^{97}Rh ε decay (30.7 min) 1974Oh07,1975Pl05

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 111, 525 (2010)	19-Nov-2009

Parent: ^{97}Rh: E=0.0; $J^{\pi}=9/2^+$; $T_{1/2}$=30.7 min *6*; Q(ε)=3520 *40*; %ε+%$β^+$ decay=100.0

^{97}Ru Levels

Level scheme is that proposed by 1974Oh07 and is based on coincidence work and energy fit. Levels have been added at 2760 (1975Pl05) and 2966 (1981Gr20). Additional levels have been proposed by 1975Pl05 at 2800.5 and 3101.4 keV, and by 1981Gr20 at 2037.0, 2050.0, 2663.4, 2966.2, 2999.5 and 3101.2 keV. However, the existence of these levels is not supported by coincidence work, and each accommodates only one previously unassigned γ.

E(level)[†]	J^{π}[‡]	Comments
0.0	$5/2^+$	
189.19 *10*	$3/2^+$	
421.54 *5*	$7/2^+$	
840.18 *7*	$7/2^+$	
878.76 *7*	$(9/2)^+$	
1199.02 *17*	$(11/2)^+$	
1229.42 *8*	$9/2^+$	
1543.01 *19*	$(7/2,9/2,11/2^+)$	
1619.6 *3*	$(11/2)^+$	
1932.32 *13*	$7/2^+$	
1990.08 *22*	(7/2)	
1998.6 *3*	$7/2^+,9/2^+,11/2^+$	
2150.9 *5*	$7/2^+$	
2185.7? *6*		E(level): level proposed by 1974Oh07, based on deexciting γ's and coincidence work. However, neither 1975Pl05 nor 1981Gr20 observed these gammas.
2591.4 *4*	$7/2^+,9/2^+,11/2^+$	
2754.7 *4*	$7/2^+$	
2760.4 *5*	$7/2^+,9/2^+,11/2^+$	
2766.2 *5*	$7/2^+,9/2^+,11/2^+$	
2914.5 *10*		
2966.4 *6*	$7/2^+$	
3368.8 *6*	$7/2^+,9/2^+,11/2^+$	

[†] From a least squares fit to Eγ.
[‡] From Adopted Levels.

ε,$β^+$ radiations

E(decay)	E(level)	I$β^+$ [‡]	Iε[‡]	Log *ft*	I(ε+$β^+$)[†‡]	Comments
(1.5×10^2 *4*)	3368.8		0.18 *6*	4.4 *3*	0.18 *6*	εK=0.832 *14*; εL=0.135 *11*; εM+=0.033 *3*
(5.5×10^2 *4*)	2966.4		0.27 *9*	5.50 *16*	0.27 *9*	εK=0.8613 *6*; εL=0.1122 *5*; εM+=0.02659 *12*
(6.1×10^2 *4*)	2914.5		0.22 *15*	5.7 *3*	0.22 *15*	εK=0.8620 *5*; εL=0.1115 *4*; εM+=0.02642 *10*
(7.5×10^2 *4*)	2766.2		0.49 *13*	5.52 *13*	0.49 *13*	εK=0.8636 *3*; εL=0.11029 *21*; εM+=0.02608 *6*
(7.6×10^2 *4*)	2760.4		0.45 *12*	5.56 *13*	0.45 *12*	εK=0.8637 *3*; εL=0.11025 *21*; εM+=0.02607 *6*
(7.7×10^2 *4*)	2754.7		0.70 *13*	5.38 *9*	0.70 *13*	εK=0.8637 *3*; εL=0.11021 *21*; εM+=0.02606 *6*
(9.3×10^2 *4*)	2591.4		1.13 *15*	5.35 *7*	1.13 *15*	εK=0.8648 *2*; εL=0.10935 *14*; εM+=0.02582 *4*
(1.33×10$^{3\#}$ *4*)	2185.7?	0.0026 *14*	0.90 *22*	5.77 *11*	0.90 *22*	av Eβ=140 *13*; εK=0.8639 *11*; εL=0.10782 *21*; εM+=0.02542 *5*
(1.37×10^3 *4*)	2150.9	0.007 *3*	1.62 *20*	5.53 *6*	1.63 *20*	av Eβ=155 *13*; εK=0.8626 *15*; εL=0.1076 *3*;

Continued on next page (footnotes at end of table)

^{97}Rh ε decay (30.7 min) 1974Oh07,1975Pl05 (continued)

ε,β+ radiations (continued)

E(decay)	E(level)	Iβ+ ‡	Iε‡	Log *ft*	I(ε+β+)†‡	Comments
						εM+=0.02536 *7*
(1.52×10^3 *4*)	1998.6	0.022 *6*	1.17 *15*	5.77 *6*	1.19 *15*	av Eβ=221 *13*; εK=0.850 *4*; εL=0.1058 *6*; εM+=0.02492 *13*
(1.53×10^3 *4*)	1990.08	0.011 *4*	0.52 *12*	6.13 *10*	0.53 *12*	av Eβ=225 *13*; εK=0.849 *5*; εL=0.1056 *6*; εM+=0.02488 *14*
(1.59×10^3 *4*)	1932.32	0.11 *2*	3.5 *3*	5.33 *5*	3.6 *3*	av Eβ=250 *13*; εK=0.841 *6*; εL=0.1045 *7*; εM+=0.02461 *17*
(1.90×10^3 *4*)	1619.6	0.087 *15*	0.57 *8*	6.28 *7*	0.66 *9*	av Eβ=385 *14*; εK=0.753 *13*; εL=0.0931 *16*; εM+=0.0219 *4*
(1.98×10^3 *4*)	1543.01	0.12 *3*	0.56 *13*	6.32 *11*	0.68 *16*	av Eβ=419 *14*; εK=0.721 *14*; εL=0.0891 *17*; εM+=0.0210 *4*
(2.29×10^3 *4*)	1229.42	1.2 *1*	2.2 *2*	5.85 *5*	3.4 *3*	av Eβ=557 *14*; εK=0.567 *16*; εL=0.0699 *19*; εM+=0.0164 *5*
(2.32×10^3 *4*)	1199.02	0.55 *6*	0.95 *11*	6.23 *6*	1.50 *16*	av Eβ=571 *14*; εK=0.551 *16*; εL=0.0679 *19*; εM+=0.0160 *5*
(2.64×10^3 *4*)	878.76	3.0 *3*	2.6 *3*	5.91 *6*	5.6 *6*	av Eβ=715 *14*; εK=0.399 *13*; εL=0.0491 *16*; εM+=0.0116 *4*
(2.68×10^3 *4*)	840.18	4.5 *5*	3.6 *4*	5.78 *5*	8.1 *8*	av Eβ=732 *14*; εK=0.383 *13*; εL=0.0471 *16*; εM+=0.0111 *4*
(3.10×10^3 *4*)	421.54	49.1 *7*	19.1 *7*	5.184 *25*	68.2 *4*	av Eβ=923 *14*; εK=0.243 *8*; εL=0.0298 *10*; εM+=0.00701 *24* E(decay): Eβ+=2.12 *9* in coin with 421.5γ (1974Oh07).
(3.33×10^3 *4*)	189.19					I(ε+β+): GTOL upper limit (method 1): 0.41.

† Deduced from Iγ balance in level scheme with I(ε+β+ to g.s.)=0.
‡ Absolute intensity per 100 decays.
# Existence of this branch is questionable.

^{97}Rh ε decay (30.7 min) 1974Oh07,1975Pl05 (continued)

$\gamma(^{97}Ru)$

Iγ normalization: Σ (Iγ to g.s.)=100 and I(ε+β^+ to g.s.)=0.
1974Oh07: measured: t, Eγ, Eβ, Iγ, I(ce), $\gamma\gamma$, $\beta\gamma$, C(ce)(t). Detectors:Ge(Li) for γ with 2.5 keV FWHM at 1332 keV, Si(Li) for β, ce with 2.1 keV FWHM at 624 keV. Source: ^{96}Ru(p,γ), ^{101}Ru(p,5n) reactions.
1975Pl05: measured: t, Eγ, Iγ, I(ce), $\gamma\gamma$. Detector:Ge(Li) for γ, Si(Li) for ce. Source: ^{96}Ru(d,n), ^{97}Pd decay.
For additional unassigned gammas, see ^{97}Rh ε decay (46.2 min).

E$_\gamma$[†]	I$_\gamma$[‡h]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Mult.	δ	α[i]	Comments
189.21 *15*	1.4[#] *4*	189.19	3/2$^+$	0.0	5/2$^+$	M1+E2	0.30 *6*	0.061 *3*	α(K)=0.053 *2*; α(L)=0.0066 *4*; α(M)=0.00121 *7*; α(N+..)=0.00023 α(K)=0.0527 *22*; α(L)=0.0066 *4*; α(M)=0.00121 *7*; α(N+..)=0.000203 *11* α(N)=0.000194 *11*; α(O)=9.5×10^{-6} *4* Mult.,δ: see ^{97}Ru ε decay (46.2 min).
x311.7[&f] *5*	0.4[&] *1*								
320.3 *5*	0.48 *7*	1199.02	(11/2)$^+$	878.76	(9/2)$^+$				
x324.6[cg] *5*	0.3[c] *2*								
351.0 *4*	0.50 *7*	1229.42	9/2$^+$	878.76	(9/2)$^+$				
389.25 *5*	1.17 *7*	1229.42	9/2$^+$	840.18	7/2$^+$				
421.55 *5*	100	421.54	7/2$^+$	0.0	5/2$^+$				
457.30 *10*	1.22 *8*	878.76	(9/2)$^+$	421.54	7/2$^+$				
651.01 *10*	1.30 *12*	840.18	7/2$^+$	189.19	3/2$^+$				
664.1[#] *8*	0.11[@] *6*	1543.01	(7/2,9/2,11/2$^+$)	878.76	(9/2)$^+$				
x683.8[&f] *5*	0.4[&] *2*								
702.84[j] *18*	0.8[jb] *2*	1543.01	(7/2,9/2,11/2$^+$)	840.18	7/2$^+$				
702.84[j] *18*	0.4[jb] *2*	1932.32	7/2$^+$	1229.42	9/2$^+$				
x707.6 *4*	0.5 *2*								
740.9 *3*	0.40 *6*	1619.6	(11/2)$^+$	878.76	(9/2)$^+$				
764.9[@] *6*	0.2[@] *1*	2754.7	7/2$^+$	1990.08	(7/2)				
777.44 *18*	1.93 *17*	1199.02	(11/2)$^+$	421.54	7/2$^+$				
807.7 *2*	1.80 *12*	1229.42	9/2$^+$	421.54	7/2$^+$				
840.13 *9*	16.1 *9*	840.18	7/2$^+$	0.0	5/2$^+$				
x845.8[#f] *8*	0.2[#] *1*								
878.80 *8*	12.1 *7*	878.76	(9/2)$^+$	0.0	5/2$^+$				
967.9[@] *6*	0.28[@] *10*	2966.4	7/2$^+$	1998.6	7/2$^+$,9/2$^+$,11/2$^+$				
1053.70 *24*	1.97 *13*	1932.32	7/2$^+$	878.76	(9/2)$^+$				
1092.1 *3*	0.75 *8*	1932.32	7/2$^+$	840.18	7/2$^+$				
1111.49 *24*	0.65 *8*	1990.08	(7/2)	878.76	(9/2)$^+$				
1158.3 *4*	1.02 *10*	1998.6	7/2$^+$,9/2$^+$,11/2$^+$	840.18	7/2$^+$				
x1162[cf] *1*	0.2[c] *1*								

^{97}Rh ε decay (30.7 min) 1974Oh07,1975Pl05 (continued)

γ(^{97}Ru) (continued)

E_γ [†]	I_γ [‡ h]	E_i(level)	J_i^π	E_f	J_f^π	Comments
1197.9 5	0.49 10	1619.6	(11/2)$^+$	421.54	7/2$^+$	
1228.7 7	1.43 23	1229.42	9/2$^+$	0.0	5/2$^+$	
1272.9 9	0.39 8	2150.9	7/2$^+$	878.76	(9/2)$^+$	
x1301.7 [&] [f] 9	0.10 [&] 6					
1310.1 6	1.5 2	2150.9	7/2$^+$	840.18	7/2$^+$	E_γ,I_γ: from 1974Oh07; 1975Pl05 suggests that this γ is a doublet, with Eγ=1310 and 1312 keV with about equal intensity, but only one γ is placed in the level scheme.
x1312 [c] 1	1.0 [d] 4					
x1322.5 [&] [f] 8	0.4 [&] 1					
1345.1 [&] 10	0.2 [&] 1	2185.7?		840.18	7/2$^+$	
1391.9 [&] 7	0.4 [&] 1	2591.4	7/2$^+$,9/2$^+$,11/2$^+$	1199.02	(11/2)$^+$	
x1415.1 [&] [f] 9	0.2 [&] 1					
x1434.7 6	0.64 12					
x1469.3 [c] [g] 10	0.2 [c] 1					
1511.0 4	0.74 13	1932.32	7/2$^+$	421.54	7/2$^+$	
1577.1 4	0.85 13	1998.6	7/2$^+$,9/2$^+$,11/2$^+$	421.54	7/2$^+$	
x1615.0 [c] 10	0.2 [d] 1					
x1708.4 [&] [f] 8	0.2 [&] 1					
1712.9 5	0.55 11	2591.4	7/2$^+$,9/2$^+$,11/2$^+$	878.76	(9/2)$^+$	
x1722.7 [c] [g] 13	0.20 [c] 15					
1730.4 [c] 13	0.2 [d] 1	2150.9	7/2$^+$	421.54	7/2$^+$	
1742.5 [c] 13	0.3 [d] 1	1932.32	7/2$^+$	189.19	3/2$^+$	
1751.2 6	0.56 12	2591.4	7/2$^+$,9/2$^+$,11/2$^+$	840.18	7/2$^+$	
1764.3 [&] 9	0.6 [&] 2	2185.7?		421.54	7/2$^+$	
x1813.4 [g] 5	0.6 2					
1876.5 5	0.4 [#] 1	2754.7	7/2$^+$	878.76	(9/2)$^+$	E_γ,I_γ: doublet, γ is assigned to both 30.7 min and 46.2 min activities.
1881.4 [c] 9	0.2 [d] 1	2760.4	7/2$^+$,9/2$^+$,11/2$^+$	878.76	(9/2)$^+$	
1888.0 6	0.2 [#] 1	2766.2	7/2$^+$,9/2$^+$,11/2$^+$	878.76	(9/2)$^+$	E_γ: 1975Pl05 and 1981Gr20 assign this γ to 46.2 min decay.
1920.0 [c] 14	0.15 [d] 10	2760.4	7/2$^+$,9/2$^+$,11/2$^+$	840.18	7/2$^+$	
1925.1 [e] 7	0.45 14	2766.2	7/2$^+$,9/2$^+$,11/2$^+$	840.18	7/2$^+$	
1931.7 6	0.71 15	1932.32	7/2$^+$	0.0	5/2$^+$	
1962.4 [c] 15	0.1 [d] 1	2150.9	7/2$^+$	189.19	3/2$^+$	
x1978.2 [&] [f] 9	0.2 [&] 1					
1989.2 6	0.26 8	1990.08	(7/2)	0.0	5/2$^+$	
x2050 [c] 1	0.10 [d] 7					
2152.1 [k] 6	<1.4	2150.9	7/2$^+$	0.0	5/2$^+$	E_γ: this γ assigned to 46.2 min decay by 1974Oh07.
2185.7 [&] 8	0.4 [&] 2	2185.7?		0.0	5/2$^+$	
2338.9 5	0.25 6	2760.4	7/2$^+$,9/2$^+$,11/2$^+$	421.54	7/2$^+$	

^{97}Rh ε decay (30.7 min) 1974Oh07,1975Pl05 (continued)

γ(^{97}Ru) (continued)

E_γ [†]	I_γ [‡ h]	E_i(level)	J_i^π	E_f	J_f^π	Comments
2492.9 *10*	0.3[#] *2*	2914.5		421.54	7/2+	E_γ: γ doublet with γ in 46.2 min decay; not observed by 1981Gr20.
2563.7[a]	0.14[a]	2754.7	7/2+	189.19	3/2+	
2753.8[#] *8*	0.2[@] *1*	2754.7	7/2+	0.0	5/2+	
2777.0[#] *10*	0.08[@] *5*	2966.4	7/2+	189.19	3/2+	
[x]2788.9[&f] *10*	0.10[&] *6*					
[x]2800.8[e] *7*	0.25 *7*					
[x]2843.8[&f] *9*	0.10[&] *7*					
2947.2 *6*	0.24 *8*	3368.8	7/2+,9/2+,11/2+	421.54	7/2+	
[x]3000.1[&f] *9*	0.10[&] *5*					
[x]3101.6 *8*	0.20 *6*					
[x]3303.6[&f] *10*	0.10[&] *5*					
[x]3400.8[&f] *10*	0.10[&] *5*					
[x]3441.4[&f] *10*	0.10[&] *5*					
[x]3494.5[&f] *10*	0.10[&] *8*					

[†] Weighted average of measurements given by 1974Oh07 and 1975Pl05, unless otherwise noted. 1981Gr20 does not quote uncertainties of measurements and in general, the values quoted agree exactly with those of 1975Pl05.
[‡] Weighted average of measurements by 1974Oh07, 1975Pl05 and 1981Gr20, unless otherwise noted.
[#] From 1974Oh07.
[@] Unweighted average of measurements by 1974Oh07 and 1981Gr20.
[&] From 1974Oh07, not observed by 1975Pl05 or 1981Gr20.
[a] From 1981Gr20, not observed by 1974Oh07 or 1975Pl05.
[b] Total intensity of the doublet divided according to the intensity ratio in 1974Oh07.
[c] From 1975Pl05.
[d] Average of measurements by 1975Pl05 and 1981Gr20, not observed by 1974Oh07.
[e] γ not observed by 1981Gr20, Iγ is the average of measurements by 1974Oh07, 1975Pl05.
[f] Assignment to g.s. or ms activity uncertain.
[g] Assigned to g.s.? activity by 1975Pl05.
[h] For absolute intensity per 100 decays, multiply by 0.7463.
[i] 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.
[j] Multiply placed with intensity suitably divided.
[k] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

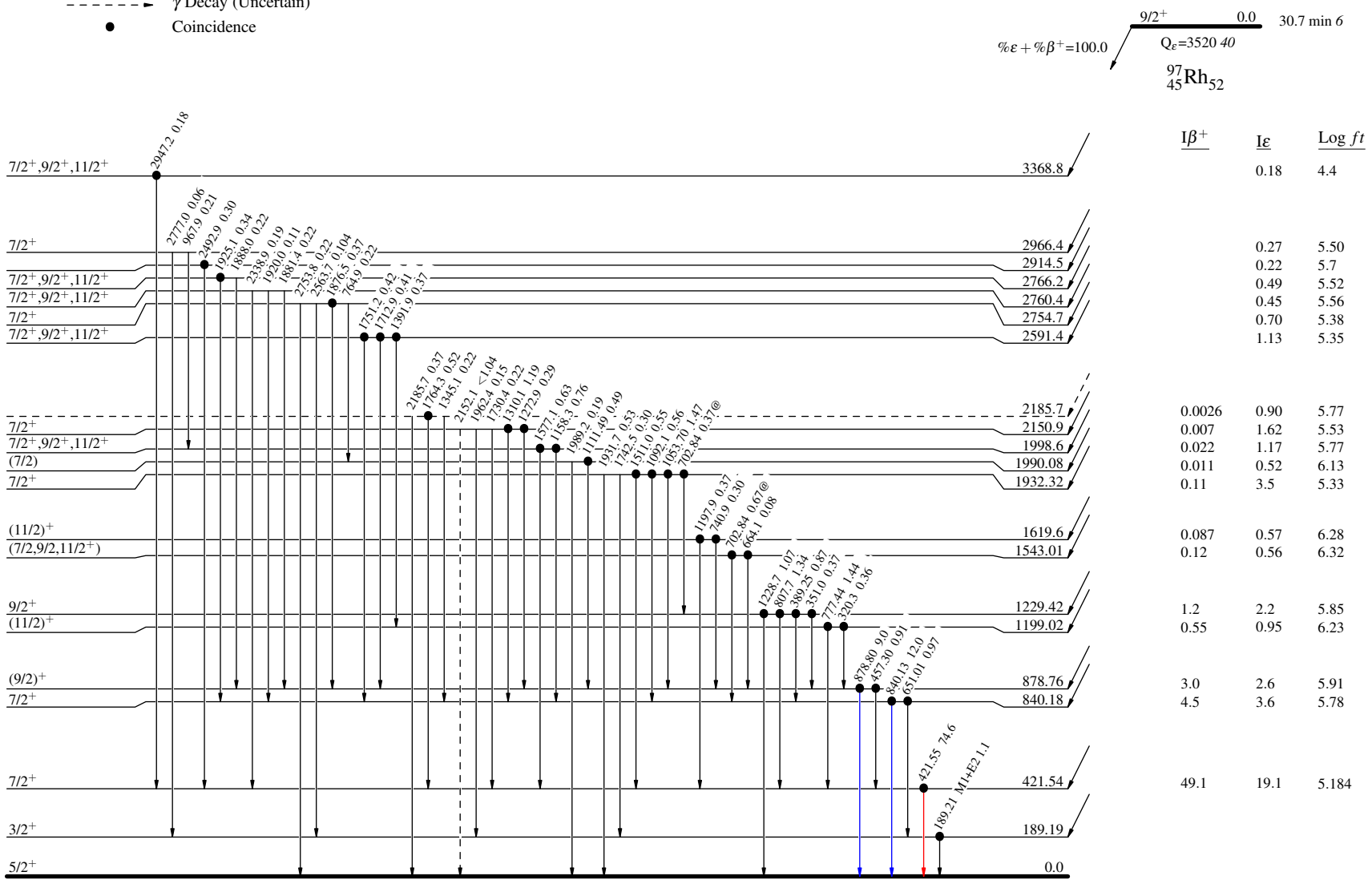
$^{97}_{44}Ru_{53}$-5

^{97}Rh ε decay (30.7 min) 1974Oh07,1975Pl05

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 decays through this branch
@ 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)
- Coincidence



$^{97}_{44}Ru_{53}$

$^{97}_{44}Ru_{53}$-6