^{72}Ga β^- decay 1968Ca20,1971Re04

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	D. Abriola(a), A. A. Sonzogni	NDS 111,1 (2010)	1-May-2009

Parent: ^{72}Ga: E=0; $J^\pi=3^-$; $T_{1/2}$=14.10 h *1*; Q(β^-)=3997.5 *10*; %β^- decay=100.0

The decay scheme is based mainly on $\gamma\gamma$ and ce-γ coincidence measurements by 1971Re04 and 1968Ca20.

The β-γ(circular polarization) data are mainly from 1971Be31, 1967Ti05.

Other measurements: β^- spectral shape: 1960La04, 1961Sm09, 1972Co36. β-γ directional correlation, circular polarization: mainly 1964Ne03, 1965Ca08. Others: 1963Al24, 1963Gr37, 1963Mi23, 1964Pe19, 1965Bh03, 1967Ti05, and 1971Be31.

α: Additional information 1.

^{72}Ge Levels

E(level)	J^π	$T_{1/2}$	Comments
0	0^+		
691.772 *25*	0^+	0.40 μs *11*	$T_{1/2}$: unweighted average of delayed coincidence values: 0.50 μs *5* (1948Bo10) and 0.29 μs *6* (1949Mc29).
834.416 *13*	2^+		
1464.295 *11*	2^+		J^π: 2 consistent with $\gamma\gamma(\theta)$ (1969Mo23).
1728.740 *13*	4^+		J^π: J from $\gamma\gamma(\theta)$ (1969Mo23,1974Ch07).
2065.347 *13*	3^+		J^π: J from $\gamma\gamma(\theta)$ (1974Ch07).
2402.537 *16*	2^+		
2464.406 *14*	4^+		J^π: J=2 to 4 from $\gamma\gamma(\theta)$ (1969Mo23).
2515.255 *12*	3^-		J^π: 3^- taken by 1969Mo23 for $\gamma\gamma(\theta)$ analysis.
2582.44 *12*			
2754.68 *3*	(0^+)		
2940.23? *3*	1^-		
2943.874 *14*	3^-		
2951.26? *3*	$1^+,2^+,3^+$		
3036.018 *13*	2^-		J^π: J=2 from $\gamma\gamma(\theta)$ (1969Mo23), and β-γ circular polarization measurements (1971Be31).
3094.54 *3*	2^+		
3325.608 *13*	$(3)^-$		J^π: spin from $\gamma\gamma(\theta)$ (1969Mo23).
3338.62? *15*	$(1,2^+)$		E(level): from 1968Ca20 but not seen in 1971Re04.
3342.135 *15*	$(2)^-$		J^π: spin from $\gamma\gamma(\theta)$ (1969Mo23).
3439.952 *19*			
3455.656 *18*	$2^-,3^-$		
3565.90 *4*	$(^-)$		
3620.30? *5*	2^+		
3678.515 *15*	$2^-,3^-$		
3707.51? *7*	2^+		Tentatively suggested by 1971Re04.
3757.81 *3*	$^-$		
3815.97 *6*	$2^-,3^-$		

β^- radiations

Iβ: from I(γ+ce) imbalance at each level.

E(decay)	E(level)	Iβ^-[†]	Log *ft*	Comments
(181.5 *10*)	3815.97	0.064 *9*	6.47 *7*	av Eβ=50.53 *31*
(239.7 *10*)	3757.81	0.137 *3*	6.533 *12*	av Eβ=68.81 *33*
(290.0[‡] *10*)	3707.51?	0.0048 *10*	8.26 *9*	av Eβ=85.28 *34*
(319.0 *10*)	3678.515	0.955 *15*	6.099 *9*	av Eβ=95.11 *38*

Continued on next page (footnotes at end of table)

^{72}Ga β^- decay 1968Ca20,1971Re04 (continued)

β^- radiations (continued)

E(decay)	E(level)	Iβ^-[†]	Log *ft*	Comments
(377.2[‡] *10*)	3620.30?	0.041 *2*	7.711 *22*	av Eβ=115.23 *36*
(431.6 *10*)	3565.90	0.27 *3*	7.09 *5*	av Eβ=134.60 *37*
(541.8 *10*)	3455.656	0.332 *11*	7.345 *15*	av Eβ=175.36 *38*
(557.5 *10*)	3439.952	0.291 *14*	7.446 *21*	av Eβ=181.31 *38*
(655.4 *10*)	3342.135	15.71 *6*	5.963 *3*	av Eβ=219.14 *40*
(658.9[‡] *10*)	3338.62?	0.0043 *6*	9.53 *6*	av Eβ=220.52 *40*
(671.9 *10*)	3325.608	22.43 *5*	5.848 *3*	av Eβ=225.64 *40*
(961.5 *10*)	3036.018	28.87 *12*	6.312 *3*	av Eβ=344.04 *43*
(1053.6 *10*)	2943.874	1.953 *16*	7.632 *4*	av Eβ=383.15 *43*
(1242.8 *10*)	2754.68	0.022 *7*	9.86 *14*	av Eβ=465.11 *44*
(1415.1[‡] *10*)	2582.44	0.0128 *14*	10.31 *5*	av Eβ=541.32 *45*
(1482.2 *10*)	2515.255	9.18 *4*	7.5382 *23*	av Eβ=571.39 *45*
(1533.1 *10*)	2464.406	0.095 *9*	9.58 *5*	av Eβ=594.26 *45*
(1595.0 *10*)	2402.537	0.10 *3*	9.63 *13*	av Eβ=622.21 *46*
(1932.2 *10*)	2065.347	3.21 *3*	8.461 *5*	av Eβ=776.52 *47*
(2268.8 *10*)	1728.740	0.70 *4*	9.412 *25*	av Eβ=933.17 *47*
(2533.2 *10*)	1464.295	9.38 *6*	8.487 *3*	av Eβ=1057.54 *48*
(3163.1 *10*)	834.416	6.80 *15*	9.041 *10*	av Eβ=1356.95 *48*

[†] Absolute intensity per 100 decays.
[‡] Existence of this branch is questionable.

^{72}Ga β^- decay 1968Ca20,1971Re04 (continued)

$\gamma(^{72}Ge)$

Iγ normalization: From ΣI(γ+ce) (to g.s.)=100.
Data from γγ(θ) are mainly in 1974Ch07 and 1969Mo23. Other: 1958Ar58.
The pair-conversion measurements of 1968Be56 have been used in making assignments for γ multipolarity, particularly the class of radiation.

E_γ	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α	Comments
50.88 *4*	0.0105 *15*	2515.255	3−	2464.406	4+			I_γ: weighted average of 0.006 *3* (1971Re04), 0.011 *1* (2001Me01). E_γ: weighted average of 50.89 *5* (1971Re04) and 50.87 *5* (1968Ca20).
112.59[#] *7*	0.113 *20*	2515.255	3−	2402.537	2+			I_γ: weighted average of 0.11 *5* (1971Re04), 0.142 *6* (1968Ca20), 0.079 *5* (2001Me01), 0.158 *9* (2004Mi10). E_γ: weighted average of 112.52 *3* (1971Re04), 112.50 *5* (1968Ca20) and 112.715 *32* (2001Me01).
113.5[#] *1*	0.006 *1*	3455.656	2−,3−	3342.135	(2)−			E_γ,I_γ: Observed only by 1968Ca20.
142.66 *6*	0.0097 *10*	834.416	2+	691.772	0+	E2	0.196	α(K)=0.1725 *25*; α(L)=0.0204 *3*; α(M)=0.00302 *5*; α(N)=0.0001684 *24*; α(N+..)=0.0001684 *24* I_γ: weighted average of 0.013 *2* (1971Re04), 0.011 *1* (1968Ca20) and 0.0087 *7* (2001Me01). E_γ: weighted average of 142.54 *6* (1971Re04), 142.5 *1* (1968Ca20) and 142.719 *35* (2001Me01).
231.06 *3*	0.0283 *8*	3325.608	(3)−	3094.54	2+			I_γ: weighted average of 0.024 *7* (1968Ca20), 0.0284 *8* (2001Me01). E_γ: weighted average of 230.6 *6* (1968Ca20) and 231.06 *3* (2001Me01).
289.51 *4*	0.209 *5*	3325.608	(3)−	3036.018	2−			I_γ: weighted average of 0.18 *1* (1971Re04), 0.210 *7* (1968Ca20), 0.2131 *14* (2001Me01), 0.191 *3* (2004Mi10). E_γ: weighted average of 289.3 *3* (1971Re04), 289.5 *2* (1968Ca20), 289.313 *66* (1974Ch07) and 289.53 *2* (2001Me01).
306.12 *18*	0.025 *2*	3342.135	(2)−	3036.018	2−			I_γ: weighted average of 0.022 *2* (1968Ca20), 0.0259 *9* (2001Me01). E_γ: weighted average of 306.0 *3* (1968Ca20) and 306.19 *23* (2001Me01).
317.87 *3*	0.0219 *5*	3757.81	−	3439.952				I_γ: weighted average of 0.023 *2* (1968Ca20), 0.0218 *5* (2001Me01). E_γ: weighted average of 317.5 *4* (1968Ca20), 317.872 *26* (2001Me01).
336.683 *19*	0.128 *4*	2065.347	3+	1728.740	4+			I_γ: weighted average of 0.11 *1* (1971Re04), 0.112 *3* (1968Ca20), 0.1308 *13* (2001Me01) and 0.131 *4* (2004Mi10). E_γ: weighted average of 336.3 *3* (1971Re04), 336.6 *2* (1968Ca20), 336.632 *42* (1974Ch07) and 336.696 *19* (2001Me01).
374.34 *3*	0.0186 *8*	3325.608	(3)−	2951.26?	1+,2+,3+			E_γ,I_γ: from 2001Me01.
381.67 *6*	0.318 *5*	3325.608	(3)−	2943.874	3−			I_γ: weighted average of 0.28 *1* (1971Re04), 0.289 *8* (1968Ca20), 0.3211 *17* (2001Me01), 0.312 *4* (2004Mi10). E_γ: weighted average of 381.2 *2* (1971Re04), 381.2 *2* (1968Ca20), 381.242 *80* (1974Ch07) and 381.694 *17* (2001Me01).
402.02 *7*	0.020 *5*	3342.135	(2)−	2940.23?	1−			I_γ: weighted average of 0.034 *2* (1968Ca20), 0.0180 *7* (2001Me01). E_γ: weighted average of 401.3 *4* (1968Ca20) and 402.03 *4* (2001Me01).
428.645 *18*	0.226 *6*	2943.874	3−	2515.255	3−			I_γ: weighted average of 0.23 *1* (1971Re04), 0.192 *8* (1968Ca20), 0.2306 *19* (2001Me01), 0.212 *4* (2004Mi10).

^{72}Ga β^- decay 1968Ca20,1971Re04 (continued)

$\gamma(^{72}Ge)$ (continued)

E_γ	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ[†]	α	Comments
449.838 *16*	0.116 *6*	2515.255	3^-	2065.347	3^+				E_γ: weighted average of 428.3 *3* (1971Re04), 428.4 *2* (1968Ca20), 428.42 *18* and 428.649 *15* (2001Me01). I_γ: weighted average of 0.16 *2* (1971Re04), 0.092 *6* (1968Ca20), 0.1210 *19* (2001Me01), 0.098 *5* (2004Mi10).
479.45 *3*	0.105 *3*	2943.874	3^-	2464.406	4^+				E_γ: weighted average of 449.6 *3* (1971Re04), 449.5 *3* (1968Ca20) and 449.840 *16* (2001Me01). I_γ: weighted average of 0.11 *1* (1971Re04), 0.090 *6* (1968Ca20), 0.1071 *20* (2001Me01), 0.097 *5* (2004Mi10).
496.07 *3*	0.0592 *9*	3439.952		2943.874	3^-				E_γ: weighted average of 479.1 *3* (1971Re04), 479.6 *3* (1968Ca20), 479.228 *98* and 479.461 *17* (2001Me01). I_γ: weighted average of 0.060 *8* (1971Re04), 0.059 *5* (1968Ca20), 0.0592 *9* (2001Me01), 0.061 *6* (2004Mi10).
520.850 *19*	0.061 *3*	3036.018	2^-	2515.255	3^-				E_γ: weighted average of 496.2 *4* (1971Re04), 495.7 *3* (1968Ca20) and 496.075 *34* (2001Me01). I_γ: weighted average of 0.066 *7* (1971Re04), 0.054 *4* (1968Ca20), 0.0638 *20* (2001Me01), 0.048 *5* (2004Mi10).
587.451 *21*	0.145 *5*	3342.135	$(2)^-$	2754.68	(0^+)				E_γ: weighted average of 520.8 *4* (1971Re04), 520.7 *3* (1968Ca20) and 520.851 *19* (2001Me01). I_γ: weighted average of 0.11 *1* (1971Re04), 0.130 *4* (1968Ca20), 0.1493 *15* (2001Me01), 0.122 *6* (2004Mi10).
600.912 *15*	6.10 *2*	2065.347	3^+	1464.295	2^+	D(+Q)			E_γ: weighted average of 587.9 *4* (1971Re04), 587.4 *3* (1968Ca20), 587.44 *24* (1974Ch07) and 587.450 *21* (2001Me01). δ: <−24 (1974Ch07), δ large (1969Mo23). I_γ: weighted average of 5.7 *2* (1971Re04), 5.84 *14* (1968Ca20), 6.13 *5* (2001Me01) and 6.102 *13* (2004Mi10).
629.967 *19*	27.38 *4*	1464.295	2^+	834.416	2^+	M1+E2	−10.3 *13*	0.001177 *17*	E_γ: weighted average of 600.85 *3* (1971Re04), 600.9 *1* (1968Ca20), 600.948 *28* (1974Ch07) and 600.916 *12* (2001Me01). α=0.001177 *17*; α(K)=0.001051 *15*; α(L)=0.0001093 *16*; α(M)=1.631×10^{-5} *23* α(N)=1.049×10^{-6} *15* Mult.: if authors′ value of 1.6×10^{-4} is a misprint and should be 1.6×10^{-3}. If α(K)(834γ)=4.93×10^{-4} (E2 theory) is used instead of 5.6×10^{-4} (1971Re04), then α(K)exp(629.9γ)=1.4×10^{-3} *1*, which indicates a pure E2 transition. δ: from $\gamma\gamma(\theta)$ of 630-834 cascade (1974Ch07). Other value: $\delta\geq 60$ or ≤ -60 (1969Mo23). Mult.: 1974Ch07 determined the E0 content to be <2% from $\gamma\gamma(\theta)$. I_γ: weighted average of 26.4 *8* (1971Re04), 25.50 *67*(1968Ca20), 27.38 *20* (2001Me01) and 27.38 *4* (2004Mi10).

$^{72}_{32}Ge_{40}$-4

^{72}Ga β^- decay 1968Ca20,1971Re04 (continued)

$\gamma(^{72}Ge)$ (continued)

E_γ	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α	$I_{(\gamma+ce)}$ ‡	Comments
									E_γ: weighted average of 629.86 *4* (1971Re04), 629.9 *1* (1968Ca20), 629.956 *36* and 629.979 *12* (2001Me01).
633.466 *14*	0.1655 *25*	3036.018	2^-	2402.537	2^+				E_γ,I_γ: from 2001Me01.
642.466 *14*	0.111 *1*	3678.515	2^-,3^-	3036.018	2^-				E_γ,I_γ: from 2001Me01.
691.2		691.772	0^+	0	0^+	E0		0.52 *5*	ce(K)/(γ+ce)=0.90 I_γ: totally converted E0 transition. ce=0.52 *5* relative to Iγ(834)=100.
735.694 *12*	0.388 *3*	2464.406	4^+	1728.740	4^+				I_γ: weighted average of 0.39 *1* (1971Re04), 0.376 *11* (1968Ca20), 0.3915 *27* (2001Me01) 0.380 *4* (2004Mi10). E_γ: weighted average of 735.9 *2* (1971Re04), 735.6 *2* (1968Ca20) and 735.694 *12* (2001Me01).
738.272 *23*	0.0496 *22*	3678.515	2^-,3^-	2940.23?	1^-				I_γ: weighted average of 0.057 *4* (1968Ca20), 0.0489 *12* (2001Me01). E_γ: weighted average of 738.5 *4* (1968Ca20), 738.271 *23* (2001Me01).
772.64 *3*	0.0300 *21*	1464.295	2^+	691.772	0^+				I_γ: weighted average of 0.045 *9* (1971Re04), 0.0301 *15* (2001Me01) and 0.024 *5* (2004Mi10). E_γ: weighted average of 772 *1* (1971Re04), 772.6 *3* (1968Ca20) and 772.643 *27* (2001Me01).
786.525 *12*	3.499 *16*	2515.255	3^-	1728.740	4^+	D			Mult.: from 1969Mo23. I_γ: weighted average of 3.41 *9* (1971Re04), 3.31 *7* (1968Ca20), 3.532 *16* (2001Me01), 3.493 *9* (2004Mi10). E_γ: weighted average of 786.4 *1* (1971Re04), 786.5 *1* (1968Ca20), 786.438 *83* and 786.529 *12* (2001Me01).
810.330 *13*	2.186 *8*	3325.608	$(3)^-$	2515.255	3^-				I_γ: weighted average of 2.10 *9* (1971Re04), 2.10 *5* (1968Ca20), 2.201 *10* (2001Me01), 2.182 *6* (2004Mi10). E_γ: weighted average of 810.24 *9* (1971Re04), 810.2 *2* (1968Ca20), 810.195 *88* (1974Ch07) and 810.335 *12* (2001Me01).
834.13 *4*	100.00 *5*	834.416	2^+	0	0^+	E2	0.000553 *8*		α=0.000553 *8*; α(K)=0.000494 *7*; α(L)=5.09×10^{-5} *8*; α(M)=7.59×10^{-6} *11*; α(N)=4.93×10^{-7} *7* α(N+..)=4.93×10^{-7} *7* E_γ: weighted average of 834.02 *3* (1971Re04), 833.95 *5* (1968Ca20), 834.026 *34* (1974Ch07) and 834.170 *12* (2001Me01).
861.179 *14*	0.984 *3*	3325.608	$(3)^-$	2464.406	4^+				I_γ: weighted average of 0.96 *3* (1971Re04), 0.963 *26* (1968Ca20), 0.987 *5* (2001Me01), 0.983 *4* (2004Mi10). E_γ: weighted average of 861.11 *5* (1971Re04), 861.0 *2* (1968Ca20) and 861.184 *12* (2001Me01).
878.52 *2*	0.067 *4*	2943.874	3^-	2065.347	3^+				I_γ: weighted average of 0.079 *8* (1971Re04), 0.074 *7* (1968Ca20), 0.0705 *17* (2001Me01), 0.055 *3* (2004Mi10). E_γ: weighted average of 878.0 *4* (1971Re04), 878.4 *2* (1968Ca20) and 878.522 *20* (2001Me01).

^{72}Ga β^- decay 1968Ca20,1971Re04 (continued)

$\gamma(^{72}Ge)$ (continued)

E_γ	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ[†]	Comments
894.327 *18*	10.619 *14*	1728.740	4^+	834.416	2^+	Q+O	+0.039 *9*	δ: from $\gamma\gamma(\theta)$ of 894-834 cascade, 1974Ch07. δ=−0.086 *25* (1969Mo23). I_γ: weighted average of 10.4 *3* (1971Re04), 10.30 *22* (1968Ca20), 10.63 *4* (2001Me01) and 10.620 *15* (2004Mi10). E_γ: weighted average of 894.22 *5* (1971Re04), 894.2 *1* (1968Ca20), 894.254 *94* (1974Ch07) and 894.336 *12* (2001Me01).
924.79 *4*	0.135 *9*	3439.952		2515.255	3^-			I_γ: weighted average of 0.15 *1* (1971Re04), 0.149 *4* (1968Ca20), 0.1223 *18* (2001Me01), 0.159 *3* (2004Mi10). E_γ: weighted average of 924.1 *2* (1971Re04), 924.5 *3* (1968Ca20) and 924.795 *17* (2001Me01).
938.4[#] *2*	0.076 *5*	2402.537	2^+	1464.295	2^+			E_γ: proposed placement of 1968Ca20, not in 1971Re04. I_γ: weighted average of 0.080 *3* (1968Ca20), 0.0707 *33* (2001Me01).
939.64 *4*	0.295 *6*	3342.135	$(2)^-$	2402.537	2^+			I_γ: weighted average of 0.27 *2* (1971Re04), 0.271 *7* (1968Ca20), 0.2937 *28* (2001Me01), 0.308 *4* (2004Mi10). E_γ: weighted average of 939.35 *8* (1971Re04), 939.4 *2* (1968Ca20) and 939.648 *16* (2001Me01).
970.76 *3*	1.156 *4*	3036.018	2^-	2065.347	3^+			I_γ: weighted average of 1.14 *3* (1971Re04), 1.155 *24* (1968Ca20), 1.163 *6* (2001Me01), 1.151 *5* (2004Mi10). E_γ: weighted average of 970.54 *6* (1971Re04), 970.6 *2* (1968Ca20) and 970.772 *12* (2001Me01).
975.539 *23*	0.0473 *13*	3439.952		2464.406	4^+			I_γ: weighted average of 0.035 *10* (1968Ca20), 0.0474 *11* (2001Me01). E_γ: weighted average of 975.5 *5* (1968Ca20) and 975.539 *23* (2001Me01).
999.989 *19*	0.841 *6*	2464.406	4^+	1464.295	2^+			I_γ: weighted average of 0.84 *2* (1971Re04), 0.832 *24* (1968Ca20), 0.851 *4* (2001Me01), 0.831 *4* (2004Mi10). E_γ: weighted average of 999.86 *6* (1971Re04), 999.9 *2* (1968Ca20) and 999.995 *12* (2001Me01).
[x]1032.3 *4*	0.068 *6*							
1037.35 *6*	0.0193 *16*	3439.952		2402.537	2^+			I_γ: weighted average of 0.022 *2* (1968Ca20), 0.0183 *12* (2001Me01). E_γ: weighted average of 1037.2 *6* (1968Ca20) and 1037.35 *6* (2001Me01).
1050.794 *17*	7.324 *11*	2515.255	3^-	1464.295	2^+	D+Q	−0.31 *5*	δ: from $\gamma\gamma(\theta)$ measurements (1974Ch07). −0.01 *16* from 1969Mo23. I_γ: weighted average of 7.2 *2* (1971Re04), 7.24 *15* (1968Ca20), 7.32 *4* (2001Me01), 7.325 *12* (2004Mi10). E_γ: weighted average of 1050.69 *6* (1971Re04), 1050.7 *1* (1968Ca20) and 1050.800 *12* (2001Me01).
1155.7[#] *6*	0.011 *2*	3620.30?	2^+	2464.406	4^+			I_γ: from 1968Ca20; other: 0.0005<(2001Me01).
1163.12 *18*	0.099 *9*	3678.515	$2^-,3^-$	2515.255	3^-			I_γ: weighted average of 0.068 *9* (1971Re04), 0.082 *6* (1968Ca20), 0.1062 *16* (2001Me01), 0.066 *4* (2004Mi10). E_γ: weighted average of 1163.2 *4* (1971Re04), 1163.1 *2* (1968Ca20), 1163.324 *20* (2001Me01).
1192.24[#] *7*	0.005 *1*	3707.51?	2^+	2515.255	3^-			E_γ,I_γ: from 2001Me01.
1215.139 *13*	0.850 *6*	2943.874	3^-	1728.740	4^+	D+Q		Mult.: from $\gamma\gamma(\theta)$ (1969Mo23), δ>0 (1969Mo23). I_γ: weighted average of 0.82 *2* (1971Re04), 0.833 *22* (1968Ca20), 0.863 *6* (2001Me01), 0.844 *5* (2004Mi10). E_γ: weighted average of 1215.16 *8* (1971Re04), 1215.1 *2* (1968Ca20) and 1215.139 *13* (2001Me01).

$^{72}_{32}Ge_{40}$-6

^{72}Ga β^- decay 1968Ca20,1971Re04 (continued)

$\gamma(^{72}Ge)$ (continued)

E_γ	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ[†]	Comments
1230.931 *13*	1.493 *8*	2065.347	3^+	834.416	2^+	D+Q	−2.0 +*15*−*25*	Mult.,δ: from $\gamma\gamma(\theta)$ (1969Mo23). I_γ: weighted average of 1.53 *4*(1971Re04), 1.513 *32* (1968Ca20), 1.513 *10* (2001Me01) and 1.487 *5* (2004Mi10). E_γ: weighted average of 1230.86 *7* (1971Re04), 1230.9 *2* (1968Ca20) and 1230.934 *13* (2001Me01).
1260.123 *13*	1.225 *9*	3325.608	$(3)^-$	2065.347	3^+			I_γ: weighted average of 1.15 *3* (1971Re04), 1.200 *25* (1968Ca20), 1.244 *8* (2001Me01), 1.220 *5* (2004Mi10). E_γ: weighted average of 1260.10 *8* (1971Re04), 1260.1 *2* (1968Ca20) and 1260.124 *13* (2001Me01).
1276.797 *13*	1.663 *5*	3342.135	$(2)^-$	2065.347	3^+			I_γ: weighted average of 1.63 *2* (1971Re04), 1.646 *34* (1968Ca20), 1.669 *11* (2001Me01), 1.665 *6* (2004Mi10). E_γ: weighted average of 1276.75 *8* (1971Re04), 1276.8 *2* (1968Ca20) and 1276.798 *13* (2001Me01).
[x]1291.3 *4*	0.059 *5*							
1390.306 *21*	0.086 *2*	3455.656	$2^-,3^-$	2065.347	3^+			I_γ: weighted average of 0.090 *9* (1971Re04), 0.089 *7* (1968Ca20), 0.0868 *20* (2001Me01), 0.079 *5* (2004Mi10). E_γ: weighted average of 1390.5 *4* (1971Re04), 1390.4 *2* (1968Ca20), 1390.304 *21* (2001Me01).
1464.054 *14*	3.781 *11*	1464.295	2^+	0	0^+			I_γ: weighted average of 3.7 *1* (1971Re04), 3.717 *78* (1968Ca20), 3.763 *31* (2001Me01) and 3.786 *12* (2004Mi10). E_γ: from (2001Me01); other: 1464.0 *1* (1971Re04).
1500.48 *7*	0.0202 *8*	3565.90	$(^-)$	2065.347	3^+			I_γ: weighted average of 0.018 *4* (1971Re04), 0.020 *1* (1968Ca20), 0.0209 *13* (2001Me01). E_γ: weighted average of 1501 *1* (1971Re04), 1500.9 *6* (1968Ca20), 1500.47 *7* (2001Me01).
[x]1519.4 *5*	0.033 *6*							
[x]1541.2 *6*	0.017 *1*							
1568.07 *2*	0.172 *16*	2402.537	2^+	834.416	2^+			I_γ: weighted average of 0.090 *9* (1971Re04), 0.208 *7* (1968Ca20), 0.1739 *24* (2001Me01). E_γ: weighted average of 1567.9 *4* (1971Re04), 1568.2 *3* (1968Ca20) and 1568.071 *20* (2001Me01).
1571.600 *14*	0.869 *10*	3036.018	2^-	1464.295	2^+			I_γ: weighted average of 0.84 *3* (1971Re04), 0.873 *25* (1968Ca20), 0.897 *9* (2001Me01), 0.858 *6* (2004Mi10). E_γ: weighted average of 1571.5 *2* (1971Re04), 1571.7 *2* (1968Ca20) and 1571.600 *14* (2001Me01).
1596.733 *14*	4.599 *14*	3325.608	$(3)^-$	1728.740	4^+	D(+Q)	+0.05 *6*	δ: from $\gamma\gamma(\theta)$ (1969Mo23). I_γ: weighted average of 4.5 *4* (1971Re04), 4.43 *9* (1968Ca20), 4.58 *4* (2001Me01), 4.605 *13* (2004Mi10). E_γ: weighted average of 1596.65 *9* (1971Re04), 1596.8 *2* (1968Ca20) and 1596.735 *14* (2001Me01).
1613.321 *20*	0.039 *3*	3678.515	$2^-,3^-$	2065.347	3^+			I_γ: weighted average of 0.040 *8* (1971Re04), 0.042 *8* (1968Ca20), 0.0388 *29* (2001Me01). E_γ: weighted average of 2785.2 *6* (1971Re04), 2785.1 *5* (1968Ca20), 2785.833 *37* (2001Me01).

$^{72}_{32}Ge_{40}$-7

^{72}Ga β^- decay 1968Ca20,1971Re04 (continued)

$\gamma(^{72}Ge)$ (continued)

E_γ	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ †	α	Comments
1629.90 *21*	0.028 *4*	2464.406	4^+	834.416	2^+				I_γ: weighted average of 0.034 *6* (1971Re04), 0.025 *4* (2001Me01). E_γ: weighted average of 1630 *1* (1971Re04) and 1629.90 *22* (2001Me01).
1680.742 *15*	0.955 *9*	2515.255	3^-	834.416	2^+				I_γ: weighted average of 1.04 *4* (1971Re04), 0.907 *24* (1968Ca20), 0.96 *1* (2001Me01), 0.955 *6* (2004Mi10). E_γ: weighted average of 1680.77 *8* (1971Re04), 1680.8 *2* (1968Ca20) and 1680.741 *15* (2001Me01).
1710.41 *20*	0.411 *12*	2402.537	2^+	691.772	0^+				I_γ: weighted average of 0.40 *1* (1968Ca20), 0.19 *6* (2001Me01) and 0.415 *5* (2004Mi10). E_γ: weighted average of 1710.9 *2* (1971Re04), and 1710.33 *8* (2001Me01).
1711.15 *15*	0.048 *11*	3439.952		1728.740	4^+				I_γ: weighted average of 0.10 *1* (1971Re04), 0.045 *2* (1968Ca20), 0.27 *4* (2001Me01). E_γ: weighted average of 1711.3 *2* (1971Re04), 1711.0 *2* (1968Ca20) and 1711.17 *13* (2001Me01).
1837.15 *4*	0.26 *3*	3565.90	$(^-)$	1728.740	4^+				I_γ: weighted average of 0.24 *1* (1971Re04), 0.212 *6* (1968Ca20), 0.231 *4* (2001Me01), 0.353 *5* (2004Mi10). E_γ: weighted average of 1837.8 *2* (1971Re04), 1837.1 *3* (1968Ca20), 1837.148 *19* (2001Me01).
1861.996 *18*	5.67 *3*	3325.608	$(3)^-$	1464.295	2^+	D+Q			Mult.: from $\gamma\gamma(\theta)$ (1969Mo23). I_γ: weighted average of 5.5 *1* (1971Re04), 5.47 *12* (1968Ca20), 5.67 *7* (2001Me01), 5.684 *19* (2004Mi10). E_γ: weighted average of 1861.09 *8* (1971Re04), 1861.1 *1* (1968Ca20) and 1860.990 *16* (2001Me01).
1877.692 *19*	0.239 *4*	3342.135	$(2)^-$	1464.295	2^+				I_γ: weighted average of 0.24 *2* (1971Re04), 0.242 *6* (1968Ca20), 0.244 *4* (2001Me01), 0.230 *5* (2004Mi10). E_γ: weighted average of 1878.0 *3* (1971Re04), 1877.8 *3* (1968Ca20) and 1877.690 *19* (2001Me01).
1920.20 *17*	0.168 *5*	2754.68	(0^+)	834.416	2^+				I_γ: weighted average of 0.15 *2* (1971Re04), 0.166 *5* (1968Ca20), 0.176 *4* (2001Me01), 0.153 *6* (2004Mi10).
1991.16 *3*	0.106 *9*	3455.656	$2^-,3^-$	1464.295	2^+				I_γ: weighted average of 0.117 *3* (1968Ca20), 0.0981 *25* (2001Me01). E_γ: weighted average of 1991.3 *3* (1968Ca20), 1991.157 *33* (2001Me01).
2028.94 *7*	0.121 *3*	3757.81	$^-$	1728.740	4^+				I_γ: weighted average of 0.10 *2* (1971Re04), 0.130 *4* (1968Ca20), 0.1187 *20* (2001Me01), 0.125 *7* (2004Mi10). E_γ: weighted average of 2030.4 *8* (1971Re04), 2029.1 *4* (1968Ca20), 2028.93 *5* (2001Me01).
2109.361 *19*	1.137 *10*	2943.874	3^-	834.416	2^+				I_γ: weighted average of 1.12 *3* (1971Re04), 1.081 *23* (1968Ca20), 1.147 *17* (2001Me01), 1.143 *8* (2004Mi10). E_γ: weighted average of 2109.5 *1* (1971Re04), 2109.5 *2* (1968Ca20) and 2109.356 *17* (2001Me01).
2201.586 *17*	28.15 *12*	3036.018	2^-	834.416	2^+	E1(+M2)	−0.05 *4*	0.000810 *12*	α=0.000810 *12*; α(K)=3.70×10^{-5} *7*; α(L)=3.72×10^{-6} *7*;

$^{72}_{32}Ge_{40}$-8

^{72}Ga β^- decay 1968Ca20,1971Re04 (continued)

$\gamma(^{72}Ge)$ (continued)

E_γ	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ[†]	α	Comments
									α(M)=5.55×10^{-7} *10*; α(N)=3.66×10^{-8} *7* α(N+..)=0.000769 *12* Mult.: E1 is preferred to M1 radiation by the pair-conversion measurements of 1968Be56 and circular polarization data (1971Be31). δ: from $\gamma\gamma(\theta)$ (1969Mo23). I_γ: weighted average of 26.8 *8* (1971Re04), 27.27 *57* (1968Ca20), 28.2 *5* (2001Me01), 28.19 *9* (2004Mi10). E_γ: weighted average of 2201.67 *8* (1971Re04), 2201.6 *2* (1968Ca20) and 2201.582 *17* (2001Me01).
2214.024 *20*	0.228 *10*	3678.515	2$^-$,3$^-$	1464.295	2$^+$				I_γ: weighted average of 0.16 *2* (1971Re04), 0.194 *11* (1968Ca20), 0.241 *4* (2001Me01), 0.220 *5* (2004Mi10). E_γ: weighted average of 2214.5 *8* (1971Re04), 2214.3 *3* (1968Ca20), 2214.022 *20* (2001Me01).
2402.57[#] *8*	0.0464 *18*	2402.537	2$^+$	0	0$^+$				E_γ: weighted average of 2402.2 *4* (1968Ca20), and 2402.58 *8* (2001Me01). I_γ: from 2001Me01.
2404.3[#] *8*	0.016 *4*	3094.54	2$^+$	691.772	0$^+$				E_γ,I_γ: Observed only by 1971Re04.
2491.026 *17*	8.10 *3*	3325.608	(3)$^-$	834.416	2$^+$	E1+M2	+0.15 *4*	0.000974 *16*	α=0.000974 *16*; α(K)=3.20×10^{-5} *8*; α(L)=3.22×10^{-6} *9*; α(M)=4.80×10^{-7} *13*; α(N)=3.17×10^{-8} *9* α(N+..)=0.000939 *16* Mult.: E1 is preferred to M1 radiation by the pair-conversion measurements of 1968Be56. δ: from $\gamma\gamma(\theta)$ (1969Mo23). I_γ: weighted average of 8.1 *2* (1971Re04), 8.3 *2* (1968Ca20), 8.10 *3* (2004Mi10). E_γ: weighted average of 2490.98 *8* (1971Re04), 2491.0 *2* (1968Ca20) and 2491.029 *18* (2001Me01).
2507.718 *17*	13.97 *6*	3342.135	(2)$^-$	834.416	2$^+$	E1+M2	+0.09 *5*	0.000993 *16*	α=0.000993 *16*; α(K)=3.10×10^{-5} *8*; α(L)=3.11×10^{-6} *8*; α(M)=4.64×10^{-7} *11*; α(N)=3.07×10^{-8} *8* α(N+..)=0.000958 *16* Mult.: E1 is preferred to M1 by pair-conversion data (1968Be56). δ: from $\gamma\gamma(\theta)$ (1969Mo23). I_γ: weighted average of 13.3 *4* (1971Re04), 13.4 *3* (1968Ca20), 14.0 *3* (2001Me01), 13.99 *4* (2004Mi10). E_γ: weighted average of 2507.80 *8* (1971Re04), 2507.7 *2* (1968Ca20) and 2507.714 *18* (2001Me01).
2515.857 *22*	0.270 *15*	2515.255	3$^-$	0	0$^+$	E3		0.000445 *7*	α=0.000445 *7*; α(K)=7.72×10^{-5} *11*; α(L)=7.83×10^{-6} *11*; α(M)=1.169×10^{-6} *17* α(N+..)=0.000359 *5* I_γ: weighted average of 0.25 *2* (1971Re04), 0.264 *10*

$^{72}_{32}Ge_{40}$-9

^{72}Ga β^- decay 1968Ca20,1971Re04 (continued)

$\gamma(^{72}Ge)$ (continued)

E_γ	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α	Comments
								(1968Ca20), 0.334 *7* (2001Me01), 0.259 *3* (2004Mi10). E_γ: weighted average of 2515.6 *5* (1971Re04), 2514.6 *4* (1968Ca20) and 2514.857 *19* (2001Me01).
2582.39# *12*	0.0133 *15*	2582.44		0	0^+			I_γ: weighted average of 0.035 *7*(1971Re04), 0.015 *1* (1968Ca20), 0.0123 *7* (2001Me01). E_γ: weighted average of 2583.5 *4* (1971Re04), 2582.2 *12* (1968Ca20) and 2582.37 *6* (2001Me01).
2605.44 *5*	0.016 *2*	3439.952		834.416	2^+			I_γ: weighted average of 0.021 *2* (1968Ca20), 0.0152 *6* (2001Me01). E_γ: weighted average of 2605.4 *4* (1968Ca20) and 2605.44 *5* (2001Me01).
2621.279 *23*	0.148 *6*	3455.656	2^-,3^-	834.416	2^+	E1	0.001063 *15*	α=0.001063 *15*; α(K)=2.87×10^{-5} *4*; α(L)=2.89×10^{-6} *4*; α(M)=4.30×10^{-7} *6*; α(N)=2.84×10^{-8} *4* α(N+..)=0.001031 *15* Mult.: from pair-conversion measurements (1968Be56). E_γ: weighted average of 2621.0 *4* (1971Re04), 2621.1 *3* (1968Ca20), 2621.281 *23* (2001Me01). I_γ: weighted average of 0.15 *2* (1971Re04), 0.137 *4* (1968Ca20), 0.150 *4* (2001Me01), 0.167 *6* (2004Mi10).
2633.57 *4*	0.0175 *13*	3325.608	$(3)^-$	691.772	0^+			I_γ: weighted average of 0.012 *2* (1971Re04), 0.016 *1* (1968Ca20), 0.0185 *6* (2001Me01). E_γ: weighted average of 2633.8 *4* (1971Re04), 2634.0 *7* (1968Ca20) and 2633.57 *4* (2001Me01).
2785.83# *5*	0.0314 *9*	3620.30?	2^+	834.416	2^+			I_γ: weighted average of 0.032 *6* (1971Re04), 0.031 *2* (1968Ca20), 0.0315 *10* (2001Me01). E_γ: weighted average of 2785.2 *6* (1971Re04), 2785.1 *5* (1968Ca20), 2785.833 *37* (2001Me01).
2844.16 *3*	0.467 *8*	3678.515	2^-,3^-	834.416	2^+	E1	0.001179 *17*	α=0.001179 *17*; α(K)=2.57×10^{-5} *4*; α(L)=2.58×10^{-6} *4*; α(M)=3.85×10^{-7} *6*; α(N)=2.54×10^{-8} *4* α(N+..)=0.001151 *17* Mult.: from pair-conversion measurements (1968Be56). I_γ: weighted average of 0.50 *2* (1971Re04), 0.429 *12* (1968Ca20), 0.467 *13* (2001Me01), 0.470 *4* (2004Mi10). E_γ: weighted average of 2844.1 *2* (1971Re04), 2843.9 *2* (1968Ca20), 2844.171 *35* (2001Me01).
x2897.1 *8*	0.005 *1*							
2940.18# *9*	0.0142 *19*	2940.23?	1^-	0	0^+			Mult.: may be (M1+E2) from pair-conversion measurements of 2937 *5* transition (1968Be56). I_γ: weighted average of 0.011 *1* (1968Ca20), 0.0154 *6* (2001Me01). E_γ: weighted average of 2939.6 *4* (1968Ca20) and 2940.19 *6* (2001Me01).
2942.4 *9*	0.027 *6*	2943.874	3^-	0	0^+			E_γ,I_γ: Observed only by 1971Re05.
2950.0# *5*	0.0049 *3*	2951.26?	1^+,2^+,3^+	0	0^+			E_γ,I_γ: from 2001Me01, other: Iγ=0.004 *1* (1968Ca20).
2981.49 *6*	0.063 *3*	3815.97	2^-,3^-	834.416	2^+			I_γ: weighted average of 0.072 *13* (1971Re04), 0.055 *5* (1968Ca20), 0.0643 *21* (2001Me01). E_γ: weighted average of 2981.4 *4* (1971Re04), 2981.0 *3* (1968Ca20), 2981.50 *5* (2001Me01).

$^{72}_{32}Ge_{40}$-10

^{72}Ga β^- decay 1968Ca20,1971Re04 (continued)

$\gamma(^{72}Ge)$ (continued)

E_γ	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α	Comments
3034.6 *4*	0.0048 *9*	3036.018	2^-	0	0^+	M2	0.000549 *8*	α=0.000549 *8*; α(K)=5.65×10^{-5} *8*; α(L)=5.72×10^{-6} *8*; α(M)=8.53×10^{-7} *12*; α(N)=5.66×10^{-8} *8* α(N+..)=0.000486 *7* Mult.: from pair-conversion measurements (1968Be56). I_γ: weighted average of 0.004 *2*(1971Re04), 0.005 *1* (1968Ca20). Other: 0.0201 *8* (2001Me01).
[x]3067.0 *6*	0.003 *1*							
3094.31 *15*	0.0170 *6*	3094.54	2^+	0	0^+			I_γ: weighted average of 0.026 *8* (1971Re04), 0.017 *2* (1968Ca20), 0.0170 *6* (2001Me01). E_γ: weighted average of 3093.9 *7* (1971Re04), 3093.7 *3* (1968Ca20) and 3094.39 *10* (2001Me01).
3325.30 *14*	0.0069 *15*	3325.608	$(3)^-$	0	0^+			I_γ: weighted average of 0.004 *2* (1971Re04), 0.003 *1* (1968Ca20), 0.0081 *5* (2001Me01). E_γ: weighted average of 3324.4 *5* (1971Re04), 3325.0 *6* (1968Ca20) and 3325.35 *11* (2001Me01).
3338.54# *15*	0.0045 *6*	3338.62?	$(1,2^+)$	0	0^+			I_γ: weighted average of 0.003 *1* (1968Ca20), 0.0047 *4* (2001Me01). E_γ: weighted average of 3338.3 *7* (1968Ca20) and 3338.55 *15* (2001Me01).
3678.5 *4*	0.0009 *2*	3678.515	$2^-,3^-$	0	0^+			E_γ,I_γ: from 2001Me01.

† Mainly from $\gamma\gamma(\theta)$ (1974Ch07,1969Mo23). δ values from 1969Mo23 have been recalculated by the evaluator from $\gamma\gamma(\theta)$ data of 1969Mo23.

‡ For absolute intensity per 100 decays, multiply by 0.9545 *6*.

Placement of transition in the level scheme is uncertain.

x γ ray not placed in level scheme.

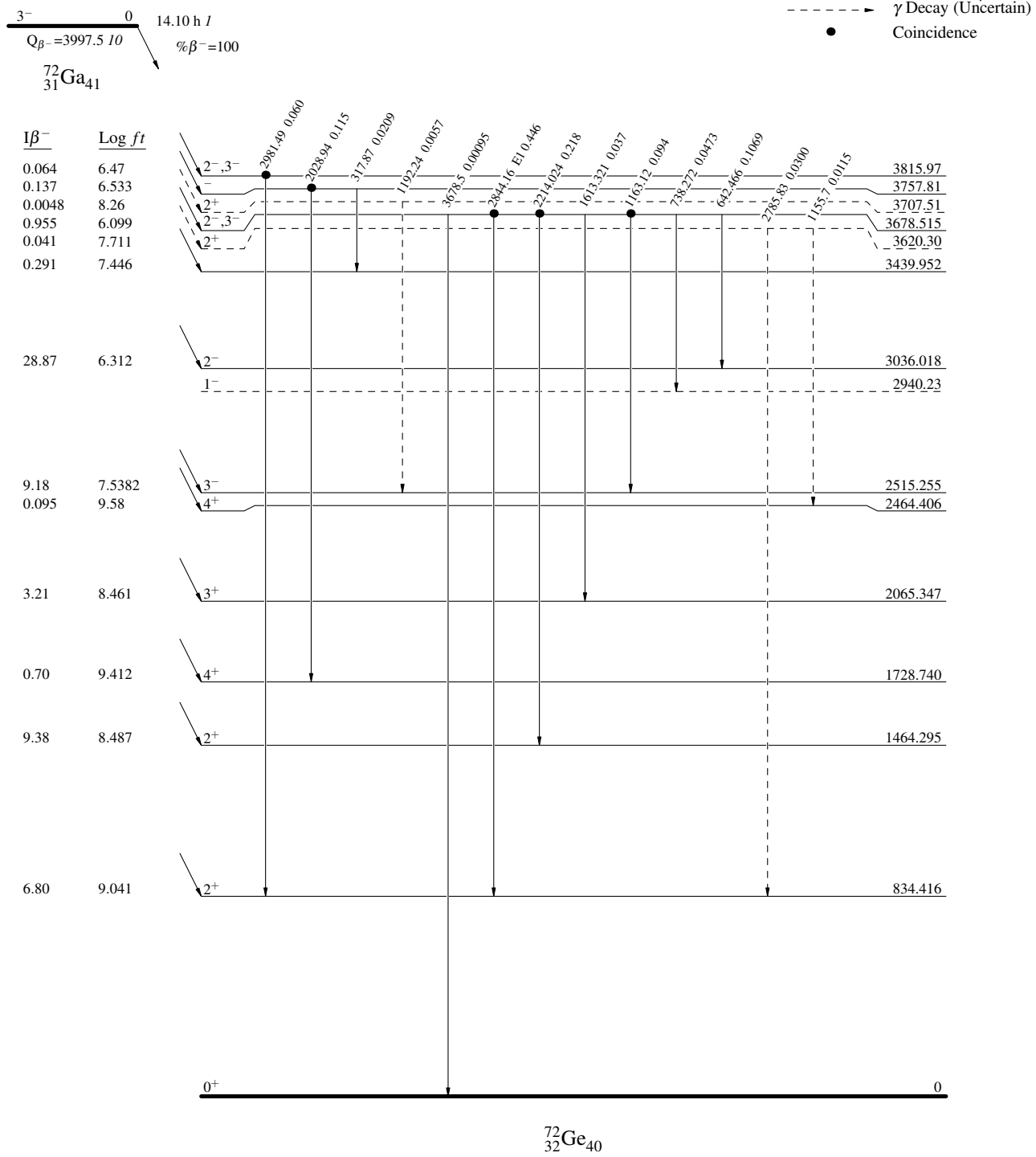
$^{72}_{32}Ge_{40}$-11

^{72}Ga β^- decay 1968Ca20,1971Re04

Decay Scheme

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

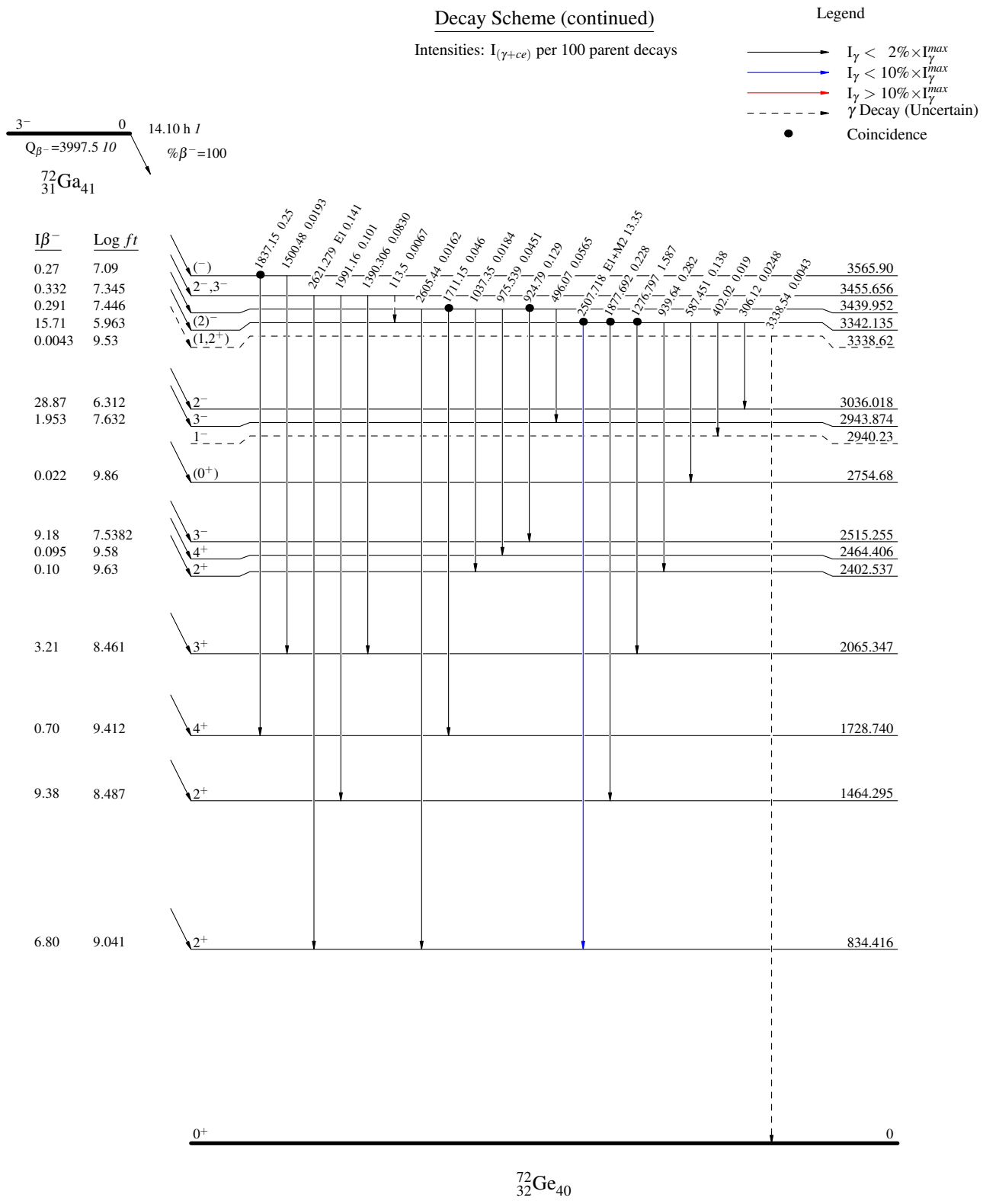
Legend
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$
- γ Decay (Uncertain)
- Coincidence



^{72}Ga β^- decay 1968Ca20,1971Re04

Decay Scheme (continued)

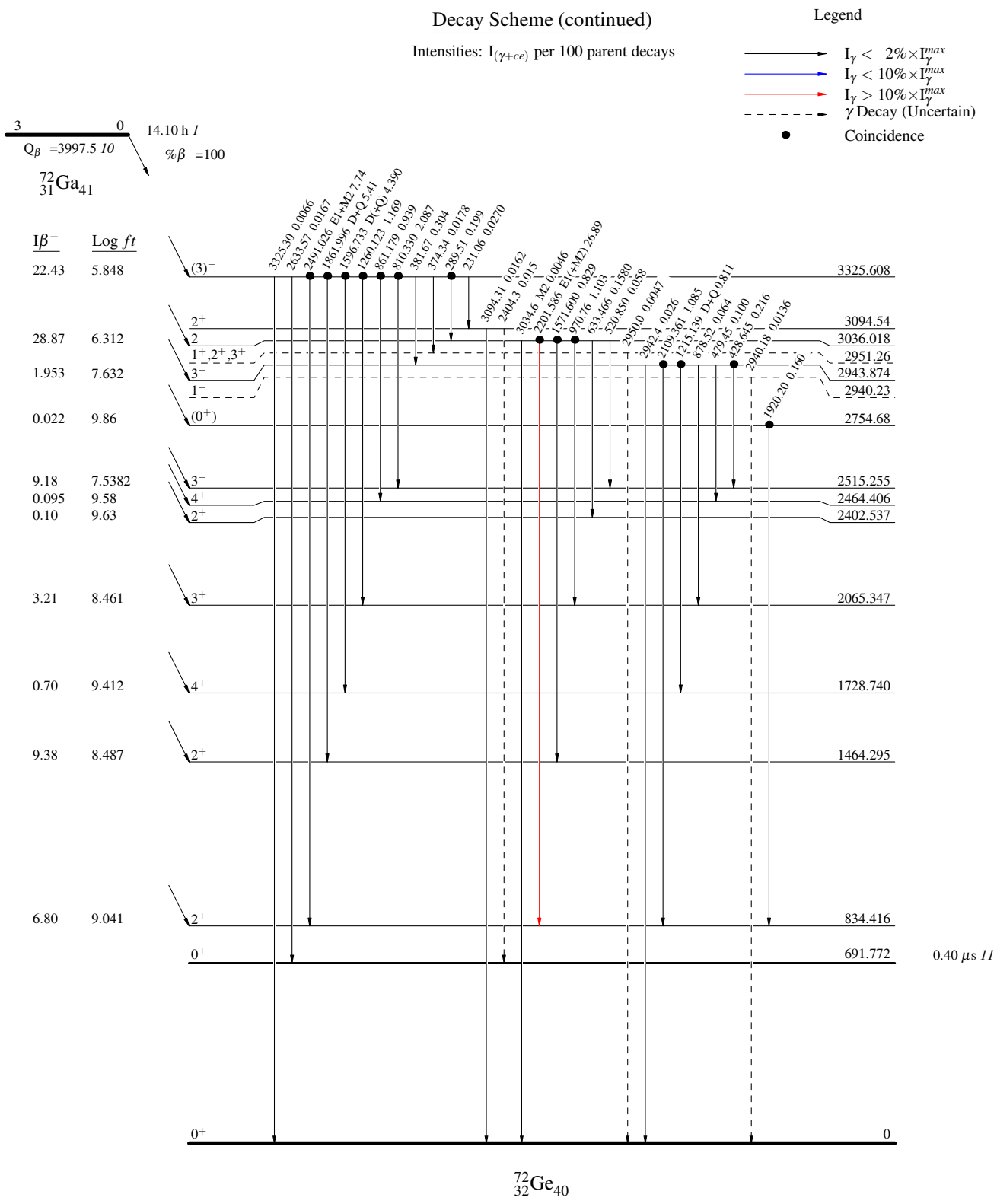
Intensities: $I_{(\gamma+ce)}$ per 100 parent decays



^{72}Ga β^- decay 1968Ca20,1971Re04

Decay Scheme (continued)

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



^{72}Ga β^- decay 1968Ca20,1971Re04

Decay Scheme (continued)

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