^{140}La - Comments on evaluation of decay data by V.P. Chechev and N.K. Kuzmenko

The first DDEP evaluation of ^{140}La decay data was done by R. Helmer in 2003 (2004BeZR). The current evaluation has been completed in May 2015 with a literature cut-off by the same date. The latter evaluators have followed fully the Helmer's approach to the evaluation of gamma ray energies and emission probabilities updating the evaluated values of ICC and other decay characteristics due to new publications of 2004-2014.

1. DECAY SCHEME

The structure of the adopted decay scheme of ^{140}La is based on the ENSDF (NDS) evaluation by N. Nica (2007Ni07). ^{140}La disintegrates by β^- emission via ^{140}Ce excited levels. The level scheme is incomplete as there are many levels in ^{140}Ce below the β^- decay energy of 3761 keV that are not reported in these decay data, so some other levels may be weakly populated.

2. NUCLEAR DATA

Q^- value is from 2012 mass evaluation by Wang et al. (2012Wa38).

The recommended half-life of ^{140}La is based on the experimental results given in Table 1.

Table 1. Experimental values of the ^{140}La half-life (in hours)

N	Author(s) and year	Reference	$T_{1/2}$ (h)	Method and comments
1	Kirby and Salutsky (1954)	1954Ki08	40.224 (20)	β counting, proportional counter
2	Yaffe *et al.* (1954)	1954Ya02	40.31 (6)	β counting, proportional counter
3	Peppard *et al.* (1957)	1957Pe09	40.27 (5)	β counting, proportional counter
4	Wille and Fink (1960)	1960Wi10	40 (2)	β counting, proportional counter; *rejected* on Chauvenet's criterion
5	Simonet *et al.* (1965)	1965Si17	40.23 (3)	Ionization chamber
6	Karlsson *et al.* (1967)	1967Ka12	40.2 (2)	Ionization chamber
7	Reynolds *et al.* (1968)	1968Re04	40.2 (2)	Ionization chamber
8	Debertin *et al.* (1977)	1977DeYO	40.272 (7)	4πγ ionization chamber; *omitted* as superseded by 13

N	Author(s) and year	Reference	$T_{1/2}$ (h)	Method and comments
9	Davis *et al.* (1978)	1978Da21	40.232 (67)	4πγ ionization chamber
10	Houtermans *et al.* (1980)	1980Ho17	40.280 (6)	4πγ ionization chamber
11	Olomo and MacMahon (1980)	1980Ol03	40.295 (5)	4πγ ionization chamber
12	Hoppes *et al.* (1982)	1982HoZJ	40.279 (17)	4πγ ionization chamber; *omitted* as superseded by 15
13	Walz *et al.* (1983)	1983Wa26	40.270 (29)	Proportional counter
14	Abzouzi *et al.* (1989)	1989Ab18	40.284 (5)	4πγ ionization chamber
15	Unterweger *et al.*	1992Un01, 2002Un02, 2012Fi12	40.293 (12)	4πγ ionization chamber; *omitted* as superseded by 17
16	Adam *et al.* (2002)	2002Ad04	40.34 (4)	Ge(Li) detector
17	Unterweger and Fitzgerald (2014)	2014Un01	40.294 (7)	4πγ ionization chamber
	Recommended value		**40.286 (5)**	**LWM**

The values 8, 12 and 15 were not used because they were replaced ultimately by later results of the same laboratory. The value 4 was rejected on Chauvenet's criterion.

The weighted average of the 13 remaining values is 40.2864 h. The internal uncertainty is 0.0027 h. The external uncertainty is 0.0036 h. The ratio of the reduced χ^2 / χ^2_{crit} is 1.7/2.1. The smallest experimental uncertainty is 0.005 h.

The recommended value of ^{140}La half-life is **40.286 (5) h, or 1.678 58 (21) d**. It can be compared with earlier evaluations of 1.678 50 (17) d (2004BeZR) and 1.678 55 (12) d (2007Ni07).

2.1. Beta Transitions

The energies of β^- transitions have been obtained using the Q^- value and the ^{140}Ce level energies (Table 2) adopted from Helmer's least-squares fit to the γ-ray energies (see section 5.2 and 2004BeZR) . The level spins, parities and half-lives of ^{140}Ce are adopted from 2007Ni07.

The probabilities of β^--transitions $P_{\beta-}$ have been deduced from the P(γ+ce) balance at each level of ^{140}Ce.

Table 2. ^{140}Ce levels populated in ^{140}La β^--decay

Level	Energy(keV)	Spin and parity	Half-life	$P_{\beta-}$ (%)
0	0	0+	Stable	-
1	1596.213 (13)	2+	0.0916 (19) ps	4.5 (6)
2	1903.29 (4)	0+	0.40 (3) ns	-
3	2083.236 (14)	4+	3.45 (3) ns	20.8 (6)
4	2107.83 (4)	6+	7.3 (15) µs	-
5	2347.868 (14)	2+	≤ 0.2 ns	5.03 (12)
6	2349.789 (9)	5+	≤ 10 ns	0.262 (22)
7	2411.997 (14)	3+	55 (15) ps	44.8 (4)
8	2464.055 (21)	3−	0.10 (2) ps	5.60 (7)
9	2480.91 (6)	4+	3.2 (3) ns	1.14 (2)
10	2515.749 (16)	3+		5.80 (4)
11	2521.414 (14)	2+	≤ 0.1 ns	11.11 (9)
12	2547.205 (26)	1+		0.636 (7)
13	2899.56 (7)	2+		0.112 (6)
14	3000.88 (9)	2+		0.085 (9)
15	3118.53 (10)	2+		0.027 (1)
16	3319.56 (24)	2+		0.0039 (3)
17	3394.82 (9)	(4−)		0.020 (4)
18	3473.55 (18)	3−		0.052 (7)
19	3520.8 (2)	(4+)		0.011 (3)

As discussed in 2004BeZR the β^- branches to the levels at 0, 1903 and 2107 keV are non unique 3rd forbidden. The log *ft* systematics of 1998Si17 give only one value, 17.5, for this class of β^- decays. From the data of 1998Si17, it is reasonable to assume a lower limit of $\log ft > 15$ for this class. The corresponding P_{β^-} limits are then < 1×10^{-4} %; < 1×10^{-5} %; and

< 1×10^{-5} %, respectively. Although there have been many analyses of the β^- spectrum, only 1966Dz05 has reported a branch to the ground state. Their intensity of 5 (2) × 10^{-5} % is compatible with the limit from the log *ft* systematics; however, since others have not seen this branch, this value is assumed to be too large. In any case, the value is negligible in determining the normalization of the γ-ray emission probabilities. These three P_{β^-} are all set to zero in the adopted decay scheme.

The average β^- energies and the log *ft* are from the LOGFT program (http://www.nndc.bnl.gov/logft/).

2.2. Gamma Transitions and Internal Conversion Coefficients

The γ-ray transition energies have been obtained as given in sect. 5.2.

The gamma-ray transition probability for $\gamma_{4,3}$ (24.6 keV) has been deduced from the intensity balance for level at 2107.8 keV assuming that corresponding P_{β^-} < 1×10^{-5} % (see sect. 2.1). The deduced value of 0.480 (11) % can be compared with the value for Pγ+ce = 0.32 (4) %, reported by 1967Ka12, which is presumably the contribution of the emission probability of L - conversion electrons.

The probability of the 1903-keV E0 transition ($\gamma_{2,0}$) of 0.0146 (15) % has been adopted from measurements of conversion electrons in 1991Ch05. Considering with this value the intensity balance at the level 2 (1903 keV) it is important to be defined with the value of $P\gamma_{11,2}$ (618 keV) as the measured values of the relative $\gamma_{11,2}$ (618 keV)-ray intensity are very discrepant (Table 5). When using the values from 1980Ka32 and 1991Ch05 (the average value $P\gamma_{11,2}$ (618 keV) = 0.041 (3) %), we have the significant intensity imbalance at the level 2. If we use for $P\gamma_{11,2}$ (618 keV) the lower value of 0.014 (3) % measured in 1982Ad02, the balance becomes exact. Therefore we adopt the value of 0.014 (3) % for $P\gamma_{11,2}$ (618 keV).

The remaining gamma-ray transition probabilities have been obtained from their gamma-ray emission probabilities and the total ICC(s).

The adopted ICC(s) are obtained from the theoretical values by using the adopted mixing ratios δ and the BrIcc computer program (http://bricc.anu.edu.au), accepting the “frozen orbital (no hole)” approximation (2008Ki07). The multipolarities and mixing ratios δ are from 2007Ni07.

3. ATOMIC DATA

The atomic data (fluorescence yields, X-ray energies and relative probabilities, and Auger electrons energies and relative probabilities) have been deduced by using the SAISINUC software (1996Be46).

4. ELECTRON EMISSIONS

The energies of the conversion electrons have been obtained from the gamma-ray transition energies and the electron binding energies. The absolute emission probabilities of the conversion electrons have been deduced using recommended Pγ and ICC values. The absolute emission probabilities of K and L Auger electrons have been calculated using the EMISSION computer program (2000Sc47).

The number of electron-positron pairs per 100 disintegrations (Pcp) have been obtained using the adopted α_π values.

β^- average energies have been calculated using the LOGFT computer program (http://www.nndc.bnl.gov/logft/).

5. PHOTON EMISSIONS

5.1. X-Ray Emissions

The absolute emission probabilities of Ce KX- and LX- rays have been calculated using the EMISSION computer program. In Table 3 these calculated absolute emission probabilities of Ce KX- rays are compared with values deduced from the experimental relative intensities and the normalization factor (0.9540) and scaling factor (1.027), see sect. 5.2.

Table 3. Experimental and recommended Ce KX - ray emission probabilities (%) in decay of ^{140}La

KX-ray	1970Ka18	1982Ad02	1991Ch05	Recommended (calculated)
Kα	2.4 (7)	1.73 (6)	1.68 (4)	1.673 (15)
Kβ	0.35 (8)	0.44 (2)	0.387 (14)	0.409 (7)

5.2. Gamma Ray Emissions

The γ-ray energies were determined from the reported values in Table 4. (2004BeZR). All of these 187 energies were entered into a simultaneous least-squares fit to determine the energies of the 19 excited levels. The adopted γ-ray transition energies were then computed from the differences between the level energies, with the corrections for recoil (2004BeZR).

The gamma-ray emission probability for Pγ+ce for $\gamma_{4,3}$ (24.6 keV) has been deduced from its gamma-ray transition probability (see section 2.2) and the total ICC α_T.

The other gamma-ray emission probabilities have been deduced from the relative γ-ray intensities which were determined from the data in Table 5. Several of these sets of data were published as emission probabilities and have been scaled by Helmer (2004BeZR) to obtain values relative to the 1596-keV γ-ray. The LWEIGHT program using the limitation of relative statistical weight method (LWM) was used to compute the average values (Browne, E. Limitation of Relative Statistical Weights, a method for evaluating discrepant data. In: INDC(NDS)-363, IAEA, March 1998. MacMahon, T.D., and Browne, E. LWEIGHT, a computer program to calculate averages, Version 1.3. March 2000). In this calculation, if a particular value contributes more than 50% of the relative weight and the initial fit has a reduced- χ^2 of more than the critical reduced - χ^2 for the number of input values, the uncertainty of the most precise value is increase to reduce its relative weight to 50%. The critical reduced - χ^2 values are: 6.6 for 2 input values; 4.6 for 3; 3.8 for 4; 3.3 for 5; 3.0 for 6; 2.5 for 9; 2.4 for 10; 2.3 for 11; and 2.2 for 12 or 13. Some values have been deleted from the averaging, as indicated in the table and the evaluator (Helmer, 2004BeZR) has arbitrarily increased a few input uncertainties.

At the time when many of these measurements were made, there was a lack of good Ge detector efficiency calibration standards in the region of 1596 keV. Therefore, the evaluator (Helmer, 2004BeZR) has introduced an energy-dependent scaling factor based on the emission probabilities from 1977De34 for thirteen lines from 266 to 2521 keV. This factor, which is shown in Table 5 and varies by 3%, corrects for this assumed systematic deviation of the Ge detector efficiencies.

The total γ-ray feeding of the ground state is set to 100%, with no direct β^- decay, to obtain a normalization factor of **0.9540 (5)** to convert these relative emission probabilities to absolute probabilities as given in the last column of Table 5.

Table 4. Experimental and adopted γ-ray energies

1964Re09	1967Ka12	1968Ba18	1968Gu05	1970Ka18	1970Ke06	1972GeZG	1978Ar28	1979Bo26	1980Ka32	1982Ad02	**Adopted (keV)**
	24.595 (4)										**24.595 (4)**
	64.130 (7)	64.135 (10)									**64.129 (4)**
	68.916 (6)	69.0 (3)									**68.923 (5)**
	109.417 (6)	109.418 (7)				109.47 (20)				109.422 (11)	**109.417 (4)**
	131.122 (8)	131.121 (8)				131.15 (20)			130.97 (20)	131.117 (8)	**131.121 (4)**
	173.550 (11)	173.536 (12)				173.50 (20)			173.49 (17)	173.543 (9)	**173.546 (5)**
241.97 (3)	241.961 (22)	241.966 (12)				241.90 (8)	241.88 (10)		242.06 (9)	241.933 (30)	**241.959 (6)**
266.52 (6)	266.547 (22)	266.551 (14)				266.61 (6)	266.58 (10)		266.67 (7)	266.543 (12)	**266.554 (5)**
		306.9 (2)				306.5 (4)			307.1 (2)	306.9 (2)	**307.08 (4)**
328.789 (15)		328.768 (12)	328.752 (30)		328.745 (15)	328.76 (5)	328.80 (10)	328.746 (25)	328.78 (5)	328.762 (8)	**328.761 (4)**
	397.8 (3)	397.79 (11)				397.66 (10)			397.8 (1)	397.52 (5)	**397.674 (6)**
432.55 (8)	432.62 (6)	432.530 (29)			432.490 (20)	432.52 (4)	432.51 (10)		432.66 (4)	432.493 (12)	**432.513 (8)**
				438.5 (4)					438 (1)	438.5 (5)	**438.178 (6)**
									445 (1)	445.5 (5)	**444.57 (4)**
487.027 (24)	487.042 (29)	487.029 (19)	487.032 (30)		486.995 (30)	487.009 (30)	487.09 (10)	487.15 (25)	486.99 (3)	487.021 (12)	**487.022 (6)**
		618.2 (7)				617.7 (3)			618.2 (1)	618.12 (5)	**618.12 (4)**
752.42 (33)	751.75 (8)	751.83 (8)				751.655 (35)	751.66 (10)		751.65 (4)	751.637 (18)	**751.653 (7)**
815.82 (10)	815.85 (7)	815.80 (9)			815.735 (40)	815.775 (30)	815.80 (10)		815.78 (4)	815.772 (19)	**815.781 (6)**
867.9 (5)	867.87 (15)	867.82 (14)				867.842 (35)	867.85 (10)		867.80 (4)	867.856 (20)	**867.839 (16)**
	919.63 (15)	919.5 (2)				919.54 (4)	919.63 (10)		919.48 (6)	919.550 (23)	**919.533 (10)**

1964Re09	1967Ka12	1968Ba18	1968Gu05	1970Ka18	1970Ke06	1972GeZG	1978Ar28	1979Bo26	1980Ka32	1982Ad02	**Adopted (keV)**
924.1 (6)	925.24 (9)	925.20 (17)				925.188 (35)	925.21 (10)		925.14 (6)	925.189 (21)	**925.198 (7)**
	950.9 (3)	951.1 (4)		951.4 (4)		951.00 (6)			950.95 (6)	950.987 (26)	**950.988 (20)**
										992.9 (5)	**992.64 (18)**
						1045.2 (3)			1045.0 (1)	1045.05 (24)	**1045.02 (9)**
						1097.2 (3)			1097.2 (2)	1097.20 (23)	**1097.58 (9)**
									1303.3 (1)	1303.5 (4)	**1303.34 (7)**
						1404.5 (2)			1404.9 (2)	1405.20 (17)	**1404.66 (9)**
1596.34 (25)	1596.49 (24)	1596/6 (2)	1596.20 (4)		1596.170 (25)	1596.17 (6)	1596.22 (10)		1596.17 (6)	1596.210 (35)	**1596.203 (13)**
										1877.29 (19)	**1877.33 (18)**
	1903.15 (30)								1903 (1)		**1903.28 (4)**
						1924.2 (3)			1924.4 (1)	1924.62 (13)	**1924.5 (2)**
									2082.9 (2)	2083.2 (5)	**2083.219 (14)**
	2348.1 (7)	2348.8 (6)				2347.80 (6)			2347.82 (6)	2347.88 (5)	**2347.847 (14)**
				2465.3 (8)					2464.0 (1)	2464.1 (5)	**2464.031 (20)**
2519.7 (34)	2521.7 (5)	2522.2 (4)				2521.32 (6)	2522.03 (10)		2521.36 (6)	2521.40 (5)	**2521.390 (14)**
	2547.1 (8)	2548.6 (8)		2547.5 (6)		2547.14 (6)			2547.19 (7)	2547.34 (11)	**2547.180 (23)**
	2900 (2)	2899.7 (5)		2899.7 (8)		2899.5 (2)			2899.5 (2)	2899.61 (16)	**2899.53 (7)**
	3119 (2)	3118.3 (7)		3119.0 (8)		3118.52 (15)			3118.4 (2)	3118.51 (16)	**3118.49 (10)**
	3322 (4)	3319.7 (25)		3319.6 (9)		3319.4 (6)			3319.3 (3)	3320.4 (6)	**3319.52 (24)**

Table 5. Experimental and adopted relative gamma-ray intensities in decay of ^{140}La. Part 1: references from 1962 to 1975

Energy (keV)	1962Ha14	1967Ka12	1968Ba18	1969KuZV	1970Ka18	1974HeYW	1975Ha50
64					~ 0.01		
68			0.065 (13)		0.064 (16)		
109		0.50 (20)	0.27 (4)	0.23 (2)	0.210 (15)	0.17 (4)	0.20 (4)
131		1.05 (15)	0.61 (9)	0.47 (3)	0.50 (3)	0.42 (5)	0.58 (4)
173			0.13 (5)		0.130 (20)	0.60 (20)	
241		0.83 (10)	0.45 (6)	0.58 (6)	0.410 (30)	0.51 (8)	0.66 (3)
266		0.83 (10)	0.56 (6)	0.53 (4)	0.490 (30) @	0.50 (5)	0.34 (3)
307			0.022 (11)		0.035 (17)		
328		25.4 (20)	21.4 (11)	22.4 (4)	19.4 (1) @	19.6 (13)	18.8 (5)
397			0.054 (25)		0.110 (35)	0.12 (3)	
432		3.5 (3)	3.11 (16)	3.06 (9)	2.85 (15)	2.94 (20)	3.0 (2)
438					0.021 (10)		
444					~ 0.25		
487		49.6 (32)	49.4 (25)	48.2 (5)	45.0 (2) @	44.7 (30)	39.7 (5)
618		0.4 (3)	0.044 (22)		~ 0.045		
751		4.5 (4)	4.40 (22)	4.66 (23)	4.40 (20)	4.5 (3)	4.9 (2)
815		23.5 (20)	24.1 (12)	24.9 (2)	23.5 (7)	24.2 (15)	26.8 (11)
867		5.6 (5)	5.64 (28)	5.91 (24)	5.60 (30)	5.7 (3)	6.5 (1)

919		2.5 (6)	2.73 (16)	2.59 (10)	2.64 (16)	2.89 (20)	3.4 (2)
925		6.8 (6)	7.24 (43)	6.94 (21)	7.10 (30)	7.2 (4)	7.9 (3)
950		0.8 (3)	0.56 (5)	0.62 (9)	0.550 (30)	0.56 (4)	
992							
1045							
1097							
1303							
1405							
1596	100.	100.	100.	100.	100.	100.	100.
1877						0.05 (2)	
1903							
1924						0.023 (5)	
2083							
2347	0.86 (17)	1.0 (2)	0.901 (45)	0.85 (6)	0.90 (6)	0.89 (6)	
2464					0.0018 (6) #		
2521	3.0 (6)	3.5 (2)	3.52 (18)	3.37 (10)	3.60 (18)	3.59 (18)	4.9 (4)
2547		0.11 (2)	0.122 (9)		0.110 (7)	0.110 (6)	
2899	0.082 (17)	0.060 (10)	0.070 (5)		0.065 (6)	0.073 (8)	
3118	0.035 (10)	0.030 (10)	0.027 (3)		0.027 (4)	0.028 (3)	
3320			0.008 (4)		0.0047 (15)	0.050 (3)	

Table 5. Experimental and adopted relative gamma-ray intensities in decay of ^{140}La. Part 2: references from 1976 to 1991

Energy (keV)	1976Li06	1977De34	1977Ge12	1978Ar28	1980Ka32	1982Ad02	1991Ch05	**LWM.**	**Reduced χ^2**	**Scaling factor**	**Adopted**	**Emission probability (%)**
64						0.011 (4)	0.015 (2)	0.0142 (18)		1.027	**0.0146 (20)**	**0.014 (2)**
68					0.070 (16)	0.080 (6)	0.079 (2)	0.0785 (19)		1.027	**0.0806 (20)**	**0.077 (2)**
109	0.20 (9)				0.170 (10) @	0.220 (10)	0.230 (4)	0.221 (6)	1.9	1.027	**0.227 (6)**	**0.217 (6)**
131	0.46 (9)				0.44 (1) @	0.48 (3)	0.49 (1) *	0.479 (15)	2.9	1.027	**0.492 (15)**	**0.47 (1)**
173					0.120 (10)	0.110 (10)	0.133 (4)	0.129 (5)	2.2	1.027	**0.132 (5)**	**0.126 (5)**
241	0.52 (18)	0.6 (1)		0.51 (9)	0.450 (10)	0.460 (30)	0.434 (8) *	0.445 (10)	2.7	1.027	**0.457 (10)**	**0.436 (10)**
266	0.53 (6)	0.7 (1)		0.50 (3)	0.520 (10)	0.500 (30)	0.488 (8)	0.502 (9)	2.3	1.027	**0.516 (9)**	**0.492 (9)**
307					0.022 (6)	0.020 (5)	0.026 (7)	0.022 (3)		1.027	**0.023 (5)**	**0.022 (5)**
328	21.2 (6)	22 (2)	21.46 (22)	21.5 (6)	21.5 (4)	21.7 (4)	21.1 (3)	21.2 (3)	5.0	1.027	**21.8 (3)**	**20.8 (3)**
397					0.078 (3)	0.070 (5)	0.077 (5)	0.0763(24)	1.15	1.027	**0.078 (3)**	**0.075 (3)**
432	3.0 (4)	3.5 (2)	3.08 (3)	2.96 (16)	3.05 (3)	2.97 (15)	3.04 (3)	3.056 (17)	1.01	1.027	**3.14 (3)**	**3.00 (3)**
438					0.006 (3) *	<0.0014	0.041 (10)	0.0 18 (10)	4.1	1.027	**0.018 (10)**	**0.017 (10)**
444					0.005 (3)	0.0036 (12)	0.003 (1)	0.0034(7)		1.027	**0.004 (1)**	**0.003 (1)**
487	46.2 (11)	47 (2)	47.7 (5)	47.3 (9)	46.6 (9)	46.4 (8)	47.7 (6)	47.0 (4)	2.6	1.027	**48.3 (5)**	**46.1 (5)**
618					0.049 (6)	0.014 (3)	0.039 (4)	0.028 (14)	18.75	1.015	**0.014 (3)** [a]	**0.014 (3)**
751	4.40 (17)	4.6 (1)	4.65 (5)	4.37 (22)	4.45 (5)	4.36 (16)	4.54 (4)	4.536 (25)	1.10	1.015	**4.60 (5)**	**4.39 (5)**

Energy (keV)	1976Li06	1977De34	1977Ge12	1978Ar28	1980Ka32	1982Ad02	1991Ch05	**LWM.**	**Reduced χ^2**	**Scaling factor**	**Adopted**	**Emission probability (%)**
815	23.8 (6)	24.2 (4)	24.85 (25)	24.1 (5)	24.0 (4)	23.5 (7)	24.4 (2)	24.49 (13)	1.43	1.015	**24.86 (20)**	**23.72 (20)**
867	6.0 (5)	5.8 (3)	5.90 (6)	5.69 (10)	5.69 (6)	5.56 (19)	5.77 (7)	5.77 (3)		1.015	**5.85 (7)**	**5.58 (7)**
919	3.1 (4)	2.6 (2)	2.91 (4)	2.57 (14)	2.83 (4)	2.80 (9)	2.79 (3)	2.812 (24)	1.65	1.015	**2.86 (3)**	**2.73 (3)**
925	7.3 (8)	7.2 (3)	7.42 (8)	7.25 (16)	7.26 (8)	7.10 (21)	7.23 (7)	7.27 (4)		1.015	**7.38 (7)**	**7.04 (7)**
950	0.63 (12)	0.67 (6)			0.553 (7)	0.56 (3)	0.544 (7)	0.549 (5)		1.015	**0.557 (7)**	**0.531 (7)**
992						0.009 (3)	0.014 (5)	0.0103 (26)		1.015	**0.010 (3)**	**0.010 (3)**
1045					0.024 (4)	0.016 (4)	0.026 (15)	0.0202 (29)	1.08	1.015	**0.021 (4)**	**0.020 (4)**
1097					0.024 (5)	0.022 (5)	0.024 (5)	0.0233 (29)		1.015	**0.024 (5)**	**0.023 (5)**
1303					0.046 (6)	0.050 (7)	0.044 (7)	0.047 (4)		1.000	**0.047 (6)**	**0.045 (6)**
1405					0.066 (9)	0.068 (8)	0.062 (7)	0.065 (5)		1.000	**0.065 (8)**	**0.062 (8)**
1596	100.0	100.0 (3)	100 (1)	100.0 (3)	100.0	100.	100.0 (15)	100.0		1.000	**100.0**	**95.40 (5)**
1877						0.042 (6)	0.043 (4)	0.043 (3)		1.000	**0.043 (6)**	**0.041 (6)**
1903											**-**	**-**
1924					0.014 (3)	0.006 (2)	0.014 (2)	0.0115 (28)	5.0	1.000	**0.012 (3)**	**0.011 (3)**
2083					0.045 (3)	0.007 (2) #	0.031 (2)	0.038 (7)	11	1.000	**0.038 (7)**	**0.036 (7)**
2347		0.90 (4)	0.891 (16)		0.89 (1)	0.89 (3)	0.89 (3)	0.890 (7)		0.996	**0.886 (16)**	**0.845 (16)**
2464					0.012 (1)	0.008 (1)	0.012 (2)	0.0102 (14)	4.4	0.996	**0.0102 (14)**	**0.0097 (13)**
2521		3.5 (2)	3.62 (7)	3.65 (18)	3.58 (5)	3.61 (9)	3.63 (4)	3.591 (25)		0.996	**3.58 (5)**	**3.41 (5)**
2547			0.109 (3)		0.105 (2)	0.109 (5)	0.106 (3)	0.1070 (13)		0.996	**0.107 (2)**	**0.102 (2)**

Energy (keV)	1976Li06	1977De34	1977Ge12	1978Ar28	1980Ka32	1982Ad02	1991Ch05	**LWM.**	**Reduced χ^2**	**Scaling factor**	**Adopted**	**Emission probability (%)**
2899			0.069 (1)		0.070 (1)	0.069 (3)	0.070 (2)	0.0695 (6)		0.996	**0.069 (1)**	**0.066 (1)**
3118			0.027 (1)		0.027 (1)	0.028 (2)	0.026 (1)	0.0269 (5)		0.996	**0.027 (1)**	**0.026 (1)**
3320					0.0040 (3)	0.0045 (4)	0.0040 (3)	0.00413 (19)		0.996	**0.0041 (3)**	**0.0039 (3)**

Comments on Table 5:

[*] Uncertainties were increased in LWM analysis to reduce relative weight to 50%; this change is only made if the reduced- χ^2 is greater than the associated critical value. These changes were: 131 keV, 1991Ch05 0.010 to 0.012; 241, 1991Ch05 0.008 to 0.0087; and 438 keV, 1980Ka32 0.003 to 0.007.

@ Uncertainties were increased by evaluator due to large deviation from average. These changes were: 109 keV, 1980Ka32 0.01 to 0.02; 131, 1980Ka32 0.01 to 0.02; 266, 1970Ka18 0.03 to 0.06; 328, 1970Ka18 0.1 to 0.3; and 487, 1970Ka18 0.2 to 0.5.

[#] Deleted from calculation.

[a] Adopted from 1982Ad02. See section 2.2.

6. ENERGY CONSERVATION

The total average energy of 3763 (10) keV, for one disintegration, calculated from the current evaluated data corresponds very well to the available energy of 3760.9 (18) keV (Q^-) from the mass tables (2012Wa38) confirming the consistency of the decay scheme and the reliability of this evaluation.

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