

⁹⁹Rh β⁺ decay (4.7 h) 1978Bu14

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

Parent: ⁹⁹Rh: E=64.3 4; J^π=9/2⁺; T_{1/2}=4.7 h 1; Q(β⁺)=2044 7; %β⁺ decay=100.0

⁹⁹Rh-Q(β⁺): from 2017Wa10.

Additional information 1.

Measured: γ, γγ (1978Bu14,1970An12), γ(θ,H,t) (1985Ed06).

⁹⁹Ru Levels

E(level)	J ^π †	E(level)	J ^π †	E(level)	J ^π †	E(level)	J ^π †
0.0	5/2 ⁺	617.79 23	7/2 ⁺	1261.19 25	7/2 ⁺	1499.0 5	9/2 ⁺
89.6 3	3/2 ⁺	719.74 23	9/2 ⁺	1277.3 3	9/2 ⁺	1584.2 11	(7/2,5/2)
321.9 4	3/2 ⁺	734.1? 4	5/2 ⁺	1306.5 5	(7/2 ⁺)		
340.75 21	7/2 ⁺	1048.4? 7	11/2 ⁺	1319.9? 7	11/2 ⁺		
575.6 3	5/2 ⁺	1119.1 10	(7/2 ⁺)	1475.5 11	(7/2,5/2)		

† Adopted values.

ε,β⁺ radiations

E(decay)	E(level)	Iβ ⁺ ‡	Iε‡	Log ft	I(ε+β ⁺)†‡	Comments
(524 7)	1584.2		0.09 4	6.91 20	0.09 4	εK=0.8609 2; εL=0.1124 1; εM+=0.02666 3
(609 7)	1499.0		0.48 8	6.31 8	0.48 8	εK=0.8622 1; εL=0.11140 8; εM+=0.02638 2
(633 7)	1475.5		0.17 6	6.80 16	0.17 6	εK=0.8625; εL=0.11117 7; εM+=0.02632 2
(788# 7)	1319.9?		0.25 5	6.83 9	0.25 5	εK=0.8640; εL=0.11001 5; εM+=0.02600 2
(802 7)	1306.5		0.40 6	6.64 7	0.40 6	εK=0.8641; εL=0.10993 4; εM+=0.02598 2
(831 7)	1277.3		3.2 2	5.77 3	3.2 2	εK=0.8643; εL=0.10977 4; εM+=0.02594 1
(847 7)	1261.19		12.7 6	5.186 24	12.7 6	εK=0.8644; εL=0.10968 4; εM+=0.02591 1
(989 7)	1119.1		0.20 5	7.13 11	0.20 5	εK=0.8652; εL=0.10906 3; εM+=0.025745 8
(1060 7)	1048.4?		0.058 23	7.72 18	0.058 23	εK=0.8655; εL=0.10882 3; εM+=0.025678 7
(1374# 7)	734.1?					
(1389 7)	719.74	0.0054 8	0.86 10	6.79 5	0.87 10	av Eβ=168.1 31; εK=0.8611 4; εL=0.10733 7; εM+=0.02530 2
(1491 7)	617.79	0.226 23	13.9 12	5.65 4	14.1 12	av Eβ=212.0 31; εK=0.8528 8; εL=0.10610 11; εM+=0.02500 3
(1533# 7)	575.6	≤0.004	≤0.2	≥7.5	≤0.2	av Eβ=230.2 31; εK=0.8477 10; εL=0.10539 14; εM+=0.02483 4
(1768 7)	340.75	5.3 4	60 5	5.16 4	65 5	av Eβ=331.7 31; εK=0.7959 22; εL=0.0986 3; εM+=0.02323 7
(1786# 7)	321.9	0.070 12	0.72 12	7.09 8	0.79 13	av Eβ=339.9 31; εK=0.7900 23; εL=0.0979 3; εM+=0.02305 7 log ft is too small for a third-forbidden transition. Probably due to unplaced γ's.
(2019# 7)	89.6	0.026 9	1.5 5	9.26 ^{2u} 15	1.5 5	av Eβ=486.1 32; εK=0.8467 5; εL=0.10977 9; εM+=0.02602 3 I(ε+β ⁺): too large for a second-unique forbidden transition. Probably due to incompleteness of the decay scheme, or to Iγ(89.6) being too large.

† From intensity balance.

‡ Absolute intensity per 100 decays.

Existence of this branch is questionable.

⁹⁹Rh β⁺ decay (4.7 h) **1978Bu14** (continued)

γ(⁹⁹Ru)

I_γ normalization: Deduced by evaluators using Iβ(0)=0, since beta transition is second-forbidden, and Σ(I(γ+ce) to g.s.) = 100%. Additional uncertainty may originate from unplaced γ rays.

E _γ	I _γ ^{&}	E _i (level)	J _i ^π	E _f	J _f ^π	Mult.	δ [@]	α [#]	Comments
89.6 5	15.4 15	89.6	3/2 ⁺	0.0	5/2 ⁺	E2+M1 [†]	-1.56 [†] 2	1.49 4	%I _γ =1.75 18 α(K)=1.17 3; α(L)=0.264 8; α(M)=0.0495 14 α(N)=0.00742 21; α(O)=0.000172 4
(101.6 6)	0.154 13	719.74	9/2 ⁺	617.79	7/2 ⁺	[M1,E2]		0.76 47	I _γ : 14 2 from 1970An12. %I _γ =0.0175 17 α(K)=0.62 36; α(L)=0.120 89; α(M)=0.022 17 α(N)=0.0034 25; α(O)=9.5×10 ⁻⁵ 48 E _γ ,Mult.: from adopted gammas. I _γ : from adopted branching ratios and I _γ (719γ)=11.0 4.
231.6 10	0.8 2	321.9	3/2 ⁺	89.6	3/2 ⁺	(M1+E2)		0.048 17	%I _γ =0.091 23 α(K)=0.042 14; α(L)=0.0056 24; α(M)=1.03×10 ⁻³ 43 α(N)=1.63×10 ⁻⁴ 66; α(O)=7.1×10 ⁻⁶ 20 Mult.: from adopted gammas.
250.9 6	4.6 4	340.75	7/2 ⁺	89.6	3/2 ⁺	(E2)		0.0493 8	%I _γ =0.52 5 α(K)=0.0421 7; α(L)=0.00589 10; α(M)=0.001087 18 α(N)=0.000170 3; α(O)=6.95×10 ⁻⁶ 12 I _γ : 1.8 3 from 1970An12. Mult.: from adopted gammas.
271.0 ^b 10	0.16 5	1319.9?	11/2 ⁺	1048.4?	11/2 ⁺	[M1,E2]		0.0295 84	%I _γ =0.018 6 α(K)=0.0255 70; α(L)=0.0033 12; α(M)=6.1×10 ⁻⁴ 21 α(N)=9.7×10 ⁻⁵ 32; α(O)=4.4×10 ⁻⁶ 10 E _γ ,Mult.: from adopted gammas. I _γ : from adopted branching ratios and I _γ (702γ)=1.5 4.
276.6 4	14.7 9	617.79	7/2 ⁺	340.75	7/2 ⁺	[M1,E2]		0.0277 76	%I _γ =1.67 13 α(K)=0.0239 64; α(L)=0.0031 11; α(M)=5.7×10 ⁻⁴ 20 α(N)=9.1×10 ⁻⁵ 30; α(O)=4.1×10 ⁻⁶ 9 I _γ : 11 1 from 1970An12. Mult.: from adopted gammas.
322.1 4	7.9 10	321.9	3/2 ⁺	0.0	5/2 ⁺	M1,E2		0.017 4	%I _γ =0.90 12 α(K)=0.015 4; α(L)=0.00191 51; α(M)=3.51×10 ⁻⁴ 94 α(N)=5.6×10 ⁻⁵ 15; α(O)=2.6×10 ⁻⁶ 5 Mult.: from adopted gammas.
340.8 4	633 30	340.75	7/2 ⁺	0.0	5/2 ⁺	M1+E2 [‡]	-0.05 [‡] 1	0.01189	%I _γ =72.0 21 α(K)=0.01041 15; α(L)=0.001217 18; α(M)=0.000223 4 α(N)=3.61×10 ⁻⁵ 6; α(O)=1.91×10 ⁻⁶ 3 I _γ : 410 60 from 1970An12.
(379.17 19)	0.29 5	719.74	9/2 ⁺	340.75	7/2 ⁺	(M1,E2)		0.0108 17	%I _γ =0.033 6

⁹⁹Rh β⁺ decay (4.7 h) **1978Bu14** (continued)

γ(⁹⁹Ru) (continued)

<u>E_γ</u>	<u>I_γ^{&}</u>	<u>E_i(level)</u>	<u>J_i^π</u>	<u>E_f</u>	<u>J_f^π</u>	<u>Mult.</u>	<u>δ[@]</u>	<u>α[#]</u>	<u>Comments</u>
									α(K)=0.0094 14; α(L)=0.00116 23; α(M)=0.00021 5 α(N)=3.4×10 ⁻⁵ 7; α(O)=1.65×10 ⁻⁶ 20 E _γ ,Mult.: from adopted gammas. I _γ : from adopted branching ratios and I _γ (719γ)=11.0 4. %I _γ =0.043 10 E _γ : from adopted gammas. I _γ : from adopted branching ratios and I _γ (734γ)=4.0 4. %I _γ =0.66 8 %I _γ =1.43 24 %I _γ =1.33 9 E _γ : from adopted gammas. I _γ : from adopted branching ratios and I _γ (937γ)=19.8 5. %I _γ =0.20 5 %I _γ =0.39 5 %I _γ =0.065 19 E _γ : from adopted gammas. I _γ : from adopted branching ratios and I _γ (702γ)=1.5 4. %I _γ =12.3 11 I _γ : 81 9 from 1970An12. %I _γ =0.11 4 %I _γ =0.55 8 %I _γ =0.86 14 %I _γ =0.17 5 %I _γ =0.17 5 %I _γ =0.080 23 %I _γ =1.25 7 I _γ : 5 1 from 1970An12. %I _γ =0.45 5 %I _γ =0.20 6 %I _γ =0.068 23 %I _γ =0.55 12 %I _γ =0.18 6 %I _γ =0.77 6 %I _γ =2.25 11 %I _γ =0.15 4 %I _γ =0.18 4 %I _γ =0.091 23 %I _γ =0.20 5 %I _γ =0.22 5 %I _γ =0.10 4 %I _γ =0.09 4 %I _γ =11.4 21
411.7 ^b 10	0.38 8	734.1?	5/2 ⁺	321.9	3/2 ⁺				
486.1 4	5.8 6	575.6	5/2 ⁺	89.6	3/2 ⁺				
528.2 4	12.6 20	617.79	7/2 ⁺	89.6	3/2 ⁺				
542.8 ^b 10	11.7 6	1277.3	9/2 ⁺	734.1?	5/2 ⁺				
558.2 6	1.8 4	1277.3	9/2 ⁺	719.74	9/2 ⁺				
575.7 4	3.4 4	575.6	5/2 ⁺	0.0	5/2 ⁺				
600.0 ^b 10	0.57 16	1319.9?	11/2 ⁺	719.74	9/2 ⁺				
617.8 4	108 9	617.79	7/2 ⁺	0.0	5/2 ⁺				
644.0 6	1.0 3	1261.19	7/2 ⁺	617.79	7/2 ⁺				
659.0 4	4.8 6	1277.3	9/2 ⁺	617.79	7/2 ⁺				
685.6 4	7.6 12	1261.19	7/2 ⁺	575.6	5/2 ⁺				
702.0 ^a 6	1.5 ^a 4	1277.3	9/2 ⁺	575.6	5/2 ⁺				
702.0 ^{ab} 6	1.5 ^a 4	1319.9?	11/2 ⁺	617.79	7/2 ⁺				
707.6 6	0.7 2	1048.4?	11/2 ⁺	340.75	7/2 ⁺				
719.3 4	11.0 4	719.74	9/2 ⁺	0.0	5/2 ⁺				
734.1 4	4.0 4	734.1?	5/2 ⁺	0.0	5/2 ⁺				
779.1 6	1.8 5	1499.0	9/2 ⁺	719.74	9/2 ⁺				
^s 808.0 10	0.6 2								
^s 850.6 6	4.8 10								
899.9 10	1.6 5	1475.5	(7/2,5/2)	575.6	5/2 ⁺				
920.0 4	6.8 4	1261.19	7/2 ⁺	340.75	7/2 ⁺				
936.6 4	19.8 5	1277.3	9/2 ⁺	340.75	7/2 ⁺				
965.7 6	1.3 3	1306.5	(7/2 ⁺)	340.75	7/2 ⁺				
984.8 6	1.6 3	1306.5	(7/2 ⁺)	321.9	3/2 ⁺				
^x 1002.0 10	0.8 2								
1119.1 10	1.8 4	1119.1	(7/2 ⁺)	0.0	5/2 ⁺				
1158.1 10	1.9 4	1499.0	9/2 ⁺	340.75	7/2 ⁺				
1172.2 10	0.9 3	1261.19	7/2 ⁺	89.6	3/2 ⁺				
1243.4 10	0.8 3	1584.2	(7/2,5/2)	340.75	7/2 ⁺				
1261.2 4	100	1261.19	7/2 ⁺	0.0	5/2 ⁺	M1+E2 [‡]	-0.07 [‡] 3	5.94×10 ⁻⁴	

⁹⁹Rh β⁺ decay (4.7 h) ¹⁹⁷⁸Bu14 (continued)

γ(⁹⁹Ru) (continued)

<u>E_γ</u>	<u>I_γ^{&}</u>	<u>E_i(level)</u>	<u>J_i^π</u>	<u>E_f</u>	<u>J_f^π</u>	<u>Comments</u>
						α(K)=0.000510 8; α(L)=5.75×10 ⁻⁵ 8; α(M)=1.053×10 ⁻⁵ 15 α(N)=1.709×10 ⁻⁶ 24; α(O)=9.22×10 ⁻⁸ 13; α(IPF)=1.451×10 ⁻⁵ 22
1277.7 10	1.0 3	1277.3	9/2 ⁺	0.0	5/2 ⁺	%I _γ =0.11 4
1306.2 10	0.8 2	1306.5	(7/2 ⁺)	0.0	5/2 ⁺	%I _γ =0.091 23
^x 1386.8 10	1.0 4					%I _γ =0.11 5
1499.5 10	0.7 2	1499.0	9/2 ⁺	0.0	5/2 ⁺	%I _γ =0.080 23

† From adopted γ.

‡ From γ(θ,H,t).

[Additional information 2.](#)

@ If No value given it was assumed δ=1.00 for E2/M1, δ=1.00 for E3/M2 and δ=0.10 for the other multipolarities.

& For absolute intensity per 100 decays, multiply by 0.114 5.

^a Multiply placed with undivided intensity.

^b Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

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Decay Scheme

Legend

- I_γ < 2% × I_γ^{max}
- I_γ < 10% × I_γ^{max}
- I_γ > 10% × I_γ^{max}
- - - - - γ Decay (Uncertain)

Intensities: I_(γ+ce) per 100 parent decays
& Multiply placed: undivided intensity given

⁹⁹Rh₅₄ 9/2⁺ 64.3 4.7 h I
Q_e=2044.7
%ε + %β⁺ = 100.0

