

⁹⁰Rb β^- decay (258 s) 1981Ta05

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	S. K. Basu, E. A. Mccutchan		NDS 165, 1 (2020)	1-Mar-2020

Parent: ⁹⁰Rb: E=106.90 3; J π =3 $^-$; T_{1/2}=258 s 4; Q(β^-)=6584 7; % β^- decay=97.5 5

1981Ta05: From ²³⁵U(n,F). Mass separation of ⁹⁰Kr. NaI and Ge(Li). Measured E γ , I γ , $\gamma\gamma$ coin, $\gamma\gamma(\theta)$. The 158-s and 258-s ⁹⁰Rb activities were distinguished by varying collection and observation times.

1977Hu03: From ²³⁵U(n,F). Mass separation. Measured T_{1/2}, E γ , I γ , $\gamma\gamma$ coin, E β .

1997Gr09: from ²⁵²Cf. On-line mass separation and measurement of γ rays using a total absorption γ -ray spectrometer to determine β^- distributions of decay intensities of fission products. Detector consisted of a large NaI scintillator with a deep axial well for the radioactive source and for a Si(Li) detector to measure $\beta\gamma$ coincidences.

Others: 1964Jo02, 1967Zh01, 1972Eh02, 1973Si12, 1973Cl02, 1974Gr29, 1976Wo05, 1978St02, 1978Wu04, 1978Wo15, 1980De02. All data are from 1981Ta05, except as noted.

α : Additional information 1.

⁹⁰Sr Levels

E(level)	J π [†]	T _{1/2} [‡]
0	0 $^+$	28.91 [†] y 3
831.67 4	2 $^+$	7 ps 2
1655.89 7	4 $^+$	12 ps 2
1892.34 5	2 $^+$	2 ps 1
2207.01 5	(3 $^-$)	\leq 1 ps
2497.30 6	(2 $^+$)	\leq 3 ps
2527.90 8	3 $^-, 4^+$	\leq 6 ps
2570.59 9		10 ps 7
2927.68 8	4	
2971.00 18	0 $^+$	
3032.85 8		\leq 1 ps
3039.25 8	1	
3144.9 4	(5 $^-$)	
3383.36 10		
3449.81 6	3	\leq 4 ps
3555.87 18		
3584.41 8		
3627.0 3		
3954.3 2		
4036.86 13		
4135.62 10	(1,2 $^+$)	
4148.80 10		
4335.35 8		
4366.05 11		
4404.60 18		
4430.9 3		
4685.5 3		
4804.0 5		
4805.10 23		
4808.50 24		
4854.3? 4		
4947.4? 4	(2 $^+$)	
5024.52 24		
5026.8? 3		
5041.42 12		
5089.44 16		
5239.2 5		
5285.87 20		

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^{90}Rb β^- decay (258 s) 1981Ta05 (continued) **^{90}Sr Levels (continued)**

E(level)	Comments
5426.65 14	$I\beta=0.57\%$ (1997Gr09). From $I(\gamma+\text{ce})$ balance at this level, the β feeding is 0.003 % 40, consistent with zero feeding.
5431.1? 3	
5557.8 3	
5785.1? 8	
5822.0 5	
5827.9 4	

† From the Adopted Levels.

‡ From $\beta\gamma(t)$ ([1991Ma05](#)), except where noted,

 β^- radiations

β^- branches are from $I(\gamma+\text{ce})$ balance at each level. Values measured with a total absorption γ -ray spectrometer ([1997Gr09](#)) are also shown with individual levels. [1997Gr09](#) found an excess of β^- population to levels above 4394 keV, and a deficit for levels below 1994 keV, compared to those values deduced from transition-intensity balances. The most dramatic example is the β^- population to the 831-keV level: 15%, from transition-intensity balance; 1.8% from the total absorption γ -ray spectrometer measurement ([1997Gr09](#)). [1997Gr09](#) proposed a fictitious level at about 3900 keV with a β^- population of 1.64% in order to interpret their data.

E(decay)	E(level)	$I\beta^-$ †	Log ft	Comments
(863 7)	5827.9	1.23 23	5.32 9	av $E\beta=298.9$ 27 $I\beta^-$: 0.82% (1997Gr09).
(869 7)	5822.0	0.61 20	5.63 15	av $E\beta=301.3$ 28 $I\beta^-$: 0.40% (1997Gr09).
(906 7)	5785.1?	0.34 10	5.96 13	av $E\beta=316.5$ 28 $I\beta^-$: 0.23% (1997Gr09).
(1133 7)	5557.8	0.57 6	6.10 5	av $E\beta=412.2$ 29 $I\beta^-$: 0.68% (1997Gr09).
(1260 7)	5431.1?	0.94 11	6.06 6	av $E\beta=466.9$ 29 $I\beta^-$: 1.36% (1997Gr09).
(1405 7)	5285.87	1.61 9	6.01 3	av $E\beta=530.7$ 30 $I\beta^-$: 2.99% (1997Gr09).
(1452 7)	5239.2	0.43 7	6.64 8	av $E\beta=551.4$ 30 $I\beta^-$: 0.79% (1997Gr09).
(1601 7)	5089.44	1.37 9	6.30 3	av $E\beta=618.4$ 30 $I\beta^-$: 2.69% (1997Gr09).
(1649 7)	5041.42	3.08 15	6.002 24	av $E\beta=640.0$ 30 $I\beta^-$: 6.02% (1997Gr09).
(1664 7)	5026.8?	0.51 7	6.80 6	av $E\beta=646.7$ 30 $I\beta^-$: 1.03% (1997Gr09).
(1666 7)	5024.52	1.14 10	6.45 4	av $E\beta=647.7$ 30 $I\beta^-$: 2.22% (1997Gr09).
(1744 7)	4947.4?	0.49 9	6.90 8	av $E\beta=682.6$ 30
(1837 7)	4854.3?	0.34 7	7.15 9	av $E\beta=725.0$ 31 $I\beta^-$: 0.82% (1997Gr09).
(1882 7)	4808.50	0.68 10	6.89 7	av $E\beta=746.0$ 31 $I\beta^-$: 1.59% (1997Gr09).
(1886 7)	4805.10	0.44 5	7.08 5	av $E\beta=747.6$ 31 $I\beta^-$: 1.03% (1997Gr09).
(1887 7)	4804.0	0.48 9	7.04 9	av $E\beta=748.1$ 31 $I\beta^-$: 1.12% (1997Gr09).

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 $^{90}\text{Rb } \beta^-$ decay (258 s) 1981Ta05 (continued)

 β^- radiations (continued)

E(decay)	E(level)	$I\beta^-^\dagger$	Log ft	Comments
(2005 7)	4685.5	0.23 6	7.47 12	av $E\beta=802.5$ 31 $I\beta^-$: 0.27% (1997Gr09).
(2260 7)	4430.9	0.92 12	7.08 6	av $E\beta=920.5$ 31 $I\beta^-$: 1.14% (1997Gr09).
(2286 7)	4404.60	1.61 10	6.86 3	av $E\beta=932.7$ 31 $I\beta^-$: 1.99% (1997Gr09).
(2356 7)	4335.35	9.00 21	6.169 14	av $E\beta=965.0$ 31 $I\beta^-$: 8.78% (1997Gr09).
(2542 7)	4148.80	15.7 4	6.067 14	av $E\beta=1052.4$ 31 $I\beta^-$: 18.87% (1997Gr09).
(2654 7)	4036.86	1.77 14	7.09 4	av $E\beta=1105.0$ 31 $I\beta^-$: 2.08% (1997Gr09).
(2737 7)	3954.3	0.47 21	7.73 20	av $E\beta=1144.0$ 32 $I\beta^-$: 0.83% (1997Gr09).
(3106 7)	3584.41	14.3 8	6.48 3	av $E\beta=1319.1$ 32 $I\beta^-$: 15.18% (1997Gr09).
(3241 7)	3449.81	6.54 23	6.897 18	av $E\beta=1383.1$ 32 $I\beta^-$: 7.29% (1997Gr09).
(3546 7)	3144.9	0.29 6	8.42 9	av $E\beta=1528.5$ 32 $I\beta^-$: 0.35% (1997Gr09).
(3658 7)	3032.85	0.60 18	8.16 13	av $E\beta=1582.1$ 32 $I\beta^-$: 0.70% (1997Gr09).
(3763 7)	2927.68	0.87 24	8.06 12	av $E\beta=1632.4$ 32 $I\beta^-$: 1.03% (1997Gr09).
(4120 7)	2570.59	1.32 11	8.05 4	av $E\beta=1803.6$ 32 $I\beta^-$: 1.17% (1997Gr09).
(4163 7)	2527.90	1.74 11	7.95 3	av $E\beta=1824.1$ 32 $I\beta^-$: 1.41% (1997Gr09).
(4194 7)	2497.30	1.49 21	8.03 7	av $E\beta=1838.8$ 32 $I\beta^-$: 1.21% (1997Gr09).
(4484 7)	2207.01	3.1 11	7.84 16	av $E\beta=1978.3$ 32 $I\beta^-$: 2.81% (1997Gr09).
(4799 7)	1892.34	4.2 4	7.84 5	av $E\beta=2129.7$ 32 $I\beta^-$: 1.82% (1997Gr09).
(5035 7)	1655.89	3.5 6	8.01 8	av $E\beta=2243.6$ 32 $I\beta^-$: 1.99% (1997Gr09).
(5859 7)	831.67	15 4	7.67 12	av $E\beta=2641.1$ 32 $I\beta^-$: 1.76% (1997Gr09).

[†] For absolute intensity per 100 decays, multiply by 1.001 5.

⁹⁰Rb β^- decay (258 s) 1981Ta05 (continued) $\gamma(^{90}\text{Sr})$

I γ normalization: deduced by evaluators assuming no β^- feeding to g.s. (3^- to 0^+), and using $\Sigma I(\gamma+\text{ce})(\text{to g.s. of } ^{90}\text{Sr}) + \Sigma I(\gamma+\text{ce})(\text{to g.s. of } ^{90}\text{Rb}) = 100\%$. For unplaced transitions possibly belonging to 258 s decay, see ⁹⁰Rb β^- decay (158 s).

E $_{\gamma}^{\dagger}$	I $_{\gamma}^{\#}$	E $_i$ (level)	J $^{\pi}_i$	E $_f$	J $^{\pi}_f$	Mult. ‡	δ^{\ddagger}	α	Comments
314.5 3	8.8 4	2207.01	(3 $^-$)	1892.34	2 $^+$	[E1]		0.00374	$\alpha(K)=0.00331$ 5; $\alpha(L)=0.000359$ 6; $\alpha(M)=6.02\times 10^{-5}$ 9; $\alpha(N)=7.51\times 10^{-6}$ 11; $\alpha(O)=4.78\times 10^{-7}$ 7
395.8 8	0.8 4	5822.0		5426.65					
442.3 4	1.2 3	4808.50		4366.05					
522.10 13	4.2 3	3449.81	3	2927.68	4	[E1]	1.01×10^{-3}		$\alpha(K)=0.000899$ 13; $\alpha(L)=9.70\times 10^{-5}$ 14; $\alpha(M)=1.626\times 10^{-5}$ 23; $\alpha(N)=2.04\times 10^{-6}$ 3 $\alpha(O)=1.315\times 10^{-7}$ 19
551.20 25	9.1 7	2207.01	(3 $^-$)	1655.89	4 $^+$	[E1]	8.91×10^{-4}		E $_{\gamma}$: author's value of 552.10 13 in Table I is a misprint. $\alpha(K)=0.000790$ 11; $\alpha(L)=8.52\times 10^{-5}$ 12; $\alpha(M)=1.427\times 10^{-5}$ 20; $\alpha(N)=1.79\times 10^{-6}$ 3 $\alpha(O)=1.157\times 10^{-7}$ 17
720.70 9	5.7 4	2927.68	4	2207.01	(3 $^-$)				
739.2 4	0.0071 12	4366.05		3627.0					I $_{\gamma}$: From I $_{\gamma}/I\gamma(4366\gamma)$ in 158-s decay.
752.1 3	0.0123 17	4135.62	(1,2 $^+$)	3383.36					I $_{\gamma}$: From I $_{\gamma}/I\gamma(4136\gamma)$ in 158-s decay.
765.1 7	0.9 3	4148.80		3383.36					
779.9 4	2.9 6	4335.35		3555.87					
824.23 10	92 5	1655.89	4 $^+$	831.67	2 $^+$	E2	9.22×10^{-4}		$\alpha(K)=0.000816$ 12; $\alpha(L)=8.97\times 10^{-5}$ 13; $\alpha(M)=1.506\times 10^{-5}$ 21; $\alpha(N)=1.88\times 10^{-6}$ 3 $\alpha(O)=1.204\times 10^{-7}$ 17
831.69 5	1000 38	831.67	2 $^+$	0	0 $^+$	E2	9.02×10^{-4}		$\alpha(K)=0.000798$ 12; $\alpha(L)=8.77\times 10^{-5}$ 13; $\alpha(M)=1.471\times 10^{-5}$ 21; $\alpha(N)=1.84\times 10^{-6}$ 3 $\alpha(O)=1.178\times 10^{-7}$ 17
872.00 15	5.6 4	2527.90	3 $^-, 4^+$	1655.89	4 $^+$				
886.3 3	0.062 12	3383.36		2497.30	(2 $^+$)				I $_{\gamma}$: From I $_{\gamma}/I\gamma(3383\gamma)$ in 158-s decay.
921.20 24	3.2 7	3449.81	3	2527.90	3 $^-, 4^+$				
952.44 7	17.9 6	3449.81	3	2497.30	(2 $^+$)				
985.4 5	0.85 25	3555.87		2570.59					
1003.9 9	0.6 3	4148.80		3144.9	(5 $^-$)				
1013.95 19	2.7 3	3584.41		2570.59					
1021.9 7	0.8 3	4404.60		3383.36					
1027.1 4	1.3 3	3954.3		2927.68	4				
1060.70 4	81 3	1892.34	2 $^+$	831.67	2 $^+$	M1+E2	+0.50 3	4.97×10^{-4}	$\alpha(K)=0.000440$ 7; $\alpha(L)=4.75\times 10^{-5}$ 7; $\alpha(M)=7.97\times 10^{-6}$ 12; $\alpha(N)=1.002\times 10^{-6}$ 14; $\alpha(O)=6.59\times 10^{-8}$ 10 Mult., δ : (1060 γ)(831 γ)(θ): A ₂ =-0.105 16, A ₄ =0.083 18 (1981Ta05).
1086.7 8	0.74 15	3584.41		2497.30	(2 $^+$)				

⁹⁰Rb β⁻ decay (258 s) 1981Ta05 (continued)

γ(⁹⁰Sr) (continued)

E _γ [†]	I _γ [#]	E _i (level)	J _i ^π	E _f	J _f ^π	Mult. [‡]	δ [‡]	α	Comments
1109.2 8	1.4 8	4036.86		2927.68	4				
1140.50 6	9.4 5	3032.85		1892.34	2 ⁺				
1146.96 25	0.16 5	3039.25	1	1892.34	2 ⁺				
1176.9 9	0.039 16	3383.36		2207.01	(3 ⁻)				I _γ : From I _γ /I _γ (3383 _γ) in 158-s decay.
1242.84 4	32.2 18	3449.81	3	2207.01	(3 ⁻)	D			Mult.: (1243 _γ)(831 _γ)(θ): A ₂ =0.01 4, A ₄ =-0.02 5 (1981Ta05).
1271.77 7	16.4 22	2927.68	4	1655.89	4 ⁺				
1298.5@ 5	2.1 4	4854.3?		3555.87					
1302.2 3	2.0 5	4685.5		3383.36					
1326.46 21	0.0186 23	4366.05		3039.25	1				I _γ : From I _γ /I _γ (4366 _γ) in 158-s decay.
1375.36 3	177 7	2207.01	(3 ⁻)	831.67	2 ⁺	(E1(+M2))	-0.02 6	2.98×10 ⁻⁴	α(K)=0.000124 3; α(L)=1.32×10 ⁻⁵ 4; α(M)=2.22×10 ⁻⁶ 6; α(N)=2.79×10 ⁻⁷ 7; α(O)=1.83×10 ⁻⁸ 5 Mult.,δ: (1375 _γ)(831 _γ)(θ): A ₂ =-0.089 13, A ₄ =0.051 15 (1981Ta05), δ is for J=3 for 2207 level. δ: other: +0.464 21 for J=2 (1981Ta05).
1377.2 5	24 8	3584.41		2207.01	(3 ⁻)				
1391.6 3	4.6 8	4430.9		3039.25	1				
1425.2 3	2.9 3	4808.50		3383.36					
1438.3 8	0.0045 17	4366.05		2927.68	4				I _γ : From I _γ /I _γ (4366 _γ) in 158-s decay.
1456.7 3	2.5 7	3954.3		2497.30	(2 ⁺)				
1460.1 6	2.0 5	4430.9		2971.00	0 ⁺				
1489.0 4	3.7 5	3144.9	(5 ⁻)	1655.89	4 ⁺				
1576.9@ 7	1.2 4	5026.8?		3449.81	3				
1603.52 20	4.9 5	5557.8		3954.3					
1658.9 3	4.6 6	5285.87		3627.0					
1665.61 7	51.0 12	2497.30	(2 ⁺)	831.67	2 ⁺				
1686.2 6	1.3 4	5822.0		4135.62	(1,2 ⁺)				
1692.07 25	2.9 5	3584.41		1892.34	2 ⁺				
1696.16 7	17.5 6	2527.90	3 ⁻ ,4 ⁺	831.67	2 ⁺				
1738.93 8	20.0 8	2570.59		831.67	2 ⁺				(1738 _γ)(831 _γ)(θ): A ₂ =-0.17 7, A ₄ =0.11 8 (1981Ta05). δ: -0.12 12 for J(2570)=3 or +0.64 18 for J(2570)=2 or -0.06 8 for J(2570)=1 (1981Ta05).
1747.3 3	2.5 4	3954.3		2207.01	(3 ⁻)				
1764.5 9	1.0 5	4335.35		2570.59					
1793.89 11	8.9 5	3449.81	3	1655.89	4 ⁺	D			Mult.: (1793 _γ)(831 _γ)(θ): A ₂ =-0.02 15, A ₄ =0.02 17 (1981Ta05).
1829.82 20	3.7 5	4036.86		2207.01	(3 ⁻)				
1838.15 14	8.7 6	4335.35		2497.30	(2 ⁺)				
1877.40 21	4.7 5	4805.10		2927.68	4				
1892.28 8	4.9 5	1892.34	2 ⁺	0	0 ⁺	[E2]		4.11×10 ⁻⁴	α(K)=0.0001370 20; α(L)=1.464×10 ⁻⁵ 21; α(M)=2.45×10 ⁻⁶ 4; α(N)=3.09×10 ⁻⁷ 5; α(O)=2.03×10 ⁻⁸ 3
1903.1 6	1.4 6	4430.9		2527.90	3 ⁻ ,4 ⁺				
1941.81 17	6.5 6	4148.80		2207.01	(3 ⁻)				

⁹⁰Rb β⁻ decay (258 s) 1981Ta05 (continued)
 $\gamma(^{90}\text{Sr})$ (continued)

E _γ [†]	I _γ [#]	E _i (level)	J _i ^π	E _f	J _f ^π	Mult. [‡]	α	Comments
2128.30 7	55.2 15	4335.35		2207.01	(3 ⁻)			
2139.33 18	1.4 6	2971.00	0 ⁺	831.67	2 ⁺	(E2)	4.99×10 ⁻⁴	$\alpha(K)=0.0001094$ 16; $\alpha(L)=1.167\times10^{-5}$ 17; $\alpha(M)=1.96\times10^{-6}$ 3; $\alpha(N)=2.46\times10^{-7}$ 4 $\alpha(O)=1.625\times10^{-8}$ 23
2200.9 3	5.1 6	5827.9		3627.0				
2207.47 11	1.71 12	3039.25	1	831.67	2 ⁺			
2256.55 17	7.0 5	4148.80		1892.34	2 ⁺			
2298.1 9	3.6 20	3954.3		1655.89	4 ⁺			
2311.2 6	3.1 10	4808.50		2497.30	(2 ⁺)			
2335.2@ 10	2.2 9	5785.1?		3449.81	3			
2381.5 5	1.8 7	4036.86		1655.89	4 ⁺			
2442.9 5	2.8 7	4335.35		1892.34	2 ⁺			
2473.94 20	0.09 1	4366.05		1892.34	2 ⁺			
2497.27 15	8.1 8	2497.30	(2 ⁺)	0	0 ⁺			(1665γ)(831γ)(θ): A ₂ =0.23 3, A ₄ =0.02 3 (1981Ta05). δ: +0.53 18-11 for J=3 or +0.03 4 for J=2 (1981Ta05).
2537.8 9	1.8 7	4430.9		1892.34	2 ⁺			
2543.9 3	3.5 4	5041.42		2497.30	(2 ⁺)			
2592.32 20	6.8 7	5089.44		2497.30	(2 ⁺)			
2617.8 3	6.5 9	3449.81	3	831.67	2 ⁺			
2724.26 21	4.6 6	3555.87		831.67	2 ⁺			
2741.0@ 12	1.5 8	4947.4?	(2 ⁺)	2207.01	(3 ⁻)			
2752.68 8	122 4	3584.41		831.67	2 ⁺			
2789.1 22	3.0 19	5822.0		3032.85				
2834.43 13	19.6 12	5041.42		2207.01	(3 ⁻)			
2900.3 13	1.2 7	5827.9		2927.68	4			
2911.7 11	1.3 7	4804.0		1892.34	2 ⁺			
3032.1 5	4.6 7	5239.2		2207.01	(3 ⁻)			
3039.17 12	2.76 21	3039.25	1	0	0 ⁺			
3197.9@ 10	1.5 6	4854.3?		1655.89	4 ⁺			
3205.09 16	11.9 9	4036.86		831.67	2 ⁺			
3214.5@ 11	1.4 6	5785.1?		2570.59				
3303.91 13	0.15 1	4135.62	(1,2 ⁺)	831.67	2 ⁺			
3317.00 12	152 4	4148.80		831.67	2 ⁺			
3370.8@ 4	4.2 6	5026.8?		1655.89	4 ⁺			
3383.24 12	6.52 14	3383.36		0	0 ⁺			
3503.52 15	25.1 11	4335.35		831.67	2 ⁺			
3534.24 13	0.77 3	5426.65		1892.34	2 ⁺			
3538.6@ 6	5.1 11	5431.1?		1892.34	2 ⁺			
3572.82 18	16.3 10	4404.60		831.67	2 ⁺			
3620.8 11	6.1 23	5827.9		2207.01	(3 ⁻)			
3627.4 7	10 4	3627.0		0	0 ⁺			
3929.4 14	1.4 8	5822.0		1892.34	2 ⁺			

⁹⁰Rb β⁻ decay (258 s) 1981Ta05 (continued)

$\gamma(^{90}\text{Sr})$ (continued)

E _γ [†]	I _γ [#]	E _i (level)	J _i ^π	E _f	J _f ^π	E _γ [†]	I _γ [#]	E _i (level)	J _i ^π	E _f	J _f ^π
3972.2 5	3.8 7	4804.0		831.67	2 ⁺	4365.90 18	1.13 8	4366.05		0	0 ⁺
4115.6 @ 4	3.7 6	4947.4?	(2 ⁺)	831.67	2 ⁺	4454.07 21	12.5 8	5285.87		831.67	2 ⁺
4135.51 17	1.17 4	4135.62	(1,2 ⁺)	0	0 ⁺	4599.4 @ 3	4.9 4	5431.1?		831.67	2 ⁺
4192.75 23	12.1 11	5024.52		831.67	2 ⁺	4685.0 14	0.4 3	4685.5		0	0 ⁺
4209.5 3	9.6 9	5041.42		831.67	2 ⁺	4726.1 7	1.2 3	5557.8		831.67	2 ⁺
4257.34 24	7.8 6	5089.44		831.67	2 ⁺	4996.2 11	0.7 3	5827.9		831.67	2 ⁺

[†] From 1981Ta05, except where noted.

[#] From the Adopted Gammas. In cases where adopted values derive from this dataset, supporting details are given in the comments.

[#] For absolute intensity per 100 decays, multiply by 0.094 4.

@ Placement of transition in the level scheme is uncertain.

$^{90}\text{Rb} \beta^-$ decay (258 s) 1981Ta05





