^{86}Br β^- decay (55.1 s) 1978LeZA,1975Hu02,1972Ac01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Alexandru Negret, Balraj Singh	NDS 124, 1 (2015)	30-Nov-2014

Parent: ^{86}Br: E=0; $J^\pi=(1^-)$; $T_{1/2}$=55.1 s *4*; Q(β^-)=7633 *3*; %β^- decay=100.0

^{86}Br-J^π,$T_{1/2}$: From ^{86}Br Adopted Levels.

^{86}Br-Q(β^-): From 2012Wa38.

1978LeZA (Table of Isotopes-1978): the decay scheme is adopted from a private communication in 1977 from S. Prussin (University of California, Berkeley). In comparison to earlier studies by 1975Hu02 and 1972Ac01, about 30 additional gamma rays and six new levels were reported in this communication, and the precision of Eγ and Iγ values was significantly better than that in previous studies. Consultation by one of the evaluators (in February 2001) with S. Prussin suggested that their work was not published, and a copy of the private communication submitted to 1978LeZA was no longer available. A copy was neither available from LBNL Isotopes Project. But in view of better energy and intensity precisions in this experiment, evaluators adopt most of the results of this study as given in 1978LeZA compilation.

1975Hu02: measured Eγ, Iγ, $T_{1/2}$; no level scheme is given in this paper.

1972Ac01: measured Eγ, Iγ, $T_{1/2}$. Mass-separated source.

1971Er15 (also 1970ErZZ): measured Eγ, Iγ, $T_{1/2}$.

2014Fi09: Modular Total Absorption Spectrometer (MTAS) system at HRIBF-ORNL facility used to obtain true beta feedings and average energy of emitted γ radiation as 4110 keV in contrast to 3260 keV from the decay scheme presented here. Authors introduced 65 pseudo levels to fit the observed total absorption spectrum.

Level scheme is mainly from 1972Ac01, with some modifications in 1978LeZA. Total absorption spectra in 2014Fi09 suggest that this level scheme is incomplete, and further state-of-the-art gamma-ray studies are needed to improve upon the knowledge of this decay scheme, and obtain some level of consistency with the total gamma absorption (TAGS) spectra.

Others:

1988Le21: measured Eγ, Iγ, yields.

1979Al05 (also 1982Al01): β and $\beta\gamma$ coin.

1977Ki14: $T_{1/2}$.

1975Al11 (also 1973Jo02): total γ absorption spectra.

1972Nu03, 1972Hi13: $T_{1/2}$.

1972KrYX: decay properties and yields.

1970Lu06: measured Eγ, Iγ, $T_{1/2}$. An additional 4.5-s activity was assigned to ^{86}Br based on the initial growth of 1564γ. This activity has not been confirmed in any of the later studies.

1966Wi03: γ, $\gamma\gamma$, β, $\beta\gamma$ coin.

1962St13: identified ^{86}Br nuclide, $T_{1/2}$.

Additional information 1.

^{86}Kr Levels

E(level)	J^π‡	E(level)	J^π‡	E(level)	J^π‡	E(level)	J^π‡
0	0^+	2916.82† *11*	(3^-)	5313.96† *20*		6211.8 *3*	1
1564.58 *6*	2^+	2926.13 *8*	$(2)^+$	5406.10 *23*	(1,2)	6720.5 *6*	(1,2)
2250.00 *9*	4^+	3009.41† *11*	$(1,2^+)$	5517.41 *18*	1^-	6768.29 *22*	(1,2)
2349.45 *7*	2^+	3098.83 *9*	3^-	6089.1† *5*	(1,2)		
2850.69 *8*	$(2,3)^+$	4315.80 *8*	(2^-)	6160.5 *4*	1^-		

† Level proposed in 1978LeZA only.

‡ From Adopted Levels.

^{86}Br β^- decay (55.1 s) 1978LeZA,1975Hu02,1972Ac01 (continued)

β^- radiations

E(decay)	E(level)	Iβ^-[†‡]	Log *ft*[†]	Comments
(865 *3*)	6768.29	0.91 *12*	5.7	av Eβ=300.7 *14*
(913 *3*)	6720.5	0.068 *14*	6.1	av Eβ=319.9 *18*
(1421 *3*)	6211.8	0.83 *14*	5.2	av Eβ=540.6 *14*
(1473 *3*)	6160.5	0.16 *2*	6.7	av Eβ=562.2 *16*
(1544 *3*)	6089.1	0.062 *14*	7.2	
2.2×10^3 *3*	5517.41	4.4 *5*	5.8	av Eβ=855.4 *15*
(2227 *3*)	5406.10	6.0 *6*	5.9	av Eβ=907.5 *15*
(2319 *3*)	5313.96	0.69 *10*	7.2	
(3317 *3*)	4315.80	51 *5*	5.4	av Eβ=1422.9 *15*
(4534[#] *3*)	3098.83	<0.7	>7.0	av Eβ=2007.3 *15*
(4624 *3*)	3009.41	0.62 *15*	7.2	
(4707 *3*)	2926.13	1.4 *5*	7.3	av Eβ=2090.5 *15*
(4716 *3*)	2916.82	0.53 *9*	7.2	No β feeding is expected to this level. Apparent feeding of 0.53% is most likely due to unobserved γ rays from higher levels feeding this level.
(4782 *3*)	2850.69	2.0 *4*	7.3	av Eβ=2127.1 *15*
(5284 *3*)	2349.45	3.7 *5*	7.3	av Eβ=2368.9 *15*
(5383[#] *3*)	2250.00	0.27 *5*		No β feeding is expected to this level. Apparent feeding of 0.27% is most likely due to unobserved γ rays from higher levels feeding this level.
(6068 *3*)	1564.58	13 *2*	7.2	av Eβ=2748.5 *15*
(7633 *3*)	0	15 *8*	7.5	av Eβ=3501.8 *15* Iβ^-: 1966Wi03 deduced from Kurie plots a g.s. β transition of roughly the same intensity as Iβ to the 1564 level and estimated I$\beta\approx$15%. 1979Al05 confirmed the existence of a g.s. branch, but no intensity was extracted. 50% uncertainty is assigned by the evaluators.

[†] Since the decay scheme is considered (by the evaluator) as incomplete, all β^- feedings and associated log *ft* values should be considered as approximate. The log *ft* values given here are not used in spin-parity assignments for levels in ^{86}Kr.
[‡] Absolute intensity per 100 decays.
[#] Existence of this branch is questionable.

$\gamma(^{86}Kr)$

Iγ normalization: Based on Ti(γ rays to g.s.)=85 *7*, adopting Iβ(g.s.)=15% 7. Note that 11.5 units of relative intensity is unplaced. Assuming half of this intensity feeds the ground state, normalization factor will be 0.59.

Following γ rays with Eγ(Iγ) reported by 1971Er15 only are omitted: 533.2 *5* (8.9), 2998 *1* (3.6), 3342 (7.3), 3622 *2* (6.6), 3762 *2* (5.8). The intensities reported by 1971Er15 are fairly large which should have been seen in 1975Hu02, 1972Ac01 or results cited in 1978LeZA compilation.

$\gamma\gamma$-coincidences from 1966Wi03. The $\gamma\gamma$-coin data using pair of Ge(Li) detectors mentioned in 1978LeZA compilation.

E$_\gamma$[†]	I$_\gamma$[†@]	E$_i$(level)	J$_i^\pi$	E$_f$	J$_f^\pi$	Comments
501.25 *7*	2.76 *25*	2850.69	(2,3)$^+$	2349.45	2$^+$	Additional information 6.
[x]538.04[‡] *17*	0.61[‡] *5*					
576.72[‡] *8*	0.79[‡] *6*	2926.13	(2)$^+$	2349.45	2$^+$	
660.02[‡] *10*	1.33[‡] *7*	3009.41	(1,2$^+$)	2349.45	2$^+$	
666.77[‡] *7*	1.40[‡] *5*	2916.82	(3$^-$)	2250.00	4$^+$	
685.37[‡] *7*	1.84[‡] *5*	2250.00	4$^+$	1564.58	2$^+$	
[x]749.5 *7*	1.1 *2*					Placement from 3099 level in 1972Ac01 is rejected here since γ is not reported in 1978LeZA, 1975Hu02 and in (n,n$'\gamma$). Assignment of this γ to ^{86}Br decay is considered uncertain.

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^{86}Br β^- decay (55.1 s) 1978LeZA,1975Hu02,1972Ac01 (continued)

$\gamma(^{86}Kr)$ (continued)

E_γ [†]	I_γ [†@]	E_i(level)	J_i^π	E_f	J_f^π	Comments
784.96 *8*	5.77 *15*	2349.45	2^+	1564.58	2^+	Additional information 4.
x803.3 *3*	4.4 *10*					Placement from 6212 level in 1972Ac01 is rejected here since γ is not reported in 1978LeZA, and in (γ,γ'). 1975Hu02 discuss an 802.5γ and its complex peak structure with contributions from several other isotopes. Also Eγ=802.5 fits poorly in the level scheme. Assignment of this γ to ^{86}Br decay is considered uncertain.
x899.81[‡#] *27*	0.42[‡] *8*					
x1155.92[‡] *17*	0.71[‡] *8*					
1217.02 *9*	10.66 *23*	4315.80	(2^-)	3098.83	3^-	Additional information 11.
1286.08 *9*	12.40 *24*	2850.69	$(2,3)^+$	1564.58	2^+	Additional information 7.
1306.57[‡] *25*	0.62[‡] *7*	4315.80	(2^-)	3009.41	$(1,2^+)$	
1361.63 *10*	16.4 *4*	2926.13	$(2)^+$	1564.58	2^+	Additional information 8.
1389.73 *9*	16.4 *3*	4315.80	(2^-)	2926.13	$(2)^+$	Additional information 12.
1398.48[‡] *22*	0.55[‡] *10*	4315.80	(2^-)	2916.82	(3^-)	
1465.09 *10*	12.0 *3*	4315.80	(2^-)	2850.69	$(2,3)^+$	Additional information 13.
1534.24 *8*	12.5 *3*	3098.83	3^-	1564.58	2^+	Additional information 10.
1564.60 *7*	100.0 *30*	1564.58	2^+	0	0^+	Additional information 3.
x1770.3 *3*	0.60 *7*					Tentative placement from a 3334 level in earlier NDS evaluations is omitted here since it is not confirmed in other experiments. Additional information 2.
1966.27 *11*	10.6 *3*	4315.80	(2^-)	2349.45	2^+	Additional information 14.
2349.37 *12*	15.7 *4*	2349.45	2^+	0	0^+	Additional information 5.
2387.79[‡] *18*	1.12[‡] *12*	5313.96		2926.13	$(2)^+$	
2418.24[‡] *23*	1.3[‡] *5*	5517.41	1^-	3098.83	3^-	
x2471.3[‡] *3*	0.72[‡] *10*					
2480.4[‡] *5*	0.64[‡] *10*	5406.10	(1,2)	2926.13	$(2)^+$	
2751.06 *15*	30.8 *9*	4315.80	(2^-)	1564.58	2^+	Additional information 15.
2925.93 *20*	3.3 *4*	2926.13	$(2)^+$	0	0^+	Additional information 9.
x2973.2[‡] *4*	0.78[‡] *10*					
3009.0[‡] *3*	1.57[‡] *12*	3009.41	$(1,2^+)$	0	0^+	
3064.38[‡#&] *19*	0.38[‡] *4*	5313.96		2250.00	4^+	
x3240.6[‡] *4*	0.49[‡] *10*					
x3573.3[‡] *4*	1.36[‡] *23*					
3758.8[‡] *3*	1.28[‡] *15*	6768.29	(1,2)	3009.41	$(1,2^+)$	
x3783.1[‡] *6*	1.5[‡] *3*					
x4136.5[‡] *3*	0.7[‡] *3*					
4316.5[‡&] *6*	0.19[‡] *10*	4315.80	(2^-)	0	0^+	
x4401.2[‡] *3*	1.37[‡] *14*					
x4415.3[‡#] *5*	0.33[‡] *7*					
x4721.0[‡] *3*	0.71[‡] *7*					
x4885.12[‡] *21*	1.98[‡] *10*					
x5032.6[‡#] *6*	0.22[‡] *5*					
5405.80 *25*	9.0 *5*	5406.10	(1,2)	0	0^+	Additional information 16.
x5466.1[‡#] *7*	0.10[‡] *3*					
5517.58 *25*	5.8 *3*	5517.41	1^-	0	0^+	Additional information 17.
x5575.0[‡#] *4*	0.12[‡] *3*					
6088.9[‡] *5*	0.10[‡] *2*	6089.1	(1,2)	0	0^+	

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^{86}Br β^- decay (55.1 s) 1978LeZA,1975Hu02,1972Ac01 (continued)

$\gamma(^{86}Kr)$ (continued)

E_γ †	I_γ †@	E_i(level)	J_i^π	E_f	J_f^π	Comments
6160.3 *4*	0.25 *3*	6160.5	1^-	0	0^+	Additional information 18.
6211.6 *3*	1.34 *20*	6211.8	1	0	0^+	Additional information 19.
6720.2 *6*	0.11 *2*	6720.5	(1,2)	0	0^+	Additional information 20.
6768.0 *3*	0.19 *2*	6768.29	(1,2)	0	0^+	Additional information 21.

† From 1978LeZA. Values from 1975Hu02, 1972Ac01 and 1971Er15 are in general agreement with those in 1978LeZA, but are less precise, especially in 1975Hu02 and 1971Er15. No uncertainties on Iγ values were given in 1971Er15.

‡ γ from 1978LeZA only.

Uncertain assignment in 1978LeZA.

@ For absolute intensity per 100 decays, multiply by 0.62 *5*.

& Placement of transition in the level scheme is uncertain.

x γ ray not placed in level scheme.

^{86}Br β^- decay (55.1 s) 1978LeZA,1975Hu02,1972Ac01

Decay Scheme

Intensities: $I_{(\gamma+ce)}$ per 100 parent decays

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

(1^-) 0 — 55.1 s 4
Q_{β^-}=7633 3 $\%\beta^-$=100
$^{86}_{35}Br_{51}$

$I\beta^-$	Log ft		
0.91	5.7	(1,2)	6768.29
0.068	6.1	(1,2)	6720.5
0.83	5.2	1	6211.8
0.16	6.7	1^-	6160.5
0.062	7.2	(1,2)	6089.1
4.4	5.8	1^-	5517.41
6.0	5.9	(1,2)	5406.10
0.69	7.2		5313.96
51	5.4	(2^-)	4315.80
<0.7	>7.0	3^-	3098.83
0.62	7.2	$(1,2^+)$	3009.41
1.4	7.3	$(2)^+$	2926.13
0.53	7.2	(3^-)	2916.82
2.0	7.3	$(2,3)^+$	2850.69
3.7	7.3	2^+	2349.45
0.27		4^+	2250.00
13	7.2	2^+	1564.58
15	7.5	0^+	0

6768.0 0.124; 3758.8 0.79; 6720.2 0.074; 6211.6 0.83; 6160.3 0.155; 6088.9 0.068; 5517.58 3.6; 2418.24 0.8; 5405.80 5.6; 2480.4 0.40; 3064.38 0.24; 2387.79 0.69; 4316.5 0.12; 2751.06 19.1; 1966.27 6.6; 1465.09 7.4; 1398.48 0.34; 1389.73 10.2; 1306.57 0.38; 1217.02 6.6; 1534.24 7.8; 3009.0 0.97; 660.02 0.82; 2925.93 2.0; 1361.63 10.2; 576.72 0.49; 666.77 0.87; 1286.08 7.7; 501.25 1.71; 2349.37 9.7; 784.96 3.6; 685.37 1.14; 1564.60 62

$^{86}_{36}Kr_{50}$