

Adopted Levels, Gammas

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen		NDS 158, 1 (2019)	16-May-2019

$Q(\beta^-) = -10470$ SY; $S(n) = 10682$ IO; $S(p) = 4779$ 7; $Q(\alpha) = -2542$ 7 [2017Wa10](#)

Estimated $\Delta Q(\beta^-) = 200$ ([2017Wa10](#)).

$S(2n) = 26370$ I30, $S(2p) = 7983$ 7, $Q(\epsilon p) = 4027$ 7 ([2017Wa10](#)).

Production and identification of ^{73}Kr isotope:

[1972Ho20](#): Zr(p,X) E=600, mass separation. Measured β -delayed protons, $p\gamma$, (p)(annihilation γ) coin. Kr collection determined by absolute counting of γ rays from daughter product 7.1-h ^{73}Se accumulated on carbon foil.

[1973Da22](#): $^{58}\text{Ni}(^{16}\text{O},n)$ E $\approx$ 50 MeV, chemical separation, growth of daughter. Identification of Kr based on buildup of daughter, and on relative photon intensity observed at two energies.

[1974Ro11](#): Zr(p,X) E=600 MeV, mass separation.

[1981As06](#), [1978As05](#): $^{93}\text{Nb}(p,X)$ E=600 MeV, mass separation. Measured β -delayed protons, p(x ray) coin.

[1981Ha44](#), [1976Ha29](#): $^{60}\text{Ni}(^{16}\text{O},3n)$ E=75 MeV. Measured E(p), I(p), $p\gamma$, p(x ray), and γ (x ray) coin.

[1999Mi17](#): $^{93}\text{Nb}(p,X)$ E=600 MeV, mass separation. Measured β -delayed proton spectra.

Mass measurements: [2002He23](#), [2006Ro11](#) (also [2005Ro39](#)), [2004Ro32](#).

[Additional information 1](#).

 ^{73}Kr Levels

Q_t =transition quadrupole moment, deduced from lifetime data obtained using DSAM in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2p n\gamma)$ ([2008Jo07](#)).

Band assignments and configurations are discussed by [2002Ke03](#) and [2010St05](#).

Cross Reference (XREF) Flags

- A ^{73}Kr IT decay (107 ns)
 B $^{40}\text{Ca}(^{36}\text{Ar},2p n\gamma),(^{40}\text{Ca},\alpha 2p n\gamma)$
 C $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2p n\gamma)$

E(level) [†]	J^π [‡]	$T_{1/2}$	XREF	Comments
0.0 [#]	(3/2) ⁻	27.3 s IO	ABC	$\% \epsilon + \% \beta^+ = 100$; $\% \epsilon p = 0.25$ 3 (1999Mi17 , 2000Gi11 , 2000Jo23) Others for ϵp studies: $\% \epsilon p = 0.68$ 12 (1972Ho20), 2003Pi03 (authors state that their measured value is in agreement with 0.24 3 from 1999Mi17 , but do not provide their own value). 1981Ha44 measured 82% proton decay branch to the g.s. and 18% to the first 2 ⁺ state in ^{72}Se . See also 1976HaWO from the same group as 1981Ha44 . J^π : log $ft = 5.7$ 1 to 1/2 ⁻ ; log $ft = 6.4$ to (5/2) ⁺ . $T_{1/2}$: weighted average of 25.9 s 6 (1973Da22), 28.4 s 7 (1981Ha44) and 29.0 s 10 (1999Mi17).
144.05 [@] 8	(5/2) ⁻		ABC	
367.74 8	(5/2) ⁺		ABC	
392.91 [#] 15	(7/2) ⁻		ABC	
433.55 ^{&} 13	(9/2) ⁺	107 ns IO	ABC	$\% \text{IT} = 100$ $T_{1/2}$: from $\gamma(t)$ (2000Ch07).
511.5 ^a 6	(7/2) ⁺		BC	
660.16 [@] 13	(9/2) ⁻		BC	
1003.88 [#] 17	(11/2) ⁻		BC	
1065.8 ^a 4	(11/2) ⁺		BC	
1177.66 ^{&} 23	(13/2) ⁺		BC	
1372.29 [@] 16	(13/2) ⁻		BC	

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Adopted Levels, Gammas (continued) ^{73}Kr Levels (continued)

E(level) [†]	J ^π [‡]	XREF	Comments
1830.49 [#] 25	(15/2 ⁻)	BC	
1892.0 ^a 4	(15/2 ⁺)	BC	
2069.7 ^{&} 3	(17/2 ⁺)	BC	
2285.31 [@] 19	(17/2 ⁻)	BC	
2864.5 [#] 4	(19/2 ⁻)	BC	Q _t =2.99 8 (2008Jo07).
2937.4 ^a 5	(19/2 ⁺)	BC	
3155.1 ^{&} 4	(21/2 ⁺)	BC	
3382.42 [@] 21	(21/2 ⁻)	BC	Q _t =3.26 8 (2008Jo07).
3614.7 11		C	
4087.6 [#] 4	(23/2 ⁻)	BC	Q _t =2.95 8 (2008Jo07).
4139.2 ^a 8	(23/2 ⁺)	BC	
4401.2 ^{&} 4	(25/2 ⁺)	BC	Q _t =2.44 8 (2008Jo07).
4645.5 [@] 3	(25/2 ⁻)	BC	Q _t =3.21 8 (2008Jo07).
5346 ^a 4	(27/2 ⁺)	BC	
5407.5 [#] 5	(27/2 ⁻)	BC	Q _t =2.90 8 (2008Jo07).
5504.5 ^b 6	(27/2 ⁻)	BC	J ^π : from 2010St05.
5615.1 ^{&} 5	(29/2 ⁺)	BC	Q _t =2.39 8 (2008Jo07).
6027.5 [@] 5	(29/2 ⁻)	BC	Q _t =3.16 8 (2008Jo07).
6197.5 11		C	
6567.5 [#] 6	(31/2 ⁻)	BC	Q _t =2.85 8 (2008Jo07).
6812.1 ^{&} 6	(33/2 ⁺)	BC	Q _t =2.34 8 (2008Jo07).
7002.0 ^b 9	(31/2 ⁻)	BC	
7330.6 [@] 6	(33/2 ⁻)	BC	Q _t =3.10 8 (2008Jo07).
7890.6 [#] 6	(35/2 ⁻)	BC	Q _t =2.78 8 (2008Jo07).
8109.1 ^{&} 7	(37/2 ⁺)	BC	Q _t =2.27 8 (2008Jo07).
8452.1 ^b 14	(35/2 ⁻)	C	
8741.6 [@] 9	(37/2 ⁻)	BC	Q _t =3.03 8 (2008Jo07).
9400.7 [#] 7	(39/2 ⁻)	BC	Q _t =2.70 8 (2008Jo07).
9534.1 ^{&} 8	(41/2 ⁺)	BC	Q _t =2.19 8 (2008Jo07).
10356.7 [@] 10	(41/2 ⁻)	BC	Q _t =2.95 8 (2008Jo07).
11105.5 [#] 8	(43/2 ⁻)	BC	Q _t =2.50 8 (2008Jo07).
11253.2 ^{&} 10	(45/2 ⁺)	BC	Q _t =1.99 8 (2008Jo07).
12099.8 [@] 11	(45/2 ⁻)	BC	Q _t =2.85 8 (2008Jo07).
12987.5 [#] 10	(47/2 ⁻)	BC	
13388.2 ^{&} 15	(49/2 ⁺)	BC	
13967.9 [@] 13	(49/2 ⁻)	BC	Q _t =2.60 8 (2008Jo07).
15031.4 [#] 12	(51/2 ⁻)	BC	
16013 ^{&} 6	(53/2 ⁺)	BC	
16147.0 [@] 15	(53/2 ⁻)	BC	
17334.5 [#] 16	(55/2 ⁻)	BC	
18769.0 [@] 25	(57/2 ⁻)	BC	
19185 ^{&} 10	(57/2 ⁺)	BC	
20029.5 [#] 19	(59/2 ⁻)	BC	
21930 [@] 10	(61/2 ⁻)	BC	
22912 ^{&} 10	(61/2 ⁺)	C	Maximum configuration spin state of $\alpha=+1/2$ signature, this band does not show a strong

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Adopted Levels, Gammas (continued) ^{73}Kr Levels (continued)

<u>E(level)[†]</u>	<u>J^π[‡]</u>	<u>XREF</u>	<u>Comments</u>
23237 [#] 5	(63/2 ⁻)	BC	decrease in quadrupole collective behavior (2010St05).

[†] From least-squares fit to E_γ data, assuming 0.1-0.3 keV uncertainty for E_γ from low-lying (<500 keV) levels and 1 keV for higher levels, when not stated. Note that level energies in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05) differ significantly above ≈ 6 MeV excitation energy, due to large differences in E_γ values between 2002Ke03 and 2010St05, values from 2002Ke03 are preferred here as the energy uncertainties are given in this work.

[‡] For excited states, the assignments are as proposed by 2002Ke03 in $^{40}\text{Ca}(^{36}\text{Ar},2\text{pn}\gamma)$, $(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$, and 2010St05 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$, based on $\gamma\gamma(\theta)$ (DCO) data for selected transitions, interconnecting dipole and quadrupole transitions, and band assignments. The parentheses have been added by the evaluator since strong arguments leading to unique assignments are lacking.

[#] Band(a): Band based on (3/2)⁻, $\alpha = -1/2$. At low spins, dominant configuration= $\nu 3/2[312]$. At high spins, configuration= $\pi[(\text{pf})^5 g_{9/2}^3] \otimes \nu[(\text{pf})^6 g_{9/2}^3]$.

[@] Band(A): Band based on (5/2)⁻, $\alpha = +1/2$. At low spins, dominant configuration= $\nu 3/2[312]$. At high spins, configuration= $\pi[(\text{pf})^5 g_{9/2}^3] \otimes \nu[(\text{pf})^6 g_{9/2}^3]$.

[&] Band(B): Band based on (9/2)⁺, $\alpha = +1/2$. At high spins, configuration= $\pi[(\text{pf})^6 g_{9/2}^2] \otimes \nu[(\text{pf})^6 g_{9/2}^3]$. This band is nearly prolate with $b_2 \approx 0.37$ at low frequencies and $\beta_2 \approx 0.30$ after the $\pi g_{9/2}^2$ alignment, triaxial parameter $\gamma = 2-3^\circ$ (2002Ke03).

^a Band(b): Band based on (7/2)⁺, $\alpha = -1/2$. At high spins, configuration= $\pi[(\text{pf})^6 g_{9/2}^2] \otimes \nu[(\text{pf})^6 g_{9/2}^3]$. See also comment for $\alpha = +1/2$ signature partner. 2002Ke03 state that this band may be based on a different configuration.

^b Band(C): Side band.

 $\gamma(^{73}\text{Kr})$

<u>E_i(level)</u>	<u>J_i^π</u>	<u>E_γ[†]</u>	<u>I_γ[†]</u>	<u>E_f</u>	<u>J_f^π</u>	<u>Mult.[@]</u>	<u>δ[@]</u>	<u>α^{&}</u>	<u>Comments</u>
144.05	(5/2 ⁻)	144.0 1	100	0.0	(3/2 ⁻)	(M1)		0.0478	
367.74	(5/2 ⁺)	223.6 [‡]	72 [‡] 3	144.05	(5/2 ⁻)	(D)			Mult.: $\Delta J=0$, dipole or $\Delta J=2$, Q from DCO data in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
		367.8 [‡]	100 [‡] 5	0.0	(3/2 ⁻)				
392.91	(7/2 ⁻)	249.0 2	38 10	144.05	(5/2 ⁻)	(M1+E2)	+0.30 9		
		392.8	100 3	0.0	(3/2 ⁻)	Q			
433.55	(9/2 ⁺)	40.8 [‡]	17 [‡] 3	392.91	(7/2 ⁻)	[E1]		1.24 4	B(E1)(W.u.)= 1.7×10^{-6} 6
		65.8 [‡]	100 [‡] 4	367.74	(5/2 ⁺)	[E2]		4.30	B(E2)(W.u.)=41.6 43
511.5	(7/2 ⁺)	143.6		367.74	(5/2 ⁺)				
660.16	(9/2 ⁻)	267.1 3	17 8	392.91	(7/2 ⁻)	(M1+E2)	+0.77 12		
		516.1 1	100 3	144.05	(5/2 ⁻)	Q			
1003.88	(11/2 ⁻)	343.6 8	9 3	660.16	(9/2 ⁻)	(M1+E2)	+1.05 29		
		611.0 1	100 10	392.91	(7/2 ⁻)	Q			
1065.8	(11/2 ⁺)	554.3 5	44 25	511.5	(7/2 ⁺)				
		632.3 4	100 19	433.55	(9/2 ⁺)				
1177.66	(13/2 ⁺)	744.1 2	100	433.55	(9/2 ⁺)	Q			
1372.29	(13/2 ⁻)	368.4 6	6 3	1003.88	(11/2 ⁻)	(M1+E2)	+0.64 23		
		712.1 1	100 20	660.16	(9/2 ⁻)	Q			
1830.49	(15/2 ⁻)	457 [#]		1372.29	(13/2 ⁻)				
		826.7 2	100 12	1003.88	(11/2 ⁻)	Q			
1892.0	(15/2 ⁺)	714.3 4	100 42	1177.66	(13/2 ⁺)	(M1+E2)	-0.42 21		
		826.2 5	<167	1065.8	(11/2 ⁺)				
2069.7	(17/2 ⁺)	892.0 2	100	1177.66	(13/2 ⁺)	Q			

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Adopted Levels, Gammas (continued) $\gamma(^{73}\text{Kr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Mult. @	$\delta^\oplus$	Comments
2285.31	(17/2 ⁻)	456 [#]		1830.49	(15/2 ⁻)			
		913.0 1	100 16	1372.29	(13/2 ⁻)	Q		
2864.5	(19/2 ⁻)	1034.0 2	100	1830.49	(15/2 ⁻)			
2937.4	(19/2 ⁺)	867.8 4	100 36	2069.7	(17/2 ⁺)	(M1+E2)	-0.29 25	
		1045.3 6	<143	1892.0	(15/2 ⁺)			
3155.1	(21/2 ⁺)	1085.4 2	100	2069.7	(17/2 ⁺)	Q		
3382.42	(21/2 ⁻)	1097.1 1	100	2285.31	(17/2 ⁻)	(Q)		
3614.7		1545 [#]	100	2069.7	(17/2 ⁺)			
4087.6	(23/2 ⁻)	1223.1 2	100	2864.5	(19/2 ⁻)	Q		
4139.2	(23/2 ⁺)	984 1	<50	3155.1	(21/2 ⁺)			
		1202 1	<100	2937.4	(19/2 ⁺)			
4401.2	(25/2 ⁺)	1246.1 2	100	3155.1	(21/2 ⁺)	(Q)		
4645.5	(25/2 ⁻)	1263.1 2	100	3382.42	(21/2 ⁻)	Q		
5346	(27/2 ⁺)	1207 3	100	4139.2	(23/2 ⁺)			
5407.5	(27/2 ⁻)	1319.9 2	100	4087.6	(23/2 ⁻)	(Q)		Mult.: from DCO data for 1320 doublet in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
5504.5	(27/2 ⁻)	1416.9 4	100	4087.6	(23/2 ⁻)			
5615.1	(29/2 ⁺)	1213.9 3	100	4401.2	(25/2 ⁺)	Q		
6027.5	(29/2 ⁻)	1382.0 4	100	4645.5	(25/2 ⁻)			
6197.5		1552 [#]	100	4645.5	(25/2 ⁻)			
6567.5	(31/2 ⁻)	1160.0 3	100	5407.5	(27/2 ⁻)			
6812.1	(33/2 ⁺)	1197.0 2	100	5615.1	(29/2 ⁺)			
7002.0	(31/2 ⁻)	1497.5 7	100	5504.5	(27/2 ⁻)			
7330.6	(33/2 ⁻)	1303.0 3	100	6027.5	(29/2 ⁻)	Q		
7890.6	(35/2 ⁻)	1323.1 2	100	6567.5	(31/2 ⁻)	Q		
8109.1	(37/2 ⁺)	1297.0 3	100	6812.1	(33/2 ⁺)	Q		
8452.1	(35/2 ⁻)	1450 [#]	100	7002.0	(31/2 ⁻)			
8741.6	(37/2 ⁻)	1411.0 6	100	7330.6	(33/2 ⁻)	Q		
9400.7	(39/2 ⁻)	1510.0 3	100	7890.6	(35/2 ⁻)	Q		E_γ : 1507 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
9534.1	(41/2 ⁺)	1425.0 5	100	8109.1	(37/2 ⁺)	Q		E_γ : 1422 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
10356.7	(41/2 ⁻)	1615.1 4	100	8741.6	(37/2 ⁻)			E_γ : 1611 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
11105.5	(43/2 ⁻)	1704.8 5	100	9400.7	(39/2 ⁻)			E_γ : 1700 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
11253.2	(45/2 ⁺)	1719.0 6	100	9534.1	(41/2 ⁺)			E_γ : 1712 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
12099.8	(45/2 ⁻)	1743.1 5	100	10356.7	(41/2 ⁻)			E_γ : 1737 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
12987.5	(47/2 ⁻)	1882.0 6	100	11105.5	(43/2 ⁻)			E_γ : 1862 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
13388.2	(49/2 ⁺)	2135 1	100	11253.2	(45/2 ⁺)			E_γ : 2130 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
13967.9	(49/2 ⁻)	1868.1 7	100	12099.8	(45/2 ⁻)			E_γ : 1875 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
15031.4	(51/2 ⁻)	2043.9 6	100	12987.5	(47/2 ⁻)			E_γ : 2039 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
16013	(53/2 ⁺)	2625 5	100	13388.2	(49/2 ⁺)			
16147.0	(53/2 ⁻)	2179.0 7	100	13967.9	(49/2 ⁻)			E_γ : 2174 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
17334.5	(55/2 ⁻)	2303 1	100	15031.4	(51/2 ⁻)			E_γ : 2297 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
18769.0	(57/2 ⁻)	2622 2	100	16147.0	(53/2 ⁻)			

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Adopted Levels, Gammas (continued) $\gamma(^{73}\text{Kr})$ (continued)

$E_i(\text{level})$	J_i^π	$E_\gamma^\dagger$	$I_\gamma^\dagger$	E_f	J_f^π	Comments
19185	(57/2 ⁺)	3172 8	100	16013	(53/2 ⁺)	E_γ : 3166 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
20029.5	(59/2 ⁻)	2695 1	100	17334.5	(55/2 ⁻)	E_γ : 2687 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
21930	(61/2 ⁻)	3161 9	100	18769.0	(57/2 ⁻)	E_γ : 3152 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).
22912	(61/2 ⁺)	3727 [#]	100	19185	(57/2 ⁺)	
23237	(63/2 ⁻)	3207 4	100	20029.5	(59/2 ⁻)	E_γ : 3190 in $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2010St05).

[†] From $^{40}\text{Ca}(^{36}\text{Ar},2\text{pn}\gamma),(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2002Ke03), unless otherwise stated.

[‡] From ^{73}Kr IT decay (107 ns).

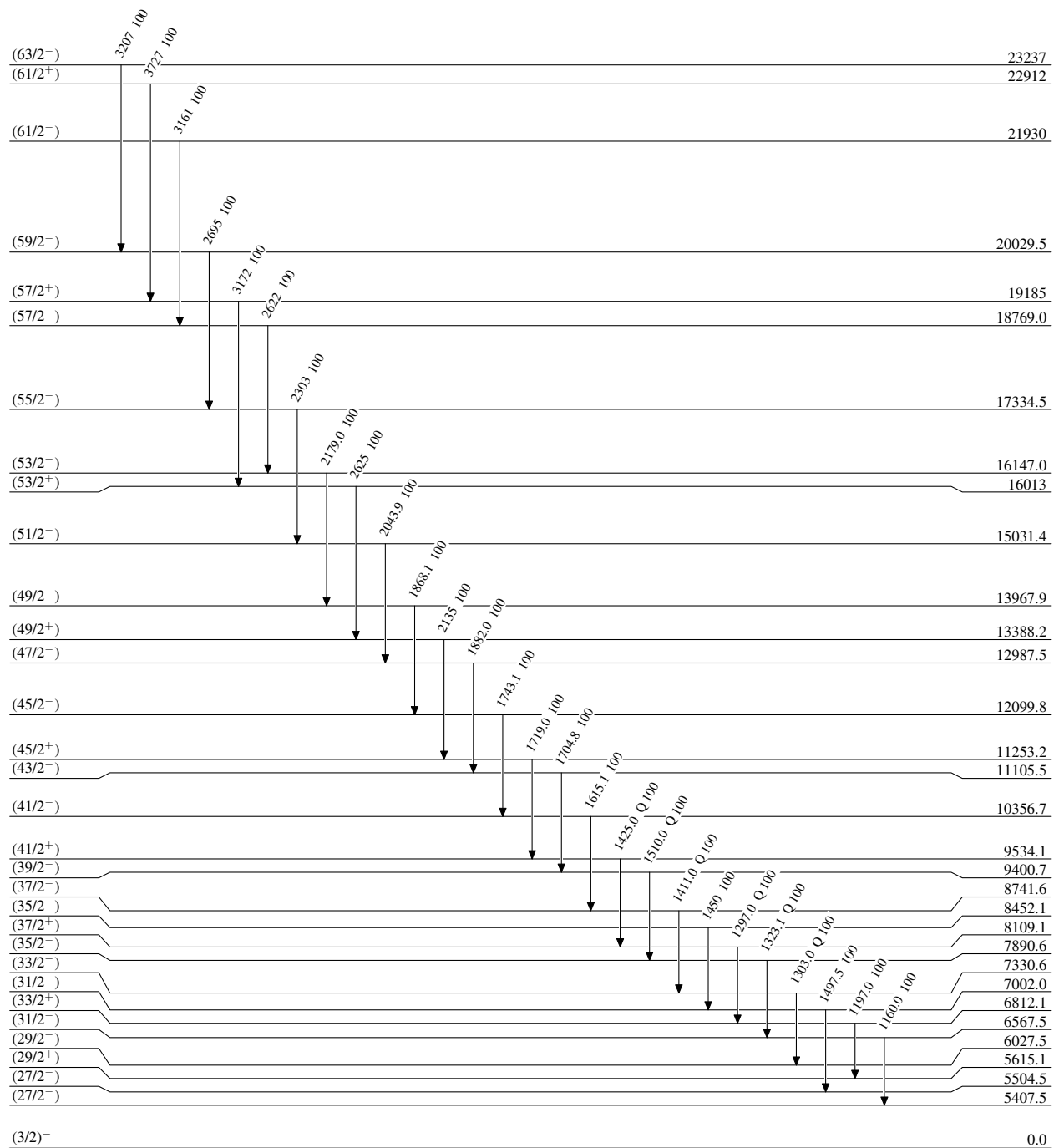
[#] From $^{40}\text{Ca}(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ only (2010St05).

@ From particle-gated $(\gamma)(\theta)$ in $^{40}\text{Ca}(^{36}\text{Ar},2\text{pn}\gamma),(^{40}\text{Ca},\alpha 2\text{pn}\gamma)$ (2002Ke03).

& [Additional information 2](#).

Adopted Levels, Gammas**Level Scheme**

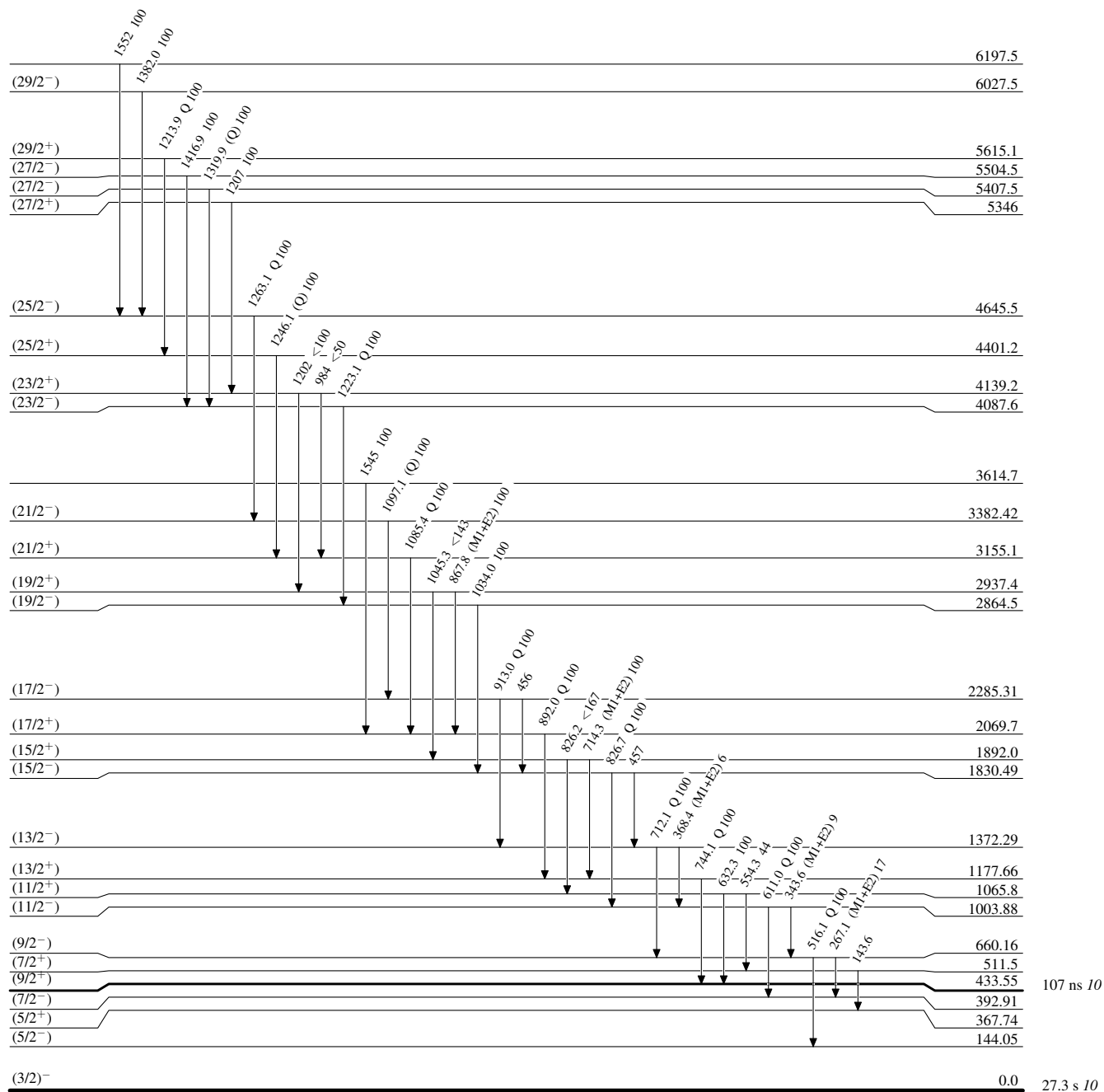
Intensities: Relative photon branching from each level



27.3 s 10

Adopted Levels, Gammas**Level Scheme (continued)**

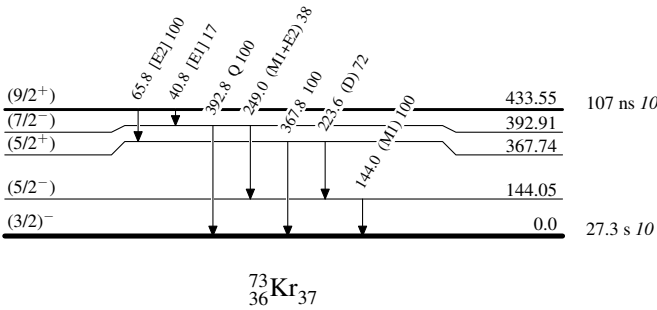
Intensities: Relative photon branching from each level



Adopted Levels, Gammas

Level Scheme (continued)

Intensities: Relative photon branching from each level



Adopted Levels, Gammas