

⁶⁶Ga – Comments on evaluation of decay data by E. Browne

1. Statistical Analysis of Data

The *Limitation of Relative Statistical Weight* (LWM) [1985ZiZY] method, used for averaging numbers throughout this evaluation, provided a uniform approach for the analysis of discrepant data. The uncertainty assigned in this evaluation to the recommended value is always greater than or equal to the smallest uncertainty in any of the experimental values used in the calculation.

2. Decay Scheme

⁶⁶Ga decays 56 (4) % by positron (β^+) emission and 44 (4) % by electron capture (ϵ) to ⁶⁶Zn ($Q(\epsilon) = 5175(3)$ keV (1995Au04)). About 140 γ -rays de-exciting 31 nuclear levels in ⁶⁶Zn are known. Emission of conversion electrons is very low and negligible compared to that of γ rays (photons) because of the low atomic number ($Z = 30$) of the daughter nucleus (⁶⁶Zn) and the high energy (> 1000 keV) of the most intense γ -ray transitions. Consequently, neither conversion coefficients (most of them $< 2 \times 10^{-4}$) nor a list of conversion electrons is given in this evaluation.

Evaluator has normalized the decay scheme using experimental results from 1960Sc06, decay-scheme information, and theory. As expected from the spins and parities of ⁶⁶Ga (0+) and ⁶⁶Zn (0+), there is a significant $\epsilon + \beta^+$ feeding (51(4)%) to the ground state of ⁶⁶Zn. Electron-capture and β^+ transition probabilities to excited states in ⁶⁶Zn given in Section 2.1 are from γ -ray transition probability balance at each level and theoretical ϵ/β^+ ratios. The decay scheme shown here is that of 1998Bh02 with the addition of levels half-lives from 2002Ga20.

3. Nuclear Data

The recommended half-life of ⁶⁶Ga, 9.49(7) hours, is a weighted average (LWM, $\chi^2/\nu=2.9$) of 9.57(6) hours (1956Ru45), 9.50(10) hours (1959Ca15), and 9.33(8) hours (1964Ru06). Other values are: 9.45 hours (1950La55), and 9.35 hours (1967Va13).

$Q(\epsilon)=5175(3)$ keV is from 1995Au04.

4. Gamma Rays

Energies

γ -ray energies in Table 1 given in boldface are from 2000He14. These values are based on a revised energy scale that uses the new adjusted fundamental constants and wave lengths deduced from an updated value of the lattice spacing of Si crystals [Cohen and Taylor [1]]. Helmer and van der Leun (2000He14) fitted the adjusted γ -ray energies of ⁶⁶Ga to a level scheme, and deduced their recommended values from level-energy differences. Less precise energies are from 1993Al15 and 1994En02, but adjusted to those of 2000He14 using a least-squares procedure. Evaluator has considered the difference between these two energy scales to be a systematic adjustment that he applied to the recommended energies given here. Thus, the uncertainties in the γ -ray energies given in this evaluation are just statistical, as reported by authors. See Table 1.

Emission Intensities

The relative emission probabilities of the most intense γ rays (given in boldface) in Table 2 are values recommended in 2002Ba38 and in this evaluation. These are weighted averages (LWM) of results from Berkeley, Budapest, and of 2000Ra36. Some of the uncertainties given in 2002Ba38, however, may be smaller than those given here, which are always greater than or equal to the smallest uncertainty in any of the experimental values used in the calculation.

Relative emission probabilities of other γ rays are weighted averages (LWM) of values from 1970Ph01, 1971Ca14, and 1994En02, each corrected by evaluator for a systematic error in the detector efficiency above ~ 1100 keV. This error was caused by an inadequate extrapolation of the detector efficiency to higher energies, and affected its value by as much as 30% at 4806 keV (1975Mc07).

The correction factor ($F = 1.116 - 0.155 E_{\gamma}(\text{MeV}) + 0.0397 E_{\gamma}^2(\text{MeV})$) given in 2002Ba38 has been used here. Uncertainties in the recommended relative emission probabilities are only statistical and have been deduced from those given in the individual measurements (see Table 2).

Absolute emission intensities given here are based on experimental results and decay-scheme normalization arguments as follows:

$$I_{\text{ce}}(1039 \gamma)/I_{\beta^+}(\text{gs}) = 2.08(10) \times 10^{-4} \quad (1960\text{Sc06})$$

$$I_{\beta^+}(\text{gs})/\Sigma I_{\beta_i^+} = 0.8697 \quad (1960\text{Sc06})$$

$$I_{\text{ce}}(1039 \gamma, E2)/I_{\gamma}(1039 \gamma) = 2.69(8) \times 10^{-4} \quad (\text{Theory, 1978Rö22}).$$

Therefore,

$$I_{\gamma}(1039 \gamma)/\Sigma I_{\beta_i^+} = 2.08(10) \times 10^{-4} \times 0.8697/2.69(8) \times 10^{-4} = 0.67(4).$$

Also $\Sigma I_{\beta_i^+}/\Sigma I_{e_i} = 1.265$ from decay scheme and theoretical values of $I_{\beta_i^+}/\epsilon_i$ for each level. Using

$$\Sigma I_{\beta_i^+} + \Sigma I_{e_i} = 100 \%, \text{ gives } \Sigma I_{\beta_i^+} = 55.8(24) \%, \text{ and}$$

$$I_{\gamma}(1039 \gamma) = 0.67(4) \times 55.8(24) = 37(3) \%.$$

Absolute γ -ray emission intensities given in Section 5.2 are relative values multiplied by 0.37(3).

5. Positron (β^+) Transitions

Positron end-point energies given in section 2.1.1 ($E_{\beta^+} = Q(\epsilon) - E(\text{keV}) - 1022$) are evaluator's values deduced using $Q(\epsilon) = 5175(3)$ keV (1995Au04) and level energies ($E(\text{keV})$) from decay scheme. Absolute β^+ emission probabilities are from γ -ray intensity balance at each nuclear level and theoretical $I_{\beta_i^+}/\epsilon_i$ ratios.

6. Electron Capture (ϵ) Transitions

ϵ transition energies ($E(\epsilon) = Q(\epsilon) - E(\text{keV})$) are evaluator's values deduced using $Q(\epsilon) = 5175(3)$ keV (1995Au04) and level energies ($E(\text{keV})$) from decay scheme. Absolute ϵ transition probabilities are from γ -ray probability balance at each nuclear level and theoretical $I_{\beta_i^+}/\epsilon_i$ ratios. Fractional atomic shell electron-capture probabilities (P_K, P_L, P_M) are evaluator's values calculated using the EC-CAPTURE computer program [2] and the nuclear level energies presented here.

7. Atomic Data

The X-ray and Auger electron energies given in sections 3, 4 are from Schönfeld and Rodloff [4] and [5], respectively. Emission intensities are evaluator's values calculated using the EMISSION (Version V.3.04) [3] program, atomic data from 1996Sc06, and the recommended γ -ray emission intensities from section 5.2.

References

1. *The 1986 Adjustment of the Fundamental Physical Constants*, E.R. Cohen and B.N. Taylor, Rev. Mod. Phys. **59**, 1121 (1987).
 2. *The Program EC-CAPTURE*, E. Schönfeld, F. Chu, and E. Browne. An interactive computer program for calculating electron capture probabilities P_K , P_L , P_M , and P_N to the K, L, M, and N atomic shells, respectively (1997).
 3. *The Program EMISSION* (version 3.04 (2002)), E. Schönfeld and H. Janssen. A computer program for calculating emission probabilities of X-rays and Auger electrons emitted in nuclear disintegration processes.
 4. *Tables of the energies of K-Auger electrons for elements with atomic numbers in the range from Z=11 to Z=100*, E. Schönfeld, G. Rodloff, Report PTB-6.11-98-1, October 1998.
 5. *Energies and relative emission probabilities of K X-rays for elements with atomic numbers in the range from Z=5 to Z=100*, E. Schönfeld, G. Rodloff, Report PTB-6.11-1999-1, February 1999.
- 1960Sc06 - A. Schwarzschild, L. Grodzins, Phys. Rev. **119**, 276 (1960).
- 1970Ph01 - M. E. Phelps, D. G. Sarantites, W. G. Winn, Nucl. Phys. **A149**, 647 (1970).
(relative γ -ray emission probabilities)
- 1971Ca14 - D. C. Camp, G. L. Meredith, Nucl. Phys. **A166**, 349 (1971).
(relative γ -ray emission probabilities)
- 1975Mc07 - G. J. MacCallum, G. E. Coote, Nucl. Instrum. Methods **124**, 309 (1975).
(relative γ -ray emission probabilities)
- 1978Rö22 - F. Rösel, H. M. Friess, K. Alder, H. C. Pauli, At. Data. Nucl. Data Tables **21**, 92 (1978).
(theoretical conversion coefficients)
- 1985ZiZY - W. L. Zijp, Report ECN FYS/RASA-85/19 (1985).
(Discrepant Data Limited Relative Statistical Weight Method).
- 1993A115 - C. Alderliesten, J. A. van Nie, A. P. Slok, P. M. Endt, Nucl. Instrum. Methods. Phys. Res. **A335**, 219 (1993).
(γ -ray energies)
- 1994En02 - P. M. Endt, C. Alderliesten, Nucl. Phys. **A575**, 297 (1994).
(γ -ray energies and relative emission probabilities)
- 1995Au04 - G. Audi, A. H. Wapstra, Nucl. Phys. **A595**, 409 (1995).
(Q_α)
- 1996Sc06 - E. Schönfeld, H. Janssen, Nucl. Instrum. Methods. Phys. Res. **A369**, 527 (1996).
(Atomic data, X-rays, Auger electrons)
- 1998Bh02 - M. R. Bhat, Nuclear Data Sheets 83, 789 (1998).
(⁶⁶Ga decay scheme)
- 2000He14 - R. G. Helmer, C. van der Leun, Nucl. Instrum. Methods. Phys. Res. **A450**, 35 (2000).
(Precise evaluated γ -ray energies)
- 2000Ra36 - S. Raman, C. Yonezawa, H. Matsue, H. Imura, N. Shinohara, Nucl. Instrum. Methods. Phys. Res. **A454**, 89 (2000).
(Precise relative γ -ray emission probabilities)
- 2002Ba38 - C. M. Baglin, E. Browne, E. B. Norman, G. L. Molnar, T. Belgya, Zs. Revay, F. Szelecsenyi, Nucl. Instrum. Meth. Phys. Res. **A481**, 365(2002).
(Precise relative γ -ray emission probabilities)
- 2002Ga20 - A. Gade, H. Klein, N. Pietralla, and P. von Brentano, Phys. Rev. C **65**, 054311 (2002)
(Levels half-life in ⁶⁶Zn)

Table 1. ⁶⁶Ga Gamma-Ray Energies

1993Al15, 1994En02	1993Al15 DE _g (keV)	2000He14 E _g (keV)	2000He14 DE _g (keV)	Fitted E _g (keV)
171.9	0.2			171.9 (2)
283.87	0.03			283.87 (3)
290.808	0.011			290.8105(11)
347.77	0.05			347.77 (5)
375.396	0.017			375.398 (17)
410.177	0.012			410.178 (12)
412.915	0.016			412.916 (16)
442.872	0.014			442.873 (14)
448.725	0.02			448.73 (2)
459.682	0.014			459.683 (14)
494.336	0.013			494.336 (13)
499.59	0.006			499.590 (6)
551.284	0.022			551.284 (22)
554.28	0.03			554.28 (3)
557.13	0.05			557.13(5)
562.241	0.01			562.241 (10)
578.54	0.019			578.540 (19)
600.789	0.021			600.788 (21)
653.569	0.014			653.568 (14)
658.57	0.03			658.57 (3)
670.252	0.014			670.251 (14)
680.56	0.1			680.56 (10)
<u>686.084</u>	0.007	686.080	0.006	686.080 (6)
705.033	0.015			705.031 (15)
708.36	0.05			708.36 (5)
718.97	0.05			718.97 (5)
723.17	0.05			723.17 (5)
749.68	0.1			749.68 (10)
763.64	0.03			763.64 (3)
796.21	0.05			796.21 (5)
800.13	0.05			800.13 (5)
<u>833.537</u>	0.003	833.5324	0.0021	833.5324 (21)
<u>853.046</u>	0.009	853.038	0.008	853.038 (8)
856.53	0.01			856.527 (10)
857.096	0.009			857.093 (9)
862.929	0.013			862.926 (13)
867.93	0.03			867.93 (3)
873.395	0.021			873.392 (21)
885	0.05			885.00 (5)
907.394	0.019			907.390 (19)
914.392	0.014			914.388 (14)
929.68	0.03			929.68 (3)
953.93	0.09			953.93 (9)
954.12	0.07			954.12 (7)
963.896	0.015			963.892 (15)
980.938	0.013			980.934 (13)
1008.593	0.012			1008.588 (12)
1010.962	0.019			1010.957 (19)
1015.086	0.018			1015.081 (18)
<u>1039.231</u>	0.006	1039.22	0.003	1039.220 (3)

1993Al15, 1994En02 E _g (keV)	1993Al15 DE _g (keV)	2000He14 E _g (keV)	2000He14 DE _g (keV)	Fitted E _g (keV)
1060.056	0.011			1060.051 (11)
1065.31	0.009			1065.305 (9)
1066.455	0.012			1066.450 (12)
1082.754	0.02			1082.75 (2)
1106.54	0.24			1106.53 (24)
1129.929	0.018			1129.923 (18)
1135.48	0.09			1135.47 (9)
<u>1147.9</u>	0.012	1147.896	0.010	1147.896 (10)
<u>1190.297</u>	0.008	1190.287	0.007	1190.287 (7)
1195.33	0.09			1195.32 (9)
1232.271	0.008			1232.264 (8)
1232.487	0.015			1232.480 (15)
1248.786	0.022			1248.779 (22)
1274.51	0.03			1274.50 (3)
1298.96	0.07			1298.95 (7)
1305.815	0.021			1305.807 (21)
<u>1333.12</u>	0.006	1333.112	0.005	1333.112 (5)
1356.112	0.009			1356.104 (9)
1356.328	0.015			1356.320 (15)
1357.258	0.012			1357.250 (12)
1409.36	0.24			1409.35 (24)
<u>1418.763</u>	0.006	1418.754	0.005	1418.754 (5)
1425.256	0.02			1425.25 (2)
1433.64	0.04			1433.63 (4)
<u>1458.67</u>	0.012	1458.662	0.012	1458.662 (12)
1468.98	0.05			1468.97 (5)
<u>1508.175</u>	0.011	1508.158	0.007	1508.158 (7)
1515.172	0.02			1515.162 (20)
1523.289	0.015			1523.279 (15)
1534.61	0.04			1534.60 (4)
1554.63	0.03			1554.62 (3)
1559.637	0.01			1559.627 (10)
1577.318	0.02			1577.308 (20)
1634.47	0.07			1634.46 (7)
1703.6	0.05			1703.59 (5)
1713.614	0.012			1713.602 (12)
<u>1740.918</u>	0.018	1740.904	0.016	1740.904 (16)
1787.45	0.09			1787.44 (9)
1797.95	0.09			1797.94 (9)
1868.118	0.02			1868.105 (20)
1872.753	0.006			1872.740 (6)
<u>1898.832</u>	0.009	1898.823	0.008	1898.823 (8)
<u>1918.341</u>	0.006	1918.329	0.005	1918.329 (5)
1927.97	0.04			1927.96 (4)
2009.643	0.016			2009.628 (16)
2026.031	0.025			2026.016 (25)
<u>2065.792</u>	0.008	2065.778	0.007	2065.778 (7)
2085.88	0.04			2085.86 (4)
2089	0.013			2088.985 (13)
<u>2173.334</u>	0.018	2173.319	0.015	2173.319 (15)
<u>2189.631</u>	0.009	2189.616	0.006	2189.616 (6)

1993Al15, 1994En02	1993Al15	2000He14	2000He14	Fitted
E_g (keV)	DE_g (keV)	E_g (keV)	DE_g (keV)	E_g (keV)
<u>2213.19</u>	0.011	2213.181	0.009	2213.181 (9)
2265.86	0.24			2265.84 (24)
2292.188	0.013			2292.171 (13)
2341.691	0.011			2341.673 (11)
<u>2393.153</u>	0.01	2393.129	0.007	2393.129 (7)
<u>2422.544</u>	0.009	2422.525	0.007	2422.525 (7)
2433.826	0.018			2433.807 (18)
2467.99	0.07			2467.97 (7)
2492.44	0.03			2492.42 (3)
2537.11	0.05			2537.09 (5)
2588.573	0.013			2588.553 (13)
2631.46	0.09			2631.44 (9)
2698.94	0.05			2698.92 (5)
2713.75	0.05			2713.73 (5)
<u>2751.852</u>	0.006	2751.835	0.005	2751.835 (5)
<u>2780.12</u>	0.018	2780.095	0.016	2780.095 (16)
2785.7	0.3			2785.7 (3)
2802.8	0.5			2802.8 (5)
2843.153	0.016			2843.130 (16)
<u>2933.395</u>	0.017	2933.358	0.009	2933.358 (9)
<u>2977.12</u>	0.05	2977.083	0.043	2977.083 (43)
<u>2993.25</u>	0.04	2993.208	0.032	2993.208 (32)
<u>3046.697</u>	0.011	3046.684	0.009	3046.684 (9)
3085.4	0.4			3085.4 (4)
3212.526	0.019			3212.499 (19)
<u>3228.824</u>	0.009	3228.800	0.006	3228.800 (6)
3256.048	0.009			3256.021 (9)
3331.379	0.014			3331.351 (14)
<u>3380.882</u>	0.01	3380.850	0.006	3380.850 (6)
<u>3422.075</u>	0.012	3422.040	0.008	3422.040 (8)
<u>3432.343</u>	0.01	3432.309	0.007	3432.309 (7)
3738.13	0.05			3738.10 (5)
<u>3766.893</u>	0.018	3766.850	0.009	3766.850 (9)
3791.036	0.008			3791.004 (8)
3810.62	0.05			3810.59 (5)
<u>4085.875</u>	0.012	4085.853	0.009	4085.853 (9)
4295.224	0.01			4295.187 (10)
<u>4461.247</u>	0.013	4461.202	0.009	4461.202 (9)
<u>4806.06</u>	0.018	4806.007	0.009	4806.007 (9)
4865.91	0.04			4865.87 (4)
5005.62	0.23			5005.6 (3)

Y= A + BX and input energies (X) from 1994En02.

Comments on evaluation

⁶⁶Ga

Table 2: ⁶⁶Ga Relative

Eg (keV)	1970Ph01		1971Ca14		1994En02		Intensities			Remarks	
	Ig	Ig(Corr.)	Ig	Ig(Corr.)	Ig	Ig(Corr.)	2000Ra00	Berkeley	Budapest		
171.9 (2)	0.028 (1)	0.028 (1)								0.028 (1)	O
283.87 (3)					0.0097 (21)	0.0097 (21)				0.0097 (21)	I
290.8105 (11)	0.150 (10)	0.150 (10)	0.131 (2)	0.131 (2)	0.146 (6)	0.146 (6)				0.133 (4)	A
347.77 (5)					0.0048 (15)	0.0048 (15)				0.0048 (15)	I
375.398 (17)					0.0058 (16)	0.0058 (16)				0.0058 (16)	I
410.178 (12)	0.300 (20)	0.300 (20)	0.172 (24)	0.172 (24)	0.177 (7)	0.177 (7)				0.177 (7)	I
412.916 (16)					0.0091 (13)	0.0091 (13)				0.0091 (13)	I
442.873 (14)					0.042 (3)	0.042 (3)				0.042 (3)	I
448.73 (2)	0.290 (10)	0.290 (10)	0.279 (58)	0.279 (58)						0.290 (10)	C
459.683 (14)	0.240 (10)	0.240 (10)	0.206 (35)	0.206 (35)						0.237 (10)	C
494.336 (13)					0.0152 (20)	0.0152 (20)				0.0152 (20)	I
499.590 (6)					0.013 (3)	0.013 (3)				0.013 (3)	I
551.284 (22)					0.0189 (16)	0.0189 (16)				0.0189 (16)	I
554.28 (3)					0.0122 (13)	0.0122 (13)				0.0122 (13)	I
557.13(5)					0.0166 (17)	0.0166 (17)				0.0166 (17)	I
562.241 (10)					0.0179 (17)	0.0179 (17)				0.0179 (17)	I
578.540 (19)	0.160 (10)	0.160 (10)	0.156 (20)	0.156 (20)						0.159 (10)	C
600.788 (21)					0.0365 (23)	0.0365 (23)				0.0365 (23)	I
653.568 (14)					0.0036 (12)	0.0036 (12)				0.0036 (12)	I
658.57 (3)					0.0203 (21)	0.0203 (21)				0.0203 (21)	I
670.251 (14)					0.0110 (18)	0.0110 (18)				0.0110 (18)	I
680.56 (10)					0.0040 (11)	0.0040 (11)				0.0040 (11)	I
686.080 (6)	0.690 (20)	0.690 (20)	0.645 (40)	0.645 (40)						0.681 (20)	C
705.031 (15)					0.0102 (11)	0.0102 (11)				0.0102 (11)	I
708.36 (5)					0.0234 (19)	0.0234 (19)				0.0234 (19)	I
718.97 (5)					0.0268 (20)	0.0268 (20)				0.0268 (20)	I
723.17 (5)					0.0093 (13)	0.0093 (13)				0.0093 (13)	I
749.68 (10)					0.0037 (11)	0.0037 (11)				0.0037 (11)	I
763.64 (3)					0.0240 (20)	0.0240 (20)				0.0240 (20)	I
796.21 (5)					0.0079 (17)	0.0079 (17)				0.0079 (17)	I
800.13 (5)					0.0027 (14)	0.0027 (14)				0.0027 (14)	I
833.5324 (21)	16.2 (7)	16.2 (7)	15.92 (17)	15.92 (17)			16.02 (24)	15.94 (14)	15.92 (6)	15.93 (6)	K
853.038 (8)			0.200 (5)	0.200 (5)	0.232 (12)	0.232 (12)				0.205 (5)	D
856.527 (10)			0.315 (10)	0.315 (10)	0.280 (12)	0.280 (12)				0.301 (17)	D

Comments on evaluation

⁶⁶Ga

Recomm. E _g (keV)	1970Ph01 lg	1970Ph01* lg(Corr.)	1971Ca14 lg	1971Ca14* lg(Corr.)	1994En02 lg	1994En02* lg(Corr.)	2000Ra00 lg	Berkeley lg	Budapest lg	Recomm. lg	Remarks
857.093 (9)					0.040 (12)	0.040 (12)				0.040 (12)	I
862.926 (13)					0.0410 (20)	0.0410 (20)				0.0410 (20)	I
867.93 (3)					0.0117 (14)	0.0117 (14)				0.0117 (14)	I
873.392 (21)					0.046 (3)	0.046 (3)				0.046 (3)	I
885.00 (5)					0.0051 (13)	0.0051 (13)				0.0051 (13)	I
907.390 (19)	0.300 (20)	0.300 (20)	<0.034 (10)		0.059 (4)	0.059 (4)				0.059 (4)	E
914.388 (14)	0.190 (10)	0.190 (10)	<0.030 (10)		0.073 (4)	0.073 (4)				0.073 (4)	E
929.68 (3)					0.0123 (15)	0.0123 (15)				0.0123 (15)	I
953.93 (9)					0.0027 (3)	0.0027 (3)				0.0027 (3)	I
954.12 (7)					0.0121 (17)	0.0121 (17)				0.0121 (17)	I
963.892 (15)					0.039 (3)	0.039 (3)				0.039 (3)	I
980.934 (13)	0.150 (20)	0.150 (20)	0.130 (5)	0.130 (5)						0.131 (5)	C
1008.588 (12)	0.183 (10)	0.183 (10)	0.138 (4)	0.138 (4)						0.160 (20)	C
1010.957 (19)					0.073 (4)	0.073 (4)				0.073 (4)	I
1015.081 (18)					0.033 (8)	0.033 (8)				0.033 (8)	I
1039.220 (3)	100	100	100	100	100	100	100.0 (16)	100.0 (9)	100.0 (3)	100.0 (3)	K
1060.051 (11)			0.033 (10)	0.033 (10)	0.043 (3)	0.043 (3)				0.042 (3)	F
1065.305 (9)					0.0063 (12)	0.0063 (12)				0.0063 (12)	I
1066.450 (12)					0.0064 (12)	0.0064 (12)				0.0064 (12)	I
1082.75 (2)					0.036 (2)	0.0358 (20)				0.0358 (20)	I
1106.53 (24)					0.0033 (10)	0.0033 (10)				0.0033 (10)	I
1129.923 (18)					0.0370 (21)	0.0367 (21)				0.0367 (21)	I
1135.47 (9)					0.0128 (13)	0.0128 (13)				0.0128 (13)	I
1147.896 (10)	0.22 (3)	0.22 (3)	0.211 (17)	0.211 (17)						0.212 (17)	C
1190.287 (7)	0.42 (4)	0.42 (4)	0.34 (1)	0.34 (1)						0.345 (19)	C
1195.32 (9)					0.0025 (9)	0.0025 (9)				0.0025 (9)	I
1232.264 (8)	1.14 (20)	1.12 (20)	1.38 (4)	1.36 (4)						1.35 (5)	C
1232.480 (15)	0.4 (2)	0.4 (2)	0.14 (4)	0.14 (4)						0.15 (5)	C
1248.779 (22)					0.0027 (9)	0.0027 (9)				0.0027 (9)	I
1274.50 (3)					0.0192 (15)	0.0189 (15)				0.0189 (15)	I
1298.95 (7)					0.0105 (12)	0.0103 (12)				0.0103 (12)	I
1305.807 (21)					0.0109 (12)	0.0107 (12)				0.0107 (12)	I
1333.112 (5)	3.28 (5)	3.21 (5)	3.25 (4)	3.18 (4)			3.17 (5)	3.20 (3)	3.171 (13)	3.175 (13)	K
1356.104 (9)	0.83 (30)	0.81 (30)	1.00 (10)	0.98 (10)						0.96 (10)	C
1356.320 (15)	0.3 (1)	0.29 (10)	0.35 (5)	0.34 (5)						0.33 (5)	C

Comments on evaluation

⁶⁶Ga

Recomm. E _g (keV)	1970Ph01 lg	1970Ph01* lg(Corr.)	1971Ca14 lg	1971Ca14* lg(Corr.)	1994En02 lg	1994En02* lg(Corr.)	2000Ra00 lg	Berkeley lg	Budapest lg	Recomm. lg	Remarks
1357.250 (12)	0.7 (2)	0.69 (20)	0.39 (10)	0.38 (10)						0.44 (13)	C
1409.35 (24)					0.0044 (18)	0.0043 (18)				0.0043 (18)	I
1418.754 (5)	1.65 (3)	1.61 (3)	1.700 (27)	1.659 (27)				1.640 (23)	1.659 (8)	1.657 (8)	M
1425.25 (2)					0.0167 (13)	0.0163 (13)				0.0163 (13)	I
1433.63 (4)					0.0050 (10)	0.0050 (10)				0.0050 (10)	I
1458.662 (12)	0.25 (7)	0.24 (7)	0.268 (6)	0.261 (6)						0.261 (6)	C
1468.97 (5)					0.0038 (10)	0.0037 (10)				0.0037 (10)	I
1508.158 (7)	1.48 (9)	1.44 (9)	1.520 (24)	1.478 (24)				1.503 (23)	1.496 (7)	1.497 (7)	M
1515.162 (20)					0.0172 (15)	0.0167 (15)				0.0167 (15)	I
1523.279 (15)					0.0152 (13)	0.0148 (13)				0.0148 (13)	I
1534.60 (4)					0.016 (4)	0.0155 (40)				0.016 (4)	I
1554.62 (3)					0.051 (3)	0.049 (3)				0.050 (3)	I
1559.627 (10)					0.061 (4)	0.059 (4)				0.059 (4)	I
1577.308 (20)					0.0111 (16)	0.0108 (16)				0.0108 (16)	I
1634.46 (7)					0.0098 (15)	0.0095 (15)				0.0095 (15)	I
1703.59 (5)					0.015 (5)	0.015 (5)				0.015 (5)	I
1713.602 (12)					0.068 (3)	0.066 (3)				0.066 (3)	I
1740.904 (16)	0.19 (4)	0.18 (4)	0.0800 (10)	0.0773 (10)						0.0773 (10)	G
1787.44 (9)					0.025 (2)	0.0240 (20)				0.0240 (20)	I
1797.94 (9)					0.0053 (14)	0.0051 (14)				0.0051 (14)	I
1868.105 (20)					0.0076 (15)	0.0073 (15)				0.0073 (15)	I
1872.740 (6)					0.064 (4)	0.062 (4)				0.062 (4)	I
1898.823 (8)	1.15 (3)	1.11 (3)	1.09 (4)	1.05 (4)				1.062 (23)	1.050 (8)	1.051 (8)	M
1918.329 (5)	5.65 (2)	5.45 (2)	5.625 (80)	5.427 (80)			5.33 (8)	5.44 (6)	5.360 (23)	5.368 (23)	K
1927.96 (4)					0.0063 (20)	0.0061 (20)				0.0061 (20)	I
2009.628 (16)					0.0086 (17)	0.0083 (17)				0.0083 (17)	I
2026.016 (25)					0.0073 (16)	0.0070 (16)				0.0070 (16)	I
2065.778 (7)	0.098 (16)	0.095 (16)	0.086 (4)	0.083 (4)						0.084 (4)	C
2085.86 (4)					0.006 (4)	0.0058 (40)				0.006 (4)	I
2088.985 (13)					0.032 (7)	0.031 (7)				0.031 (7)	I
2173.319 (15)	0.38 (3)	0.37 (3)	0.236 (12)	0.228 (12)						0.228 (12)	G
2189.616 (6)	15.0 (3)	14.5 (3)	15.06 (18)	14.56 (18)			14.54 (21)	14.50 (13)	14.39 (6)	14.42 (6)	K
2213.181 (9)	0.38 (5)	0.37 (5)	0.365 (12)	0.353 (12)						0.354 (12)	C
2265.84 (24)					0.0038 (14)	0.0037 (14)				0.0037 (14)	I
2292.171 (13)			0.110 (10)	0.107 (10)	0.047 (3)	0.046 (3)				0.046 (3)	H

Comments on evaluation

⁶⁶Ga

Recomm. E _g (keV)	1970Ph01 lg	1970Ph01* lg(Corr.)	1971Ca14 lg	1971Ca14* lg(Corr.)	1994En02 lg	1994En02* lg(Corr.)	2000Ra00 lg	Berkeley lg	Budapest lg	Recomm. lg	Remarks
2341.673 (11)					0.0089 (17)	0.0086 (17)				0.0086 (17)	I
2393.129 (7)	0.64 (2)	0.62 (2)	0.670 (20)	0.651 (20)						0.635 (20)	C
2422.525 (7)	5.06 (10)	4.93 (10)	5.16 (5)	5.023 (5)			5.12 (8)	5.15 (6)	5.072 (24)	5.085 (24)	K
2433.807 (18)					0.0206 (17)	0.0201 (17)				0.0201 (17)	I
2467.97 (7)					0.0234 (19)	0.0228 (19)				0.0228 (19)	I
2492.42 (3)			0.063 (6)	0.061 (6)	0.061 (4)	0.060 (4)				0.060 (4)	F
2537.09 (5)					0.014 (3)	0.014 (3)				0.014 (3)	I
2588.553 (13)			0.073 (7)	0.072 (7)	0.072 (4)	0.071 (4)				0.071 (4)	F
2631.44 (9)					0.008 (3)	0.008 (3)				0.008 (3)	I
2698.92 (5)					0.0101 (17)	0.0100 (17)				0.0100 (17)	I
2713.73 (5)					0.017 (5)	0.017 (5)				0.017 (5)	I
2751.835 (5)	60.9 (8)	60.3 (8)	61.2 (6)	60.6 (6)			61.2 (8)	61.5 (6)	61.34 (26)	61.35 (26)	K
2780.095 (16)	0.33 (2)	0.33 (2)	0.337 (8)	0.334 (8)						0.334 (8)	C
2785.7 (3)					0.0081 (14)	0.0080 (14)				0.0080 (14)	I
2802.8 (5)					0.0040 (11)	0.0040 (11)				0.0040 (11)	I
2843.130 (16)					0.0045 (9)	0.0045 (9)				0.0045 (9)	I
2933.358 (9)	0.57 (3)	0.57 (3)	0.574 (8)	0.576 (8)						0.576 (8)	C
2977.083 (43)			0.062 (6)	0.062 (6)						0.062 (6)	N
2993.208 (32)			0.084 (8)	0.085 (8)						0.085 (8)	N
3046.684 (9)	0.17 (2)	0.17 (2)	0.150 (6)	0.152 (6)						0.154 (6)	C
3085.4 (4)					0.0052 (13)	0.0053 (13)				0.0053 (13)	I
3212.499 (19)					0.0049 (10)	0.0050 (10)				0.0050 (10)	I
3228.800 (6)	3.85 (6)	3.96 (6)	3.96 (4)	4.08 (4)			4.06 (8)	4.07 (4)	4.087 (22)	4.082 (22)	K
3256.021 (9)	0.31 (3)	0.32 (3)	0.241 (5)	0.249 (5)	0.270 (14)	0.279 (14)				0.254 (10)	A
3331.351 (14)					0.0059 (8)	0.0061 (8)				0.0061 (8)	I
3380.850 (6)	3.68 (4)	3.85 (4)	3.78 (4)	3.95 (4)			3.96 (8)	3.99 (4)	3.950 (23)	3.960 (23)	K
3422.040 (8)	2.10 (9)	2.21 (9)	2.18 (4)	2.29 (4)				2.29 (3)	2.321 (16)	2.314 (16)	M
3432.309 (7)	0.73 (3)	0.77 (3)	0.740 (10)	0.778 (10)						0.777 (10)	C
3724.8 (10)			0.0060 (10)	0.0065 (10)						0.0065 (10)	N
3738.10 (5)			0.032 (3)	0.035 (3)	0.0353 (20)	0.0385 (20)				0.0374 (20)	F
3766.850 (9)	0.37 (2)	0.41 (2)	0.364 (14)	0.399 (15)						0.403 (15)	C
3791.004 (8)	2.63 (11)	2.89 (11)	2.675 (32)	2.940 (35)			2.96 (5)	2.96 (4)	2.929 (24)	2.941 (24)	K
3806.3 (10)			0.0060 (10)	0.0066 (10)						0.0066 (11)	N
3810.59 (5)			0.0210 (20)	0.0231 (22)	0.025 (3)	0.028 (3)				0.0248 (22)	F
3827.5 (8)			0.0170 (20)	0.0190 (22)						0.0190 (22)	N

Recomm.	1970Ph01	1970Ph01*	1971Ca14	1971Ca14*	1994En02	1994En02*	2000Ra00	Berkeley	Budapest	Recomm.	Remarks
E _g (keV)	I _g	I _g (Corr.)	I _g	I _g (Corr.)	I _g	I _g (Corr.)	I _g	I _g	I _g	I _g	
4085.853 (9)	2.91 (6)	3.33 (7)	3.07 (4)	3.52 (5)			3.38 (8)	3.42 (4)	3.455 (20)	3.445 (20)	K
4295.187 (10)	9.2 (2)	10.88 (24)	9.17 (11)	10.84 (13)			10.24 (26)	10.54 (15)	10.25 (7)	10.30 (8)	K, L
4461.202 (9)	1.84 (4)	2.23 (5)	1.875 (22)	2.277 (27)				2.20 (4)	2.275 (23)	2.26 (3)	M
4806.007 (9)	3.96 (6)	5.10 (6)	3.82 (4)	4.92 (4)			4.93 (11)	5.00 (7)	5.04 (3)	5.03 (3)	K
4865.87 (4)					0.0058 (5)	0.0075 (6)				0.0075 (6)	I
5005.6 (3)					0.0025 (3)	0.0033 (4)				0.0033 (4)	I

*γ-ray intensities (I_γ) corrected for a systematic inaccuracy in the detector efficiency curve above 1050 keV.

Correction factor $f = 1.116 - 0.155 E_{\gamma} (\text{MeV}) + 0.0397 E_{\gamma} \times E_{\gamma}$ (2002Ba38). Uncertainties are statistical values given by authors.

A: Weighted average of values from 1970Ph01, 1971Ca14, and 1994En02

B: Weighted average of values from 1971Ca14 and 1994En02. Value from 1970Ph01 is too high (peak may contain impurities).

C: Weighted average of values from 1970Ph01 and 1971Ca14.

D: Weighted average of values from 1970Ph01 and 1994En02.

E: From 1994En02. Value from 1970Ph01 is too high (peak may contain impurities).

F: Weighted average of values from 1971Ca14 and 1994En02.

G: From 1971Ca14. Value from 1970Ph01 is too high (peak may contain impurities).

H: From 1994En02. Value from 1971Ca14 is too high (peak may contain impurities).

I: From 1994En02.

K: Weighted average (in boldface) of values from 2000Ra36, from Berkeley, and from Budapest, as given in 2002Ba38 (except for the recommended uncertainties, which are never smaller than the smallest experimental uncertainty).

L: After correction for single-escape contribution from the 4806-keV line.

M; Weighted average (in boldface) of values from Berkeley and Budapest, as given in 2002Ba38

N: From 1971Ca14

O: Reported only by 1970Ph01.