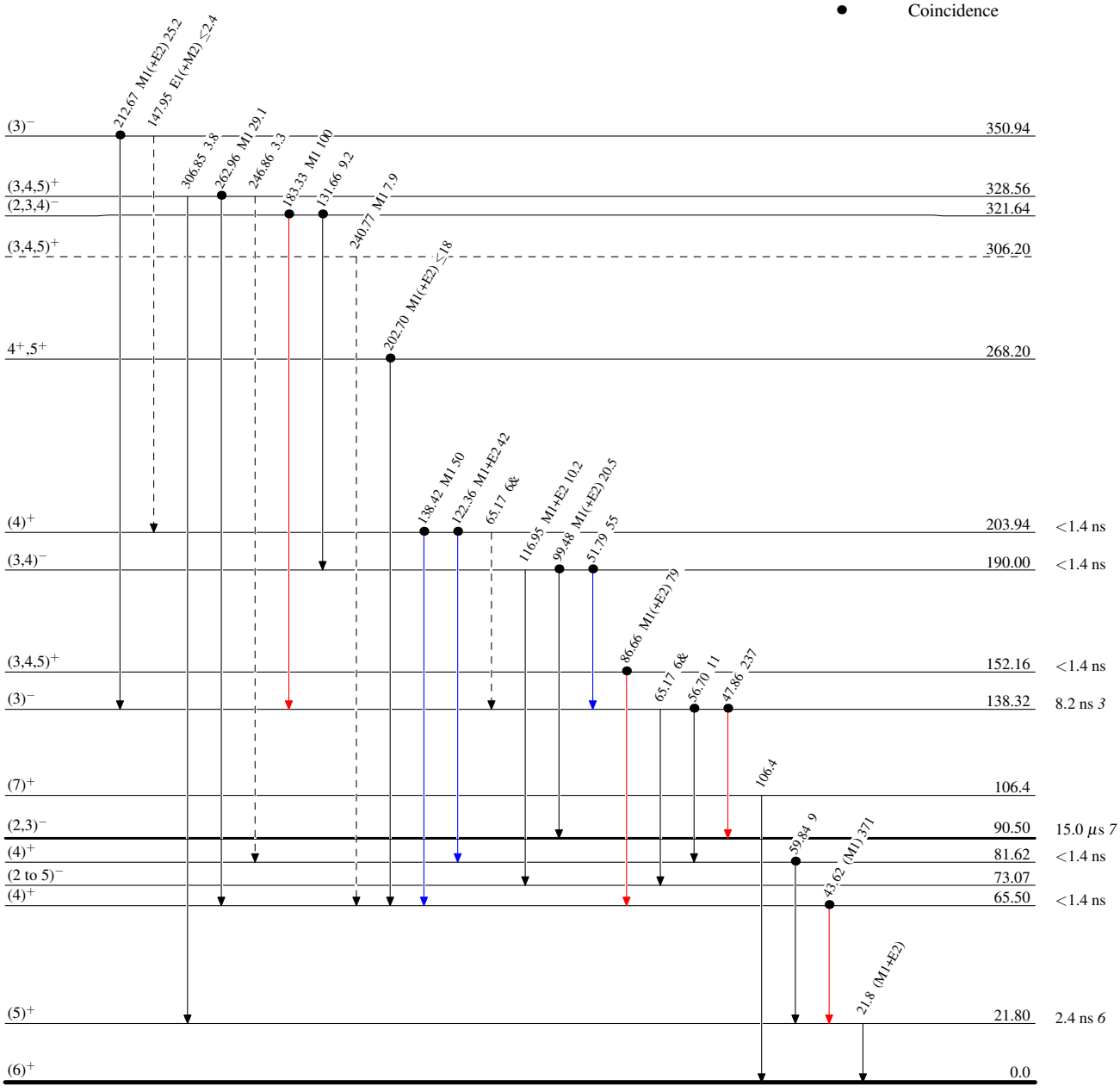
$^{98}_{43}Tc_{55}$

^{98}Mo(p,nγ) 1982Ar12,1977Mi06,1976Fi04

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

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)
- Coincidence



$^{98}_{43}Tc_{55}$