^{185}Re(α,4nγ),^{187}Re(α,6nγ) 1979An20,1989Ba02

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	S. -c. Wu	NDS 106, 619 (2005)	1-Nov-2005

Additional information 1.

1989Ba02: Eα=78 MeV for ^{187}Re target. OSIRIS array of six Compton-suppressed germanium detectors; measured Eγ, Iγ, γγ(θ), DCO ratios; level structure.

1979An20: Eα=41, 47, 51, 56 MeV for the ^{185}Re target, Eα=72, 77 MeV for the ^{187}Re target. Ge(Li) detectors; measured Eγ, Iγ, γ(θ), γγ(t); level structure; $T_{1/2}$.

γ(t) from 1979An20: 641.0γ(t): $T_{1/2}$(646.8 level)=21.5 ns *20* 247.5γ(t), 256.6γ(t): $T_{1/2}$(2157.2+x)=120 ns *20* 99.7γ(t), 138.6γ(t), 218.5γ(t): $T_{1/2}$(2614.0+x)=40 ns *10*.

^{185}Ir Levels

E(level)†	Jπ‡	T1/2#	E(level)†	Jπ‡	T1/2#
0.0	5/2−		1745.9 *5*	17/2+	
5.82 *10*	9/2−		1779.3 *6*	(19/2−)	
158.64 *14*	13/2−		1856.7 *4*	(23/2−)&	
229.58 *10*	3/2+		1900.65 *18*	(17/2,19/2)&	
335.01 *24*	5/2+		1949.0 *5*	19/2+	
418.8 *3*	3/2+		1997.5 *4*	(23/2−)&	
442.16 *14*	5/2+		2001.37 *23*	29/2−	
448.83 *16*	17/2−		2012.6 *4*	(25/2−)&	
465.9 *3*	11/2−		2130.9 *8*		
496.7 *4*	7/2+		2148.0 *4*	(19/2,21/2)&	
555.9 *3*	5/2+		2154.5 *6*	(21/2+)	
646.83 *14*	11/2−	21.5 ns *20*	2157.3 *5*	(19/2,21/2)&	
648.6 *6*	7/2+		2157.2+x@		120 ns *20*
696.6 *3*	7/2+		2183.0 *5*	(27/2−)&	
755.97 *16*	15/2−		2278.5 *5*		
852.3? *3*	(11/2−)		2282.9 *4*	(27/2−)	
861.94 *19*	21/2−		2295.8+x@		
881.1 *4*	9/2+		2393.0 *5*	(29/2−)&	
944.7 *4*	13/2−		2514.3+x@		
1017.0 *5*			2597.6 *6*	(31/2−)&	
1086.6 *3*	11/2+		2614.0+x@ *22*		40 ns *10*
1130.2 *3*			2702.3 *6*	33/2−	
1163.9 *3*	19/2−		2827.9? *7*		
1192.3 *4*	15/2−		2940.4+x@		
1304.9 *4*	13/2+		2962.9 *5*	(31/2−)	
1315.9 *4*	(17/2−)&		3171.6+x@		
1383.66 *21*	25/2−		3304.0+x@		
1511.0 *4*	(19/2−)&		3469.1 *7*	37/2−	
1515.4 *5*	17/2−		3630+x?@		
1531.3 *3*	15/2+		4264.9	41/2−	
1622.42 *19*	(19/2−)&		4292.0? *9*		
1670.9 *4*			5054.4	(45/2−)	
1677.5 *4*	23/2−		5881?		
1734.9 *3*	(21/2−)&				

† Deduced by evaluator from a least-squares fit to γ-ray energies; using 0.1 keV uncertainty for 152.8γ, 212.6γ, 229.6γ, 290.2γ, 390.0γ, 413.1γ, 444.8γ, 521.7γ, 597.3γ, 617.7γ, 641.0γ, 1173.6γ, and 1451.8γ, and 0.5 keV for the rest.

‡ From 1979An20 and 1989Ba02, based on γγ coin. and band structures. A few states that J^{π}'s are not adopted are noted separately.

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^{185}Re(α,4nγ),^{187}Re(α,6nγ) 1979An20,1989Ba02 (continued)

^{185}Ir Levels (continued)

From γγ(t) (1979An20).

@ x ≤80 keV.

& Assigned by 1979An20 from γ(θ) and γ-ray decay patterns. Not adopted by evaluator, since some transitions assignments are uncertain.

γ(^{185}Ir)

$E_γ$[†]	$I_γ$[‡]	E_i(level)	$J^π_i$	E_f	$J^π_f$	Comments
(x)	100	2157.2+x		2157.3	(19/2,21/2)	$E_γ$: x ≤80. γ ray is not observed; its existence is inferred from the 247.5- and 256.6-keV γ rays that decay with $T_{1/2}$=120 ns. These transitions were observed in prompt coincidence with 152.8γ, 290.2γ, and 1451.8γ. Eγ≤80 is deduced from nonobservation of any Eγ>80 keV with $T_{1/2}$=120 ns.
5.8 *1*		5.82	9/2$^-$	0.0	5/2$^-$	$E_γ$: from ^{185}Pt ε decay.
84.0	1.5 *2*	418.8	3/2$^+$	335.01	5/2$^+$	$E_γ$: based on Adopted Levels, Gammas, this transition is probably a doublet.
[x]92.1	1.9 *2*					
[x]97.4	1.7 *2*					
99.7	4.6[&] *3*	2614.0+x		2514.3+x		
105.6	2.4 *2*	335.01	5/2$^+$	229.58	3/2$^+$	
106.9	1.3 *2*	442.16	5/2$^+$	335.01	5/2$^+$	
112.7	1.3 *2*	1734.9	(21/2$^-$)	1622.42	(19/2$^-$)	
114.0	3.9 *2*	555.9	5/2$^+$	442.16	5/2$^+$	
121.8	2.0 *2*	1856.7	(23/2$^-$)	1734.9	(21/2$^-$)	
[x]125.4	4.2 *3*					$I_γ$: includes 125-keV γ of ^{185}Re.
[x]126.9	1.8 *2*					$I_γ$: includes 127-keV γ of ^{185}Ir.
137.2[@]	6.2[&@] *6*	555.9	5/2$^+$	418.8	3/2$^+$	
138.6	6.4[&] *6*	2295.8+x		2157.2+x		
141.2	5.9 *4*	696.6	7/2$^+$	555.9	5/2$^+$	
152.8	100 *4*	158.64	13/2$^-$	5.82	9/2$^-$	
155.7	5.0 *8*	2012.6	(25/2$^-$)	1856.7	(23/2$^-$)	
161.9	0.3 *2*	496.7	7/2$^+$	335.01	5/2$^+$	
[x]165.7[a]	1.6 *6*					$I_γ$: mostly belongs to ^{186}Ir.
[x]169.3[a]	1.6 *3*					
170.2	5.6 *4*	2183.0	(27/2$^-$)	2012.6	(25/2$^-$)	
[x]178.7	2.4 *5*					
[x]182.9	4.4 *5*					
184.2[@]	9.2[&@] *10*	881.1	9/2$^+$	696.6	7/2$^+$	
[x]185.9[a]	3.8 *6*					
[x]187.4	4.0 *4*					
[x]201.7	2.7 *3*					
202.8	3.9 *4*	1949.0	19/2$^+$	1745.9	17/2$^+$	
205.2[d]	10.3[d] *5*	1086.6	11/2$^+$	881.1	9/2$^+$	
205.2[d]	10.3[d] *5*	2154.5	(21/2$^+$)	1949.0	19/2$^+$	
205.2[d]	10.3[d] *5*	2597.6	(31/2$^-$)	2393.0	(29/2$^-$)	
210.3	3.0 *8*	2393.0	(29/2$^-$)	2183.0	(27/2$^-$)	
212.6	12.1 *5*	442.16	5/2$^+$	229.58	3/2$^+$	
214.4	4.2 *3*	1745.9	17/2$^+$	1531.3	15/2$^+$	
218.5[e]	8.7[e&@] *9*	2514.3+x		2295.8+x		
218.5[e@]	7.2[e@] *9*	1304.9	13/2$^+$	1086.6	11/2$^+$	
226.3	8.2 *6*	1531.3	15/2$^+$	1304.9	13/2$^+$	

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^{185}Re(α,4nγ),^{187}Re(α,6nγ) 1979An20,1989Ba02 (continued)

γ(^{185}Ir) (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult. [#]	Comments
229.6	43.5[&] *17*	229.58	3/2$^+$	0.0	5/2$^-$		
230.0[@]		1900.65	(17/2,19/2)	1670.9			
231[@]		3171.6+x		2940.4+x			
[x]246.3[a]	3.4 *7*						
247.5[e]	5.9[e@] *10*	1192.3	15/2$^-$	944.7	13/2$^-$		
247.5[e@]	7.3[e&@] *10*	2148.0	(19/2,21/2)	1900.65	(17/2,19/2)		
256.6	7.6[&] *5*	2157.3	(19/2,21/2)	1900.65	(17/2,19/2)		
263.9[@]	2.5[@] *5*	1779.3	(19/2$^-$)	1515.4	17/2$^-$		
267.0	6.3 *6*	496.7	7/2$^+$	229.58	3/2$^+$		
277.8[e@]	3.3[e@] *8*	696.6	7/2$^+$	418.8	3/2$^+$		
277.8[ef]	3.1[e]	1130.2		852.3?	(11/2$^-$)		
277.8[e]	3.1[e]	2012.6	(25/2$^-$)	1734.9	(21/2$^-$)		
290[@]		755.97	15/2$^-$	465.9	11/2$^-$		
290.2	151[&] *6*	448.83	17/2$^-$	158.64	13/2$^-$		
291.0[@]		2148.0	(19/2,21/2)	1856.7	(23/2$^-$)		
297.8	8 *2*	944.7	13/2$^-$	646.83	11/2$^-$		
307.4[d]	5.0[d] *4*	465.9	11/2$^-$	158.64	13/2$^-$		
307.4[d]	5.0[d] *4*	755.97	15/2$^-$	448.83	17/2$^-$		
[x]312.6[a]	3.2 *4*						
313.6	3.9 *4*	648.6	7/2$^+$	335.01	5/2$^+$		
317.6	2.0 *6*	2614.0+x		2295.8+x			
323.0	4.5 *4*	1515.4	17/2$^-$	1192.3	15/2$^-$		
325.2	7.0 *6*	881.1	9/2$^+$	555.9	5/2$^+$		
326.4[d]	8.1[d] *6*	2940.4+x		2614.0+x			
326.4[d]	8.1[d] *6*	3630+x?		3304.0+x			Placement of transition in the level scheme is uncertain.
326.4[d]	8.1[d] *6*	2183.0	(27/2$^-$)	1856.7	(23/2$^-$)		Placement of transition in the level scheme is uncertain.
335.2	8.7 *6*	335.01	5/2$^+$	0.0	5/2$^-$		
351.6[@]	1.5[@]	2130.9		1779.3	(19/2$^-$)		
361.8	4.4 *6*	696.6	7/2$^+$	335.01	5/2$^+$		
363.6	5 *1*	3304.0+x		2940.4+x			
370.2[e]	3.8[e] *13*	1017.0		646.83	11/2$^-$		
370.2[e]	1.4[e@] *6*	1900.65	(17/2,19/2)	1531.3	15/2$^+$		
380.6[e]	2.6[e@] *4*	1511.0	(19/2$^-$)	1130.2			
380.6[e]	3.2[e] *5*	2393.0	(29/2$^-$)	2012.6	(25/2$^-$)		
390.0	19.2[&] *10*	1086.6	11/2$^+$	696.6	7/2$^+$		
407.2	4.9 *8*	1163.9	19/2$^-$	755.97	15/2$^-$		
409.0[@]		2154.5	(21/2$^+$)	1745.9	17/2$^+$		
413.1	104[&] *4*	861.94	21/2$^-$	448.83	17/2$^-$	Q	Mult.: DCO=1.00 *2* (1989Ba02).
414.0[@f]		2597.6	(31/2$^-$)	2183.0	(27/2$^-$)		
[x]416.8	≤8.5						I_γ: Iγ(416.8γ+417.6γ)=7.5 *10*.
417.6	≤8.5	1949.0	19/2$^+$	1531.3	15/2$^+$		I_γ: Iγ(416.8γ+417.6γ)=7.5 *10*.
418.7	6.1	418.8	3/2$^+$	0.0	5/2$^-$		
423.6	9.3 *10*	1304.9	13/2$^+$	881.1	9/2$^+$		
[x]427.1[a]	2.9 *7*						I_γ: possibly includes γ in ^{186}Ir.
434.9[f]		2827.9?		2393.0	(29/2$^-$)		Iγ=11.6 *7* from 1979An20. I(γ+ce) feeding the 2392.8 level exceeds its

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^{185}Re(α,4nγ),^{187}Re(α,6nγ) 1979An20,1989Ba02 (continued)

γ(^{185}Ir) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Mult.[#]	Comments
							deexcitation. Iγ value may be a misprint.
441.1[@]	7.6[@] 4	1745.9	17/2+	1304.9	13/2+		
444.8	14.0 7	1531.3	15/2+	1086.6	11/2+		
457.2[f]	1.8 5	1622.42	(19/2−)	1163.9	19/2−		
459.9	8.6 6	465.9	11/2−	5.82	9/2−		
^{x}465.2	2.9 4						I_γ: includes γ in ^{186}Ir.
^{x}469.8[a]	2.5 4						I_γ: mostly belongs to γ in ^{186}Ir.
486.0[f]	5.2 4	1997.5	(23/2−)	1511.0	(19/2−)		
492.3	3.8 6	1622.42	(19/2−)	1130.2			
514.0[@]		1677.5	23/2−	1163.9	19/2−		
521.7	61.6 25	1383.66	25/2−	861.94	21/2−	Q	Mult.: DCO=1.03 6 (1989Ba02).
^{x}539.9	6.2 5						I_γ: includes γ in ^{184}Ir.
^{x}542.9	4.4 6						
545.5	5.9 5	1192.3	15/2−	646.83	11/2−		
557.9	4.8 5	3171.6+x		2614.0+x			
559.7	3.4 8	1315.9	(17/2−)	755.97	15/2−		
570.7[e@]	2.1[e@] 6	1515.4	17/2−	944.7	13/2−		
570.7[e]	3.7[e@] 6	1734.9	(21/2−)	1163.9	19/2−		
^{x}574.0[a]	3.2 6						
^{x}580.8[a]	3.5 5						
584.5	3.1[&] 6	1670.9		1086.6	11/2+		
587.1	3.4 5	1779.3	(19/2−)	1192.3	15/2−		
597.3	19.7[&] 10	755.97	15/2−	158.64	13/2−		
^{x}600.5	5.9 10						
^{x}603.8	4.2 10						
606[@]		2282.9	(27/2−)	1677.5	23/2−		
617.7	30.4 15	2001.37	29/2−	1383.66	25/2−	Q	Mult.: DCO=1.06 8 (1989Ba02).
641.0	19.4[&] 9	646.83	11/2−	5.82	9/2−		
^{x}666.8[a]	3.1 6						
680.2	2.4 5	2962.9	(31/2−)	2282.9	(27/2−)		
690[@]		3304.0+x		2614.0+x			
693.6[f]	11 2	852.3?	(11/2−)	158.64	13/2−		
700.9	14.3 9	2702.3	33/2−	2001.37	29/2−	Q	Mult.: DCO=1.1 1 (1989Ba02).
715.1	11 1	1163.9	19/2−	448.83	17/2−		
^{x}718.2[a]	11.6 10						I_γ: mostly belongs to γ in ^{184}Ir.
^{x}728.4	8.7 10						I_γ: mostly belongs to γ in ^{186}Ir.
^{x}741.6	1.2 4						
^{x}759.6[a]	1.6 3						I_γ: probably part of it belongs to γ in ^{186}Ir.
766.8[@]	5.2[@] 5	3469.1	37/2−	2702.3	33/2−	Q	Mult.: DCO=1.1 3 (1989Ba02).
789.5[b]	[c]	5054.4	(45/2−)	4264.9	41/2−		
795.8[b]	[c]	4264.9	41/2−	3469.1	37/2−	Q	Mult.: DCO=1.1 6 (1989Ba02).
815.7	7.7 5	1677.5	23/2−	861.94	21/2−		
822.9[@f]	1.5[@] 5	4292.0?		3469.1	37/2−		
827[bf]	[c]	5881?		5054.4	(45/2−)		
^{x}835.2[a]	4.1 8						
^{x}843.2[a]	9.5 19						
846.5[f]	7.8 12	852.3?	(11/2−)	5.82	9/2−		
867.2	3.2 4	1315.9	(17/2−)	448.83	17/2−		
^{x}891.2[a]	1.8 3						
894.8	2.7 4	2278.5		1383.66	25/2−		

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^{185}Re(α,4nγ),^{187}Re(α,6nγ) 1979An20,1989Ba02 (continued)

γ(^{185}Ir) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J^π_i	E_f	J^π_f	Comments
898.9	3.5 4	2282.9	(27/2⁻)	1383.66	25/2⁻	
961.4[@]	5.4[@] 5	2962.9	(31/2⁻)	2001.37	29/2⁻	
971.5	7.1 5	1130.2		158.64	13/2⁻	
994.4	3.8 4	1856.7	(23/2⁻)	861.94	21/2⁻	
[x]1007.8	2.3 4					
[x]1014.4[a]	8.3 5					I_γ: mostly belongs to some impurity source.
[x]1058.0	1.0 3					
1061.9	6.3 5	1511.0	(19/2⁻)	448.83	17/2⁻	
1136.1	2.5 5	1997.5	(23/2⁻)	861.94	21/2⁻	
1144.6	1.6[&] 5	1900.65	(17/2,19/2)	755.97	15/2⁻	
[x]1150.7[a]	1.9 5					
[x]1155.4[a]	2.5 5					
[x]1167.0[a]	1.6 4					
1173.6	15.6[&] 9	1622.42	(19/2⁻)	448.83	17/2⁻	
1286.2[d]	6.8[d] 5	1734.9	(21/2⁻)	448.83	17/2⁻	
1286.2[df]	6.8[d] 5	2148.0	(19/2,21/2)	861.94	21/2⁻	Placement from 2148 level is tentative.
[x]1355.5[a]	1.6 4					
[x]1389.6[a]	2.7 4					
[x]1430.6[a]	1.6 4					
[x]1439.3[a]	1.6 4					
1451.8	20.1[&] 10	1900.65	(17/2,19/2)	448.83	17/2⁻	

† Uncertainties are ≈0.1 keV for strong, well resolved transitions and ≈0.5 keV for weak or poorly resolved peaks (1979An20), unless otherwise specified.

‡ Relative photon intensities from ^{185}Re(α,4nγ) reaction at Eα=51 MeV (1979An20).

From $\gamma\gamma(\theta)$, DCO ratios (1989Ba02). DCO=1.0 for stretched quadrupole transitions.

@ From $\gamma\gamma$ coin (1979An20).

& Transition with a delayed component (1979An20).

a Assignment to ^{185}Ir is uncertain (1979An20).

b From 1989Ba02.

c Iγ(827γ):Iγ(789.5γ):Iγ(795.8γ):Iγ(766.8γ)=<0.5:0.7 4:1.6 4: 5.2 5.

d Multiply placed with undivided intensity.

e Multiply placed with intensity suitably divided.

f Placement of transition in the level scheme is uncertain.

x γ ray not placed in level scheme.

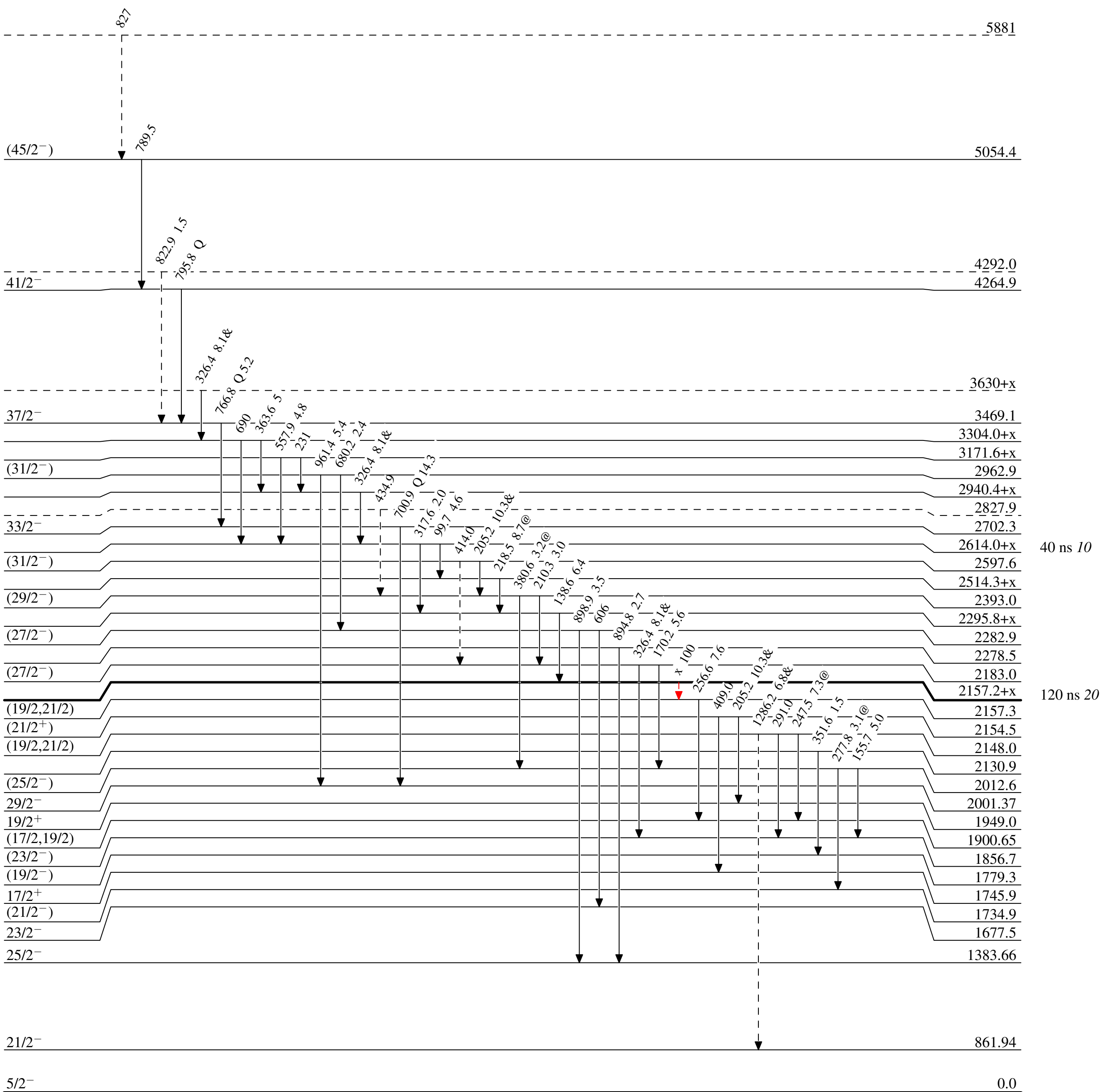
$^{185}Re(\alpha,4n\gamma),^{187}Re(\alpha,6n\gamma)$ 1979An20,1989Ba02

Level Scheme

Intensities: Relative I_γ
& Multiply placed: undivided intensity given
@ 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)



$^{185}_{77}Ir_{108}$

$^{185}Re(\alpha,4n\gamma),^{187}Re(\alpha,6n\gamma)$ 1979An20,1989Ba02

Level Scheme (continued)

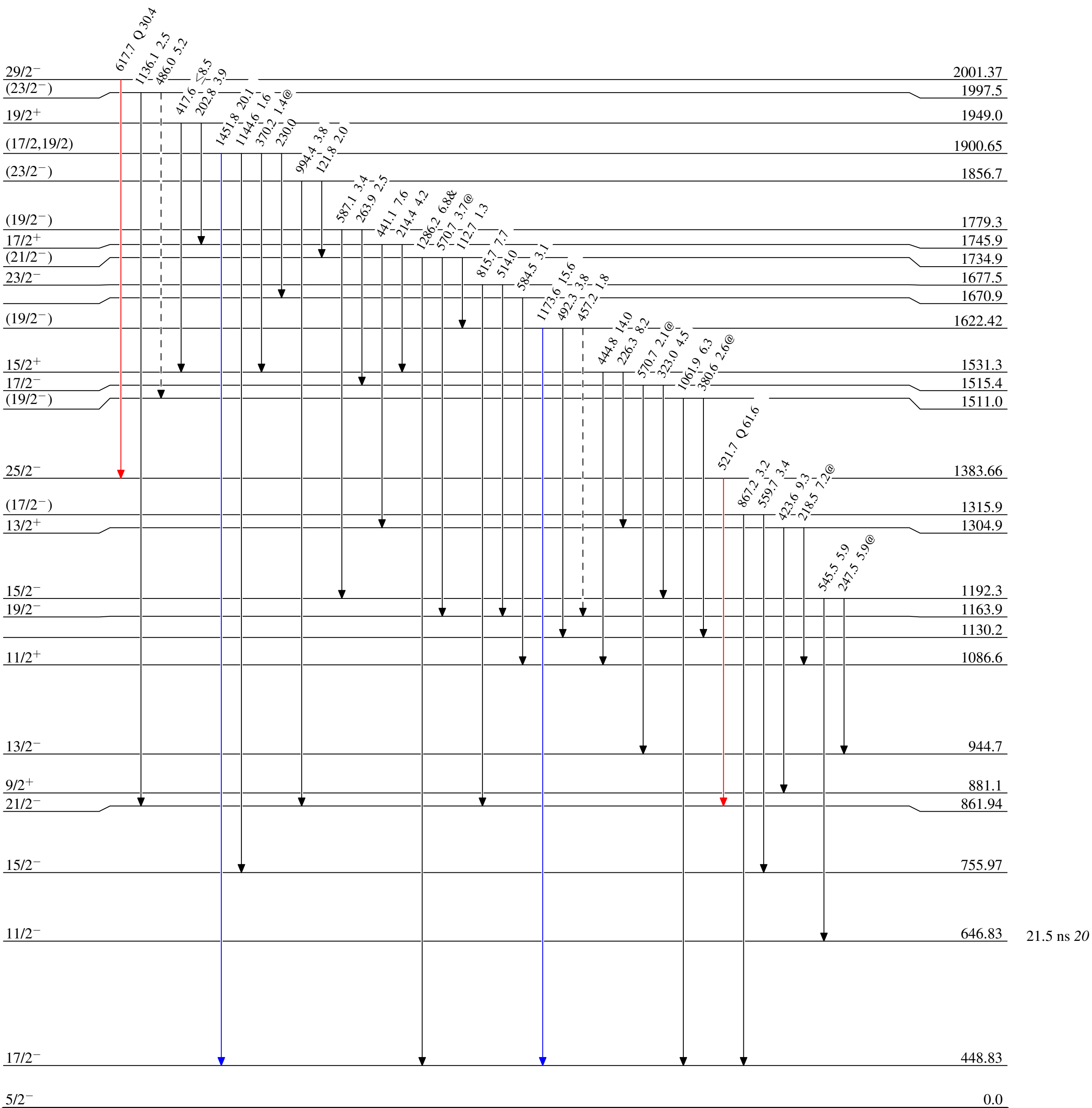
Intensities: Relative I_γ

& Multiply placed: undivided intensity given

@ 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)



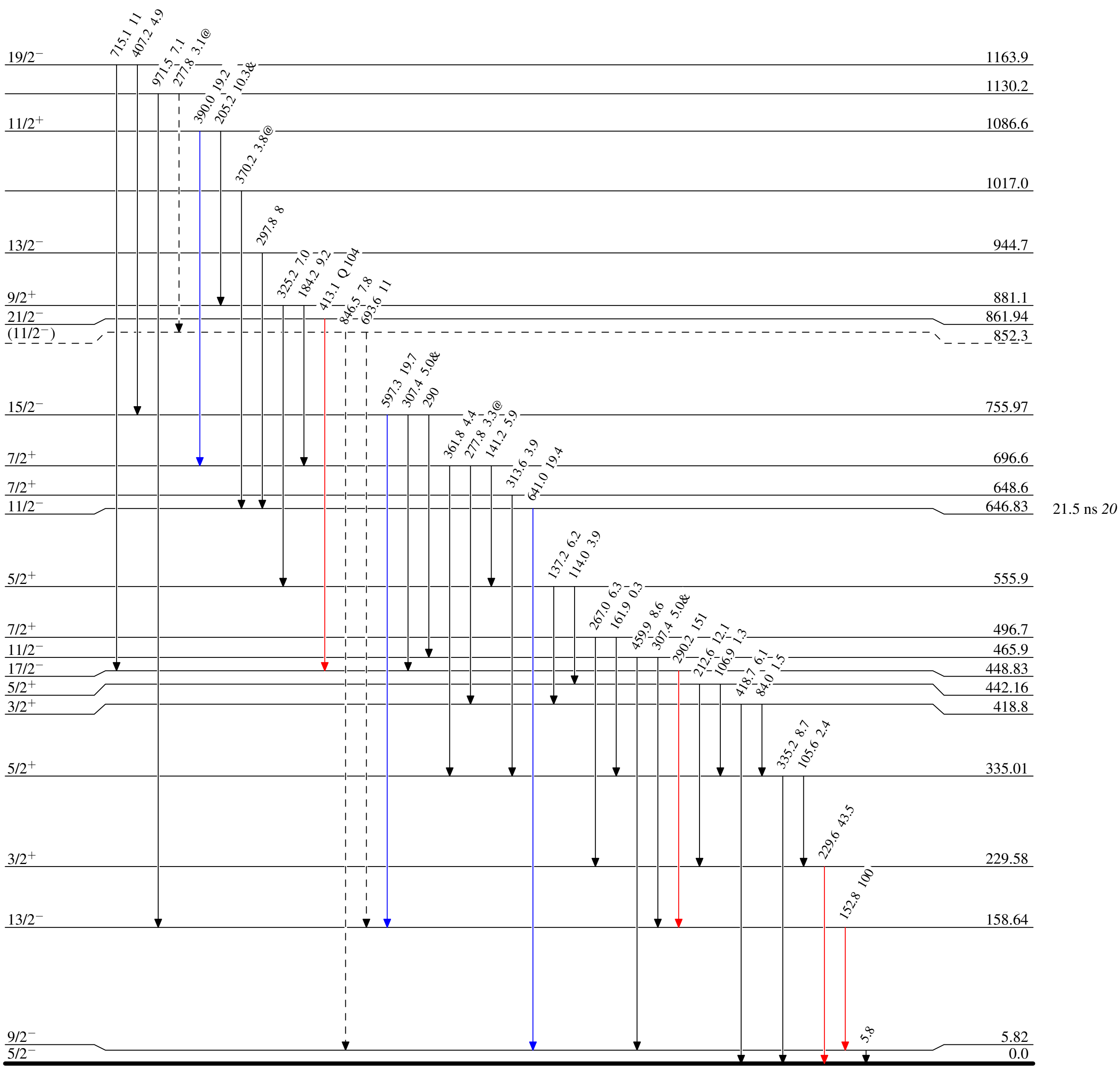
$^{185}_{77}Ir_{108}$

^{185}Re(α,4nγ),^{187}Re(α,6nγ) 1979An20,1989Ba02

Level Scheme (continued)

Intensities: Relative I_γ
& Multiply placed: undivided intensity given
@ 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)



$^{185}_{77}Ir_{108}$