Nuclear Data Sheets for $A = 83^*$

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Abstract: Spectroscopic data for all nuclei with mass number $A=83$ have been evaluated, and the corresponding level schemes from radioactive decay and reaction studies are presented. A significant amount of new data has been added since the prior evaluation (2001Wu02). While excited state data are still not currently available for ^{83}Zn , ^{83}Ga , and ^{83}Mo , new measurements on their ground state half-lives have been performed. Excited state data have become available for ^{83}Ge and new high-spin data has been measured for ^{83}As and ^{83}Se . Improved measurements on the decay of ^{83}Se and ^{83}Sr have been performed.

Cutoff Date: All data received by December 31, 2014 have been evaluated. The main source of bibliographic information is the NSR database (2011Pr03) at www.nndc.bnl.gov/nsr/

General Policies and Organization of Material: see <http://www.nndc.bnl.gov/nds/NDSPolicies.pdf>.

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General Comments: The statistical analysis of γ -ray data and deduced level schemes is carried out through computer codes available at Brookhaven Lab's website: www.nndc.bnl.gov. The direct feeding(s) to excited states in β^- and ϵ decays have generally been computed by the evaluator from $I(\gamma+ce)$ intensity balances at each level; the associated $\log ft$ values are calculated using LOGFT code. Theoretical conversion coefficients are from BrIcc code: v2.3 (29-March-2013) (2008Ki07) with "Frozen Orbitals" approximation, and with implicit uncertainty of 1.4%.

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NUCLEAR DATA SHEETS

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Skeleton Scheme for A=83

Ground-State and Isomeric-Level Properties				
Nuclide	Level	J π	T _{1/2}	Decay Modes
⁸³ Zn	0.0		117 ms 20	% β^- =100; % β^- n=?
⁸³ Ga	0.0		308.1 ms 10	% β^- =100; % β^- n=62.8 25
⁸³ Ge	0.0	(5/2)+	1.85 s 6	% β^- =100; % β^- n=?
⁸³ As	0.0	(5/2-)	13.4 s 4	% β^- =100
⁸³ Se	0.0	9/2+	22.3 min 2	% β^- =100
	228.92	1/2-	70.1 s 4	% β^- =100
⁸³ Br	0.0	3/2-	2.374 h 4	% β^- =100
⁸³ Kr	0.0	9/2+	stable	
	41.5575	1/2-	1.83 h 2	%IT=100
⁸³ Rb	0.0	5/2-	86.2 d 1	% ϵ =100
	42.0780	9/2+	>0.3 ms	
⁸³ Sr	0.0	7/2+	32.41 h 3	% ϵ +% β^+ =100
	259.15	1/2-	4.95 s 12	%IT=100
⁸³ Y	0.0	9/2+	7.08 min 8	% ϵ +% β^+ =100
	62.04	3/2-	2.85 min 2	% ϵ +% β^+ =60 5; %IT=40 5
⁸³ Zr	0.0	(1/2-)	42 s 2	% ϵ +% β^+ =100; % ϵ p=?
⁸³ Nb	0.0	(5/2+)	3.9 s 2	% ϵ +% β^+ =100
⁸³ Mo	0.0		6 ms +30-3	% ϵ +% β^+ =100
⁸⁴ Ga	0.0	(0-)	85 ms 10	% β^- n=74 14; ...

Skeleton Scheme for A=83 (continued)

Adopted Levels

$Q(\beta^-)=12519$ SY; $S(n)=2203$ SY; $S(p)=18357$ SY; $Q(\alpha)=-11453$ SY 2012Wa38.

$\Delta Q(\beta^-)=503$; $\Delta S(n)=585$; $\Delta S(p)=945$; $\Delta Q(\alpha)=945$ (2012Wa38).

$S(2n)=6681$ syst 503; $Q(\beta^-n)=8121$ syst 503 (2012Wa38).

1997Be70: ^{83}Zn isotope produced and identified in projectile fission in $^9\text{Be}(^{238}\text{U},X)$ at 750 MeV / nucleon. Fission fragments separated using the fragment separator (FRS) in achromatic mode and identified using ΔE -Bp-TOF measurements. Measured production cross section = 1 nb.

2012Ma37: ^{83}Zn isotope produced in proton induced fission on a UC_x target with $E(p)=50$ MeV. Fission products extracted as positive ions and selected using two consecutive mass separation magnets with $\Delta m/m = 1,000$ and 10,000, respectively. Measured $E\gamma$, $I\gamma$, $\gamma(t)$ and β - γ coincidences using LeRIBSS consisting of four HPGe clover detectors for γ -rays and two plastic scintillators for β particles.

A 109.6-keV γ ray is assigned by 2012Ma37 to the β^- decay of ^{83}Zn .

 ^{83}Zn Levels

E(level)	$T_{1/2}$	Comments
0.0	117 ms 20	$\% \beta^- = 100$; $\% \beta^- n = ?$ $\% \beta^- n = 90$ (calculated, 2005Bo19), 40 (systematics, 2012Mc04). $J\pi$: 5/2+ from systematics (2012Au07). $T_{1/2}$: from 2012Ma37 derived from growth and decay curve of 109.6-keV γ -ray.

Adopted Levels

$Q(\beta^-)=11719$ 4; $S(n)=4398$ 4; $S(p)=13940$ SY; $Q(\alpha)=-9783$ SY 2012Wa38.

$\Delta S(p)=298$; $\Delta Q(\alpha)=401$ (2012Wa38).

$S(2n)=7772$ 4; $S(2p)=32045$ syst 800; $Q(\beta^-n)=8087$ 3 (2012Wa38).

1976Ru01, 1980Lu04: first production and identification of ^{83}Ga isotope in mass-separated fission studies.

1986Wa17, 1991Kr15, 1993Ru01: measured half-life and delayed neutron emission probability.

2006Pe20 (also 2007Ib01, 2004Ve14, 2003Pe18): ^{83}Ga isotope produced by neutron induced fission of ^{238}U . Fission products selected with magnetic mass separator. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ and $\beta\gamma$ coincidences using 4 π plastic scintillator and two Ge detectors.

2009Wi03: ^{83}Ga isotope produced in proton induced fission of ^{238}U with $E(p)=54$ MeV. Fission products selected by charge exchange cell followed by a high resolution mass separator, then reaccelerated to 225 MeV. Isotopes identified using a microchannel plate detector (for time signal) and a six segment ion chamber. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ and $\beta\gamma$ coincidences using four HPGe clover detectors and two plastic scintillators. Derived βn emission probability.

 ^{83}Ga Levels

E(level)	$T_{1/2}$	Comments
0.0	308.1 ms 10	$\% \beta^- = 100$; $\% \beta^- n = 62.8$ 25 (2009Wi03). $\% \beta^- n$: from comparison of absolute intensities of most intense γ rays from nuclei in the $\beta^- n$ branch to the number of ions deposited; weighted average of $\% \beta^- n = 64$ 3 and 61 4 (2009Wi03). Others: 14.9 18 (1993Ru01), 54 7 (1986Wa17), 43 7 (1980Lu04). Uncertainty of 1986Wa17 does not include that of the neutron-efficiency detection. 2002Pf04 compilation adopted $\% \beta^- n = 39$ 10. $J\pi$: 3/2- from systematics (2012Au07), 1/2- in calculations of 1997Mo25. $T_{1/2}$: weighted average of values from $\gamma(t)$: 0.317 s 17 (1348 γ in ^{82}Ge), 0.319 s 24 (1238 γ in ^{83}Ge) (2006Pe20), and from β^- -delayed neutron activity: 0.307 s 7 (1993Ru01), 0.308 s 1 (1991Kr15), 0.31 s 1 (1986Wa17), 0.31 s 1 (1980Lu04). Other: 0.31 s 1 (1976Ru01).

Adopted Levels, Gammas

$Q(\beta^-)=8693\ 4$; $S(n)=3633\ 3$; $S(p)=15335\ 3$; $Q(\alpha)=-9969\ 3$ 2012Wa38.
 $S(2n)=10827\ 3$; $S(2p)=29355\ 6$, $Q(\beta^-n)=1055\ 5$ (2012Wa38).

 ^{83}Ge Levels

Cross Reference (XREF) Flags

A ^{83}Ga β^- Decay (308.1 ms)
 B ^{84}Ga β^-n Decay (85 ms)
 C $^2\text{H}(^{82}\text{Ge},p)$

E(level) [†]	J π	XREF	T _{1/2}	Comments
0.0	(5/2)+	ABC	1.85 s 6	% β^- =100; % β^-n =? J π : L=2 in $^2\text{H}(^{82}\text{Ge},p)$; systematics of N=51 isotones from ^{89}Sr to ^{95}Ru . T _{1/2} : from $\gamma(t)$ of 306-keV γ ray (1988Wi17). Others: 1.9 s 4, by periodic milking of the ^{83}Se daughter activity (1972De43); ≤ 1.6 s (1974KrZG). % β^-n : 0.02 (systematics, 2012Mc04) and 0.1 (QRPA theory, 2002Pf04). XREF: C(280). J π : L=0 in $^2\text{H}(^{82}\text{Ge},p)$.
247.2 3	1/2+	ABC		
1045.52 20		AB		
1237.97 13		A		

[†] From a least-squares fit to E_γ by evaluator.

 $\gamma(^{83}\text{Ge})$

E(level)	E_γ [†]	I_γ [†]	[†] Weighted average of values from ^{83}Ga β^- decay and ^{84}Ga β^-n decay.
247.2	247.2 3	100	
1045.52	798.6 10	17 8	
	1045.5 2	100 15	
1237.97	1237.96 13	100	

 ^{83}Ga β^- Decay (308.1 ms) 2010Wi03,2006Pe20

Parent ^{83}Ga : E=0.0; J π =?; T_{1/2}=308.1 ms 10; Q(g.s.)=11719 4; % β^- decay=100.

^{83}Ga -% β^- decay: % β^-n =62.8 25 (2009Wi03).

2010Wi03 (also 2009Gr06, 2008WiZZ): ^{83}Ga isotope produced in proton induced fission of ^{238}U with E(p)=54 MeV.

Fission products passed through charge exchange cell, separated in the high-resolution injector magnet and re-accelerated to 225 MeV. Identification based on time-of-flight and energy loss. Measured E_γ , I_γ , $\gamma\gamma$ and $\beta\gamma$ coincidences using four HPGe clover detectors and two plastic scintillator detectors.

2006Pe20 (also 2007Ib01,2004Ve14,2004PeZW thesis,2003Pe18): ^{83}Ga isotope produced by fast neutron fission of ^{238}U .

Fission products ionized and magnetically mass separated. Measured E_γ , I_γ , $\gamma\gamma$ and $\beta\gamma$ coincidences using two large volume HPGe detectors and a 4π plastic scintillator.

Level scheme is that of 2010Wi03. 2006Pe20 report two γ rays belonging to the decay of ^{83}Ga into ^{83}Ge with energies of 867.4 8 and 1238.2 5 keV. 2010Wi03 use $\gamma\gamma$ coincidence data to show that the 867.4-keV γ -ray belongs to ^{82}Ge , populated in the β^-n decay of ^{83}Ga .

The decay scheme is very incomplete evidenced by the gap of nearly 10 MeV between the highest energy level observed and the decay Q value. The total energy release of 2.3 MeV 14 as calculated by the code RADLST is substantially smaller than the Q value of 11.7 MeV.

 ^{83}Ge Levels

E(level) [†]	J π [‡]	[†] From E_γ . [‡] From the Adopted Levels.
0.0	(5/2)+	
247.05 17	1/2+	
1045.51 19		
1237.97 13		

^{83}Ga β^- Decay (308.1 ms) 2010Wi03,2006Pe20 (continued) β^- radiations

$E\beta^-$	E(level)	$I\beta^{-\dagger\S}$	$\text{Log } ft^{\ddagger}$
(10481 4)	1237.97	1.9 1	6.7 1
(10673 4)	1045.51	0.65 12	7.2 1
(11472 4)	247.05	0.43 11	7.6 2
(11719 4)	0.0	<34	>5.7

$\dagger$ From an intensity balance at each level, by evaluator. Should be considered upper limits, as the decay scheme is highly incomplete.

$\ddagger$ Should be considered lower limits, as the decay scheme is highly incomplete.

$\S$ Absolute intensity per 100 decays.

 $\gamma(^{83}\text{Ge})$

$I\gamma$ normalization: From measured absolute intensity of 1348 γ , $I\gamma(1348\gamma)=28.4\%$ 10 (2010Wi03). The 1348 γ is observed in ^{82}Ge following the β^- n decay of ^{83}Ga .

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger\S}$	Comments
247.05 17	247.05	1.5 4	
1045.50 19	1045.51	2.3 4	
1237.96 13	1237.97	6.7 3	$E\gamma$: other: 1238.2 5 (2006Pe20).

$\dagger$ From 2010Wi03.

$\ddagger$ From 2010Wi03, normalized to $I\gamma(1348\gamma)=100$. The 1348 γ is observed in ^{82}Ge following the β^- n decay of ^{83}Ga .

$\S$ For absolute intensity per 100 decays, multiply by 0.284 10.

Decay Scheme

^{84}Ga β^- n Decay (85 ms) 2010Wi03,2009Le26

Parent ^{84}Ga : $E=0.0$; $J\pi=(0-)$; $T_{1/2}=85$ ms 10; $Q(\text{g.s.})=8440$ syst; $\% \beta^-$ n decay=74 14.

$^{84}\text{Ga}-\% \beta^-$ n decay: $\% \beta^-$ =100; $\% \beta^-$ n=74 14 (2010Wi03). Other: $\% \beta^-$ n=70 15 (1991Kr15,2002Pf04).

2010Wi03 (also 2009Gr06, 2008WiZS): ^{84}Ga isotope produced in proton induced fission of ^{238}U with $E(p)=54$ MeV.

Fission products passed through charge exchange cell, separated in the high-resolution injector magnet and re-accelerated to 225 MeV. Identification based on time-of-flight and energy loss. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ and $\beta\gamma$ coincidences using four HPGe clover detectors and two plastic scintillator detectors.

2009Le26 (also 2009Ve11): ^{84}Ga isotope produced in photofission of UC_x target with a 50-MeV electron beam. Fission products ionized and magnetically mass separated. Measured $E\gamma$, $I\gamma$, $\beta\gamma$ coincidences using a coaxial HPGe detector, a small EXOGAM clover detector and a cylindrical plastic scintillator.

2006Pe20 (also 2007Ib01,2004Ve14,2003Pe18): ^{84}Ga isotope produced in fast neutron induced fission of ^{238}U . Fission products ionized and magnetically mass separated. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ and $\beta\gamma$ coincidences using two large volume HPGe detectors and a 4π plastic scintillator.

2009Le26 suggest the presence of an isomer in ^{84}Ga with half-life of <85 ms and $J\pi=(3-,4-)$. This isomer may also decay by delayed- neutron emission, but no details of such a decay are known.

Continued on next page (footnotes at end of table)

^{84}Ga β^- -n Decay (85 ms) 2010Wi03,2009Le26 (continued)

Level scheme is that of 2010Wi03. 2006Pe20 place a 867γ from a level at 867 keV. Such a transition is not reported by 2009Pe20 or 2010Wi03 in ^{84}Ga β^- -n decay, and thus, the 867-keV level and γ ray are not adopted here. See also comments on ^{83}Ga β^- decay for additional discussion of the 867γ and 867-keV level. 2009Le26 report the 1046γ as belonging to the β^- decay of ^{84}Ga into ^{84}Ge and based on an intensity imbalance, suggest the presence of an isomer in ^{84}Ga with half-life of <85 ms and $J\pi=(3-,4-)$. 2010Wi03 observe the 1046γ in both their ^{83}Ga and ^{84}Ga decay data, supporting its placement as a transition in ^{83}Ga .

^{83}Ge Levels

E(level) [†]	$J\pi^{\ddagger}$
0.0	(5/2)+
247.7 3	1/2+
1046.0 6	

[†] From a least-squares fit to $E\gamma$, by evaluator.

[‡] From the Adopted Levels.

$\gamma(^{83}\text{Ge})$

$I\gamma$ normalization: From measured absolute intensity of 248 γ , $I\gamma(248\gamma)=8.6\%$ 8 (2010Wi03).

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger\S}$	Comments
247.7 3	247.7	100 7	$E\gamma$: weighted average of 247.8 3 (2009Le26) and 247.3 5 (2010Wi03).
798.6 10	1046.0	8 4	
1045.9 7	1046.0	48 7	

[†] From 2010Wi03, except where noted.

[‡] From 2010Wi03, normalized to $I\gamma(248\gamma)=100$.

[§] For absolute intensity per 100 decays, multiply by 0.086 17.

Decay Scheme

²H(⁸²Ge,p) 2007Th15

2007Th15, 2005Th03 (also 2008CiZZ,2007Jo09,2005Ci07,2005JoZZ,2005Th12,2004Th12): E(⁸²Ge)=327 MeV, produced through proton induced fission of UC_x target. Target was 430 μg/cm² CD₂. Measured E_p, σ(θ) using large-area silicon detector array, SIDAR, consisting of six MSL-type YY1 wedges, each with sixteen annular strips (FWHM=300 keV). Protons measured in coincidence with beamlike recoils using an ionization chamber located downstream of the target. DWBA analysis.

Measured reaction Q value=1470 20, uncertainty is statistical; systematic uncertainty=70 keV.

⁸³Ge Levels

Included in the comments are the asymptotic normalization coefficients (ANC) C²_{lj} which are given by C²_{lj}=S_{lj}b²_{lj} where b²_{lj} are model-dependent, single-particle ANCs.

E(level)	Jπ	L [†]	S _{lj}	Comments
0.0	(5/2)+	2	0.48 14	C ² _{lj} =4.0 fm ⁻¹ 10. Jπ: 3/2+,5/2+ from L=2; 5/2+ is supported by the systematics of ground states of even Z and N=51 isotones.
280 20	1/2+	0	0.50 15	Jπ: from L=0. C ² _{lj} =25 fm ⁻¹ 6.

[†] From comparison of differential cross sections with DWBA calculations.

Adopted Levels, Gammas

Q(β⁻)=5671 4; S(n)=7638 5; S(p)=11543 4; Q(α)=-9547 3 2012Wa38.
S(2n)=13279 4; S(2p)=26619 4 (2012Wa38).

⁸³As Levels

Cross Reference (XREF) Flags

A ⁸³Ge β⁻ Decay
B ²⁰⁸Pb(¹⁸O,Xγ)
C ²³⁸U(⁸²Se,⁸³Asγ)

E(level) [†]	Jπ [‡]	XREF	T _{1/2}	Comments
0.0	(5/2-)	ABC	13.4 s 4	%β ⁻ =100. T _{1/2} : weighted average of 14.1 s 11 (1968De19), 13.3 s 4 (1969ScZY), 13.3 s 6 (1974KrZG). Jπ: the first two orbitals located above the Z=28 shell closure are πf5/2 and πp3/2, thus the low-lying levels are expected to have Jπ=3/2-,5/2-. ⁸⁵ Br (Z=35) has Jπ(g.s.)=3/2-, suggesting that the f5/2 orbital is filled first; therefore, ⁸³ As(Z=33) should have Jπ(g.s.)=5/2-. Non observation of the 306-keV level in ²⁰⁸ Pb(¹⁸ O,Xγ) further suggests the spin of the ground state is higher than that of the 306-keV level. Jπ: see comment on Jπ of ground state.
306.51 4	(3/2-)	A C		
711.67 5		A		
1193.70 10		A		
1196.53 14		A		
1256.76 9		A		
1329.87 10		A		
1415.11 10		A		
1434.92 9		A		
1525.48 13		A		
1543.41 15	(9/2)	ABC		Jπ: Q 1543γ to (5/2-).
1804.78 11		A		
1866.21 25	(11/2)	BC		Jπ: D 323γ to (9/2).
1977.86 18		A		
2222.89 21		A		
2777.3 4		BC		
3093.9 3	(13/2)	BC		Jπ: D 1228γ to (11/2).
3100.2? 3		A		
3206.4 5		BC		
3456.7 5	(15/2)	BC		Jπ: D 363γ to (13/2).
3522.6 3		A		
3733.5 4		A		
3956.5 3		A		
3999.7 4		A		
4030.6? 5		A		
4130.11 23		A		
4191.5 4		A		
4221.2 4		A		
4228.3 4		A		
4364.4 5		A		
4405.7 3		A		
4434.1 3		A		
4841.8 7		A		

[†] From a least-squares fit to E_γ, by evaluator.

[‡] For levels with spin assignments above 1.5 MeV, there is the assumption of increasing spin with increasing excitation energy for levels populated in heavy-ion induced reactions. Based on systematics of neighboring N=50 nuclei, negative parity is proposed for the 1543-, 1866-, 3094-, and 3457-keV levels in both ²⁰⁸Pb(¹⁸O,Xγ) and ²³⁸U(⁸²Se,⁸³Asγ) (2011Po13,2012Sa46).

γ(⁸³As)

E(level)	E _γ [†]	I _γ [†]	Mult. [§]
306.51	306.51 5	100	
711.67	405.18 5	100 6	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{83}\text{As})$ (continued)

E(level)	$E\gamma^\dagger$	$I\gamma^\dagger$	Mult.§	E(level)	$E\gamma^\dagger$	$I\gamma^\dagger$	Mult.§
711.67	711.66 8	27 3		3206.4	429.1 $\ddagger$ 3	100 $\ddagger$	D
1193.70	886.96 20	10.7 24		3456.7	362.8 $\ddagger$ 4	100 $\ddagger$	D
	1193.77 11	100 6		3522.6	2087.7 3	100 13	
1196.53	890.01 15	100 8			2325.9 4	75 16	
	1196.2 5	7 5		3733.5	3427.1 5	100 12	
1256.76	950.14 18	27 3			3733.1 6	45 9	
	1256.81 11	100 8		3956.5	2626.8 4	100 17	
1329.87	618.37 12	36 4			3649.4 6	44 8	
	1023.1 3	37 10		3999.7	2194.7 6	59 23	
	1329.61 18	100 16			3693.2 6	100 23	
1415.11	1108.4 3	13 3		4030.6?	2834.0 5	100	
	1415.09 11	100 7		4130.11	2604.8 4	28 7	
1434.92	1128.52 16	53 7			2873.3 4	47 7	
	1434.87 11	100 7			3823.2 6	54 16	
1525.48	1219.5 24	15 3			4129.9 5	100 9	
	1525.50 14	100 9		4191.5	4191.4 4	100	
1543.41	1543.39 15	100	Q	4221.2	2805.7@ 6	28 8	
1804.78	1093.10 10	100			3027.7 5	100 12	
1866.21	322.8 $\ddagger$ 2	100 $\ddagger$	D	4228.3	3031.2 9	21 10	
1977.86	562.6 3	42 12			3921.9 5	100 22	
	1671.2 3	85 15		4364.4	4364.3 5	100	
	1978.1 3	100 19		4405.7	2880.1 4	54 10	
2222.89	966.24 22	67 13			4405.6 6	100 18	
	1916.0 4	100 42		4434.1	2908.8 5	23 5	
2777.3	911.1 $\ddagger$ 3	94# 24	D		2999.3 5	42 5	
	1234 $\ddagger$ 1	100# 40			4433.6 5	100 10	
3093.9	1227.7 $\ddagger$ 1	100 $\ddagger$	D	4841.8	4841.6 7	100	
3100.2?	2793.6 3	100					

$\dagger$ From ^{83}Ge β^- decay, except where noted.

$\ddagger$ From $^{208}\text{Pb}(^{18}\text{O},\text{X}\gamma)$.

§ From $\gamma(0)$ and R_{DCO} in $^{238}\text{U}(^{82}\text{Se},^{83}\text{As}\gamma)$.

From $^{238}\text{U}(^{82}\text{Se},^{83}\text{As}\gamma)$. A limit on $I\gamma(1234\gamma)$ of $I\gamma(1234\gamma)/I\gamma(911\gamma) < 0.33$ is given in $^{208}\text{Pb}(^{18}\text{O},\text{X}\gamma)$ (2011Po13).

@ Placement of transition in the level scheme is uncertain.

 ^{83}Ge β^- Decay 1988Wi17

Parent ^{83}Ge : $E=0.0$; $J\pi=(5/2)^+$; $T_{1/2}=1.85$ s 6; $Q(\text{g.s.})=8693$ 4; % β^- decay=100.

^{83}Ge activity from thermal neutron induced fission of ^{235}U . Products mass separated and deposited onto a moving tape collector. Measured $E\gamma$, $I\gamma$, $\gamma(t)$, $\beta\gamma$ and $\gamma\gamma$ coincidences using a Ge(Li) detector, a HPGe detector, and a thin plastic scintillator.

Decay-scheme normalization was not calculated because β^- population to ^{83}As g.s. is unknown. Authors deduced $\log ft$ values (not shown here) based on β^- decay of the isotone ^{85}Se to ^{85}Br .

 ^{83}As Levels

E(level) †	$J\pi^\ddagger$	$T_{1/2}^\ddagger$	E(level) †	E(level) †
0.0	(5/2-)	13.4 s 4	1543.41? 15	4130.11 23
306.51 4	(3/2-)		1804.78 11	4191.5 4
711.67 5			1977.86 18	4221.2 4
1193.70 10			2222.89 21	4228.3 4
1196.53 14			3100.2? 3	4364.4 5
1256.76 9			3522.6 3	4405.7 3
1329.87 10			3733.5 4	4434.1 3
1415.11 10			3956.5 3	4841.8 7
1434.92 9			3999.7 4	
1525.48 13			4030.6? 5	

$\dagger$ From a least-squares fit to $E\gamma$, by evaluator.

$\ddagger$ From the Adopted Levels.

⁸³Ge β⁻ Decay 1988Wi17 (continued)

γ(⁸³As)

E _γ	E(level)	I _γ	E _γ	E(level)	I _γ	E _γ	E(level)	I _γ
306.51 5	306.51	100.0 5	1329.61 18	1329.87	7.0 11	2880.1 4	4405.7	2.1 4
405.18 5	711.67	11.4 7	1415.09 11	1415.11	11.1 8	2908.8 5	4434.1	1.8 4
562.6 3	1977.86	1.1 3	1434.87 11	1434.92	11.8 8	2999.3 5	4434.1	3.2 4
618.37 12	1329.87	2.5 3	1525.50 14	1525.48	13.6 12	3027.7 5	4221.2	5.0 6
711.66 8	711.67	3.1 3	1543.39 15	1543.41?	7.9 6	3031.2 9	4228.3	1.2 6
886.96 [†] 20	1193.70	2.2 [†] 5	1671.2 3	1977.86	2.2 4	3427.1 5	3733.5	5.8 7
890.01 15	1196.53	9.9 8	1916.0 [†] 4	2222.89	2.4 [†] 10	3649.4 6	3956.5	2.1 4
950.14 18	1256.76	2.4 3	1978.1 3	1977.86	2.6 5	3693.2 6	3999.7	2.2 5
966.24 22	2222.89	1.6 3	2087.7 3	3522.6	3.2 4	3733.1 6	3733.5	2.6 5
1023.1 [†] 3	1329.87	2.6 [†] 7	2194.7 6	3999.7	1.3 5	3823.2 6	4130.11	4.1 12
1093.10 [†] 10	1804.78	5.5 [†] 13	2325.9 4	3522.6	2.4 5	3921.9 5	4228.3	5.8 13
1108.4 3	1415.11	1.4 3	2604.8 4	4130.11	2.1 5	4129.9 5	4130.11	7.6 7
1128.52 16	1434.92	6.3 8	2626.8 4	3956.5	4.8 8	4191.4 4	4191.5	9.9 9
1193.77 11	1193.70	20.5 12	2793.6 [‡] 3	3100.2?	5.3 6	4364.3 5	4364.4	8.8 9
1196.2 5	1196.53	0.7 5	2805.7 [‡] 6	4221.2	1.4 4	4405.6 6	4405.7	3.9 7
1219.5 [†] 24	1525.48	2.1 [†] 4	2834.0 5	4030.6?	1.7 5	4433.6 5	4434.1	7.7 8
1256.81 11	1256.76	8.8 7	2873.3 4	4130.11	3.6 5	4841.6 7	4841.8	7.9 10

[†] From spectrum in coincidence with 306γ.

[‡] Placement of transition in the level scheme is uncertain.

Decay Scheme

Intensities: relative I_γ

$^{208}\text{Pb}(^{18}\text{O},\text{X}\gamma)$ 2011Po13

$E(^{18}\text{O})=85$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ coincidences using the Euroball array consisting of 15 Cluster HPGe detectors, 26 Clover HPGe detectors and 30 tapered single-crystal HPGe detectors. Identification of ^{83}As by analyzing γ rays in coincidence with the complementary fragment, ^{139}La .

 ^{83}As Levels

<u>E(level)[†]</u>	<u>$J\pi^{\ddagger}$</u>
0.0	(5/2-)
1543.3 10	(9/2)
1866.1 11	(11/2)
2777.2 11	
3093.8 11	(13/2)
3206.3 11	
3456.6 11	(15/2)

[†] From a least-squares fit to $E\gamma$, by evaluator.

[‡] From the Adopted Levels. Based on similarities with levels in ^{85}Br , 2011Po13 suggest negative parity for the 1543-, 1866-, 3094-, and 3457-keV levels.

 $\gamma(^{83}\text{As})$

<u>$E\gamma$</u>	<u>E(level)</u>	<u>$I\gamma^{\dagger}$</u>
322.8 2	1866.1	100 15
362.8 4	3456.6	20 7
429.1 3	3206.3	25 7
911.1 3	2777.2	45 12
1227.7 1	3093.8	55 14
1234 [‡] 1	2777.2	<15
1543.3 7	1543.3	

[†] Relative intensities normalized to $I\gamma(323\gamma)=100$.

[‡] Placement of transition in the level scheme is uncertain.

 $^{238}\text{U}(^{82}\text{Se},^{83}\text{As}\gamma)$ 2012Sa46

$E(^{82}\text{Se})=515$ MeV. Reaction products separated by the PRISMA magnetic spectrometer and identified by ΔE measurement at the focal plane of the spectrometer. Measured $E\gamma$, $I\gamma$, $\gamma(\theta)$, $\gamma\gamma$ and recoil- γ coincidences using CLARA array consisting of 23 Compton-suppressed HPGe clover detectors. In a separate experiment, $E\gamma$, $I\gamma$, $\gamma\gamma$ and ADO ratios measured with the GASP array. Similar measurements are reported in 2008SaZY, 2008SaZU, 2008DeZP, 2007De37, 2006GaZV, and 2005Lu07.

 ^{83}As Levels

<u>E(level)[†]</u>	<u>$J\pi^{\ddagger}$</u>
0.0	(5/2-)
306 1	(3/2-)
1542 1	(9/2)
1865 1	(11/2)
2776 1	
3093 2	(13/2)
3206 2	
3457 2	(15/2-)

[†] From a least-squares fit to $E\gamma$, by evaluator.

[‡] From the Adopted Levels. Based on systematics of neighboring N=50 nuclei, 2012Sa46 propose negative parity for the 1542-, 1865-, 3093-, and 3457-keV levels.

$^{238}\text{U}(^{82}\text{Se}, ^{83}\text{As}\gamma)$ 2012Sa46 (continued) $\gamma(^{83}\text{As})$

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S}$	Mult. ‡	Comments
306 1	306	16 6		$a_2=-0.7$ 9.
323 1	1865	54 8	D	$R_{\text{ADO}}=0.8$ 1; $a_2=-0.14$ 6.
364 1	3457	17 7	D	$R_{\text{ADO}}=0.7$ 1; $a_2=-0.01$ 15.
430 1	3206	13 3	D	$R_{\text{ADO}}=0.8$ 2; $a_2=-0.08$ 16.
911 1	2776	16 4	D	$R_{\text{ADO}}=0.8$ 1.
1228 1	3093	25 7	D	$R_{\text{ADO}}=0.8$ 1; $a_2=-0.17$ 18.
1234 1	2776	17 6		
1542 1	1542	100 9	Q	$R_{\text{ADO}}=1.2$ 1; $a_2=0.45$ 7.

† Authors provide only a general statement that uncertainties are within 1 keV.

‡ From $\gamma(\theta)$ and R_{ADO} . R_{ADO} is γ -ray angular distribution from oriented nuclei where $R=I\gamma_1(\text{at } 35^\circ(145^\circ) \text{ gated by } \gamma_2)/I\gamma_1(\text{at } 90^\circ \text{ gated by } \gamma_2)$. R_{ADO} ratios centered at 1.2 and 0.8 for stretched quadrupole and stretched dipole transitions, respectively.

§ Relative intensities normalized to $I\gamma(1542\gamma)=100$.

Adopted Levels, Gammas

$Q(\beta^-)=3673\ 5$; $S(n)=5818\ 3$; $S(p)=12526\ 5$; $Q(\alpha)=-8240\ 40$ 2012Wa38.
 $S(2n)=15094\ 3$; $S(2p)=23627\ 4$ (2012Wa38).

 ^{83}Se Levels**Cross Reference (XREF) Flags**

A ^{83}As β^- Decay
 B $^{82}\text{Se}(\text{pol d,p}),(\text{d,p})$
 C $^{82}\text{Se}(n,\gamma)$ E=thermal
 D $^{208}\text{Pb}(^{18}\text{O},X\gamma)$

E(level) [†]	J π	XREF	T _{1/2}	Comments
0.0 [§]	9/2+	ABCD	22.3 min 2	% β^- =100. T _{1/2} : weighted average of 22.6 min 2 (1967Ma35), 22.4 min 2 (1969To11), 22.1 min 1 (1974Kr27), and 22.4 min 2 (1974KrZG). J π : L(pol d,p)=4, vector-analyzing power.
228.92 7	1/2-	ABC	70.1 s 4	% β^- =100. T _{1/2} : weighted average of 70.4 s 3 (1969Ph03), 69.2 s 6 (1974Kr27), and 69 s 2 (1974KrZG). J π : L(pol d,p)=1, vector-analyzing power.
360 [‡] 20	(1/2+)	B		J π : L(d,p)=(0).
430 [‡] 20	3/2+, 5/2+	BC		XREF: C(448?). J π : L(d,p)=2.
539.74 9	1/2+	ABC		XREF: C(546?). J π : L(pol d,p)=0.
582.22 6	5/2+	ABC	3.6 ns 6	XREF: C(577?). J π : L(pol d,p)=2, vector-analyzing power.
822 [‡] 3	3/2+	B		T _{1/2} : from $\gamma\gamma(t)$ in ^{83}As β^- decay.
963.40 5	3/2+	AB		J π : L(pol d,p)=2, vector-analyzing power. XREF: B(958). J π : L(pol d,p)=2, vector-analyzing power.
1062.99 7	(1/2+, 3/2, 5/2-)	A		J π : 834 γ to 1/2-, 268 γ from 5/2+.
1100.47 7	3/2+	AB		J π : L(pol d,p)=2, vector-analyzing power.
1265.09 10	(5/2+, 7/2+)	AB		J π : 165 γ to 3/2+, 1265 γ to 9/2+.
1296.34 [§] 9	(11/2+)	A D		J π : 1296 γ to 9/2+, band assignment.
1331.63 5	5/2+	AB		J π : L(pol d,p)=2, vector-analyzing power.
1472.97 10	(3/2+)	ABC		XREF: C(1473?). J π : L(d,p)=2, 1243 γ to 1/2-.
1526.52 8	(7/2+, 9/2+)	A		J π : 230 γ to (11/2+), 944 γ to 5/2+.
1587 [‡] 3	3/2+, 5/2+	B		J π : L(d,p)=2.
1664.82 18	5/2+	AB		J π : L(pol d,p)=2, vector-analyzing power.
1710.48 7	(1/2+, 3/2)	A		J π : 1128 γ to 5/2+, 1170 γ to 1/2+, 1481 γ to 1/2-.
1807.98 [§] 16	(13/2+)	D		J π : (E2) 1808 γ to 9/2+, band assignment.
1822.54 6	(5/2+, 7/2, 9/2+)	A		J π : 491 γ to 5/2+, 1822 γ to 9/2+.
1908.0 3		AB		XREF: B(1916).
1943.41 8	(5/2+, 7/2+)	A		J π : 980 γ to 3/2+, 1944 γ to 9/2+.
2076.92 5	(5/2+, 7/2+)	AB		J π : 1113 γ to 3/2+, 2077 γ to 9/2+.
2120 [‡] 3	(5/2-, 7/2-)	BC		XREF: C(2122?). J π : L(d,p)=(3).
2137.85 11	(1/2+, 3/2)	AB		J π : 806 γ to 5/2+, 1597 γ to 1/2+, 1909 γ to 1/2-.
2178 [‡] 3		B		
2189.86 20	(5/2+)	AB		XREF: B(2195). J π : L(d,p)=(2), 2191 γ to 9/2+.
2298.7 [§] 3	(15/2+)	D		J π : D 491 γ to (13/2+), 1002 γ to (11/2+), band assignment.
2314 [‡] 3	5/2+	B		J π : L(pol d,p)=2, vector-analyzing power.
2409 [‡] 3		BC		XREF: C(2413?).
2477.9 4	17/2	D		J π : D 179 γ to (15/2+).
2482.35 8	5/2+	AB		J π : L(pol d,p)=2, vector-analyzing power.
2545.71 21	3/2+	AB		XREF: B(2536). J π : L(pol d,p)=2, vector-analyzing power.
2678.82 10		A		
2724.71 7	(5/2+, 7/2+)	A		J π : 1761 γ to 3/2+, 2725 γ to 9/2+.
2741 [‡] 3	5/2+	B		J π : L(pol d,p)=2, vector-analyzing power.
2803 [‡] 15		B		
2858.10 6	5/2+	AB		J π : L(d,p)=2, 2858 γ to 9/2+.

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Adopted Levels, Gammas (continued) ^{83}Se Levels (continued)

E(level) [†]	J π	XREF	Comments
2880.62 5		A	
2900 $\frac{1}{2}$ 15		B	E(level): possibly corresponds to the 2880-keV level.
2971.2 3	(3/2-)	ABC	XREF: B(2978)C(2975?).
			J π : L(d,p)=(1), 2388 γ to 5/2+.
2981.10 6	(5/2+, 7/2+)	A	J π : 2018 γ to 3/2+, 2981 γ to 9/2+.
3023 $\frac{1}{2}$ 15		B	
3106 $\frac{1}{2}$ 18		B	
3167.31 7	(1/2+, 3/2)	A	J π : 685 γ to 5/2+, 2629 γ to 1/2+, 2938 γ to 1/2-.
3211 $\frac{1}{2}$ 15	5/2+	B	J π : L(pol d,p)=2, vector-analyzing power.
3243.59 7	(5/2+, 7/2+)	A	J π : 2280 γ to 3/2+, 3244 γ to 9/2+.
3282.02 8	(1/2+, 3/2, 5/2+)	A	J π : 2700 γ to 5/2+, 2742.5 γ to 1/2+.
3333.32 8		A	
3353 $\frac{1}{2}$ 13	5/2+	B	J π : L(pol d,p)=2, vector-analyzing power.
			E(level): possibly corresponds to the 3333-keV level.
3386.5 3		A	
3424.0 6		A	
3463.7 10	5/2+	AB	J π : L(pol d,p)=2, vector-analyzing power.
3558.5 10		A	
3610 $\frac{1}{2}$ 15		B	
3647 $\frac{1}{2}$ 12		B	
3690.0 5		A	
3777 $\frac{1}{2}$ 12	(1/2+)	B	J π : L(d,p)=(0).
3800 $\frac{1}{2}$ 15		B	
3827.8? 8	(1/2+)	AB	XREF: B(3841).
			J π : L(d,p)=(0).
3898.8 6		D	
3911.7 20		A	
4001.5 11		A	
4020? $\frac{1}{2}$ 20		B	E(level): possibly corresponds to the 4001-keV level.
4080 $\frac{1}{2}$ 20	(3/2+, 5/2+)	B	J π : L(d,p)=(2).
4180 $\frac{1}{2}$ 20	3/2+, 5/2+	B	J π : L(d,p)=2.
4286.3 9		D	
4290? $\frac{1}{2}$ 20		B	
4420? $\frac{1}{2}$ 20		B	
4520? $\frac{1}{2}$ 20		B	
4680? $\frac{1}{2}$ 20		B	
4770? $\frac{1}{2}$ 20		B	
4950? $\frac{1}{2}$ 20		B	

[†] From a least-squares fit to E γ , by evaluator, except where noted.[‡] From $^{82}\text{Se}(\text{pol d,p}), (\text{d,p})$.[§] (A): Yrast sequence. Configuration suggested as a v9/2 hole coupled to the yrast states of ^{84}Se (2009Po04). $\gamma(^{83}\text{Se})$

E(level)	E γ [†]	I γ [†]	Mult.	α	Comments
539.74	311.5 3	100			
582.22	42 $\frac{1}{2}$ 2	≤ 0.01	[E2]	20 4	B(E2)(W.u.) ≤ 6 .
	582.4 1	100 2	[E2]	1.74×10^{-3}	B(E2)(W.u.) ≤ 0.11 .
963.40	380.7 8	0.04 3			
	423.0 $\frac{1}{2}$ 20	< 0.06			
	734.9 1	100 1			
1062.99	480.0 $\frac{1}{2}$ 20	< 0.2			
	834.1 1	100 1			
1100.47	135.8 30	0.6 6			
	518.2 1	100 6			
	560.6 1	29 3			
	871.0 15	4 3			
1265.09	165.3 12	0.8 8			
	682.9 1	100 7			
	1265.1 5	7.3 24			

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Se})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult.	α	Comments
1296.34	1296.2 1	100			
1331.63	231 $\S$ 2	≤ 0.5			
	268 2	0.15 15			
	367.5 20	0.4 4			
	748.8 2	9.0 18			
	791.0 10	0.29 22			
	1331.2 1	100 3			
1472.97	207 $\S$ 2	<14			
	372.6 1	100 11			
	933.1 2	84 9			
	1243.0 10	23 18			
1526.52	195 $\S$ 1	<2.2			
	230.0 2	12.3 12			
	944.0 3	0.7			
	1526.4 1	100 4			
1664.82	192 2	10 8			
	333.2 $\S$ 6	<7			
	400 $\S$ 2	<6			
	565 $\S$ 2	<3			
	603 $\S$ 2	<6			
	702.1 $\S$ 16	<20			
	1082.9 5	100 20			
	1125.0 3	39 8			
	1664.6 3	25 6			
1710.48	237.0 $\S$	1.0			
	445.6 2	68 3			
	609.7 1	5 3			
	648 $\S$ 2	<4			
	1127.8 1	100 8			
	1170.0 $\S$	2.0			
	1480.7 3	28 5			
1807.98	511.0 $\ddagger$ 3	29 $\ddagger$ 8			
	1808.3 $\ddagger$ 2	100 $\ddagger$ 10	(E2)	3.39×10^{-4}	Mult.: Q from $\gamma\gamma(0)$ in $^{208}\text{Pb}(^{18}\text{O},\text{X}\gamma)$, (E2) from assumed band structure.
1822.54	157.2 13	1.1 11			
	296 $\S$ 2	<1.2			
	350 $\S$ 2	<0.7			
	491.2 1	9.9 5			
	526 $\S$ 2	<1			
	557 $\S$ 2	<0.24			
	722 $\S$ 2	<0.7			
	759 2	<0.7			
	1240.0 5	1.0 5			
	1822.5 1	100 3			
1908.0	807.5 3	100 30			
	845.0 15	40 20			
	1326.8 10	60 30			
	1367.0 $\S$ 11	<8			
1943.41	979.8 1	100 5			
	1944.0 5	19 10			
2076.92	411.8 $\S$ 11	<0.55			
	549.8 2	0.94 11			
	745.4 1	0.80 17			
	812.0 20	0.08 8			
	1014.0 1	16.9 6			
	1113.4 1	100 3			
	2077.0 1	69.3 14			
2137.85	806.0 10	16 8			
	1036.8 $\S$ 20	<8			
	1074.0 7	75 10			
	1596.6 8	5 3			
	1908.9 1	100 6			
2189.86	1607.0 15	90 60			

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Adopted Levels, Gammas (continued)
 $\gamma(^{83}\text{Se})$ (continued)

E(level)	E $\gamma^{\dagger}$	I $\gamma^{\dagger}$	Mult.	α	Comments
2189.86	2190.6 7	100 60			
2298.7	490.8 $\frac{1}{2}$ 3	100 $\frac{1}{2}$ 15	(M1)	0.00181	Mult.: D from $\gamma\gamma(\theta)$ in $^{208}\text{Pb}(^{18}\text{O},\text{X}\gamma)$, (M1) from assumed band structure.
	1002.0 $\frac{1}{2}$ 5	6 $\frac{1}{2}$ 3			
2477.9	179.2 $\frac{1}{2}$ 3	100 $\frac{1}{2}$	D		Mult.: from $\gamma\gamma(\theta)$ in $^{208}\text{Pb}(^{18}\text{O},\text{X}\gamma)$.
2482.35	817.2 10	11 5			
	1010.0 20	4 4			
	1151.1 4	23.3 19			
	1218.0 10	2.7 23			
	1381.2 10	8 4			
	1419.5 2	8.9 16			
	1518.4 1	100 4			
	1900.3 5	7 3			
2545.71	1582.3 2	100			
2678.82	1615.5 1	100 3			
	2098.3 12	4 4			
	2141.7 3	13 3			
	2449.9 2	43 4			
2724.71	1623.6 4	55 5			
	1761.4 1	100 5			
	2142.5 7	10 5			
	2724.6 1	25 8			
2858.10	781.1 1	19.0 14			
	914.5 1	3.1 3			
	1331.1 3	8.3 6			
	1795.3 1	11.8 6			
	1894.8 2	72.4 18			
	2858.1 1	100 2			
2880.62	397.8 1	1.9 3			
	690.8 2	2.1 3			
	803.8 1	72.1 16			
	1058.2 1	59.7 16			
	1169.3 1	11.1 7			
	1408.0 2	<3			
	1548.8 1	24.0 8			
	1780.2 1	12.6 5			
	1818.0 2	4.7 8			
	1917.3 1	100 3			
	2299.2 1	6.9 4			
2971.2	1641.0 4	7 7			
	2388.3 9	79 17			
	2429.5 5	100 17			
2981.10	904.0 1	5.5 4			
	1036.8 $\frac{1}{2}$ 20	<30			
	1158.7 1	25 4			
	1454.7 3	100 6			
	1649.2 1	41.5 13			
	1715.6 5	1.5 6			
	1919.3 5	13 3			
	2017.9 1	24.0 19			
	2981.2 5	29.1 11			
3167.31	685.0 20	1.2 4			
	1258.0 21	0.9 3			
	2104.2 2	1.7 2			
	2204.2 1	100 2			
	2585.2 1	0.80 14			
	2629.0 15	0.14 9			
	2937.9 1	3.1 5			
3243.59	760.6 15	4.0 17			
	1420.0 10	6.6 11			
	1912.0 10	1.4 11			
	2180.3 19	0.9 9			
	2279.9 1	16.0 14			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Se})$ (continued)

E(level)	$E\gamma^\dagger$	$I\gamma^\dagger$	E(level)	$E\gamma^\dagger$	$I\gamma^\dagger$	E(level)	$E\gamma^\dagger$	$I\gamma^\dagger$
3243.59	3243.8 1	100 3	3333.32	2001.0 1	11 9	3690.0	2626.7 5	16 4
3282.02	1143.6 3	9.1 24		2270.8 5	13 4		2729.0 15	100 10
	2218.7 2	57 6		2370.4 1	100 5	3827.8?	2865.0 § 12	=100
	2318.8 1	100 2	3386.5	2423.1 3	100		3245.0 10	=70
	2699.6 1	20.6 12	3424.0	2092.0 10	56 12	3898.8	1421.0 ‡ 5	100 ‡
	2742.5 2	17.5 20		2360.0 10	28 16	3911.7	2580.0 20	100
3333.32	1196.0 6	12 3		2461.9 10	100 16	4001.5	3038.0 11	100
	1257.0 2	20 4	3463.7	2881.4 10	100	4286.3	388 ‡ 1	100 ‡ 30
	1860.0 3	15 9	3558.5	2976.2	100		1808 ‡ 1	100 ‡ 70

† From ^{83}As β^- decay, except where noted.

‡ From $^{208}\text{Pb}(^{18}\text{O},\text{X}\gamma)$.

§ Placement of transition in the level scheme is uncertain.

(A) Yrast sequence.**Configuration**suggested as a $\nu 9/2$

hole

^{83}As β^- Decay 1975Kr08,1982Me01,1984LiZW

Parent ^{83}As : $E=0.0$; $J\pi=(5/2^-)$; $T_{1/2}=13.4$ s 4; $Q(\text{g.s.})=5671$ 4; % β^- decay=100.

1975Kr08: ^{83}As activity from thermal neutron induced fission of ^{235}U and ^{233}U followed by chemical separation.

Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ using two Ge(Li) detectors.

1982Me01,1984LiZW: ^{83}As activity from fission products followed by chemical separation. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, $\gamma\gamma(t)$ using Ge(Li) detectors. 1984LiZW is a thesis describing in more detail the results presented in 1982Me01.

Others: 1989WaZV, 1974KrZG, 1968De19.

The decay scheme is incomplete and/or there are problems with the decay scheme normalization (see comment on $I\gamma$ normalization. For this reason, β -feedings and log ft values are not derived for this dataset.

 ^{83}Se Levels

E(level) [†]	$J\pi^\dagger$	$T_{1/2}^\dagger$	Comments
0.0	9/2+	22.3 min 2	
228.72 7	1/2-	70.1 s 4	
539.86 8	1/2+		
582.16 6	5/2+	3.6 ns 6	$T_{1/2}$: from $\gamma\gamma(t)$ in 1984LiZW. Other: ≈ 3 ns estimated from $\gamma\gamma(t)$ in 1982Me01.
963.26 5	3/2+		
1062.89 7	(1/2+, 3/2, 5/2-)		
1100.45 7	3/2+		
1265.03 10	(5/2+, 7/2+)		
1296.27 9	(11/2+)		
1331.56 5	5/2+		

Continued on next page (footnotes at end of table)

^{83}As β^- Decay 1975Kr08,1982Me01,1984LiZW (continued) ^{83}Se Levels (continued)

$E(\text{level})^\dagger$	$J\pi^\ddagger$	Comments
1472.96 10	(3/2)+	
1526.49 8	(7/2+, 9/2+)	
1664.84 18	5/2+	
1710.43 7	(1/2+, 3/2)	
1822.48 6	(5/2+, 7/2, 9/2+)	
1907.66 21		
1943.31 8	(5/2+, 7/2+)	
2076.84 5	(5/2+, 7/2+)	
2137.67 11	(1/2+, 3/2)	
2189.80 20	(5/2+)	
2482.25 8	5/2+	
2545.58 21	3/2+	
2678.72 11		
2724.65 7	(5/2+, 7/2+)	
2858.02 6	5/2+	
2880.54 5		
2971.2 3	(3/2-)	
2981.02 6	(5/2+, 7/2+)	
3167.19 7	(1/2+, 3/2)	
3243.03 7	(5/2+, 7/2+)	
3281.93 8	(1/2+, 3/2, 5/2+)	
3333.22 8		
3386.4 3		
3423.9 6		
3463.6 10	5/2+	
3558.4 10		
3689.9 5		
3827.7 8	(1/2+)	
3865.1? 20		E(level): observed only by 1975Kr08, not included in the Adopted Levels.
3911.6 20		
4001.3 11		

 † From a least-squares fit to E_γ , by evaluator. ‡ From the Adopted Levels. $\gamma(^{83}\text{Se})$

I_γ normalization: an absolute intensity of 34.0% 34 for the 734-keV γ ray from ^{83}As β^- decay has been reported by 1989WaZV. Using this value and the decay scheme, $\Sigma I(\gamma+\text{ce})$ to $^{83}\text{Se}(\text{g.s.})=30.9\%$ 16 is deduced by the evaluator. This value compares with 36% 8 (1968De19) and 23% 9 (1974KrZG). However, this normalization results in only 74% β -feeding intensity, indicating incompleteness in the decay scheme or problems with the absolute γ -ray intensity and $\Sigma I(\gamma+\text{ce})$ measurements.

$E_\gamma^\dagger$	$E(\text{level})$	$I_\gamma^\dagger$	Mult.	α	Comments
42# 2	582.16	≤ 0.001	[E2]	20 4	
135.8 30	1100.45	0.02 2			
157.2 13	1822.48	0.09 9			
165.3 12	1265.03	0.01 1			
192 2	1664.84	0.07 6			
195# 1	1526.49	< 0.18			
207# 2	1472.96	< 0.06	[E2]	0.0561 22	
230.0 2	1526.49	1.0 1			
231# 2	1331.56	≤ 0.06			
237.0#	1710.43	0.01			E_γ, I_γ : in Figure IV.4 of 1984LiZW, but not included in Table IV.3.
268 2	1331.56	0.02 2	[E1]	0.00437 12	
296# 2	1822.48	< 0.10			
311.5 1	539.86	3.07 9	[E1]	0.00287	E_γ, I_γ : likely corresponds to an unplaced $E_\gamma=310.0$ 3, $I_\gamma=2.7$ 3 transition observed in 1975Kr08.
333.2# 6	1664.84	< 0.05			
350# 2	1822.48	< 0.06			
367.5 20	1331.56	0.06 5			

Continued on next page (footnotes at end of table)

^{83}As β^- Decay 1975Kr08,1982Me01,1984LiZW (continued) $\gamma(^{83}\text{Se})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\dagger$	Mult.	α	Comments
372.6 1	1472.96	0.44 5			
380.7 8	963.26	0.04 3			
397.8 1	2880.54	0.25 3			
400# 2	1664.84	<0.04			
411.8# 11	2076.84	<0.2			
423.0# 20	963.26	<0.06			
445.6 2	1710.43	0.66 3			
480.0# 20	1062.89	<0.04			
491.2 1	1822.48	0.81 4			
518.2 1	1100.45	3.43 21			
526# 2	1822.48	<0.08			
549.8 2	2076.84	0.34 4			
557# 2	1822.48	<0.02			
560.6 1	1100.45	1.0 1			
565# 2	1664.84	<0.02			
582.4 1	582.16	10.9 2	[E2]	1.74×10^{-3}	$E\gamma, I\gamma$: likely corresponds to an unplaced $E\gamma=582.0$ 1, $I\gamma=9.9$ 4 transition observed in 1975Kr08.
603# 2	1664.84	<0.04	[E1]	5.30×10^{-4} 9	
609.7 1	1710.43	0.05 3			
648# 2	1710.43	<0.04			
682.9 1	1265.03	1.23 9			
685.0 20	3167.19	0.25 8			
690.8 2	2880.54	0.27 3			
702.1# 16	1664.84	<0.14			
722# 2	1822.48	<0.06			
734.9 1	963.26	100 1	[E1]	3.40×10^{-4}	
745.4 1	2076.84	0.29 6			
748.8 2	1331.56	1.23 24			
759# 2	1822.48	<0.06			
760.6 15	3243.03	0.14 6			
781.1 1	2858.02	3.23 23	[E1]	2.99×10^{-4}	$E\gamma$: other: 780.5 2 (1975Kr08). $I\gamma$: other: 2.8 3 (1975Kr08).
791.0 10	1331.56	0.04 3	[E2]	7.50×10^{-4}	
803.8 1	2880.54	9.3 2			$I\gamma$: other: 9.2 4 (1975Kr08).
806.0 10	2137.67	0.31 15			
807.5 3	1907.66	0.25 8			
812.0 20	2076.84	0.03 3			
817.2 10	2482.25	0.27 14			
834.1 1	1062.89	20.0 2			$E\gamma$: 1975Kr08 observed a γ ray with $E\gamma=833.8$ 1, $I\gamma=19.5$ 17 which could not be placed in the decay scheme. 1975Kr08 observe coincidences with the 735 γ , inconsistent with its placement from 1062-keV level. 1984LiZW do not observe coincidences between the 834 γ and the 735 γ .
845.0 15	1907.66	0.10 5			
871.0 15	1100.45	0.15 12	[E1]	2.39×10^{-4}	
891# 2	1472.96	<0.03			
904.0 1	2981.02	0.29 2			
914.5 1	2858.02	0.53 4			
933.1 2	1472.96	0.37 4			
944.0# 3	1526.49	0.06@			$E\gamma, I\gamma$: in Figure IV.4 of 1984LiZW, but not included in Table IV.3.
	1907.66	<0.18@			$E\gamma$: half-life of transition not in agreement with that of ^{83}As , not included in the Adopted Levels.
979.8 1	1943.31	0.73 4			
1010.0 20	2482.25	0.10 10			
1014.0 1	2076.84	6.1 2			$E\gamma, I\gamma$: likely corresponds to an unplaced $E\gamma=1013.7$ 2, $I\gamma=6.1$ 5 transition observed in 1975Kr08.
1036.8# 20	2137.67	<0.16@			
	2981.02	<1.6@			
1058.2 1	2880.54	7.7 2			$E\gamma, I\gamma$: possibly corresponds to an unplaced $E\gamma=1057.6$ 2, $I\gamma=4.7$ 10 transition observed in 1975Kr08.
1074.0 7	2137.67	1.5 2			
1082.9 5	1664.84	0.71 14			

Continued on next page (footnotes at end of table)

^{83}As β^- Decay 1975Kr08,1982Me01,1984LiZW (continued) $\gamma(^{83}\text{Se})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\dagger$	Mult.	α	Comments
1113.4 1	2076.84	36.1 11			I γ : other: 34.1 27 (1975Kr08).
1125.0 3	1664.84	0.28 6	[E2]	3.22×10^{-4}	
1127.8 1	1710.43	0.97 8			
1143.6 3	3281.93	0.23 6			
1151.1 4	2482.25	0.60 5			
1158.7 1	2981.02	1.31 20			E γ ,I γ : possibly corresponds to an unplaced E γ =1158.4 2, I γ =4.6 5 transition observed in 1975Kr08.
1169.3 1	2880.54	1.43 9			E γ ,I γ : in Figure IV.4 of 1984LiZW, but not included in Table IV.3.
1170.0#	1710.43	0.02			
1196.0 6	3333.22	0.14 3			I γ : other: 15.8 11 (1975Kr08).
1218.0 10	2482.25	0.07 6			
1240.0 5	1822.48	0.08 4			
1243.0 10	1472.96	0.10 8	[E1]	1.96×10^{-4}	
1257.0 2	3333.22	0.23 4			
1258.0 21	3167.19	0.19 5			
1265.1 5	1265.03	0.09 3			
1296.2 1	1296.27	1.24 6			
1326.8 10	1907.66	0.15 8			
1331.1 3	2858.02	1.41 10	[E2]	2.58×10^{-4}	
1331.2 1	1331.56	13.7 4	[E2]	2.58×10^{-4}	E γ : possibly a transition from the β decay of ^{82}As , not included in Adopted Levels. I γ : other: 3.0 2 (1975Kr08).
1367.0# 11	1907.66	<0.02			
1381.2 10	2482.25	0.20 10			
1408.0 2	2880.54	<0.4			
1419.5 2	2482.25	0.23 4	[E1]	2.88×10^{-4}	
1420.0 10	3243.03	0.23 4			
1454.7 3	2981.02	5.3 3			
1480.7 3	1710.43	0.27 5			
1518.4 1	2482.25	2.57 10			
1526.4 1	1526.49	8.1 3			
1537.2# 16	2076.84	0.22 8			E γ ,I γ : likely corresponds to an unplaced E γ =1822.4 1, I γ =7.9 7 transition observed in 1975Kr08.
1548.8 1	2880.54	3.1 1			
1582.3 2	2545.58	0.30 5			
1596.6 8	2137.67	0.09 5			
1607.0 15	2189.80	0.10 7			
1615.5 1	2678.72	2.27 7			
1623.6 4	2724.65	0.40 4			
1641.0 4	2971.2	0.02 2			
1649.2 1	2981.02	2.20 7			
1664.6 3	1664.84	0.18 4	[E2]	2.96×10^{-4}	
1715.6 5	2981.02	0.08 3			I γ : other: 14.8 17 (1975Kr08).
1761.4 1	2724.65	0.73 4			
1780.2 1	2880.54	1.62 6			
1795.3 1	2858.02	2.0 1	[E1]	5.46×10^{-4}	
1818.0 2	2880.54	0.61 10			
1822.5 1	1822.48	8.2 2			
1860.0 3	3333.22	0.17 10			
1894.8 2	2858.02	12.3 3			
1900.3 5	2482.25	0.19 8			
1908.9 1	2137.67	1.99 12			
1912.0 10	3243.03	0.05 4			I γ : other: 27.7 28 (1975Kr08).
1917.3 1	2880.54	12.9 4			
1919.3 5	2981.02	0.70 14			
1944.0 5	1943.31	0.14 7			
2001.0 1	3333.22	0.12 10			
2017.9 1	2981.02	1.27 10			
2077.0 1	2076.84	25.0 5			
2092.0 10	3423.9	0.14 3			
2098.3 12	2678.72	0.09 8			
2104.2 2	3167.19	0.37 4			
2141.7 3	2678.72	0.29 6			

Continued on next page (footnotes at end of table)

^{83}As β^- Decay 1975Kr08,1982Me01,1984LiZW (continued) $\gamma(^{83}\text{Se})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\dagger$	Mult.	α	Comments
2142.5 7	2724.65	0.07 4			
2180.3 19	3243.03	0.03 3			
2190.6 7	2189.80	0.11 7			
2204.2 1	3167.19	21.3 4			$E\gamma$: other: 2202.9 2 (1975Kr08). $I\gamma$: other: 22.2 19 (1975Kr08).
2218.7 2	3281.93	1.44 16			
2270.8 5	3333.22	0.15 4			
2279.9 1	3243.03	0.56 5			
2299.2 1	2880.54	0.89 5			
2318.8 1	3281.93	2.52 5			$E\gamma, I\gamma$: possibly corresponds to an unplaced $E\gamma=2316.5$ 10, $I\gamma=1.8$ 9 transition observed in 1975Kr08.
2360.0 10	3423.9	0.07 4			
2370.4 1	3333.22	1.14 6			
2388.3 9	2971.2	0.23 5			
2423.1 3	3386.4	0.58 7			
2429.5 5	2971.2	0.29 5			
2449.9 2	2678.72	0.97 8			
2461.9 10	3423.9	0.25 4			
2580.0 20	3911.6	0.2 2			
2585.2 1	3167.19	0.17 3			
2626.7 5	3689.9	0.11 3			
2629.0 15	3167.19	0.03 2			
^x 2660.1 [‡] 10		2.6 [‡] 4			
2699.6 1	3281.93	0.52 3			
2724.6 1	2724.65	0.18 6			
2729.0 15	3689.9	0.67 7			
2742.5 2	3281.93	0.44 5			
2858.1 1	2858.02	17.0 3	[E2]	7.70×10^{-4}	$I\gamma$: other: 16.3 15 (1975Kr08).
2865.0 12	3827.7	0.07 7			
2881.4 10	3463.6	0.11 6			
2937.9 1	3167.19	0.66 10			
2976.2	3558.4	0.11 6			
2981.2 5	2981.02	1.54 6			
3038.0 11	4001.3	0.2 2			
3242.8 1	3243.03	3.5 1			$I\gamma$: other: 4.1 4 (1975Kr08).
3245.0 10	3827.7	0.05 5			
3865.0 [‡] # 20	3865.1?	1.1 [‡] 5			

† From 1984LiZW, except where noted.

‡ From 1975Kr08.

Placement of transition in the level scheme is uncertain.

@ Multiply placed; intensity suitably divided.

^x γ ray not placed in level scheme.

^{83}As β^- Decay 1975Kr08,1982Me01,1984LiZW (continued)

Decay Scheme

^{83}As β^- Decay 1975Kr08,1982Me01,1984LiZW (continued)

Decay Scheme (continued)

$(5/2^-)$ 0.0 13.4 s
 $^{83}_{33}\text{As}_{50}$
 $Q=5671^4$
 $\% \beta^- = 100$

Intensities: relative I_γ
 @ Multiply placed; intensity suitably divided

^{83}As β^- Decay 1975Kr08,1982Me01,1984LiZW (continued)

Decay Scheme (continued)

$(5/2^-)$ 0.0 13.4 s
 $^{83}_{34}\text{As}_{50}$
 $Q^- = 5671^4$
 $\% \beta^- = 100$

Intensities: relative I γ
 @ Multiply placed; intensity suitably divided

^{83}As β^- Decay 1975Kr08,1982Me01,1984LiZW (continued)

Decay Scheme (continued)

$(5/2^-)$ 0.0 13.4 s
 $^{83}_{34}\text{As}_{50}$
 $Q^- = 5671^4$
 $\% \beta^- = 100$

Intensities: relative I_γ
 @ Multiply placed; intensity suitably divided

⁸²Se(n,γ) E=thermal 1979BrZE

Thermal neutrons on target enriched to 87.8% ⁸²Se. Measured E_γ, I_γ using pair spectrometer.

Level scheme should be considered extremely tentative. Due to the very low capture cross section of ⁸²Se, the most intense lines observed in the spectrum were from activation of the beryllium capsule and capture on ^{76,77}Se impurities. Except in cases where supporting evidence for transitions is provided by other datasets, the results in this dataset are not included in the Adopted Levels.

⁸³Se Levels

E(level) [†]	Jπ	Comments
0.0		
228.9		
448.3		
546.0		
571.0		
577.1		
1473.0		
2121.8		
2347.1		
2413.1		
2627.4		
2975.0		
5816.0 4	(1/2+)	Jπ: s-wave capture on ⁸² Se (g.s. Jπ=0+).

[†] From 1979BrZe.

γ(⁸³Se)

E _γ	E(level)	I _γ [†]	Comments
2841.0 2	5816.0	12.3 30	
3188.6 2	5816.0	11.6 22	
3402.7 5	5816.0	5.0 15	E _γ : anomalous peak shape.
3468.9 3	5816.0	7.6 16	
3694.1 3	5816.0	4.2 12	
^x 4317.4 3		3.6 7	
4343.0 3	5816.0	4.2 8	
^x 4735.6 3		5.7 7	
^x 4764.2 3		2.7 6	
^x 4791.6 3		2.0 5	
^x 5019.8 3		2.1 5	
5238.9 3	5816.0	2.0 5	
5245.0 3	5816.0	2.8 5	
5270.0 4	5816.0	2.3 8	
^x 5313.7 3		2.1 5	
5367.7 5	5816.0	2.7 11	
5587.07 23	5816.0	25.4 18	

[†] Intensity per 100 neutron captures.

^x γ ray not placed in level scheme.

⁸²Se(pol d,p),(d,p) 1978Mo12,1965Li08

1978Mo12: E(d, pol d)=12.5 MeV. Measured σ(θ), vector-analyzing power using magnetic spectrograph and nuclear emulsions (FWHM=22 keV); DWBA analysis.

1965Li08: E(d)=15 MeV. Measured σ(θ) using a magnetic spectrograph and photographic plates (FWHM=40 keV) for θ=10° to 50°; DWBA analysis.

⁸³Se Levels

Continued on next page (footnotes at end of table)

$^{82}\text{Se}(\text{pol d,p}),(\text{d,p})$ 1978Mo12,1965Li08 (continued) **^{83}Se Levels (continued)**

E(level) [†]	$J\pi^{\S}$	$L^{\ddagger}$	$(2J+1)C^2S^{\oplus}$	Comments
0.0	9/2+	4	1.80	$d\sigma/d\Omega_{\text{max}}=1.06$ mb/sr (1965Li08).
229 3	1/2-	1	0.11	$d\sigma/d\Omega_{\text{max}}=1.05$ mb/sr (1965Li08).
360& 20	(1/2+) [#]	(0)	0.24	$d\sigma/d\Omega_{\text{max}}=3.56$ mb/sr (1965Li08).
430& 20	3/2+, 5/2+ [#]	2	0.11	$d\sigma/d\Omega_{\text{max}}=0.54$ mb/sr (1965Li08).
540 3	1/2+	0	0.56	
582 3	5/2+	2	2.76	$d\sigma/d\Omega_{\text{max}}=17.7$ mb/sr (1965Li08).
822 3	3/2+	2	0.05	$d\sigma/d\Omega_{\text{max}}=0.62$ mb/sr (1965Li08).
958 3	3/2+	2	0.02	$d\sigma/d\Omega_{\text{max}}=0.70$ mb/sr (1965Li08).
1104 3	3/2+	2	0.60	$d\sigma/d\Omega_{\text{max}}=5.15$ mb/sr (1965Li08).
1266 3				
1333 3	5/2+	2	0.33	$d\sigma/d\Omega_{\text{max}}=2.38$ mb/sr (1965Li08).
1466 3	3/2+, 5/2+ [#]	2 [#]	0.12 [#]	$d\sigma/d\Omega_{\text{max}}=0.68$ mb/sr (1965Li08).
1587 3	3/2+, 5/2+	2	0.04	
1668 3	5/2+	2	0.38	$d\sigma/d\Omega_{\text{max}}=1.84$ mb/sr (1965Li08).
1916? 20				E(level): average of 1902 keV (1978Mo12) and 1930 keV (1965Li08).
2080 3				
2120 3	(5/2-) [#]	(3) [#]	0.42 [#]	$d\sigma/d\Omega_{\text{max}}=0.51$ mb/sr (1965Li08).
2140 3				
2178 3				
2195 3	(3/2+, 5/2+) [#]	(2) [#]	0.22 [#]	$d\sigma/d\Omega_{\text{max}}=1.20$ mb/sr (1965Li08).
2314 3	5/2+	2	0.20	
2350?& 20	3/2+, 5/2+ [#]	2	0.14	E(level): may be identical to the 2314-keV level. $d\sigma/d\Omega_{\text{max}}=0.79$ mb/sr (1965Li08).
2409 3				
2483 3	5/2+	2	0.47	
2536 3	3/2+	2	1.98	
2580?& 20	3/2+, 5/2+ [#]	2	2.68	E(level): may be identical to the 2536-keV level. $d\sigma/d\Omega_{\text{max}}=15.7$ mb/sr (1965Li08).
2741 3	5/2+	2	0.21	
2790?& 20	3/2+, 5/2+ [#]	2	0.24	E(level): may be identical to the 2741-keV level. $d\sigma/d\Omega_{\text{max}}=1.46$ mb/sr (1965Li08).
2803 15				
2860 ^a 15	3/2+, 5/2+	2	0.17	$d\sigma/d\Omega_{\text{max}}=1.82$ mb/sr (1965Li08).
2900 15				
2978 15	(1/2-, 3/2-) [#]	(1) [#]	0.27 [#]	$L,(2J+1)C^2S$: measured at E=3010 keV by 1965Li08. $d\sigma/d\Omega_{\text{max}}=3.16$ mb/sr (1965Li08).
3023 15				
3106 ^a 18				
3211 ^a 15	5/2+	2	0.21	$d\sigma/d\Omega_{\text{max}}=1.68$ mb/sr (1965Li08).
3353 ^a 13	5/2+	2	0.20	$d\sigma/d\Omega_{\text{max}}=1.04$ mb/sr (1965Li08).
3462 ^a 13	5/2+	2	0.35	$d\sigma/d\Omega_{\text{max}}=2.64$ mb/sr (1965Li08).
3610 15				
3647 ^a 12				
3777 12	(1/2+) [#]	(0) [#]	0.17 [#]	E(level): weighted average of 3770 keV 15 (1978Mo12) and 3790 keV 20 (1965Li08). $d\sigma/d\Omega_{\text{max}}=1.79$ mb/sr (1965Li08).
3800 15				
3841 14	(1/2+) [#]	(0) [#]	0.28 [#]	E(level): weighted average of 3830 keV 15 (1978Mo12) and 3860 keV 20 (1965Li08). $d\sigma/d\Omega_{\text{max}}=3.03$ mb/sr (1965Li08).
4020? 20				
4080& 20	(3/2+, 5/2+) [#]	(2)	0.054	$d\sigma/d\Omega_{\text{max}}=0.40$ mb/sr (1965Li08).
4180& 20	(3/2+, 5/2+) [#]	2	0.066	$d\sigma/d\Omega_{\text{max}}=0.50$ mb/sr (1965Li08).
4290? 20				
4420? 20				
4520? 20				
4680? 20				
4770? 20				
4950? 20				

[†] From 1978Mo12 using unpolarized deuterons, except where noted.[‡] From DWBA of 1978Mo12, except where noted.[§] From DWBA analysis of angular distribution and vector analyzing power (1978Mo12), except where noted.

$^{82}\text{Se}(\text{pol d,p}),(\text{d,p})$ 1978Mo12,1965Li08 (continued) **^{83}Se Levels (continued)**

From 1965Li08.

@ (2J+1) C^2S from DWBA (1978Mo12), except where noted.

& Level seen only by 1965Li08.

^a Weighted average of 1965Li08 and 1978Mo12. **$^{208}\text{Pb}(^{18}\text{O},\text{X}\gamma)$ 2009Po04**

2009Po04: $E(^{18}\text{O})=85$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, $\gamma\gamma(\theta)$ using Euroball IV array consisting of 15 Cluster, 26 Clover, and 30 tapered single-crystal HPGe detectors. ^{83}Se identified through coincidences with known transitions in the complementary fragments of $^{138,139,140}\text{Ba}$.

2006Fo13: $E(^{18}\text{O})=91$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ using Gammasphere array consisting of 100 Compton-suppressed HPGe detectors. ^{83}Se identified through coincidences with known transitions in the complementary fragments of $^{138,139,140}\text{Ba}$.

The level scheme is that of 2009Po04. The level schemes of 2009Po04 and 2006Fo13 are in agreement, with 2009Po04 observing three additional transitions from higher excitation energy levels.

 ^{83}Se Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$
0.0 §	9/2+
1297.0 § 2	(11/2+)
1808.3 § 2	(13/2+)
2299.1 § 3	(15/2+)
2478.3 5	(17/2)
3899.2 7	
4286.7 9	

[†] From a least-squares fit to $E\gamma$, by evaluator.[‡] From the Adopted Levels.[§] (A): Yrast sequence. Configuration suggested as $\text{vg}9/2$ hole coupled to yrast states of ^{84}Se . **$\gamma(^{83}\text{Se})$**

$E\gamma^\dagger$	$E(\text{level})$	$I\gamma^\dagger$	Mult. [‡]	$I\gamma^\S$
179.2 3	2478.3	34 8	D	50 15
388 1	4286.7	3 1		
490.8 3	2299.1	66 10	D	70 10
511.0 3	1808.3	29 8		35 15
1002.0 5	2299.1	4 2		7 2
1296.9 3	1297.0	25 8		30 10
1421.0 5	3899.2	8 3		
1808 1	4286.7	3 2		
1808.3 2	1808.3	100 10	Q	100

[†] From 2009Po04. $I\gamma$ are given relative to $I\gamma(1808.5\gamma)=100$.[‡] From $\gamma\gamma(\theta)$ in 2009Po04. The 179γ - 1808γ and 491γ - 1808γ cascades both indicate a D-Q cascade and the presence of the 511γ - 1297γ cascade suggests the 1808γ to have Q character.[§] From 2006Fo13. $I\gamma$ are given relative to $I\gamma(1808.5\gamma)=100$.

Adopted Levels, Gammas

Q(β⁻)=977 4; S(n)=9587 4; S(p)=8708 4; Q(α)=-7802 7 2012Wa38.
S(2n)=17180 4; S(2p)=21058 5 (2012Wa38).

⁸³Br Levels

Cross Reference (XREF) Flags

A ⁸³Se β⁻ Decay (22.25 min)
B ⁸³Se β⁻ Decay (70.1 s)
C ⁸⁰Se(α,p)
D ⁸²Se(p,p),(p,n) IAR
E ⁸²Se(³He,d)
F ⁸²Se(⁷Li,α2nγ)
G ⁸⁴Kr(pol d,³He)

E(level) [†]	Jπ	XREF	T _{1/2} [‡]	Comments
0.0&	3/2-	ABC EFG	2.374 h 4	%β ⁻ =100. Jπ: L=1 and analyzing power in (pol d, ³ He). T _{1/2} : weighted average of 2.373 h 3 (2015Kr02), 2.41 h 2 (1961Bo22), 2.48 h 5 (1962Cr08), 2.39 h 3 (1963Pa09), and 2.35 h 4 (1969Ph03).
356.703& 6	5/2-	ABC EFG		Jπ: L=3 and analyzing power in (pol d, ³ He).
799.190 7	(5/2, 7/2)-	AB E		Jπ: L(³ He,d)=3.
866.878& 7	7/2-	AB F		Jπ: M1(+E2) 510γ to 5/2-, 867γ to 3/2-, band assignment.
871.8? 21	(1/2-, 3/2-)	E		Jπ: L(³ He,d)=(1).
988.022 21	1/2-, 3/2-	AB E		Jπ: L(³ He,d)=1.
1030.655 21	(3/2)-	AB E		Jπ: log ft=5.35 from 1/2- parent, 322γ from (5/2)+.
1053.78 8	1/2-, 3/2-	Bc E G		XREF: c(1100). Jπ: L(³ He,d)=1.
1092.096 8	9/2+	A c EF	4.1 ns 1	XREF: c(1100). Jπ: L(³ He,d)=4, stretched E1 225γ to 7/2-.
1114 3		c E		T _{1/2} : from γγ(t) in ⁸³ Se β ⁻ decay (22.3 min). XREF: c(1100).
1238.439 11	(5/2, 7/2-)	A		Jπ: 372γ to 7/2-, 1239γ to 3/2-, 1456γ from (7/2)+.
1352.779 6	(5/2)+	A E		Jπ: L(³ He,d)=2, 486γ to 7/2-.
1421.038 8	(7/2-, 5/2+)	A		Jπ: 329.5γ to 9/2+, 1421γ to 3/2-; log ft=8.1 from 9/2+ parent favors the 7/2- assignment.
1423.1 20	+	E		Jπ: L(³ He,d)=2+4.
1438.927& 9	9/2-	A F	1.5 ps 4	Jπ: E2 1082γ to 5/2-, excitation function in (⁷ Li,α2nγ), band assignment.
1660.08 9	1/2-, 3/2-	B E		Jπ: L(³ He,d)=1.
1700.6 11	3/2-	C G		Jπ: L(α,p)=1, L(pol d, ³ He)=(1). E(level): given the poor resolution in (α,p) and (pol d, ³ He), could correspond to the 1660-keV level.
1701.538 15	13/2+	A F	21 ps 4	Jπ: E2 609γ to 9/2+; excitation function in (⁷ Li,α2nγ). E(level): see ⁸³ Se β ⁻ decay (22.25 min) dataset for discussion on possible doublet of levels at this energy.
1704.1 18	+	E		Jπ: L(³ He,d)=2+4.
1804.443 8	(7/2)	A		Jπ: 452γ to (5/2)+, 1447γ to 5/2-; log ft=6.9 from 9/2+ parent.
1810.356 7	(7/2+)	A EF		XREF: E(1809.3). E(level): the 1809.3 level seen in (³ He,d) is probably identical to the 1810 level or a doublet containing the 1810 level.
1915.51 9	1/2(-), 3/2	B		Jπ: L(³ He,d)=2+4, 372γ to 9/2-.
2051.47 7	1/2-, 3/2-	B e		Jπ: log ft=5.9 from 1/2- parent, 1559γ to 5/2-.
				E(level): the 2050.1-keV level seen in (³ He,d) with L=(1+2) is assumed to be a doublet including the 2051-keV and 2058-keV levels.
2058.746 9	(5/2+, 7/2, 9/2+)	A C e		Jπ: log ft=4.8 from 1/2- parent. XREF: C(?).
2073.301 11	(5/2-, 7/2-)	A		Jπ: 706γ to (5/2)+, 996γ to 9/2+.
2127.33& 13	11/2-	F	1.2 ps 4	Jπ: 635γ to 9/2-, 2073γ to 3/2-.
2134.414 19	11/2+	A F	0.3 ps 2	Jπ: E2 1260.5γ to 7/2-, band assignment.
2240	(1/2-, 3/2-)	G		Jπ: M1+E2 433γ to 13/2+, M1+E2 1042γ to 9/2+.
2338.06 18	(11/2+)	F		Jπ: L(pol d, ³ He)=(1).
2398.023 11	9/2+, 7/2+	A C E		Jπ: 527γ to (7/2+), M1+E2 637γ to 13/2+.
				XREF: C(2450).
2531.552 11		A		Jπ: L(³ He,d)=4, σ(θ) in (α,p) favors Jπ=9/2+.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

83Br Levels (continued)

E(level) [†]	J π	XREF	T _{1/2} [‡]	Comments
2647.146 8	(7/2)+	A		J π : log <i>ft</i> =4.8 from 9/2+ parent, 2290 γ to 5/2-.
2694.261 8	(7/2)+	A c		J π : log <i>ft</i> =4.9 from 9/2+ parent, 2337.5 γ to 5/2-.
2729.6 18	1/2-, 3/2-	c E		J π : L(³ He,d)=1.
2738.330 8	(9/2)+	A		J π : log <i>ft</i> =5.0 from 9/2+ parent, 1036.5 γ to 13/2+, 1384 γ to (5/2)+.
2759.9 24	(1/2-, 3/2-)	E		J π : L(³ He,d)=(1).
2765.83 20	17/2+	F	1.4 ps 2	J π : E2 1064 γ to 13/2+.
2777.077 22	(7/2, 9/2)	A		J π : log <i>ft</i> =6.2 from 9/2+ parent, 2420 γ to 5/2-.
2788.97 17	13/2+	F	1.0 ps 4	J π : M1+E2 655 γ to 11/2+.
2809.71 19	1/2-, 3/2-	B E		XREF: E(2813).
2811.70& 15	13/2-	F		J π : L(³ He,d)=1.
2946.750 9	9/2+, 11/2+	A		J π : E2 1373 γ to 9/2-, band assignment.
2953.3 17	3/2+, 5/2+	E		J π : log <i>ft</i> =4.8 from 9/2+ parent, 1245 γ to 13/2+.
2993.8 22		E		J π : L(³ He,d)=2.
3024.21 18		F		
3034.6 20	3/2+, 5/2+	E		J π : L(³ He,d)=2.
3050.66 14	15/2(+)	F		J π : 916 γ to 11/2+, (M1+E2) 1349 γ to 13/2+.
3069.2 4	(19/2-)	F	0.7 μ s 1	T _{1/2} [‡] from $\gamma(t)$ in ¹⁹⁸ Pt(⁷⁶ Ge,X γ) (1997Is13). Other: 0.6 μ s 2 from $\alpha\gamma(t)$ in (⁷ Li, α 2n γ).
				J π : D(+Q) 303 γ to 17/2+, excitation function in (⁷ Li, α 2n γ), systematics of neighboring Rb isotopes.
3091.3 3	1/2-, 3/2-	B		J π : log <i>ft</i> =5.7 from 1/2- parent.
3130.6 23	1/2+	E		J π : L(³ He,d)=0.
3135.35 20	(17/2)	F		J π : 1434 γ to 13/2+.
3137.724 15	9/2+, 11/2+	A C		J π : log <i>ft</i> =5.0 from 9/2+ parent, 1436 γ to 13/2+.
3260.37 20		F		
3333.63& 22	15/2-	F		J π : E2 1206 γ to 11/2-; band assignment.
3369.0 22		E		
3418.7 4	(15/2+)	F		J π : (M1+E2) 630 γ to 13/2+.
3441.0 27		E		
3534.0 4		F		
3548.4 23		E		
3613.7 22		E		
3667.8 22		E		
3749.3 22		E		
3804.9 22		E		
3875.1 5		EF		
3967.5 22		E		
4016.3 22		E		
4049.2 26		E		
4097.6 25		E		
4160.3 22		E		
4194.1 27		E		
4222.3 3	(21/2+)	F	0.3 ps 1	J π : (E2) 1456 γ to 17/2+.
4582.9 4		F		
5118.6 6		F		
5391.1 7		F		
5635.4 8		F		
S(p)+4861\$ 21		D	28 keV# 6	
S(p)+4917\$ 7		D	25 keV# 6	
S(p)+5079\$ 6	1/2+@	D	38 keV# 1	
S(p)+5121\$ 6	5/2+@	D	37 keV# 2	
S(p)+5400\$		D		
S(p)+5640\$ 7	(5/2+)+@	D	45 keV# 11	
S(p)+5903\$ 10	5/2+@	D	14 keV# 2	
S(p)+6233\$ 10	5/2+@	D	33 keV# 2	
S(p)+6267? \$ 10	1/2+@	D	32 keV# 1	
S(p)+6917\$ 10	5/2+@	D	20 keV# 6	
S(p)+7056\$ 10	(3/2+)+@	D	58 keV# 3	
S(p)+7075\$ 10	(1/2+)+@	D	64 keV# 4	
S(p)+7341\$ 10	5/2+@	D	23 keV# 4	
S(p)+7460\$ 10		D		

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{83}Br Levels (continued)

E(level) [†]	J π	XREF	T _{1/2} [‡]
S(p)+7531 [§] 10	5/2+ [@]	D	42 keV [#] 22

[†] From a least-squares fit to E γ , by evaluator, for levels with $\Delta E < 1$ keV. From ($^3\text{He}, d$) if $\Delta E \geq 1$ keV, except where noted.

[‡] From Doppler Shift Attenuation method (DSAM) in ($^7\text{Li}, \alpha 2n\gamma$), except where noted.

[§] IAR's from (p,p),(p,n).

[#] Γ of IAR's from (p,p),(p,n).

[@] J π of IAR's from (p,p),(p,n).

[&] (A): Band based on 3/2- ground state.

 $\gamma(^{83}\text{Br})$

E(level)	E γ [†]	I γ [†]	Mult. [‡]	δ [§]	α	Comments
356.703	356.73 ^{&} 1	100	M1(+E2)	+0.02 16	0.00428 16	
799.190	442.494 [#] 14	7.35 [#] 9				
	799.225 [#] 10	100 [#] 1				
866.878	510.204 [#] 14	100 ^{#&} 1	M1(+E2)	-0.04 12	0.00184 4	Mult.: D(+Q) from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), M1(+E2) from assumed band structure.
	866.912 [#] 17	17.8 ^{#&} 21	[E2]		6.45×10^{-4}	
988.022	188.9 [@] 1	1.12 [@] 11				
	631.2 [@] 1	2.88 [@] 16				
	988.05 [@] 12	100 [@] 4				
1030.655	231.5 [@] 1	1.54 [@] 8				
	673.98 [@] 11	71.9 [@] 25				
	1030.6 [@] 1	100 [@] 3				
1053.78	1053.7 [@] 1	100 [@]				
1092.096	225.219 ^{&} 11	100 ^{&} 2	E1(+M2)	-0.07 7	0.0080 10	B(E1)(W.u.)= 7.3×10^{-6} 3.
	735.375 ^{&} 14	2.13 ^{&} 15	[M2]		0.00216	B(M2)(W.u.)=0.038 3.
1238.439	371.671 [#] 14	80.9 [#] 12				
	439.39 [#] 3	25.0 [#] 12				
	881.957 [#] 21	100 [#] 1				
	1238.72 [#] 5	25.6 [#] 11				
1352.779	322.07 [#] 4	3.25 [#] 22				
	485.894 [#] 14	49.4 [#] 4				
	553.608 [#] 17	75.6 [#] 7				
	996.054 [#] 14	32.8 [#] 3				
	1352.799 [#] 10	100 [#] 1				
1421.038	329.599 ^{#a} 18	8.11 [#] 18				E γ : questionable placement as measured energy disagrees with level energy difference 329.0 keV; not included in least-squares fitting.
	433.03 [#] 5	3.00 [#] 15				
	621.796 [#] 14	11.47 [#] 18				
	1064.336 [#] 14	100 [#] 1				
	1421.014 [#] 20	21.2 [#] 3				
1438.927	572.015 ^{&} 10	100 ^{&} 1	M1(+E2)	-0.07 13	0.00142 3	B(M1)(W.u.)=0.048 13. Mult.: D(+Q) from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), $\Delta\pi$ =no from level scheme.
	1082.247 ^{&} 14	63 ^{&} 4	E2		3.81×10^{-4}	B(E2)(W.u.)=4.6 13. Mult.: Q from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), M2 excluded by comparison to RUL.
1660.08	1303.3 [@] 3	45 [@] 3				
	1660.1 [@] 1	100 [@] 10				
1701.538	609.369 [#] 14	100 [#]	E2		0.00166 12	B(E2)(W.u.)=15 4.
1804.443	451.666 [#] 10	31.7 [#] 4				
	712.344 [#] 10	100.0 [#] 11				
	1447.73 [#] 3	17.0 [#] 3				
1810.356	389.293 [#] 15	4.46 [#] 6				
	457.592 [#] 10	24.0 [#] 3				
	718.253 [#] 10	100 [#] 1	M1+E2	-0.12 10	8.56×10^{-4} 14	Mult.: D+Q from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), $\Delta\pi$ =no from level scheme.
	943.480 [#] 15	5.14 [#] 5				

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)
 $\gamma(^{83}\text{Br})$ (continued)

E(level)	E $\gamma^{\dagger}$	I $\gamma^{\dagger}$	Mult. ‡	$\delta^{\S}$	α	Comments
1915.51	884.5@ 5 1116.3@ 1 1558.9@ 2	17@ 6 57@ 4 100@ 6				
2051.47	391.5@ 2 997.6@ 1 1020.75@ 15 1063.7@ 2 1694.7@ 2 2051.5@ 2	1.09@ 14 10.9@ 5 19.3@ 14 31.7@ 9 7.0@ 5 100@ 3				
2058.746	705.94# 3 966.74# 5 1191.861# 14 1259.603# 14	7.2# 2 4.0# 2 100# 1 22.7# 2				
2073.301	634.55# 4 652.26# 5 834.789# 14 1085.264# 22 1206.46# 4 1274.20# 4 2073.35# 5	15.5# 12 16.1# 9 100# 2 73.6# 12 58.4# 15 21.6# 10 40.5# 12				
2127.33	688.3 2 1260.5 2	100 3 97 3	M1+E2 E2	-0.19 16 	9.46 $\times 10^{-4}$ 23 2.91 $\times 10^{-4}$	B(M1)(W.u.)=0.028 9. Mult.: D+Q from R(DCO) in (⁷ Li, α 2n γ), $\Delta\pi$ =no from level scheme. B(E2)(W.u.)=3.4 12. Mult.: Q from R(DCO) in (⁷ Li, α 2n γ), M2 excluded by comparison to RUL.
2134.414	432.9 2 1042.3 2	17.3 13 100 3	M1+E2 M1+E2	0.6 4 =-1.1	0.0032 5 =4.02 $\times 10^{-4}$	B(M1)(W.u.)=0.10 8. Mult.: D+Q from R(DCO) in (⁷ Li, α 2n γ), $\Delta\pi$ =no from level scheme. B(E2)(W.u.)=33; B(M1)(W.u.)=0.025. Mult.: D+Q from R(DCO) in (⁷ Li, α 2n γ), E1+M2 excluded by comparison to RUL.
2338.06	527.4 4 636.6 2	21 2 100 2	M1+E2	0.36 24	0.00115 6	Mult.: D+Q from R(DCO) in (⁷ Li, α 2n γ), $\Delta\pi$ =no from level scheme.
2398.023	593.580# 14 1305.930# 23 1531.09# 6	100# 1 98.2# 18 26.6# 11				
2531.552	472.84# 4 1092.538# 14 1110.44# 3 1664.66# 3 2174.95 7	32.9# 16 66.4# 24 100# 3 99.1# 23 21.2 14				
2647.146	573.71# 7 836.797# 10 1208.22# 4 1226.124# 14 1294.324# 14 1408.73# 9 1555.019# 14 1780.22# 2 1847.97# 2 2290.40# 2	1.13# 8 100# 1 4.10# 11 11.69# 12 19.9# 3 0.75# 7 22.4# 3 22.0# 3 8.92# 12 75.9# 6				
2694.261	296.23# 3 559.99# 5 636.57# a 3 883.897# 10 889.85# 3	3.85# 14 2.06# 11 5.24# 13 100# 1 3.99# 14				E γ : questionable placement as measured energy disagrees with level energy difference 635.5 keV; not included in least-squares fitting.

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Br})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult. [‡]	$\delta^{\S}$	α	Comments
2694.261	992.37# a 4	2.91# 12				$E\gamma$: questionable placement as adopted J π 's lead to M3 or E4 multipolarity for the transition.
	1341.498# 10	73.3# 7				
	1455.66# 5	3.69# 14				
	1827.318# 23	20.7# 2				
	1895.05# 2	100# 1				
	2337.53# 2	43.8# 5				
2738.330	340.316# 16	8.96# 18				
	603.91# 6	2.21# 16				
	665.007# 14	62.9# 7				
	679.578# 14	22.3# 3				
	928.02# 8	2.77# 16				
	933.878# 15	14.15# 13				
	1036.45# 4	6.5# 2				
	1299.419# 14	100# 1				
	1317.259# 14	81.9# 8				
	1385.35# 6	4.9# 2				
	1646.17# 5	4.18# 13				
	1871.49# 2	32.6# 3				
2765.83	1064.3 2	100	E2		3.96×10^{-4}	B(E2)(W.u.)=13.8 20. Mult.: Q from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), M2 excluded by comparison to RUL.
2777.077	1684.94# 3	100# 3				
	2420.36# 3	97.6# 15				
2788.97	654.5 2	100	M1+E2	-1.1 4	0.00121 7	B(E2)(W.u.)=120 70; B(M1)(W.u.)=0.035 20. Mult.: D+Q from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), E1+M2 excluded by comparison to RUL.
2809.71	1779.0@ 2	≤ 600 @				
	2453.2@ 7	100@ 28				
	2809.9@ 7	31@ 7				
2811.70	684.3 2	73 13	M1+E2	-0.17 25	0.00096 4	Mult.: D+Q from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), $\Delta\pi$ =no from level scheme.
	1372.8 2	100 7	E2		2.73×10^{-4}	Mult.: Q from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), E2 from assumed band structure.
2946.750	208.40# 1	44.7# 9				
	415.112# 14	41.0# 4				
	812.31# 2	11.3# 3				
	888.031# 10	100# 1				
	1136.21# 6	3.5# 2				
	1245.38# a 2	18.7# 2				
	1507.81# 3	12.1# 3				
	1854.61# 3	48.9# 5				
3024.21	235.2 4	21 7				
	889.8 2	100 7				
3050.66	261.5 4	28 4				
	916.2 2	48 4				
	1349.2 2	100 4	(M1+E2)	≈ -1.1	$\approx 2.68 \times 10^{-4}$	Mult.: D+Q from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), large δ value favors M1+E2 character.
3069.2	303.4 4	100	E1(+M2)	-0.04 7	0.0034 3	B(E1)(W.u.)= 1.8×10^{-8} 3; B(M2)(W.u.)=0.00144 21. Mult.: D(+Q) from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), $\Delta\pi$ =no from level scheme.
3091.3	2734.7@ 3	100@ 19				
	3090.7@ 5	81@ 13				
3135.35	1433.8 2	100	(Q)		0.00018	
3137.724	1436.18# 2	100.0# 14				
	1716.61# a 3	69.9# 12				
	2045.62# 2	99.3# 14				
3260.37	495 1	18 9				
	1558.8 2	100 9				
3333.63	521.9 2	100 8				

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Br})$ (continued)

E(level)	$E\gamma^\dagger$	$I\gamma^\dagger$	Mult. [‡]	$\delta^\S$	α	Comments
3333.63	1206.4 4	77 8	E2		3.08×10^{-4}	Mult.: Q from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), E2 from assumed band structure.
3418.7	629.7 4	100	(M1+E2)	-1.2 7	0.00136 15	Mult.: D+Q from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$); large δ value favors M1+E2 character.
3534.0	398.6 4	100				
3875.1	805.9 2	100				
4222.3	1456.4 2	100	(E2)		2.71×10^{-4}	B(E2)(W.u.)=13 5. Mult.: (Q) from R(DCO) in ($^7\text{Li}, \alpha 2n\gamma$), M2 excluded by comparison to RUL.
4582.9	360 1	100 19				
	1817.1 4	44 6				
5118.6	1243.5 4	100				
5391.1	272.4 4	100				
5635.4	244.3 4					
	517 1					

[†] From ($^6\text{Li}, \alpha 2n\gamma$), except where noted.

[‡] From R(DCO) and linear polarization measurements in ($^6\text{Li}, \alpha 2n\gamma$), except where noted.

[§] From R(DCO) in ($^6\text{Li}, \alpha 2n\gamma$).

From ^{83}Se β^- decay (22.25 min).

@ From ^{83}Se β^- decay (70.1 s).

& Weighted average of ^{83}Se β^- decay (22.25 min) and ($^6\text{Li}, \alpha 2n\gamma$).

a Placement of transition in the level scheme is uncertain.

**(A) Band based on
3/2- ground state.**

^{83}Se β^- Decay (22.25 min) 2015Kr02,1974Kr27,1973Fe08

Parent ^{83}Se : $E=0.0$; $J\pi=9/2+$; $T_{1/2}=22.25$ min 4; $Q(\text{g.s.})=3673$ 5; % β^- decay=100.

2015Kr02: ^{83}Se activity from $^{82}\text{Se}(\text{n},\gamma)$, $E=\text{thermal}$. Measured E_γ , I_γ , and $\gamma(t)$ using two HPGe detectors; deduced $T_{1/2}$.

1974Kr27: ^{83}Se activity from $^{82}\text{Se}(\text{n},\gamma)$, $E=\text{thermal}$. Measured E_γ , I_γ , $\gamma\gamma$ using two coaxial Ge(Li) detectors.

1973Fe08: ^{83}Se activity from $^{82}\text{Se}(\text{n},\gamma)$, $E=\text{thermal}$. Measured E_γ , I_γ , $\gamma\gamma$ using two Ge(Li) detectors.

All of the gamma rays observed in 1974Kr27 and 1973Fe08 have been confirmed by 2015Kr02 with the exception of two transitions: a 581.9-keV transition reported by 1973Fe08 was determined to be due to coincidence summing and a 2167-keV transition reported by 1973Fe08 was found to be associated with the decay of ^{38}Cl .

Others: 1973BeXW, 1967Ma35, 1962Ba27, 1960Yt03, 1959Co51.

A total energy release of 3770 keV 30 is calculated for this decay scheme using the RADLST code, compared with the Q value of 3673 keV 5. Non-physical negative β feedings and a large reduced χ^2 for least-squares fit to γ -ray energies suggests that some aspects of the decay scheme remain unsettled.

 ^{83}Br Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\S$	Comments
0.0	3/2-	2.374 h 4	
356.733 6	5/2-		
799.223 7	(5/2, 7/2)-		
866.930 7	7/2-		
988.171 14	1/2-, 3/2-		
1030.797 20	(3/2)-		
1092.138 7	9/2+	4.1 ns 1	$T_{1/2}$: from $\gamma\gamma(t)$ in 1967Ma35. Other: 3.65 ns 9 from $\beta\gamma(t)$ in 1973BeXW.
1238.625 10	(5/2, 7/2-)		
1352.815 6	(5/2)+		
1421.078 8	(7/2-, 5/2+)		
1438.972 9	9/2-		
1701.726 17	13/2+		$E(\text{level})$: energy sums involving this level group into two values which differ by 0.4 keV suggesting this level is possibly a closely spaced doublet (2015Kr02). Further support for a doublet comes from the negative β^- feeding intensity derived for this level and the fact that the 671- and 1702-keV transitions would correspond to E5 or M6 multipolarities given the adopted $J\pi$'s of the levels.
1804.485 8	(7/2)		
1810.398 7	(7/2+)		
2058.787 9	(5/2+, 7/2, 9/2+)		
2073.408 10	(5/2-, 7/2-)		
2134.502 13	11/2+		$E(\text{level})$: level included by the evaluator since placement of the 1042 γ is known from ($^7\text{Li}, \alpha 2n\gamma$).
2398.068 11	9/2+, 7/2+		
2531.592 11			
2647.187 8	(7/2)+		
2694.305 8	(7/2)+		
2738.382 8	(9/2)+		
2777.114 22	(7/2, 9/2)		
2946.784 9	9/2+, 11/2+		
3137.825 16	9/2+, 11/2+		

† From a least-squares fit to E_γ , by evaluator. Large reduced χ^2 suggests incorrect placements in the level scheme or that the uncertainties are underestimated.

‡ From the Adopted Levels.

§ From the Adopted Levels, except where noted.

 β^- radiations

Levels at 1352.8, 1701.9, and 2073.4 keV have negative β^- feedings of -0.53 11, -1.16 2, and -0.73 5, respectively.

$E\beta^-$	$E(\text{level})$	$I\beta^{-\ddagger\ddagger}$	$\text{Log } ft$	$E\beta^-$	$E(\text{level})$	$I\beta^{-\ddagger\ddagger}$	$\text{Log } ft$
(535 5)	3137.825	1.91 2	5.0 1	(1538 5)	2134.502	0.60 2	7.3 2
(726 5)	2946.784	10.3 1	4.8 1	(1614 5)	2058.787	0.56 7	7.4 1
(896 5)	2777.114	0.90 1	6.2 1	(1863 5)	1810.398	0.4 2	7.77 22
(935 5)	2738.382	16.4 2	5.0 1	(1869 5)	1804.485	2.98 5	6.9 1
(979 5)	2694.305	26.3 2	4.9 1	(2234 5)	1438.972	0.60 8	7.9 1
(1026 5)	2647.187	30.7 3	4.8 1	(2252 5)	1421.078	0.44 8	8.1 1
(1141 § 5)	2531.592	<0.05	>7.8	(2434 5)	1238.625	0.50 3	8.2 1
(1275 5)	2398.068	0.94 2	6.7 1	(2581 5)	1092.138	4.1 6	7.4 1

Continued on next page (footnotes at end of table)

⁸³Se β⁻ Decay (22.25 min) 2015Kr02,1974Kr27,1973Fe08 (continued)

β⁻ radiations (continued)

Eβ ⁻	E(level)	Iβ ^{-†‡}	Log <i>ft</i>
(2806 § 5)	866.930	1.9 7	7.83 16
(2874 5)	799.223	1.7 2	9.31u 1
(3316 5)	356.733	1.2 9	9.81u 4

† From γ-ray transition intensity balance.

‡ Absolute intensity per 100 decays.

§ Existence of this branch is questionable.

γ(⁸³Br)

Iγ normalization: ΣI(γ+ce) to g.s.=100. Direct g.s. feeding is not expected with ΔJ=3 and Δπ=yes.

Eγ [†]	E(level)	Iγ ^{†§}	Mult.‡	δ‡	α	Comments
208.40 1	2946.784	2.54 5				Iγ: others: 2.9 3 (1974Kr27), 2.7 2 (1973Fe08).
225.22 1	1092.138	42.5 8	E1 (+M2)	-0.07 7	0.0080 10	Iγ: others: 48 4 (1974Kr27), 46.5 20 (1973Fe08).
^x 260.584 22		0.352 13				
^x 263.68 4		0.295 18				
296.232 23	2694.305	0.412 15				Iγ: others: 0.5 3 (1974Kr27), 0.4 1 (1973Fe08).
322.07 4	1352.815	0.221 15				Eγ,Iγ: unplaced transition with Eγ=322.2 3, Iγ=0.10 5 observed in 1973Fe08.
329.599@ 18	1421.078	0.640 14				Iγ: other: 0.28 5 (1974Kr27). Iγ: other: 0.86 11 (1974Kr27). Eγ: questionable placement as measured energy disagrees significantly with level energy difference=328.94 keV; not included in least-squares fitting.
340.316 16	2738.382	0.684 14				Iγ: others: 0.69 9 (1974Kr27), 0.6 1 (1973Fe08).
356.73 1	356.733	100 1	M1 (+E2)	+0.02 16	0.00428 16	
371.671 14	1238.625	0.858 13				Iγ: others: 0.88 8 (1974Kr27), 0.8 1 (1973Fe08).
						Eγ: placed by 1973Fe08 and 1974Kr27 as depopulating the 1810-keV level. However, Eγ differs by more than 12σ from the level energy difference and thus, 2015Kr02 propose a placement as depopulating the 1239-keV level.
389.293 15	1810.398	0.945 13				Iγ: others: 0.94 8 (1974Kr27), 0.9 1 (1973Fe08).
415.112 14	2946.784	2.33 2				Iγ: other: unplaced transition with Eγ=415.2 5 and Iγ=2.32 15 observed in 1974Kr27.
433.03 5	1421.078	0.237 12				Iγ: other: 0.23 6 (1974Kr27).
439.39 3	1238.625	0.265 13				
442.494 14	799.223	1.55 2				Eγ: 1974Kr27 doubly place a 442γ as depopulating the 779- and 3137-keV levels. The level energy difference from the 779-keV level is 442.5 keV whereas it is 443.5 keV from the 3137-keV level. 2015Kr02 find that the transition is well fit as a singlet and thus conclude that its contribution to the placement from the 3137-keV level is negligible.
451.666 10	1804.485	1.47 2				Iγ: others: 1.42 11 (1974Kr27), 1.2 1 (1973Fe08).
457.592 10	1810.398	5.08 5				Iγ: others: 4.8 3 (1974Kr27), 5.1 3 (1973Fe08).

Continued on next page (footnotes at end of table)

^{83}Se β^- Decay (22.25 min) 2015Kr02,1974Kr27,1973Fe08 (continued) $\gamma(^{83}\text{Br})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger\S}$	Mult. ‡	$\delta^{\ddagger}$	α	Comments
472.82 4	2531.592	0.243 12				$E\gamma, I\gamma$: unplaced transition with $E\gamma=473$ 1, $I\gamma=0.25$ 5 observed in 1974Kr27. $I\gamma$: other: 0.21 5 (1973Fe08). $I\gamma$: others: 3.5 3 (1974Kr27), 3.3 2 (1973Fe08).
485.894 14	1352.815	3.37 3				
$\times 502.27$ 6		0.178 14				
510.204 14	866.930	61.7 6	M1 (+E2)	-0.04 12	0.00184 4	$I\gamma$: others: 56 3 (1974Kr27), 64.6 25 (1973Fe08). $I\gamma$: others: 4.8 3 (1974Kr27), 6.2 15 (1973Fe08).
553.608 17	1352.815	5.14 5				
559.99 5	2694.305	0.220 12				
572.015 10	1438.972	6.42 6	M1 (+E2)	-0.07 13	0.00142 3	$I\gamma$: others: 5.7 3 (1974Kr27), 6.5 3 (1973Fe08).
573.71 7	2647.187	0.187 14				
593.580 14	2398.068	1.09 1				$I\gamma$: others: 1.03 6 (1974Kr27), 1.1 1 (1973Fe08).
$\times 600.97$ 3		0.302 13				
603.91 6	2738.382	0.169 12				
609.369@ 14	1701.726	4.34 4	E2		1.65×10^{-3}	$I\gamma$: others: 4.00 15 (1974Kr27), 4.5 3 (1973Fe08). $E\gamma$: questionable placement as measured energy disagrees with level energy difference=609.59 keV; not included in least-squares fitting.
621.796 14	1421.078	0.905 14				$I\gamma$: others: 0.90 6 (1974Kr27), 0.6 1 (1973Fe08).
634.55 4	2073.408	0.187 14				
636.57@ 3	2694.305	0.561 14				$I\gamma$: other: 0.6 3 (1974Kr27). $E\gamma$: questionable placement as measured energy disagrees significantly with level energy difference=635.52 keV; not included in least-squares fitting.
652.26 5	2073.408	0.195 11				
665.007 14	2738.382	4.80 5				$E\gamma, I\gamma$: unplaced transitions with $E\gamma=665.0$ 3 and $I\gamma=4.3$ 2 observed in 1974Kr27. 1973Fe08 place a transition with $E\gamma=664.8$ 1 and $I\gamma=4.7$ 3 as depopulating a level at 1021 keV. $I\gamma$: other: 0.48 9 (1974Kr27). $E\gamma$: adopted $J\pi$'s suggest an E5 or M6 multipolarity for this transition; not included in the adopted levels.
670.899 22	1701.726	0.512 14				$E\gamma$: 1973Fe08 placed this γ ray in ^{83}Se β^- decay (70.1 s) only. $I\gamma$: others: 1.39 8 (1974Kr27), 1.6 1 (1973Fe08).
$\times 688.32$ 5		0.172 17				
705.94 3	2058.787	0.453 15				$I\gamma$: others: 0.60 6 (1974Kr27), 0.3 1 (1973Fe08).
$\times 708.03$ 6		0.218 14				
712.344 10	1804.485	4.63 5				$I\gamma$: others: 4.63 15 (1974Kr27), 3.9 2 (1973Fe08).
718.253 10	1810.398	21.2 2	M1+E2	-0.12 10	8.56×10^{-4} 14	$I\gamma$: others: 19.0 6 (1974Kr27), 23.8 10 (1973Fe08).
$\times 723.01$ 3		0.433 18				
735.375 14	1092.138	0.90 1				$I\gamma$: others: 1.00 9 (1974Kr27), 1.2 1 (1973Fe08).
799.225 10	799.223	21.1 2				$I\gamma$: others: 19.0 5 (1974Kr27), 23.3 10 (1973Fe08).
812.311 19	2946.784	0.641 13				$E\gamma$: placed by evaluator after introducing the 2134-keV level found in ($^7\text{Li}, \alpha 2n\gamma$). γ not placed by 1974Kr27. $I\gamma$: other: 0.54 6 (1974Kr27).

Continued on next page (footnotes at end of table)

⁸³Se β⁻ Decay (22.25 min) 2015Kr02,1974Kr27,1973Fe08 (continued)

⁸³Br (continued)

E _γ [†]	E(level)	I _γ ^{†§}	Mult. [‡]	α	Comments
834.789 14	2073.408	1.21 2			
836.797 10	2647.187	16.6 2			I _γ : others: 15.4 (1974Kr27), 23.2 10 (1973Fe08).
866.912 17	866.930	11.9 1	[E2]	6.45×10 ⁻⁴	I _γ : others: 10.5 2 (1974Kr27), 12.9 5 (1973Fe08).
881.957 21	1238.625	1.06 1			
883.897 10	2694.305	10.7 1			I _γ : others: 10.2 2 (1974Kr27), 11.3 5 (1973Fe08).
888.031 10	2946.784	5.68 6			I _γ : others: 5.2 2 (1974Kr27), 6.9 3 (1973Fe08).
889.85 3	2694.305	0.427 15			
928.02 8	2738.382	0.211 12			I _γ : other: 0.31 11 (1974Kr27).
933.878 15	2738.382	1.08 1			I _γ : others: 1.03 8 (1974Kr27), 1.0 1 (1973Fe08).
943.480 15	1810.398	1.09 1			I _γ : others: 1.22 6 (1974Kr27), 1.3 1 (1973Fe08).
966.74 5	2058.787	0.251 13			I _γ : other: 0.39 11 (1974Kr27).
988.200 17	988.171	1.12 1			I _γ : others: 1.03 12 (1974Kr27), 0.9 1 (1973Fe08).
992.37 4	2694.305	0.311 13			I _γ : other: 0.5 3 (1974Kr27).
996.054 14	1352.815	2.23 2			I _γ : others: 1.85 15 (1974Kr27), 1.9 2 (1973Fe08).
1030.80 5	1030.797	0.321 12			E _γ : 1973Fe08 placed this γ ray in ⁸³ Se β ⁻ decay (70.1 s) only.
					I _γ : other: 0.32 12 (1974Kr27).
1036.45 4	2738.382	0.495 15			I _γ : others: 0.54 11 (1974Kr27), 0.3 1 (1973Fe08).
1042.392 14	2134.502	1.89 2			E _γ : placement by evaluator based on data in (⁷ Li,α2nγ). Placement is supported by observed coincidences with 225γ and 356γ in 1974Kr27. The 1042γ is unplaced in both 1974Kr27 and 1973Fe08.
					I _γ : others: 1.82 8 (1974Kr27), 1.5 1 (1973Fe08).
1064.336 14	1421.078	7.89 8			I _γ : others: 7.3 3 (1974Kr27), 8.6 4 (1973Fe08).
1082.247 14	1438.972	4.11 4	E2	3.81×10 ⁻⁴	I _γ : others: 3.77 14 (1974Kr27), 3.9 3 (1973Fe08).
1085.264 22	2073.408	0.890 15			
1092.538 14	2531.592	0.491 18			E _γ : 1974Kr27 place a 1093 1 transition with I _γ =0.39 12 from the 1091.9-keV level. This, however, results in an energy mismatch of 10σ.
1110.44 3	2531.592	0.739 18			E _γ ,I _γ : unplaced transition with E _γ =1110.2 9, I _γ =0.71 5 observed in 1974Kr27.
					I _γ : other: 0.6 1 (1973Fe08).
1136.21 6	2946.784	0.199 10			
^x 1148.75 5		0.253 12			
^x 1179.36 5		0.194 11			
1191.861 14	2058.787	6.30 6			I _γ : others: 5.7 2 (1974Kr27), 6.1 3 (1973Fe08).
1206.46 4	2073.408	0.707 18			E _γ ,I _γ : unplaced transition with E _γ =1206.9 2 and I _γ =1.3 1 observed in 1973Fe08.
1208.22 4	2647.187	0.681 18			E _γ ,I _γ : other: unresolved doublet (I _γ =1.1) with an unplaced 1206.9γ (1974Kr27).
1226.124 14	2647.187	1.94 2			I _γ : others: 1.87 9 (1974Kr27), 1.8 2 (1973Fe08).
1238.72 5	1238.625	0.271 12			E _γ ,I _γ : unplaced transition with E _γ =1239 1 and I _γ =0.31 6 observed in 1974Kr27.
1245.38@ 2	2946.784	1.06 1			I _γ : others: 0.96 6 (1974Kr27), 1.0 1 (1973Fe08).
					E _γ : questionable placement as measured energy disagrees with level energy difference=1245.06 keV; not included in least-squares fitting.
1259.603 14	2058.787	1.43 1			I _γ : others: 1.30 9 (1974Kr27), 1.3 1 (1973Fe08).
1274.20 4	2073.408	0.261 12			
1294.324 14	2647.187	3.31 5			I _γ : other: 2.4 5 (1973Fe08).
1299.419 14	2738.382	7.63 8			I _γ : others: 6.9 2 (1974Kr27), 8.5 4 (1973Fe08).
1305.930 23	2398.068	1.07 2			I _γ : others: 0.97 11 (1974Kr27), 0.8 1 (1973Fe08).
1317.259 14	2738.382	6.25 6			I _γ : others: 5.6 2 (1974Kr27), 6.0 6 (1973Fe08).
1341.498 10	2694.305	7.84 8			I _γ : others: 7.1 2 (1974Kr27), 8.3 4 (1973Fe08).
^x 1345.74 5		0.318 15			
1352.799 10	1352.815	6.80 7			I _γ : others: 6.3 2 (1974Kr27), 7.0 4 (1973Fe08).
^x 1383.26 6		0.194 15			
1385.35 6	2738.382	0.377 15			I _γ : other: 0.54 14 (1974Kr27).
1408.73 9	2647.187	0.124 12			
1421.014 20	1421.078	1.67 2			I _γ : others: 1.64 9 (1974Kr27), 1.6 1 (1973Fe08).
1436.179 21	3137.825	1.38 2			E _γ ,I _γ : unplaced transition with E _γ =1435.8 3, I _γ =1.2 1 observed in 1973Fe08.
					I _γ : other: 1.28 9 (1974Kr27).

Continued on next page (footnotes at end of table)

^{83}Se β^- Decay (22.25 min) 2015Kr02,1974Kr27,1973Fe08 (continued) $\gamma(^{83}\text{Br})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\ddagger$	Comments
1447.73 3	1804.485	0.788 15	$I\gamma$: others: 0.68 11 (1974Kr27), 0.7 1 (1973Fe08).
1455.66 5	2694.305	0.395 15	$E\gamma, I\gamma$: unplaced transition with $E\gamma=1456$ 2 and $I\gamma=0.43$ 11 observed in 1974Kr27.
^x 1475.58 2		1.21 2	
1507.81 3	2946.784	0.685 16	$I\gamma$: other: 0.73 8 (1974Kr27).
1531.09 6	2398.068	0.290 12	$I\gamma$: other: 0.311 12 (1974Kr27).
1555.019 14	2647.187	3.71 4	$I\gamma$: others: 3.4 3 (1974Kr27), 3.7 2 (1973Fe08).
^x 1565.25 6		0.276 11	
1646.17 5	2738.382	0.319 10	$I\gamma$: other: 0.65 11 (1974Kr27).
1664.66 3	2531.592	0.732 17	$E\gamma, I\gamma$: unplaced transition with $E\gamma=1665$ 2, $I\gamma=0.80$ 9 observed in 1974Kr27. $I\gamma$: other: 0.8 1 (1973Fe08).
1684.94 3	2777.114	0.657 15	$E\gamma, I\gamma$: unplaced transition with $E\gamma=1684.2$ 10, $I\gamma=0.3$ 1 observed in 1973Fe08. $I\gamma$: other: 0.65 8 (1974Kr27).
1701.79@ 7	1701.726	0.251 12	$E\gamma$: adopted $J\pi$'s suggest an E5 or M6 multipolarity for this transition; not included in the adopted levels. $I\gamma$: other: 0.31 8 (1974Kr27).
1716.61@ 3	3137.825	0.965 16	$E\gamma$: placement from 1974Kr27. Alternate placement by 1973Fe08 is from the 2737-keV level, however, this results in population of a 1021-keV level, the existence of which could not be confirmed by 2015Kr02. Thus, the placement of 1974Kr27 is adopted here. $I\gamma$: others: 0.94 9 (1974Kr27), 0.9 3 (1973Fe08).
1780.218 21	2647.187	3.65 4	$I\gamma$: others: 3.1 3 (1974Kr27), 2.8 4 (1973Fe08).
1827.318 23	2694.305	2.21 2	$I\gamma$: others: 1.85 15 (1974Kr27), 2.0 2 (1973Fe08).
1847.970 18	2647.187	1.48 2	$I\gamma$: others: 1.57 14 (1974Kr27), 1.0 1 (1973Fe08).
1854.607 23	2946.784	2.78 3	$I\gamma$: others: 2.8 3 (1974Kr27), 2.2 2 (1973Fe08).
1871.493 19	2738.382	2.49 2	$I\gamma$: others: 2.3 2 (1974Kr27), 2.1 2 (1973Fe08).
1895.053 17	2694.305	10.7 1	$I\gamma$: others: 10.5 9 (1974Kr27), 11.3 5 (1973Fe08).
^x 1973.45 3		0.874 17	
2045.624 21	3137.825	1.37 2	$E\gamma, I\gamma$: unplaced transition with $E\gamma=2045.2$ 5, $I\gamma=1.0$ 1 observed in 1973Fe08. $I\gamma$: other: 1.39 15 (1974Kr27).
2073.35 5	2073.408	0.490 14	$E\gamma, I\gamma$: unplaced transition with $E\gamma=2072.4$ 7 and $I\gamma=0.4$ 1 observed in 1973Fe08; unplaced transition with $E\gamma=2075$ 2 and $I\gamma=0.5$ 1 observed in 1974Kr27.
^x 2084.99 3		1.07 2	
2174.95 7	2531.592	0.157 10	
2290.398 18	2647.187	12.6 1	$I\gamma$: others: 12.0 12 (1974Kr27), 13.5 5 (1973Fe08).
2337.529 19	2694.305	4.69 5	$I\gamma$: others: 4.6 5 (1974Kr27), 5.0 3 (1973Fe08).
2420.36 3	2777.114	0.641 10	$E\gamma, I\gamma$: unplaced transition with $E\gamma=2419.9$ 4, $I\gamma=0.6$ 1 observed in 1973Fe08. $I\gamma$: other: 0.60 8 (1974Kr27).

[†] From 2015Kr02. Intensities from 1974Kr27 and 1973Fe08 are included in the comments.[‡] From the Adopted Gammas.[§] For absolute intensity per 100 decays, multiply by 0.694 5.

@ Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

$^{83}\text{Se} \beta^-$ Decay (22.25 min) 2015Kr02,1974Kr27,1973Fe08 (continued)

Decay Scheme

 Intensities: I(γ +ce) per 100 parent decays

^{83}Se β^- Decay (22.25 min) 2015Kr02,1974Kr27,1973Fe08 (continued)

Decay Scheme (continued)

 Intensities: I(γ +ce) per 100 parent decays

$^{83}\text{Se} \beta^-$ Decay (22.25 min) 2015Kr02,1974Kr27,1973Fe08 (continued)

Decay Scheme (continued)

 Intensities: I(γ +ce) per 100 parent decays

^{83}Se β^- Decay (70.1 s) 1973Fe08,1976Kr20

Parent ^{83}Se : $E=228.92$ 7; $J\pi=1/2^-$; $T_{1/2}=70.1$ s 4; $Q(\text{g.s.})=3673$ 5; % β^- decay=100.

1976Kr20: ^{83}Se activity from $^{82}\text{Se}(n,\gamma)$, $E=\text{thermal}$. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ using two coaxial Ge(Li) detectors.

1973Fe08: ^{83}Se activity from $^{82}\text{Se}(n,\gamma)$, $E=\text{thermal}$. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ using two Ge(Li) detectors.

Others: 1986Sc10, 1967Ma35, 1958Co57.

A total energy release of 3940 keV 40 is calculated for this decay scheme using the RADLST code, in good agreement with the Q value of 3902 keV 5.

 ^{83}Br Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\ddagger$	Comments
0.0	3/2-	2.374 h 4	
356.69 4	5/2-		
799.12 6	(5/2, 7/2)-		
866.80 11	7/2-		
987.96 7	1/2-, 3/2-		
1030.65 6	(3/2)-		
1053.78 8	1/2-, 3/2-		
1660.08 9	1/2-, 3/2-		
1915.45 10	1/2(-), 3/2		$E(\text{level})$: reported by 1976Kr20 only.
2051.45 8	1/2-, 3/2-		
2809.71 19	1/2-, 3/2-		
3091.3 3	1/2-, 3/2-		

† From a least-squares fit to $E\gamma$, by evaluator.

‡ From the Adopted Levels.

 β^- radiations

$E\beta^-$	$E(\text{level})$	$I\beta^-^\dagger$	$\log ft$	Comments
(811 5)	3091.3	0.095 12	5.7 1	
(1092 5)	2809.71	0.21 15	5.9 4	
(1850 5)	2051.45	18.6 4	4.8 1	
(1986 5)	1915.45	2.07 11	5.9 1	
(2242 5)	1660.08	2.63 20	6.0 1	
(2848 5)	1053.78	0.36 10	7.3 1	
(2871 5)	1030.65	33.2 11	5.4 1	
(2914 5)	987.96	12.8 8	5.8 1	
(3035 5)	866.80	<0.27	>7.5	
(3103 5)	799.12	<0.20	>7.7	
(3902 5)	0.0	31.0 7	6.0 1	$I\beta^-$: from 1968Sc10.

† Absolute intensity per 100 decays.

 $\gamma(^{83}\text{Br})$

$I\gamma$ normalization: From $\Sigma I(\gamma+ce)$ to g.s.=100 - 31.0% 7 with $I\beta(\text{g.s.})=31.0\%$ 7 from 1968Sc10.

$E\gamma^\dagger$	$E(\text{level})$	$I\gamma^\dagger@$	Mult.#	$\delta^\#$	α	Comments
188.9 1	987.96	1.03 10				
231.5 1	1030.65	1.86 10				
$^x322.2$ 3		0.15 15				
356.69 5	356.69	100 6	M1(+E2)	+0.02 16	0.00428 16	$I\gamma$: $\Delta I\gamma$ from 1976Kr20.
$^x371.66$ 12		0.56 7				
391.5 2	2051.45	0.70 9				
442.4 1	799.12	0.37 7				
510.1 1	866.80	1.2 4	M1(+E2)	-0.04 12	0.00184 4	$I\gamma$: from 1976Kr20. 1973Fe08 give an upper limit of $I\gamma<2.1$.
631.2 1	987.96	2.65 15				
673.98 11	1030.65	87 3				
$^x698.9$ 3		0.5 1				
799.15 15	799.12	7.2 3				
$^x812.6$ § 3		1.1 4				
884.5 § 5	1915.45	1.2 4				

Continued on next page (footnotes at end of table)

$\gamma(^{83}\text{Br})$ (continued)

^x γ ray not placed in level scheme.

Intensities: I(γ +ce) per 100 parent decays

$^{80}\text{Se}(\alpha, p)$ 1973Bu13

$E(\alpha)=20.5$ MeV. Measured $\sigma(\theta)$ from 20° to 100° in 5° steps using two Si NE-2A detectors (FWHM=220 keV); DWBA analysis with DWUCK code.

 ^{83}Br Levels

E(level)	$J\pi^\ddagger$	$L^\dagger$	Comments
0 70	3/2-	1	
356 70	5/2-	3	
680? 70			E(level): Weakly excited; not included in Adopted Levels.
1100 70		1+4	E(level): Doublet. L: one of the transitions contributing to this doublet has L=1. The other has L=4, or possibly, 3. A somewhat better fit is obtained with L=1+4 versus L=1+3.
1700 70	3/2-	1	
2080? 70			E(level): Weakly excited.
2450 70	9/2+	4	
2710 70			E(level): Weakly excited and unresolved from 2450 peak.
3100 70		(4)	E(level): Possible doublet with principal component having L=4.

† From angular distribution with DWBA.

‡ From J dependence of angular distribution.

 $^{82}\text{Se}(p, p), (p, n)$ IAR 1968Ba23, 1968Zi03, 1977Ta09

1968Ba23: (p, p) and (p, n) reactions, $E(p)=3.0 - 4.75$ MeV. Measured $\sigma(E)$ with three silicon surface-barrier detectors (FWHM=35 keV) at $\theta=90^\circ$, 125° , and 150° for protons and ^3He proportional counter for neutrons; deduced Γ .

1968Zi03: (p, n) reaction, $E(p)=4.1 - 5.8$ MeV. Measured $\sigma(E)$ with ^3He proportional counter; deduced Γ .

1977Ta09: (p, p) and (p, p') reactions, $E(p)=4.5 - 7.7$ MeV. Measured $\sigma(E_p, \theta)$ using solid state barrier detectors at 70° , 90° , 120° , and 150° ; deduced Γ .

 ^{83}Br Levels

E(level) †	$J\pi^\ddagger$	$\Gamma^\S$	S $^\#$	Comments
S(p)+4861 21		28 keV 6		E(level): analog of ^{83}Se 360 level. Γ : from 1968Zi03.
S(p)+4917 7		25 keV 6		E(level): analog of ^{83}Se 430 level. Γ : from 1968Zi03.
S(p)+5079 6	1/2+	38 keV 1	0.37	E(level): analog of ^{83}Se 539 level.
S(p)+5121 6	5/2+	37 keV 2	0.47	E(level): analog of ^{83}Se 582 level.
S(p)+5400				E(level): seen by 1968Zi03 only. Probably doublet, analog of ^{83}Se 822 level and 963 level.
S(p)+5640 7	(5/2)+	45 keV 11	0.14	E(level): analog of ^{83}Se 1100 level. $J\pi$: the analog ^{83}Se 1100 level has $J\pi=3/2+$ from vector-analyzing power of (pol d, p).
S(p)+5903 10	5/2+	14 keV 2	0.034	E(level): analog of ^{83}Se 1330 level.
S(p)+6233 10	5/2+	33 keV 2	0.056	E(level): analog of ^{83}Se 1665 level.
S(p)+6267? 10	1/2+	32 keV 1	0.088	E(level): analog of ^{83}Se 1710 level.
S(p)+6917 10	5/2+	20 keV 6	0.05	E(level): analog of ^{83}Se 2314 level.
S(p)+7056 10	(3/2+)	58 keV 3	0.68	E(level): analog of ^{83}Se 2536 level.
S(p)+7075 10	(1/2+)	64 keV 4	0.13	E(level): no analog in ^{83}Se was found.
S(p)+7341 10	5/2+	23 keV 4	0.05	E(level): analog of ^{83}Se 2858 level.
S(p)+7460 10				E(level): analog of ^{83}Se 3023 level.
S(p)+7531 10	5/2+	42 keV 22	0.07	E(level): analog of ^{83}Se 3106 level.

† For $E(\text{level}) < S(p) + 5.7$ MeV, weighted average of 1968Ba23, 1968Zi03, and 1977Ta09. For $E(\text{level}) > S(p) + 5.7$ MeV, resonances are only observed by 1977Ta09.

‡ From angular distribution, determined from $^{82}\text{Se}(p, p')^{82}\text{Se}$ (0.655 MeV 2+) by 1977Ta09.

§ Weighted average of $\Gamma(\text{tot})$ of 1968Ba23, 1968Zi03, and 1977Ta09, except where noted. For $E(\text{level}) > S(p) + 5.7$ MeV, Γ from 1977Ta09.

$^\#$ From Breit-Wigner resonance formula plus DWBA background by 1977Ta09. S is extracted from elastic scattering.

$^{82}\text{Se}(^3\text{He},d)$ 1983Zu01

$E(^3\text{He})=24.0$ MeV. Measured $E(d)$ and $\sigma(\theta)$ from $\theta=5^\circ$ to 60° using 100 cm magnetic spectrograph and nuclear track plates for $E(d)$ (FWHM=18–25 keV) and position sensitive gas proportional counters for $\sigma(\theta)$ (FWHM=25–30 keV); DWBA analysis using DWUCK4 code. See also 1982Zu04 for Q value determination and 1981ZuZX, thesis.

 ^{83}Br Levels

E(level)	L [†]	(2J+1)C ² S [‡]	Comments
0.0	1	1.55 16	(2J+1)C ² S: for adopted $J\pi=3/2^-$.
357.5 14	3	1.94 19	
801.9 14	3	1.04 10	
871.8 21	(1)	0.018, 0.015	
990.5 14	1	0.59, 0.50	
1030.5 21	(1)	0.064, 0.055	
1056.0 14	1	1.37, 1.18	
1093.9 14	4	5.4 5	(2J+1)C ² S: for adopted $J\pi=9/2^-$. (2J+1)C ² S=10.4 10 for $J\pi=7/2^-$.
1113.7 26			
1355.6 17	2	0.34 3	(2J+1)C ² S: for adopted $J\pi=5/2^+$. (2J+1)C ² S=0.44 4 for $J\pi=3/2^+$.
1423.1 20	2+4	0.017, 0.013	(2J+1)C ² S: for L=2. For L=4, (2J+1)C ² S=0.25 and 0.129.
1662.6 15	1	0.191, 0.165	
1704.1 18	2+4	0.044, 0.034	(2J+1)C ² S: for L=2. For L=4, (2J+1)C ² S=0.52 and 0.271.
1809.3 25	2+4	0.010, 0.008	(2J+1)C ² S: for L=2. For L=4, (2J+1)C ² S=0.104 and 0.055.
2050.1 24	(1+2)	0.006, 0.005	L: or 2+4.
			(2J+1)C ² S: for L=1. For L=2, (2J+1)C ² S=0.021 and 0.016. For L=4, (2J+1)C ² S=0.061 and 0.032.
2400.3 14	4	2.27, 1.20	
2729.6 18	1	0.055, 0.048	
2759.9 24	(1)	0.069, 0.059	
2813.3 22	1	0.031, 0.027	
2953.3 17	2	0.150, 0.117	
2993.8 22			
3034.6 20	2	0.039, 0.030	
3130.6 23	0	0.023 2	
3369.0 22			
3441.0 27			
3548.4 23			
3613.7 22			
3667.8 22			
3749.3 22			
3804.9 22			
3873.0 22			
3967.5 22			
4016.3 22			
4049.2 26			
4097.6 25			
4160.3 22			
4194.1 27			

[†] From DWBA analysis of $\sigma(\theta)$.

[‡] Derived from $\sigma_{\text{exp}}=N \times (2J+1)C^2S \times \sigma_{\text{DWBA}}/(2J+1)$, with $N=4.42$. The first value given is for $J=L-1/2$, the second one for $J=L+1/2$. Authors provide only a general statement that uncertainty is $\approx 10\%$. For L=3 transitions, 1983Zu01 deduced, from shell model considerations, that only the $1f_{5/2}$ orbital is available, so only $J=5/2$ is tabulated.

⁸²Se(⁷Li,α2nγ) 1995Sc04

1995Sc04: E(⁷Li)=32,35 MeV. Measured E_γ, I_γ, γ_γ, γγ_α, γ(θ), γγ(θ)(DCO) using OSIRIS CUBE consisting of six Ge detectors for γ-rays and 14 Si detectors for α particles; deduced T_{1/2} using Doppler Shift Attenuation method (DSAM). Subset of results published in 1995Sc48.

1989Wi01: E(⁷Li)=35 MeV. Measured E_γ, I_γ, γ_γ, γ(θ), αγ(t), γ-ray linear polarization using two Ge(Li) detectors for γ rays and two Si detectors for α particles.

1982Ze02: E(⁷Li)=25-36 MeV in 2 MeV steps. Includes also (⁶Li,αnγ) at E(⁶Li)=21-29 MeV. Measured E_γ, I_γ, γ_γ, γ(θ), excitation function using two Ge(Li) detectors. See also thesis 1979PeZM.

⁸³Br Levels

E(level) [†]	Jπ [‡]	T _{1/2} [§]	Comments
0.0	3/2-		
356.61 15	5/2-		
866.80 15	7/2-		
1091.90 20	9/2+		
1438.84 19	9/2-	1.5 ps ^{&} 4	
1701.2 3	13/2+	21 ps [#] 4	
1810.2 3	(7/2+)		
1929.8? 4			E(level): reported only by 1982Ze02; not included in Adopted Levels.
2127.24 21	11/2-	1.2 ps ^{&} 4	
2134.2 3	11/2+	0.3 ps [@] 2	
2337.8 3	(11/2+)		
2765.5 3	17/2+	1.4 ps [#] 2	
2788.7 3	13/2+	1.0 ps [@] 4	
2811.61 23	13/2-		
3024.0 3			
3050.4 3	15/2(+)		
3068.9 4	(19/2-)	0.6 μs 2	T _{1/2} : from αγ(t) (1989Wi01).
3135.0 3	(17/2)		
3260.0 3			
3333.5 3	15/2-		
3418.4 4	(15/2+)		
3533.6 5			
3874.8 4			
4221.9 4	(21/2+)	0.3 ps [#] 1	
4582.5 5			
5118.3 6			
5390.7 7			
5635.1 8			

[†] From a least-squares fit to E_γ, by evaluator.

[‡] From the Adopted Levels.

[§] From DSAM in 1995Sc04, except where noted.

[#] T_{1/2} of the feeding of the level at 4582.3 keV has been assumed to be in the range of 0.35-3.5 ps (1995Sc04).

[@] T_{1/2} of the feeding of the levels at 3023.8 keV and 3050.2 keV have been assumed to be in the range of 0.7-2.1 ps, and T_{1/2} of the feeding of the level at 3418.3 keV has been assumed to be in the range of 0.35-1.4 ps (1995Sc04).

[&] T_{1/2} of the feeding of the levels at 2811.6 keV and 3333.5 keV have been assumed to be in the range of 0.35-3.5 ps (1995Sc04).

γ(⁸³Br)

E _γ [†]	E(level)	I _γ [‡]	Mult. [§]	δ [§]	Comments
225.0 2	1091.90	72.6 11	E1(+M2)	-0.07 7	E _γ ,I _γ : other: 224.4 1, 66 4 (1982Ze02). Mult.,δ: D(+Q) from R(DCO)=0.95 4 gated on D 356γ; Δπ=no from linear polarization in 1989Wi01.
235.2 4	3024.0	0.3 1			
244.3 4	5635.1	<1			
261.5 4	3050.4	0.7 1			
272.4 4	5390.7	<1			
303.4 2	3068.9	2.6 1	D(+Q)	-0.04 7	E _γ ,I _γ : other: 303.4 1, 9.9 8 (1982Ze02). Mult.,δ: R(DCO)=1.01 3 gated on D 225γ.
356.6 2	356.61	100 1	M1(+E2)	+0.02 16	E _γ ,I _γ : other: 356.6 1, 100 3 (1982Ze02). Mult.,δ: D(+Q) from R(DCO) in coincidence with 609γ; Δπ=no from linear polarization in 1989Wi01.
360 1	4582.5	1.6 3			

Continued on next page (footnotes at end of table)

$^{82}\text{Se}(^7\text{Li}, \alpha 2n\gamma)$ 1995Sc04 (continued) $\gamma(^{83}\text{Br})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\ddagger$	Mult. [§]	$\delta^\S$	Comments
398.6 4	3533.6	0.9 1			
432.9 2	2134.2	1.3 1	D+Q	0.6 4	Mult., δ : R(DCO)=0.72 15 gated on D 225 γ and R(DCO)=0.45(16) gated on Q 609 γ .
495 1	3260.0	0.2 1			
510.1 2	866.80	87 2	D(+Q)	-0.04 12	$E\gamma, I\gamma$: other: 510.5 1, 80 4 (1982Ze02). Mult., δ : R(DCO)=1.04 3 gated on D 356 γ .
517 1	5635.1	≤ 0.8			
521.9 2	3333.5	1.3 1			
527.4 4	2337.8	1.0 1			
572.0 2	1438.84	9.1 2	D(+Q)	-0.07 13	$E\gamma, I\gamma$: other: 572.1 2, 9.5 10 (1982Ze02). Mult., δ : R(DCO)=1.02 3 gated on D 356 γ and R(DCO)=0.98 3 gated on D 510 γ .
609.3 2	1701.2	38.4 6	E2		$E\gamma, I\gamma$: other: 609.6 1, 44 3 (1982Ze02). Mult.: Q from R(DCO)=1.69 5 gated on D 225 γ and R(DCO)=1.50 7 gated on D 356 γ ; $\Delta\pi$ =no from linear polarization in 1989Wi01.
629.7 2	3418.4	1.5 1	D+Q	-1.2 7	Mult., δ : R(DCO)=0.42 16 gated on D 225 γ .
636.6 2	2337.8	4.7 1	D+Q	0.36 24	Mult., δ : R(DCO)=0.80 13 gated on D 225 γ and R(DCO)=0.53 11 gated on Q 609 γ .
654.5 2	2788.7	3.8 1	D+Q	-1.1 4	Mult., δ : R(DCO)=0.45 7 gated on D 225 γ .
684.3 2	2811.61	1.1 2	D(+Q)	-0.17 25	Mult., δ : R(DCO)=0.95 16 gated on D 225 γ .
688.3 2	2127.24	3.8 1	D+Q	-0.19 16	Mult., δ : R(DCO)=0.90 5 gated on D 356 γ and R(DCO)=0.97 6 gated on D 572 γ .
718.2 2	1810.2	3.8 1	D+Q	-0.12 10	$E\gamma, I\gamma$: other: 718.4 2, 6.7 12 (1982Ze02). Mult., δ : R(DCO)=0.98 8 gated on D 225 γ .
735.4 2	1091.90	2.9 2			
805.9 2	3874.8	2.1 1			
837.9@ 4	1929.8?				$E\gamma$: unresolved doublet observed in 1982Ze02 only.
866.8 2	866.80	12.9 2			$E\gamma, I\gamma$: other: 867.1 1, 16.6 13 (1982Ze02).
889.8 2	3024.0	1.4 1			
916.2 2	3050.4	1.2 1			
1042.3 2	2134.2	7.5 2	D+Q	=-1.1 #	$E\gamma, I\gamma$: other: 1042.6 2, 9.5 12 (1982Ze02). Mult., δ : R(DCO)=0.38 4 gated on D 225 γ .
1064.3 2	2765.5	18.0 5	Q		$E\gamma, I\gamma$: other: 1064.6 2, 19.2 15 (1982Ze02). Mult.: R(DCO)=1.53 12 gated on D 225 γ and R(DCO)=0.93 11 gated on Q 609 γ .
1082.2 2	1438.84	4.3 2	Q		$E\gamma, I\gamma$: other: 1082.6 2, 5.1 12 (1982Ze02). Mult.: R(DCO)=1.45 19 gated on D 356 γ . Mult.: R(DCO)=1.8 7 gated on D 356 γ .
1206.4 4	3333.5	1.0 1	Q		
1243.5 4	5118.3	0.7 1			
1260.5 2	2127.24	3.7 1	Q		Mult.: R(DCO)=1.6 3 gated on D 356 γ .
1349.2 2	3050.4	2.5 1	D+Q	=-1.1 #	Mult., δ : R(DCO)=0.35 6 gated on D 225 γ .
1372.8 2	2811.61	1.5 1	Q		
1433.8 2	3135.0	1.5 1	(Q)		Mult.: R(DCO)=1.7 6 gated on D 225 γ .
1456.4 2	4221.9	4.4 2	(Q)		Mult.: R(DCO)=1.2 4 gated on D 225 γ .
1558.8 2	3260.0	1.1 1			
1817.1 4	4582.5	0.7 1			

[†] From 1995Sc04. Authors provide only a general statement that uncertainties range from 0.1 to 0.4 keV. Evaluator adopts $\Delta E\gamma=0.2$ keV for $I\gamma>1.0$ and $\Delta E\gamma=0.4$ keV for $I\gamma\leq 1.0$. For γ -ray energies given to the nearest keV, $\Delta E\gamma=1$ keV is assumed. Values from 1982Ze02 are included in the comments.

[‡] Relative intensity at $E(^7\text{Li})=32$ MeV, normalized to $I\gamma(356.6\gamma)=100$ (1995Sc04). Values from 1982Ze02 are included in the comments.

[§] From R(DCO) in 1995Sc04, except where noted.

Corresponds to the position of the minimum of the curve R(DCO) versus $\arctan(\delta)$.

@ Placement of transition in the level scheme is uncertain.

⁸⁴Kr(pol d,³He) 1986Pf01

E(pol d)=51 MeV. Measured σ(θ) and analyzing power, iT₁₁(θ) using six Si surface barrier telescopes (FWHM=220 keV); DWBA analysis with DWUCK IV.
The following broad, unresolved multiplets were also observed 2500–3200 (C²S=0.46); 3200–3800 (C²S=0.48); 3800–4300 (C²S=0.89); 4300–5300 (C²S=2.11); 5300–6700 (C²S=1.67); 6700–9400 (C²S=2.39). These are all attributed to pick-up from a highly fragmented 1f_{7/2} shell.

⁸³Br Levels

E(level)	Jπ	L	C ² S	Comments
0 . 0	3 / 2 - †	1	1 . 32	
357	5 / 2 - †	3	1 . 75	
1040				E(level): multiplet with L=1+3. C ² S(J=3/2)=0.77; C ² S(J=5/2)=2.36.
1700	(1 / 2 - , 3 / 2 -) ‡	(1)		C ² S(J=1/2)=0.20; C ² S(J=3/2)=0.15.
2240	(1 / 2 - , 3 / 2 -) ‡	(1)		C ² S(J=1/2)=0.31; C ² S(J=3/2)=0.23.

† From L value and analyzing power.
‡ From L value.

Adopted Levels, Gammas

$Q(\beta^-) = -919.4 \text{ 23}$; $S(n) = 7471.0 \text{ 9}$; $S(p) = 9781.7 \text{ 13}$; $Q(\alpha) = -6497.5 \text{ 4}$ 2012Wa38.

$S(2n) = 18437.8 \text{ 14}$; $S(2p) = 18179.0 \text{ 13}$ (2012Wa38).

See 1996Br21, 1995Ke04, 1993Ca41, 1992Sc19, 1991Pa14, 1990Sc30, 1990Ca26, 1989Tr04, 1989Br11, 1986Sc13 and 1990AlZX, for recent hfs and isotope shift data.

 ^{83}Kr Levels**Cross Reference (XREF) Flags**

A ^{83}Br β^- Decay	F $^{82}\text{Se}(\alpha, 3n\gamma)$
B ^{83}Rb ε Decay	G Coulomb Excitation
C ^{83}Kr IT Decay (1.83 h)	H $^{82}\text{Kr}(\text{d}, \text{p})$
D $^{76}\text{Ge}(^{11}\text{B}, \text{p}3n\gamma)$	I $^{84}\text{Kr}(^3\text{He}, \alpha)$
E $^{80}\text{Se}(\alpha, n\gamma)$	

E(level) [†]	J π	XREF	T _{1/2} [‡]	Comments
0.0	9/2+	ABC EFGHI	stable	Q=+0.26 3; $\mu = -0.970669 \text{ 3}$. J π : from optical spectroscopy (1955Ra46) and atomic beam (1961Ku07). $\pi = +$ from comparison of experimental μ with Schmidt limits. μ : from atomic beam (1968Br16, 2011StZZ). Q: from collinear fast beam laser spectroscopy (1995Ke04, 2011StZZ). Others: 0.253 5 atomic beam (1963Fa01), 0.259 1 recalculation (2001Ke15).
9.4057 6	7/2+	ABC EFG	156.8 ns 5	Q=+0.495 10; $\mu = -0.943 \text{ 2}$. J π : M1+E2 9.4 γ to 9/2+, log ft=7.9 from ^{83}Rb ε decay with J $\pi = 5/2^-$. T _{1/2} : weighted average of 156.94 ns 34 from ^{83}Kr IT decay (1.83 h) and 155.1 ns 12 from ^{83}Rb ε decay. μ : from Mossbauer (1969Ca06, 2011StZZ). Other: -1.82 25 DPAC (1978LeZA). Q: from Mossbauer (does not include polarization correction) (1977Ho33, 2011StZZ). Other: -0.507 3 recalculation (2001Ke15).
41.5575 7	1/2-	ABC EF H	1.83 h 2	XREF: H(35). %IT=100; $\mu = 0.591 \text{ 2}$. μ : from collinear fast beam laser spectroscopy (1995Ke04, 2011StZZ). J π : E3 32 γ to 7/2+, log ft=5.0 from ^{83}Br β^- decay with J $\pi = 3/2^-$. T _{1/2} : from ^{83}Kr IT decay (1.83 h). J π : stretched E2 520 γ to 1/2-.
561.9585 8	5/2-	AB E I	6.2 ps 21	J π : (M1+E2) 530 γ to 1/2-, log ft=6.35 from ^{83}Rb ε decay with J $\pi = 5/2^-$. J π : stretched E2 649 γ to 1/2-.
571.1538 10	(3/2-)	AB E H	1.04 ps 35	XREF: A(?). J π : L(d,p)=2, stretched E2 799 γ to 9/2+.
690.146 8	5/2-	AB EF I	10.4 ps 35	T _{1/2} : other: 1.9 ps 2 from B(E2) in Coul. Ex.
799.48 3	5/2+	AB E GH	1.7 ps 5	J π : L($^3\text{He}, \alpha$)=1.
811 [#] 8	1/2-, 3/2-	I		J π : stretched E2 1003 γ to 7/2+, (M1+E2) 1012 γ to 9/2+.
1011.80 9	11/2+	EFG	0.76 ps 14	T _{1/2} : other: 1.20 ps 14 from B(E2) in Coul. ex.
1100 [#] 10	(1/2-, 3/2-)	I		J π : L($^3\text{He}, \alpha$)=(1).
1102.73 11	9/2+	EFG	0.24 ps 8	J π : stretched E2 619 γ from 13/2+, (M1+E2) 1093 γ to 7/2+, (M1+E2) 1103 γ to 9/2+.
1122.03 8	13/2+	EFG	1.3 ps 4	T _{1/2} : other: 0.21 ps 6 from B(E2) in Coul. ex.
1170.40 7	(7/2-)	EF	2.1 ps 6	J π : stretched E2 1122 γ to 9/2+.
1214	3/2+, 5/2+	H		T _{1/2} : other: 0.99 ps 7 from B(E2) in Coul. ex.
1221.856 20	(5/2, 7/2-)	E	1.3 ps 5	J π : (E1) 1170 γ to 9/2+, (M1+E2) 480 γ to 5/2-.
1277.9 3	1/2+	E H		J π : L(d,p)=2.
1517.05 21	(7/2+)	E	0.31 ps 14	J π : 1212 γ to 7/2+, 651 γ to (3/2-).
1529.14 16	9/2-	E	0.90 ps 21	XREF: H(1271).
1533.66 21		E		J π : L(d,p)=0.
1642.46 21	(7/2+, 9/2, 11/2+)	E	0.21 ps 7	J π : (M1+E2) 718 γ to 5/2+, (M1+E2) 1517 γ to 9/2+.
				J π : stretched E2 967 γ to 5/2-.
				J π : 631 γ to 11/2+, 1633 γ to 7/2+.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

 ^{83}Kr Levels (continued)

E(level) [†]	J π	XREF	T _{1/2} [‡]	Comments
1668?# 15	(5/2-, 7/2-)	I		E(level): possible doublet. J π : L($^3\text{He}, \alpha$)=(3).
1721.43 11	13/2+	EF	0.49 ps 14	J π : stretched E2 1722 γ to 9/2+, (M1+E2) 710 γ to 11/2+.
1738.19 12	11/2+	EF	0.35 ps +14-7	J π : stretched E2 1729 γ to 7/2+, (M1+E2) 1738 γ to 9/2+.
1888.89 23	(-)	E	0.7 ps 3	J π : E2 1199 γ to 5/2-.
2035 15	(5/2-, 7/2-)	I		J π : L($^3\text{He}, \alpha$)=(3).
2121 15	(3/2+, 5/2, 7/2-)	I		J π : L($^3\text{He}, \alpha$)=(2,3).
2188 15	(3/2+, 5/2, 7/2-)	I		J π : L($^3\text{He}, \alpha$)=(3,2).
2236	3/2+, 5/2+	H		J π : L(d,p)=2.
2261? 20	(3/2+, 5/2, 7/2-)	I		J π : L($^3\text{He}, \alpha$)=(3,2).
2265.80 10	(15/2+)	EF	1.0 ps 5	J π : (E2) 528 γ to 11/2+, (M1+E2) 1144 γ to 13/2+.
2271.3 3		EF		
2290.31 17		EF		
2338.06 15	(11/2-)	EF		J π : stretched (E2) 1167 γ to (7/2-).
2379	1/2+	H		J π : L(d,p)=0.
2470.42& 13	(17/2-)	DEF	24 ps 10	J π : E1 205 γ to (15/2+).
2478.1 3	(15/2+)	F		J π : stretched (E2) 1467 γ to 11/2+.
2483.84 18	17/2+	EF	0.21 ps +14-7	J π : stretched E2 γ to 13/2+.
2495? 20	(1/2-, 3/2-)	I		J π : L($^3\text{He}, \alpha$)=(1).
2510.15 ^a 14	(13/2-)	DEF	2.1 ps +21-10	J π : (M1+E2) 172 γ to (11/2-).
2550.85 15	17/2+	DEF	0.9 ps 7	J π : stretched E2 830 γ to 13/2+.
2585 20	3/2+, 5/2+	HI		J π : L(d,p)=2. E(level): from ($^3\text{He}, \alpha$).
2640.63 ^a 13	(15/2-)	DEF	4 ps 2	J π : (M1+E2) 130.5 γ to (13/2-); band assignment.
2733? 20	(5/2-, 7/2-)	I		J π : L($^3\text{He}, \alpha$)=(3).
2733.8 3	(9/2+, 17/2+)	E	0.35 ps 10	J π : stretched E2 1162 γ to 13/2+.
2841.20 ^a 13	(17/2-)	DEF	1.73 ps 35	T _{1/2} : from DSAM in $^{76}\text{Ge}^{(11}\text{B}, \text{p}3\text{n}\gamma)$. Other: 4.9 ps 14 from RDDS in $^{80}\text{Se}(\alpha, \text{n}\gamma)$.
2944	3/2+, 5/2+	H		J π : (M1+E2) 200.6 γ to (15/2-); band assignment.
2985.9 3	(11/2, 13/2, 15/2)	F		J π : L(d,p)=2.
3140	1/2+	H		J π : (D+Q) 1864 γ to 13/2+.
3157.51 ^a 16	(19/2-)	DEF	1.11 ps 7	J π : L(d,p)=0.
3322.0 4		F		J π : M1(+E2) 316 γ to (17/2-); band assignment.
3367.03& 24	(21/2-)	F	4 ps [§] +4-1	T _{1/2} : from DSAM in $^{76}\text{Ge}^{(11}\text{B}, \text{p}3\text{n}\gamma)$. Others: 1.2 ps +6-3 from RDDS in $^{80}\text{Se}(\alpha, \text{n}\gamma)$, 2.8 ps +14-7 from DSAM in $^{82}\text{Se}(\alpha, 3\text{n}\gamma)$.
3411.54 20	(21/2+)	F		J π : E2 897 γ to (17/2-); band assignment.
3493.2? 7		F		J π : (E2) 928 γ to 17/2+.
3603.06 ^a 24	(21/2-)	D F	0.69 ps 14	T _{1/2} : from DSAM in $^{76}\text{Ge}^{(11}\text{B}, \text{p}3\text{n}\gamma)$. Other: 1.0 ps +4-3 from DSAM in $^{82}\text{Se}(\alpha, 3\text{n}\gamma)$.
3685.8 6		F		J π : 761 γ to (17/2-), (M1+E2) 446 γ to (19/2-); band assignment.
3718	3/2+, 5/2+	H		J π : L(d,p)=2.
3772	7/2+, 9/2+	H		J π : L(d,p)=4.
3804.4 6		F		
3820.7 3		F		
3906.4 3	(19/2+)	F		J π : stretched (E2) 1428 γ to (15/2+).
4025.7 3	(21/2+)	F		J π : stretched (E2) 1542 γ to 17/2+.
4172.3@ 3	(21/2+)	F		J π : stretched (E2) 1621 γ to 17/2+.
4218.4 ^a 3	(23/2-)	D F	0.42 ps 9	T _{1/2} : from DSAM in $^{76}\text{Ge}^{(11}\text{B}, \text{p}3\text{n}\gamma)$. Other: 0.55 ps +35-21 from DSAM in $^{82}\text{Se}(\alpha, 3\text{n}\gamma)$.
4585.2@ 3	(23/2+)	F		J π : (M1+E2) 615 γ to (21/2-), 1061 γ to (19/2-); band assignment.
4629.8 5		F		J π : (M1+E2) 413 γ to (21/2+); band assignment.
4694.6& 4	(25/2-)	F	1.5 ps [§] +4-3	J π : stretched (E2) 1328 γ to (21/2-); band assignment.
4870.0 ^a 3	(25/2-)	D F	0.6 ps [§] 1	T _{1/2} : other: < 0.7 ps from DSAM in $^{76}\text{Ge}^{(11}\text{B}, \text{p}3\text{n}\gamma)$.
5103.3@ 4	(25/2+)	F	≤ 0.4 ps [§]	J π : stretched (E2) 1267 γ to (21/2-); band assignment.
5183.9 4		F		J π : (D+Q) 518 γ to (23/2+); band assignment.

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Adopted Levels, Gammas (continued)
⁸³Kr Levels (continued)

E(level) [†]	J π	XREF	T _{1/2} [‡]	Comments
5641.2 ^a 8	(27/2-)	D F		J π : 771 γ to (25/2-), 1423 γ to (23/2-); band assignment.
5683.4 [@] 6	(27/2+)	F		J π : 580 γ to (25/2+); band assignment.
5736.0 ^{&} 5	(29/2-)	F		J π : 1041 γ to (25/2-); band assignment.
5778.4 4		A		
6373.4 [@] 12	(29/2+)	F	≤ 0.2 ps [§]	J π : 690 γ to (27/2+); band assignment.

[†] From a least-squares fit to E γ , by evaluator, when E γ data are available. For levels observed in transfer reactions, level energy is from the indicated dataset.

[‡] From DSAM and RDDS in ⁸⁰Se(α ,n γ), except where noted.

[§] From DSAM in ⁸²Se(α ,3n γ).

[#] From ⁸⁴Kr(³He, α). The L value suggests a level different from the neighboring levels seen in ⁸⁰Se(α ,n γ). However, angular distributions in ⁸⁴Kr(³He, α) are rather structureless. So this level may be identical to the neighboring level.

[@] (A): Proposed 3 quasi-particle band. Configuration = $\pi g_{9/2}^2 \nu g_{9/2}$.

[&] (B): Negative parity band built on (17/2-) state. Proposed configuration = $\nu g_{9/2}^{-2} p_{1/2}$.

^a (C): Negative parity band built on (13/2-) state.

 $\gamma(^{83}\text{Kr})$

E(level)	E γ [†]	I γ [†]	Mult. [‡]	δ [‡]	α	Comments
9.4057	9.4057 [@] 6	100	M1+E2	0.0129 3	17.09 5	B(E2)(W.u.)=21.0 10; B(M1)(W.u.)=0.00933 4. Mult.: δ : from ⁸³ Kr IT decay, derived from L/M-subshell conversion ratio.
41.5575	32.1516 [@] 5	100	E3		2035	B(E3)(W.u.)=0.00623 11. Mult.: from α (K)exp in ⁸³ Kr IT decay.
561.9585	520.3991 [§] 5 552.5512 [§] 7 562.16 ^{§b} 7	100 [#] 1 35.5 [#] 4 0.019 [§] 2	E2 (E1)		0.00287	B(E2)(W.u.)=80 30. B(E1)(W.u.)=9. $\times 10^{-5}$ 3. E γ : observed in ⁸³ Rb ϵ decay only. Placement is questionable as it would indicate M2 or E3 multipolarity for the transition, the latter is excluded by comparison to RUL.
571.1538	529.5945 [§] 6	100 [§]	(M1+E2)	-0.20 +5-1	0.00194	B(E2)(W.u.)=23 8; B(M1)(W.u.)=0.14 5.
690.146	118.96 [#] 3	17.8 [#] 12	(M1+E2)		0.28 20	Mult.: (D+Q) from γ (θ) in ⁸⁰ Se(α ,n γ), $\Delta\pi$ =no from level scheme. I γ : others: 17 3 in ⁸³ Rb ϵ decay and 8.9 17 in ⁸⁰ Se(α ,n γ).
	128.55 ^{#b} 8 648.587 [#] 10 680.727 [#] 19	0.49 [#] 10 100 [#] 1 30.4 [#] 6	[M1, E2] E2 [E1]		0.22 15 0.00151	B(E2)(W.u.)=15 6. B(E1)(W.u.)=2.3 $\times 10^{-5}$ 9. B(E2)(W.u.)>26; B(M1)(W.u.)<0.00031.
799.48	790.15 [§] 4 799.37 [§] 5	100 [§] 3 36.1 [§] 14	M1+E2 E2	>9		B(E2)(W.u.)=13 4. B(E2)(W.u.)=1.7 6.
1011.80	1002.6 3 1011.8 1	5.2 12 100 8	E2 (M1+E2)	-1.07 +10-20		B(E2)(W.u.)=17 4; B(M1)(W.u.)=0.012 3.
1102.73	1093.4 2 1102.7 3	100 8 9.2 21	(M1+E2) (M1+E2)	0.27 +7-6 1.3 +4-3		B(E2)(W.u.)=4.4 15; B(M1)(W.u.)=0.060 21. B(E2)(W.u.)=3.6 15; B(M1)(W.u.)=0.0021 9.
1122.03	1122.0 1	100	E2			B(E2)(W.u.)=11 4.
1170.40	480.38 13 608.37 17	58 6 34 6	(M1+E2) (M1+E2)	-0.58 3 -0.36 2	0.00266 0.00144	B(E2)(W.u.)=27 8; B(M1)(W.u.)=0.016 5. I γ : from ⁸⁰ Se(α ,n γ). Other: 106 17 in ⁸² Se(α ,3n γ). B(E2)(W.u.)=2.2 8; B(M1)(W.u.)=0.0054 18.
	1160.97 11 1170.30 15	100 7 69 8	(E1) (E1)			B(E1)(W.u.)=4.1 $\times 10^{-5}$ 13. B(E1)(W.u.)=2.8 $\times 10^{-5}$ 9.
1221.856	650.8 3 1212.44 2	100 28 66 14				

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Kr})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult. ‡	$\delta^{\ddagger}$	α	Comments
1277.9	706.7 3	100				
1517.05	717.9 3	100 21	(M1+E2)	0.47 +40-20		B(E2)(W.u.)=47 25; B(M1)(W.u.)=0.09 5.
	1516.7 3	71 21	(M1+E2)	-0.6 +4-5		B(E2)(W.u.)=1.2 7; B(M1)(W.u.)=0.006 4.
1529.14	839.2 4	21 7	E2			B(E2)(W.u.)=7 3.
	967.4 3	100 12	E2			B(E2)(W.u.)=16 5.
	1519.5 3	48 9	[E1]			B(E1)(W.u.)=2.6 $\times 10^{-5}$ 8.
	1529.0 3	42 7	[E1]			B(E1)(W.u.)=2.2 $\times 10^{-5}$ 7.
1533.66	843.7 3	100 21				
	971.5 3	45 15				
1642.46	630.6 3	100 21				
	1633.0 3	96 29				
	1643.5 10	100 29	(D+Q)			
1721.43	599.3 2	54 3	(M1+E2)			Mult.: (D+Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha, 3n\gamma)$, $\Delta\pi=\text{no}$ from level scheme.
	618.8 2	=44	E2			B(E2)(W.u.)=88.6.
	709.7 2	100 6	(M1+E2)	0.6 +4-2	0.00104 4	B(E2)(W.u.)=27 8; B(M1)(W.u.)=0.031 9.
	1721.4 3	96 6	E2			B(E2)(W.u.)=1.2 4.
1738.19	616.9 3	43 29	(M1+E2)	+0.18 1	0.00136	B(E2)(W.u.)=4 3; B(M1)(W.u.)=0.04 3.
	635.42 13	54 4	(M1+E2)	+1.1 +1-5	0.00145 4	B(E2)(W.u.)=70 +30-50; B(M1)(W.u.)=0.020 +9-5.
	1728.7 3	100 10	E2			B(E2)(W.u.)=1.6 +4-5.
	1738.1 3	108 6	(M1+E2)	+0.84 10		B(E2)(W.u.)=0.69 +35-29; B(M1)(W.u.)=0.0025 +13-10.
1888.89	1198.7 3		E2			
	1318 ^b					
	1326.8 ^b 4					
2265.80	527.8 3	11.5 12	(E2)&		0.00275	B(E2)(W.u.)=50 30.
	544.4 2	32 3	(M1+E2)	0.15 +2-1	0.00180	B(E2)(W.u.)=2.7 14; B(M1)(W.u.)=0.030 15.
	1143.7 1	100 2	(M1+E2)	-1.73 +25-7		B(E2)(W.u.)=7 4; B(M1)(W.u.)=0.0026 13.
2271.3	1168.6 5	100				
2290.31	552.2 2	100	(D+Q)&			
2338.06	1167.6 5	100 10	(E2)			
	1235.4 2	15 5				
2470.42	204.6 1	100	E1&			B(E1)(W.u.)=0.0017 8.
2478.1	1356.1 5	100 26				
	1466.7 5	42 10	(E2)			Mult.: Q from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha, 3n\gamma)$, E2 from assumed band structure.
2483.84	594 ^b					
	1361.8 2		E2&			
2510.15	172.1 1	100 8	(M1+E2)			Mult.: (D+Q) from $\gamma(\theta)$ in $^{80}\text{Se}(\alpha, n\gamma)$, E1+M2 excluded by comparison to RUL.
	238.8 3	27 4	(D+Q)			
	772 1	=21	[E1]			
2550.85	285.1 2	82 15	(M1+E2)			Mult.: (D+Q) from $\gamma(\theta)$ in $^{80}\text{Se}(\alpha, n\gamma)$, $\Delta\pi=\text{no}$ from level scheme.
	829.5 3	59 6	E2&			
	1428.5 3	100 18	(E2)			
2640.63	130.5 1	100 10	(M1+E2)			Mult.: (D+Q) from $\gamma(\theta)$ in $^{80}\text{Se}(\alpha, n\gamma)$, E1+M2 excluded by comparison to RUL.
	350.4 2	65 3	(D+Q)			
	374.7 3	23.4 21				
	919.2 3	13.8 14	(E1+M2)			Mult.: (D+Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha, 3n\gamma)$, $\Delta\pi=\text{yes}$ from level scheme.

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Kr})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult. [‡]	$\delta^{\ddagger}$	Comments
2640.63	1519 1	14 4	(E1+M2)		Mult.: (D+Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$, $\Delta\pi=\text{yes}$ from level scheme.
2733.8	1611.7 3	100	E2		B(E2)(W.u.)=6.9 20.
2841.20	200.6 1	100 5	(M1+E2)	+0.035 ^a 10	B(E2)(W.u.)=49 10; B(M1)(W.u.)=1.3 3.
	370.76 7	18.1 13	E2&		B(E2)(W.u.)=330 70.
2985.9	1863.8 3	100	(D+Q)		
3157.51	316.3 1	100 6	M1 (+E2)	+0.008 ^a 30	B(E2)(W.u.)=0.43 4; B(M1)(W.u.)=0.57 6.
					Mult.: (D+Q) from $\gamma(\theta)$ in $^{80}\text{Se}(\alpha,n\gamma)$, E1+M2 excluded by comparison to RUL.
	606.6 5	2.1 10			$I\gamma$: from $^{76}\text{Ge}(^{11}\text{B},p3n\gamma)$. Other: =5 in $^{82}\text{Se}(\alpha,3n\gamma)$.
	687.2 3	8.7 10			
3322.0	336.1 3	100			
3367.03	896.6 2	100	E2&		B(E2)(W.u.)=11 +4-6.
3411.54	860.7 2	40 2	(E2)		Mult.: (Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$, assumed E2.
	927.7 2	100 3	(E2)		Mult.: (Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$, assumed E2.
3493.2?	2371 ^b				
3603.06	445.6 2	100 5	(M1+E2)	-0.042 ^a 2	B(E2)(W.u.)=3.2 7; B(M1)(W.u.)=0.31 7.
					Mult.: (D+Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$ and $^{76}\text{Ge}(^{11}\text{B},p3n\gamma)$; $\Delta\pi=\text{no}$ from level scheme.
	761	18 5	[E2]		B(E2)(W.u.)=23 8.
					$I\gamma$: from $^{76}\text{Ge}(^{11}\text{B},p3n\gamma)$. Other: =17 in $^{82}\text{Se}(\alpha,3n\gamma)$.
3685.8	363.8 4	100	(D+Q)&		
3804.4	482.4 4	100			
3820.7	409.2 2	100			
3906.4	413 1	43 11			
	1422.5 4	54 7			
	1428.4 3	100 15	(E2)		Mult.: (Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$; E2 from assumed band structure.
4025.7	1541.8 3	100	(E2)		Mult.: (Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$; E2 from assumed band structure.
4172.3	266.0 2	100 6	(M1+E2)		Mult.: (D+Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$; $\Delta\pi=\text{no}$ from level scheme.
	761 ^c	$\approx 29^c$			
	1621.3 4	31 3	(E2)		Mult.: (Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$; E2 from assumed band structure.
4218.4	615.3 2	100 18	(M1+E2)	-0.21 ^a 9	B(E2)(W.u.)=24 8; B(M1)(W.u.)=0.17 5.
					Mult.: (D+Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$ and $^{76}\text{Ge}(^{11}\text{B},p3n\gamma)$; E1+M2 excluded by comparison to RUL.
	1060.8 5	27 10	[E2]		B(E2)(W.u.)=10 5.
					$I\gamma$: from $^{76}\text{Ge}(^{11}\text{B},p3n\gamma)$. Other: ≈ 23 in $^{82}\text{Se}(\alpha,3n\gamma)$.
4585.2	412.9 2	100 10	(M1+E2)&		Mult.: (D+Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$, (M1+E2) from assumed band structure.
	559 1	≈ 24			
4629.8	1026.7 4	100	(D+Q)&		
4694.6	1327.6 3	100	(E2)		B(E2)(W.u.)=4.3 +11-9.
					Mult.: (Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$, M2 excluded by comparison to RUL.
4870.0	651.4 3	63 6	(M1+E2)		Mult.: (D+Q) from R_{DCO} in $^{76}\text{Ge}(^{11}\text{B},p3n\gamma)$; $\Delta\pi=\text{no}$ from level scheme..
	1267.1 4	100 9	(E2)		B(E2)(W.u.)=8.2 17.
					Mult.: (Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$, M2 excluded by comparison to RUL.
5103.3	518.1 2	100	(M1+E2)&		Mult.: (D+Q) from $\gamma(\theta)$ in $^{82}\text{Se}(\alpha,3n\gamma)$, (M1+E2) from assumed band structure.
5183.9	1772.3 4	100	(D+Q)		
5641.2	771 1	≈ 100			
	1423 ^b	97 13			
5683.4	580.1 5	100			
5736.0	1041.4 3	100			
5778.4	1957.6 3	100	(Q)&		
6373.4	690 1	100			

Footnotes continued on next page

Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Kr})$ (continued)

† Weighted average of values from $^{80}\text{Se}(\alpha, \gamma)$ and $^{82}\text{Se}(\alpha, 3n\gamma)$, except where noted.

‡ From $\gamma(\theta)$ and linear polarization measurements in $^{80}\text{Se}(\alpha, \gamma)$, except where noted. Sign of δ is only relative, since sign convention is not given by 1981Ca01.

§ From ^{83}Rb ϵ decay.

From ^{83}Br β^- decay.

@ From IT decay.

& From $\gamma(\theta)$ and linear polarization measurements in $^{82}\text{Se}(\alpha, 3n\gamma)$.

a From $\gamma(\theta)$ (R_{PCO}) measurements in $^{76}\text{Ge}(^{11}\text{B}, p3n\gamma)$.

b Placement of transition in the level scheme is uncertain.

c Multiply placed; intensity suitably divided.

Note: For bands flagged by †, interband transitions are not shown.

$^{83}_{36}\text{Kr}_{47}$

^{83}Br β^- Decay 2015Kr02,1976Va03

Parent ^{83}Br : $E=0.0$; $J\pi=3/2^-$; $T_{1/2}=2.374$ h 4; $Q(\text{g.s.})=977$ 4; $\%\beta^-$ decay=100.

2015Kr02: ^{83}Br activity from the decay of ^{83}Se produced via $^{82}\text{Se}(n,\gamma)$, $E=\text{thermal}$. Measured $E\gamma$, $I\gamma$, and $\gamma(t)$ using two HPGe detectors; deduced $T_{1/2}$.

1976Va03: ^{83}Br activity from neutron irradiation of natural Se target followed by chemical separation. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, Ece, Ice using a Ge(Li) detector, a low-energy Ge(Li) detector and a Si(Li) detector for γ rays, a surface-barrier Si detector for conversion electrons and a Ge(Li)-NaI(Tl) detector system for $\gamma\gamma$ coincidences.

x-rays measured by 1969Ph03 with Si(Li), resolution 260 eV at 6.406 keV. $K\alpha_1$ x ray=12.71 keV 8, $K\beta_1$ x ray=14.13 keV 8. $I_{K\alpha}/I_{\gamma}=3.14$ 4 (from IT decay).

A total energy release of 935 keV 6 is calculated for this decay scheme using the RADLST code, compared with the Q value of 977 keV 4.

 ^{83}Kr Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\ddagger$
0.0	9/2+	stable
9.4051 8	7/2+	
41.5567 9	1/2-	1.83 h 2
561.954 7	5/2-	
571.151 10	(3/2-)	
690.141 9	5/2-	
799.5? 10	5/2+	

† From a least-squares fit to $E\gamma$, by evaluator.

‡ From the Adopted Levels.

 β^- radiations

$E\beta^-$	$E(\text{level})$	$I\beta^-^\dagger$	$\text{Log } ft$	Comments
(178 $^\pm$ 5)	799.5?	<0.000012	>9.5	
(287 4)	690.141	0.021 4	6.9 1	
(406 4)	571.151	1.3 4	5.62 14	
(415 4)	561.954	0.084 20	6.84 11	
(935 4)	41.5567	98.6 4	5.0 1	$I\beta^-$: from absolute β and γ intensities (1963Pa09).
(968 4)	9.4051	<0.13	>8.5 ^{1u}	$I\beta^-$: if $\log f^1 u t \geq 8.5$ from $J\pi$.

† Absolute intensity per 100 decays.

‡ Existence of this branch is questionable.

 $\gamma(^{83}\text{Kr})$

$I\gamma$ normalization: taking $I\beta(\text{g.s.})=0$ ($\Delta J=3$), $I\beta(9\text{-keV})=0.07$ 6 ($\Delta J=2, \Delta\pi=\text{yes}$), and $I\beta(41\text{-keV})=98.6$ 4 (1963Pa09).

$E\gamma^\dagger$	$E(\text{level})$	$I\gamma^\dagger^\#$	Mult. ‡	$\delta^\ddagger$	α	Comments
9.4051 $^\pm$ 8	9.4051		M1+E2	0.0129 3	16.31 24	$E\gamma$: 9.39 1 (1976Va03).
32.1516 $^\pm$ 5	41.5567	0.05 § 1	E3		1950	$E\gamma$: 32.16 3 (1976Va03).
118.96 3	690.141	0.183 12	(M1+E2)		0.28 21	$E\gamma$: other: 119.32 2 (1976Va03). $I\gamma$: other: 0.11 1 (1976Va03).
128.55 § 8	690.141	0.005 § 1	[M1, E2]		0.22 15	
520.397 10	561.954	4.79 5	[E2]		0.00283	$E\gamma$: other: 520.41 5 (1976Va03). $I\gamma$: other: 4.80 15 (1976Va03).
529.589 10	571.151	100 1	(M1+E2)	-0.20 +5-1	0.00191	$E\gamma$: other: 529.64 1 (1976Va03).
552.546 10	561.954	1.70 2	(E1)		7.63×10^{-4}	$E\gamma$: other: 552.65 3 (1976Va03). $I\gamma$: other: 1.67 9 (1976Va03).
562.16 $^\S\&$	561.954					
648.587 10	690.141	1.03 1	E2		1.49×10^{-3}	$E\gamma$: other: 648.96 5 (1976Va03). $I\gamma$: other: 1.03 8 (1976Va03).
680.727 19	690.141	0.313 6	[E1]		4.72×10^{-4}	$E\gamma$: other: 681.17 7 (1976Va03). $I\gamma$: other: 0.32 3 (1976Va03).
790.1 $^\S\&$	799.5?	<0.001 §	(M1+E2)	>9	8.82×10^{-4}	

† From 2015Kr02, except where noted. Values from 1976Va03 are included in the comments.

‡ From the Adopted Gammas.

§ From 1976Va03.

Footnotes continued on next page

^{83}Br β^- Decay 2015Kr02,1976Va03 (continued) $\gamma(^{83}\text{Kr})$ (continued)

For absolute intensity per 100 decays, multiply by 0.013 4.

& Placement of transition in the level scheme is uncertain.

^{83}Kr IT Decay (1.83 h) 1971Ru17,1972Ko35,1989St05 Parent ^{83}Kr : E=41.5575 7; $J\pi=1/2-;$ $T_{1/2}=1.83$ h 2; %IT decay=100.2012Si01: $^{83\text{m}}\text{Kr}$ activity from $^{\text{nat}}\text{Kr}(p,xn)$ reaction followed by chemical separation. Measured precise $E\gamma$ of 9.4 γ using Si(Li) detector (FWHM=224 eV at 9.4 keV).2009Ka30: $^{83\text{m}}\text{Kr}$ activity from ^{83}Rb ϵ decay. Measured Ece, Ice, ce(t) in liquid Xe scintillator.2006Ve03: $^{83\text{m}}\text{Kr}$ activity from $^{\text{nat}}\text{Kr}(p,xn)$ reaction followed by chemical separation. Measured precise $E\gamma$ of 32 γ using Si(Li) detector (FWHM=330 eV at 33 keV).1992Pi10, 1992Pi11: $^{83\text{m}}\text{Kr}$ activity from ^{83}Rb ϵ decay. Measured Ece, Ice, precise $E\gamma$ of 9.4 γ and 32 γ using solenoid retarding spectrometer (SRS) (FWHM=2 keV at 20 keV).1989St05: $^{83\text{m}}\text{Kr}$ activity from Na-Rb stearate followed by chemical separation. Measured precise $E\gamma$ of 32 γ using Si(Li) detector (FWHM=330 eV at 33 keV).1972Ko35: $^{83\text{m}}\text{Kr}$ activity from thermal neutron irradiation of ^{82}Kr . Measured $E\gamma$, $I\gamma$ with Si(Li) detector and a xenon-proportional counter and Ece, Ice using a double-focusing β spectrometer.1971Ru17: Measured $E\gamma$, $I\gamma$, Ece, Ice, $\gamma(t)$ with Si(Li) (FWHM=550 eV at 9.4 keV).

Others: 2010Li13, 1995Co31, 1993Ko45, 1992La09.

 ^{83}Kr Levels

E(level) [†]	$J\pi^{\dagger}$	$T_{1/2}$	Comments
0.0	9/2+	stable	
9.4057 6	7/2+	156.94 ns 34	$T_{1/2}$: from time difference between 32 γ and 9.4 γ (2009Ka30). Other: 147 ns 4 from $\gamma\gamma(t)$ (1963Ru03).
41.5575 7	1/2-	1.83 h 2	$T_{1/2}$: weighted average of 1.856 h 36 from ce(t) of 32.1 γ (2009Ka30), 1.846 h 49 from ce(t) of 9.4 γ (2009Ka30), 1.82 h 2 (2010Li13), 1.83 h 2 (1971Ru17).

[†] From the Adopted Levels.

⁸³Kr IT Decay (1.83 h) 1971Ru17,1972Ko35,1989St05 (continued)

 $\gamma(^{83}\text{Kr})$

I γ normalization: 0.058 *I* from decay scheme using I(γ +ce)(9 γ)=100 and α (9.4 γ)=16.31 24, 0.046 from α (32 γ)=1950.

E γ	E(level)	I $\gamma^{\dagger\dagger}$	Mult.	δ	α	I(γ +ce) §	Comments
9.4057 6	9.4057	100 3	M1+E2	0.0129 3	16.31 24	100	α (exp)=19.5 15; ce(L)/(γ +ce)=0.800 7; ce(M)/(γ +ce)=0.1296 24; ce(N)/(γ +ce)=0.01259 25; Particle normalization/T _{1/2} =0.01259 25. E γ : weighted average of 9.4058 3 (2012SI01), 9.396 3 (1993Ko45), and 9.4059 8 (1992Pi10). Others: 9.40 keV 2 (1971Ru17), 9.40 keV 3 (1972De67), 9.40 keV 1 (1972Ko35), and 9.39 keV 1 (1976Va03). δ : weighted average of 0.00129 3 (1993Ko45) and 0.00130 8 (1980Sp07). Derived from L/M-subshell conversion ratio. α (exp): deduced from α (K)exp/ α (L)exp + α (M)exp=0.312 5 of the 32 γ (weighted average of 0.305 9 (1972Ko35) and 0.315 6 (1980Sp07)). Ratio of K x ray to 9.4 γ =3.14 4 (weighted average of 3.15 6 (1972Ko35) and 3.13 5 (1971Ru17)), fluorescence yield=0.643 19 (1979Kr13) and α (K)(exp)(32 γ)=462 18 (1971Ru17). ce(K)/(γ +ce)=0.248 5; ce(L)/(γ +ce)=0.637 8; ce(M)/(γ +ce)=0.1069 20; ce(N)/(γ +ce)=0.00783 16; Particle normalization/T _{1/2} =0.00783 16. E γ : weighted average of 32.1517 5 (2006Ve03), 32.1515 11 (1992Pi10), 32.1510 8 (1989St05), and 32.1521 8 (1993GoZL). Values from 1989St05 and 1993GoZL have been corrected for change in ²⁴¹ Am standard. Others: 32.16 keV 2 (1971Ru17), 32.1 keV 1 (1972De67), 32.14 keV 5 (1972Ko35), and 32.16 keV 3 (1976Va03). α (K)exp=462 18 (1971Ru17), corrected for fluorescence yield=0.643 (1979Kr13). Mult.: from α (K)exp (1971Ru17).
32.1516 5	41.5575	1.12 6	E3		1950	100	

 † From unweighted average of I γ (32 γ)/I γ (9 γ)=0.0106 (1971Ru17) and 0.0118 (1972De67).

 ‡ For absolute intensity per 100 decays, multiply by $\approx$ 0.055.

 § Absolute intensity per 100 decays.

Decay Scheme

Intensities: I(γ +ce) per
100 parent decays
%IT=100

^{83}Rb ϵ Decay 1976Va03,1993Ch32

Parent ^{83}Rb : $E=0.0$; $J\pi=5/2^-$; $T_{1/2}=86.2$ d 1; $Q(\text{g.s.})=919.4$ 23; $\% \epsilon$ decay=100.

1976Va03: ^{83}Br activity from neutron irradiation of natural Se target followed by chemical separation. Measured E_γ ,

I_γ , $\gamma\gamma$, Ece, Ice using a Ge(Li) detector, a low-energy Ge(Li) detector and a Si(Li) detector for γ rays, a surface-barrier Si detector for conversion electrons and a Ge(Li)-NaI(Tl) detector system for $\gamma\gamma$ coincidences.

1988Al01: precise measurements of E_γ using a Ge(Li) detector.

1990Me15: precise measurements of E_γ and I_γ using Ge(Li) detectors.

1993Ch32: precise measurements of E_γ using a HPGe detector.

Others: 1995Ah04, 1982Gr07, 1972Br37, 1970Go45, 1964Do11, 1955Pe19, 1952Ca39, 1950Ka62.

A total energy release of 920 keV 40 is calculated for this decay scheme using the RADLST code, in good agreement with the Q value of 919.4 keV 23.

 ^{83}Kr Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\S$	Comments
0.0	9/2+	stable	
9.4057 6	7/2+	155.1 ns 12	$T_{1/2}$: from electronic timing between 553 γ and 9.4 γ (1995Ah04).
41.5575 7	1/2-	1.83 h 2	
561.9586 8	5/2-		
571.1538 10	(3/2-)		
690.53 4	5/2-		
799.49 3	5/2+		

† From a least-squares fit to E_γ by evaluator.

‡ From the Adopted Levels.

§ From the Adopted Levels, except where noted.

 β^+, ϵ Data

$E\epsilon$	$E(\text{level})$	$I\epsilon^\dagger$	$\text{Log } ft$	$I(\epsilon+\beta^+)^\dagger$	Comments
(119.9 23)	799.49	0.90 11	6.87 6	0.90 11	
(228.9 23)	690.53	0.137 17	8.30 6	0.137 17	
(348.2 23)	571.1538	29.4 23	6.35 4	29.4 23	$\epsilon L(\text{exp})/\epsilon K(\text{exp})=0.128$ 2 (1970Go45).
(357.4 23)	561.9586	61 4	6.05 3	61 4	$\epsilon L(\text{exp})/\epsilon K(\text{exp})=0.132$ 2, $(\epsilon L(\text{exp}) + \epsilon M(\text{exp}))/\epsilon K(\text{exp})=0.164$ 2, $\epsilon M(\text{exp})/\epsilon L(\text{exp})=0.240$ 15. Measured by 1970Go45 with Ge(Li), CsI, NaI; internal-source method.
(910.0 23)	9.4057	6.4 30	7.86 21	6.4 30	$I(\epsilon+\beta^+)$: from 1964Do11, deduced from intensity ratio of K x ray to total γ intensity and from X γ to K x ray rate.
(919.4 23)	0.0	<5.0	>8.5 ^{1u}	<5.0	$I(\epsilon+\beta^+)$: calculated assuming $\log f^{1u}_t \geq 8.5$ for $\Delta J=2$, $\Delta\pi=\text{yes}$.

† Absolute intensity per 100 decays.

 $\gamma(^{83}\text{Kr})$

I_γ normalization: if $I(\beta^++\epsilon)(\text{g.s.})=2.5$ 25 ($\Delta J=2$, $\Delta\pi=\text{yes}$) and $I(\beta^++\epsilon)(42 \text{ keV})=0$ ($\Delta J=2$, $\Delta\pi=\text{no}$) and $I(\beta^++\epsilon)(9 \text{ keV})=6.4$ 30 (1964Do11), and using $\Sigma I(\gamma+\text{ce})(\text{g.s.}+9+42)=91\%$ 4.

$E_\gamma^\dagger$	$E(\text{level})$	$I_\gamma^\ddagger$	Mult. §	$\delta^\S$	α	Comments
9.4057 § 6	9.4057	13.1 30	M1+E2	0.0129 3	16.3 3	$\alpha=16$ 5 (1973Va03).
32.1516 § 5	41.5575	0.08 1	E3		1950	$\alpha: \alpha(K)\text{exp}/(\alpha(L)\text{exp} + \alpha(M)\text{exp})=0.30$ 5 (1973Va03).
119.32 9	690.53	0.032 5	(M1+E2)		0.28 21	
128.55 12	690.53	0.0030 5	[M1, E2]		0.22 15	
$\approx 237.19^\&$	799.49	<0.0011				
520.3991 5	561.9586	100 5	E2		0.00283	E_γ : from 1993Ch32. Other values: 520.389 12 (1988A101); 520.41 3 (1976Va03); 520.423 25 (1990Me15).
529.5945 6	571.1538	65.6 30	(M1+E2)	-0.20 +5-1	0.00191	E_γ : from 1993Ch32. Other values: 529.591 13 (1988A101); 529.64 1 (1976Va03); 529.653 11 (1990Me15).
552.5512 7	561.9586	35.7 15	(E1)		7.63×10^{-4}	E_γ : from 1993Ch32. Other values: 552.588 20 (1988A101); 552.65 2 (1976Va03); 552.664 21 (1990Me15).

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⁸³Rb ε Decay 1976Va03,1993Ch32 (continued)

 $\gamma(^{83}\text{Kr})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^{\ddagger\#}$	Mult.§	$\delta^\S$	α	Comments
562.17 7	561.9586	0.019 2				E γ : weighted average of 562.16 7 (1976Va03) and 562.174 70 (1990Me15).
648.97 5	690.53	0.19 1	E2		1.49×10^{-3}	E γ : weighted average of 648.96 5 (1976Va03) and 648.976 50 (1990Me15).
681.18 7	690.53	0.07 1	[E1]		4.72×10^{-4}	E γ : weighted average of 681.17 7 (1976Va03) and 681.187 65 (1990Me15).
790.15 4	799.49	1.47 4	(M1+E2)	>9	8.82×10^{-4}	E γ : weighted average of 790.14 5 (1976Va03) and 790.160 35 (1990Me15).
799.37 5	799.49	0.53 2	E2		8.57×10^{-4}	E γ : weighted average of 799.36 5 (1976Va03) and 799.380 51 (1990Me15).

[†] From 1976Va03, except where noted.

[‡] From 1976Va03. $I\gamma$ given by 1990Me15 are from 1976Va03.

[§] From the Adopted Gammas.

[#] For absolute intensity per 100 decays, multiply by 0.447 24.

[&] Placement of transition in the level scheme is uncertain.

Decay Scheme

Intensities: $I(\gamma+ce)$ per 100 parent decays

$^{76}\text{Ge}(^{11}\text{B}, \text{p}3\text{n}\gamma)$ 2011Ga44

$E(^{11}\text{B})=50$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, $\gamma\gamma(\theta)$ using 12 Compton-suppressed HPGe detectors and a 14-element BGO multiplicity filter; deduced $T_{1/2}$ using Doppler Shift Attenuation method (DSAM). Authors provide only a partial level scheme for states at $E=2470.4$ keV and higher in excitation energy.

 ^{83}Kr Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\S$
2470.4	(17/2-)	
2510.0	(13/2-)	
2550.9	17/2+	
2640.5	(15/2-)	
2841.2	(17/2-)	1.73 ps 35
3157.3	(19/2-)	1.11 ps 7
3602.3	(21/2-)	0.69 ps 14
4217.4	(23/2-)	0.42 ps 9
4868.4	(25/2-)	<0.7 ps
5639.4	(27/2-)	

† From 2011Ga44.

‡ From the Adopted Levels. These are similar to those proposed by 2011Ga44, with the exception that some parentheses have been added by the evaluator.

§ From Doppler Shift Attenuation Method (DSAM) measurements.

 $\gamma(^{83}\text{Kr})$

$E\gamma$	$E(\text{level})$	$I\gamma^\dagger$	Mult. ‡	$\delta^\ddagger$	Comments
130.5	2640.5				$E\gamma$: only shown in authors Figure 1.
200.7	2841.2	100 6	(D+Q)	+0.035 10	Mult.: $R_{\text{DCO}}=0.49$ 6 gated on 316 γ .
316.1	3157.3	96.0 53	(D+Q)	+0.008 30	Mult.: $R_{\text{DCO}}=0.93$ 7 gated on 201 γ .
370.7	2841.2	18.1 33			
445.0	3602.3	74.6 52	(D+Q)	-0.042 2	Mult.: $R_{\text{DCO}}=0.94$ 7 gated on 316 γ .
606.6	3157.3	2 1			
615.1	4217.4	42.9 75	(D+Q)	-0.21 19	Mult.: $R_{\text{DCO}}=1.19$ 14 gated on 316 γ .
651.0	4868.4	23.2 51	(D+Q)		Mult.: $R_{\text{DCO}}=1.2$ 6 gated on 316 γ .
687.2	3157.3	8.3 24			
761.1	3602.3	13.7 36			
771.0	5639.4	13.8 37			
1060.1	4217.4	11.6 44			
1266.1	4868.4	35.8 71			

† Relative intensity normalized to $I\gamma(201\gamma)=100$.

‡ From R_{DCO} measurements defined as $R_{\text{DCO}}=I\gamma(144^\circ)$ gated by γ at 98° / $I\gamma(98^\circ)$ gated by γ at 144° .

 $^{80}\text{Se}(\alpha, \text{n}\gamma)$ 1981Ca01, 1982Es01, 1986Pi05

1981Ca05: $E(\alpha)=14$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ using two Ge(Li) detectors, $\gamma(\theta)$ using a Compton-suppressed Ge(Li) detector, and γ lin pol using a three Ge(Li) Compton polarimeter; deduced $T_{1/2}$ from Doppler Shift Attenuation Method (DSAM) measurement.

1982Es01: $E(\alpha)=10$, 12.8, and 14.8 MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, $\gamma(\theta)$, excitation function using Ge(Li) detectors.

1984Ku23: $E(\alpha)=11.1$ and 14.8 MeV. Measured $E\gamma$, $I\gamma$ using Ge(Li) detector; deduced $T_{1/2}$ from Doppler Shift Attenuation Method (DSAM) and Recoil Distance Doppler Shift (employing a plunger) measurements.

1996Pi05: $E(\alpha)=11$, 13, 15, and 17 MeV. Measured $E\gamma$, $\gamma\gamma$, $\gamma(\theta)$, excitation function using two Ge(Li) detectors.

 ^{83}Kr Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\S$	Comments
0.0	9/2+		
9.4057 6	7/2+		
41.5573 8	1/2-	1.83 h 2	$T_{1/2}$: from the Adopted Levels.
561.94 8	5/2-	6.2 ps # 21	

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$^{80}\text{Se}(\alpha, n\gamma)$ 1981Ca01, 1982Es01, 1986Pi05 (continued) **^{83}Kr Levels (continued)**

E(level) [†]	$J\pi^{\ddagger}$	$T_{1/2}^{\S}$	Comments
571.14 9	(3/2-)	1.04 ps 35	
690.02 10	5/2-	10.4 ps [#] 35	
798.49 13	5/2+	1.7 ps 5	
1011.84 9	11/2+	0.76 ps 14	$J\pi$: proposed as $J\pi=7/2+$ by 1981Co01 based on M1+E2 assignment to 1003 γ .
1102.81 12	9/2+	0.24 ps 8	$T_{1/2}$: weighted average of 0.21 ps 6 (1981Ca01) and 0.42 ps 14 (1984Ku23).
1122.02 9	13/2+	1.3 ps 4	$T_{1/2}$: other: 1.2 ps 4 (1981Ca01).
1170.38 10	(7/2-)	2.1 ps 6	$T_{1/2}$: weighted average of 1.9 ps 6 (1981Ca01) and 2.4 ps +10-7 (1984Ku23).
1221.85 17	(5/2, 7/2-)	1.3 ps 5	$T_{1/2}$: weighted average of 1.25 ps +50-35 (1981Ca01) and 1.5 ps 7 (1984Ku23).
1277.8 3	1/2+		
1516.56 22	(7/2+)	0.31 ps 14	
1529.12 16	9/2-	0.90 ps 21	
1533.51 21			
1538.07 [@] 6			
1642.47 21	(7/2+, 9/2, 11/2+)	0.21 ps 7	$T_{1/2}$: other: 0.45 ps 13 (1981Ca01).
1721.56 13	13/2+	0.49 ps 14	$J\pi$: proposed as $J\pi=9/2+$ by 1981Co01 based on M1+E2 assignment to 1722 γ .
1738.43 16	11/2+	0.35 ps +14-7	$T_{1/2}$: other: 0.64 ps 17 (1981Ca01).
1780.97 [@] 4		0.31 ps +35-14	$T_{1/2}$: from 1981Ca01.
1888.81 24	(-)	0.7 ps 3	$T_{1/2}$: weighted average of 1.0 ps 4 (1981Ca01) and 0.6 ps 3 (1984Ku23).
2145.37 [@] 7			
2265.85 17	(15/2+)	1.0 ps 5	$J\pi$: assigned as $J\pi=11/2+$ in 1981Ca01. Analysis of 1144 γ in excitation function data in 1986Pi05 suggests $J\pi=15/2+$.
2271.5 3			
2290.40 25			
2338.18 23	(11/2-)		
2470.64 23	(17/2-)	24 ps [#] 10	
2483.60 21	17/2+	0.21 ps +14-7	$T_{1/2}$: other: 1.0 ps +12-6 (1981Ca01).
2510.29 24	(13/2-)	2.1 ps [#] +21-10	
2550.74 24	17/2+	0.9 ps [#] 7	
2640.80 23	(15/2-)	4 ps [#] 2	
2733.7 3	(9/2+, 17/2+)	0.35 ps 10	
2841.5 3	(17/2-)	4.9 ps [#] 14	
3157.9 3	(19/2-)	1.2 ps [#] +6-3	

[†] From a least-squares fit to $E\gamma$, by evaluator.[‡] From the Adopted Levels. Discrepancies between spin and parity assignments of 1981Ca01 and 1982Es01 have been resolved by 1986Pi05 using $\gamma(\theta)$ and relative γ -ray excitation functions. These discrepancies are noted in the comments.[§] From Doppler-shift attenuation method (DSAM) in 1984Ku23, except where noted.[#] From Recoil Distance Doppler Shift method (RDDM) in 1984Ku23 using a plunger device.[@] Observed by 1981Ca01 only. Not included in Adopted Levels. **$\gamma(^{83}\text{Kr})$**

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger}$	Mult. [§]	$\delta^{\#}$	Comments
(9.4057 6)	9.4057				$E\gamma$: from the Adopted Levels.
(32.1516 5)	41.5573				$E\gamma$: from the Adopted Levels.
118.9 2	690.02	1.6 3	(D+Q)		$I\gamma$: other: $I\gamma(119\gamma)/I\gamma(648\gamma)=0.24$ 1 (1981Ca01).
130.5 2	2640.80	5.7 7	(D+Q)		
172.1 2	2510.29	9.3 10	(D+Q)		
200.7 2	2841.5	8.4 10	(D+Q)		
204.8 2	2470.64	11 1	(D+Q)		
238.8 3	2510.29	2.1 5	(D+Q)		
285.1 3	2550.74	2.7 5	(D+Q)		
316.4 2	3157.9	3.7 6	(D+Q)		
350.5 2	2640.80	3.9 6	(D+Q)		
370.9 3	2841.5	1.6 10	(E2)		Mult.: stretched Q from $\gamma(\theta)$ in 1982Es01, M2 excluded by comparison with RUL.
480.4 2	1170.38	5.8 6	(M1+E2) ^b	-0.58 3	$I\gamma$: other: $I\gamma(480\gamma)/I\gamma(1061\gamma)=0.71$ 2 (1981Ca01).
520 ^c	1533.51				

Continued on next page (footnotes at end of table)

⁸⁰Se(α,nγ) 1981Ca01,1982Es01,1986Pi05 (continued)

γ(⁸³Kr) (continued)

Eγ [†]	E(level)	Iγ [‡]	Mult.§	δ [#]	Comments
520.4 1	561.94	22 2	E2 ^a		
529.6 1	571.14	19 2	(M1+E2) ^a	-0.20 +5-1	
544.4 2	2265.85	5.3 6	(M1+E2) ^b	+0.15 +2-1	Iγ: other: Iγ(544γ)/Iγ(1144γ)=0.20 1 (1981Ca01). δ: other: 0.9 +7-5 (1986Pi05).
552.2 3	2290.40	13 3			
552.4 3	561.94	7.7 10	(E1) ^a		Iγ: other: Iγ(552γ)/Iγ(520γ)=0.24 1 (1981Ca01).
559.0@ ^c 4	1780.9?				
594@	2483.60				
599.3 3	1721.56	5.8 10			
608.4 2	1170.38	3.4 6	(M1+E2) ^b	-0.36 2	Iγ: other: Iγ(608γ)/Iγ(1061γ)=0.41 2 (1981Ca01).
616.9 3	1738.43	3 2	(M1+E2) ^b	+0.18 1	Iγ: other: Iγ(617γ)/Iγ(1729γ)=0.83 2 (1981Ca01).
618.8 2	1721.56	6 3	E2		Mult.: stretched Q from γ(θ) in 1986Pi05, M2 excluded by comparison to RUL.
630.6 3	1642.47	2.4 5			
635.5 2	1738.43	4.2 7	(M1+E2) ^b	+1.1 +1-5	Iγ: other: Iγ(636γ)/Iγ(1729γ)=0.32 1 (1981Ca01).
648.5 2	690.02	18 2	E2 ^a		
650.8 3	1221.85	2.9 8			
680.7 2	690.02	5.7 7			Iγ: other: Iγ(681γ)/Iγ(648γ)=0.24 1 (1981Ca01). Mult.: indicated as M1+E2 in 1981Ca01 with δ=-0.10 +2-3, however, this is inconsistent with their assignment as a 5/2- to 7/2+ transition.
706.7 3	1277.8	<2			
709.8 2	1721.56	10 2	(M1+E2)	+0.6 +4-2	
717.9 3	1516.56	2.4 5	(M1+E2) ^b	0.47 +40-20	Iγ: other: Iγ(718γ)/Iγ(1517γ)=0.40 2 (1981Ca01).
789.0 2	798.49	8.6 10	M1+E2 ^a	>9	δ: value given by 1981Ca01 is δ=19 +∞-10.
798.5 2	798.49	3.0 6	E2 ^a		Iγ: other: Iγ(799γ)/Iγ(789γ)=0.36 1 (1981Ca01).
839.2 4	1529.12	1.8 6	E2		Mult.: stretched Q from γ(θ) in 1986Pi05, M2 excluded by comparison to RUL.
843.7 3	1533.51	3.3 7			
848@ ^c	1538.0?				
962.3 ^c	1533.51				Eγ: from 1986Pi05. Not observed in 1982Es01.
967@ ^c	1538.0?				
967.4 3	1529.12	8.5 10	E2		Mult.: stretched Q from γ(θ) in 1986Pi05, M2 excluded by comparison to RUL.
971.5 3	1533.51	1.5 5			
976@ ^c	1538.0?				
1002.7 3	1011.84	2.5 10	E2		Mult.: γ(θ) in 1982Es01 and 1986Pi05 both indicate stretched Q character. 1981Ca01 found (M1+E2) multipolarity with δ=-1.43 +24-5.
1011.8 1	1011.84	49 4	(M1+E2) ^b	1.07& +10-20	Iγ: other: Iγ(1003γ)/Iγ(1012γ)=0.071 3 (1981Ca01). δ: other: δ=-1.73 +31-19 (1981Ca01).
1093.4 2	1102.81	24 2	(M1+E2) ^b	0.27 +7-6	δ: other: δ=0.7 +5-4 (1986Pi05).
1102.7 3	1102.81	2.2 5	(M1+E2) ^b	1.3 +4-3	Iγ: other: Iγ(1093γ)/Iγ(1103γ)=0.094 4 (1981Ca01).
1122.0 1	1122.02	100	E2 ^a		
1143.8 3	2265.85	20 2	(M1+E2) ^b	-1.73 +25-7	
1161.0 2	1170.38	10 1	(E1) ^a		δ: δ(E1/M2)=-0.14 14 (1981Ca01).
1167.5 6	2338.18	7 3	(E2) ^a		
1168.7 5	2271.5	4 2			
1170.3 2	1170.38	6.7 10	(E1) ^a		Iγ: other: Iγ(1170γ)/Iγ(1061γ)=0.63 2 (1981Ca01). δ: δ(E1/M2)=0.00 1 (1981Ca01).
1198.7 3	1888.81	3.9 6	E2 ^a		
1212.4 2	1221.85	1.9 4			
1235.4 3	2338.18	3.5 6			
1236.2 ^c	1277.8				Eγ: tentative transition in 1981Ca01; not observed in 1982Es01 or 1986Pi05.
1313@ ^c	2483.60				
1318@	1888.81				
1326.8@ ^c 4	1888.81				
1361.6 2	2483.60	5.9 8	(E2)		Mult.: stretched Q from γ(θ) in 1986Pi05, M2 excluded by comparison to RUL.
1428.5 3	2550.74	3.3 6	(E2)		Mult.: stretched Q from γ(θ) in 1986Pi05 and 1982Es01, M2 excluded by comparison with RUL.
^x 1453.2 3		28 6			

Continued on next page (footnotes at end of table)

$^{80}\text{Se}(\alpha, n\gamma)$ 1981Ca01, 1982Es01, 1986Pi05 (continued) **$\gamma(^{83}\text{Kr})$ (continued)**

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger}$	Mult. §	$\delta^{\#}$	Comments
1516@c	2640.80				
1516.7 3	1516.56	1.7 5	(M1+E2) ^b	-0.6 +4-5	
1519.5 3	1529.12	4.1 8			
1529.0 3	1529.12	3.6 6			
1583.3@c 7	2145.3?				
1611.7 3	2733.7	2.1 5	E2		Mult.: stretched Q from $\gamma(\theta)$ in 1986Pi05 and 1982Es01, M2 excluded by comparison with RUL.
1633.0 3	1642.47	2.3 7			
1643.0 8	1642.47	2.4 7	(D+Q)		E γ : weighted average of 1644.4 5 (1981Ca01) and 1642.5 3 (1982Es01).
1721.9 4	1721.56	9.3 10	E2		Mult.: $\gamma(\theta)$ in 1982Es01 and 1986Pi05 both indicate stretched Q character and comparison to RUL excluded M2. 1981Ca01 found (M1+E2) multipolarity with $\delta=0.51 +2-4$.
1729.1 6	1738.43	7.0 10	E2 ^a		E γ : weighted average of 1728.5 3 (1982Es01) and 1729.7 3 (1981Ca01).
1738.4 5	1738.43	6.6 10	(M1+E2) ^b	+0.84 10	I γ : other: $I\gamma(1738\gamma)/I\gamma(1729\gamma)=0.97$ 3 (1981Ca01).

[†] Weighted average of 1982Es01 and 1981Ca01, unless noted otherwise.

[‡] From 1982Es01. 1981Ca01 give branching ratios for only select levels. Where available, these data are included in the comments, given as a ratio to the strongest depopulating transition.

[§] From angular distribution measurements in 1981Ca01, 1982Es01, and 1986Pi05, except where noted.

[#] From angular distribution and polarization measurements in 1981Ca01, except where noted. Sign of delta should be taken as relative, as sign convention is not explicitly stated by 1981Ca01.

@ Observed by 1981Ca01 only.

& From $\gamma(\theta)$ in 1986Pi05.

^a From angular distribution in 1981Ca01, 1982Es01, and 1986Pi05; electric or magnetic character from γ -ray linear polarization measurements in 1981Ca01.

^b D+Q from $\gamma(\theta)$, comparison with RUL excludes E1+M2.

^c Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

 $^{82}\text{Se}(\alpha, 3n\gamma)$ 1986Ke12

E(α)=36-45 MeV. Measured E γ , I γ , $\gamma\gamma$, $\gamma(\theta)$, γ lin pol, excitation function using two Ge(Li) detectors and a polarimeter; deduced $T_{1/2}$ from Doppler Shift Attenuation Method (DSAM). $\gamma\gamma$ and $\gamma(\theta)$ measurements performed at E(α)=42 MeV, DSAM measurements performed at E(α)=27 MeV, and γ lin pol measurements performed at E(α)=36 MeV.

 ^{83}Kr Levels

E(level) [†]	J $\pi^{\ddagger}$	$T_{1/2}^{\S}$	Comments
0.0	9/2+		
9.44 19	7/2+		
41.3 5	1/2-		
690.0 4	5/2-		
1011.72 15	11/2+		
1102.75 19	9/2+		
1122.09 9	13/2+		
1170.45 21	(7/2-)		
1721.38 12	13/2+		
1738.04 16	11/2+		
2265.81 11	(15/2+)		
2271.3 3			
2290.26 20			J π : 13/2- proposed by 1986Ke12.
2337.99 20	(11/2-)		
2470.41 14	(17/2-)		
2478.2 3	(15/2+)		
2483.99 18	17/2+		
2510.08 18	(13/2-)		

Continued on next page (footnotes at end of table)

$^{82}\text{Se}(\alpha,3n\gamma)$ 1986Ke12 (continued) **^{83}Kr Levels (continued)**

E(level) [†]	J π [‡]	T _{1/2} [§]	Comments
2550.94 17	17/2+		
2640.58 16	(15/2-)		
2841.18 16	(17/2-)		
2985.9 3	(11/2, 13, 2, 15/2)		J π : 15/2- proposed by 1986Ke12.
3157.49 18	(19/2-)	2.8 ps +14-7	
3322.0 4			
3367.02 24	(21/2-)	4 ps +4-1	T _{1/2} : from E(α)=42 MeV. At E(α)=27 MeV, the author obtain T _{1/2} ≥5.5 ps.
3411.66 20	(21/2+)		
3493.3? 7			
3603.0 3	(21/2-)	1.0 ps +4-3	
3685.8 6			
3804.4 6			
3820.9 3			
3906.5 3	(19/2+)		
4025.8 3	(21/2+)		
4172.4 3	(21/2+)		
4218.4 3	(23/2-)	0.55 ps +35-21	
4585.3 3	(23/2+)		
4629.7 5			J π : (23/2-) proposed by 1986Ke12.
4694.6 4	(25/2-)	1.5 ps +4-3	
4869.9 4	(25/2-)	0.6 ps 1	
5103.4 4	(25/2+)	≤0.4 ps	
5184.0 4	(23/2+)		
5641.2 8	(27/2-)		
5683.5 6	(27/2+)		
5736.0 5	(29/2-)		
5778.5 4			
6373.5 12	(29/2+)	≤0.2 ps	

[†] From a least-squares fit to E γ , by evaluator.[‡] From the Adopted Levels. When differences are present, the J π assignments of 1986Ke12 are indicated in the comments.[§] From Doppler Shift Attenuation Method (DSAM). In a pulsed-beam experiment, no levels with T_{1/2}≥0.14 ns were observed. **$\gamma(^{83}\text{Kr})$**

E γ	E(level)	I γ [†]	Mult. [‡]	Comments
130.5 1	2640.58	145 15	(D+Q)	A ₂ =-0.30 2, A ₄ =0.00 2; POL=-0.4 2.
172.1 1	2510.08	116 9	(D+Q)	A ₂ =-0.28 2, A ₄ =-0.03 3; POL=-0.23 10.
200.6 1	2841.18	310 16	(D+Q)	A ₂ =-0.32 3, A ₄ =-0.06 6; POL=-0.27 6.
204.6 1	2470.41	360 20	E1	A ₂ =-0.24 3, A ₄ =-0.05 6; POL=+0.33 6.
238.7 3	2510.08	35 [#] 5		
^x 242.7 4		11 2		
266.0 2	4172.4	68 4	(D+Q)	A ₂ =-0.28 3, A ₄ =+0.01 6; POL=-0.15 10.
285.1 2	2550.94	75 4	(D+Q)	A ₂ =-0.16 4, A ₄ =-0.09 9; POL=-0.30 9.
316.3 1	3157.49	300 15	(D+Q)	A ₂ =-0.38 2, A ₄ =-0.01 3; POL=-0.14 3.
336.1 3	3322.0	40 8		A ₂ =-0.3 1.
350.3 2	2640.58	94 5	(D+Q)	A ₂ =-0.26 3, A ₄ =0.00 5; POL=-0.20 6.
363.8 4	3685.8	18 2	(D+Q)	A ₂ =-0.35 4, A ₄ =+0.05 7.
370.7 2	2841.18	56 4	E2	A ₂ =+0.41 4, A ₄ =-0.06 6; POL=+0.48 14.
374.7 3	2640.58	34 3		A ₂ =+0.39 3, A ₄ =-0.04 5; POL=-0.6 3.
^x 389 1		=40 [#]		
409.2 2	3820.9	59 4		A ₂ =+0.3 1.
412.9 ^a 2	4585.3	100 ^{#a} 10	(D+Q)	A ₂ =-0.37 3, A ₄ =-0.03 7; POL=-0.10 9 including contribution from 413 γ .
413 ^a 1	3906.5	23 ^{#a} 6		A ₂ =-0.37 3, A ₄ =-0.03 7; POL=-0.10 9 including contribution from 412.9 γ .
445.6 2	3603.0	230 12	(D+Q)	A ₂ =-0.42 3, A ₄ =-0.03 4; POL=-0.06 7.
480.5 3	1170.45	37 6		A ₂ =+0.4.
482.4 4	3804.4	21 4		A ₂ =-0.2.
^x 484.5 4		28 5		
518.1 2	5103.4	62 5	(D+Q)	A ₂ =-0.32 12, A ₄ =0.0 2; POL=-0.6 3.
527.8 3	2265.81	38 4	(E2)	A ₂ =+0.39 5, A ₄ =-0.20 7; POL=+0.4 2.
544.4 2	2265.81	110 6	(D+Q)	A ₂ =-0.41 4, A ₄ =-0.04 6; POL=-0.04 8.

Continued on next page (footnotes at end of table)

$^{82}\text{Se}(\alpha, 3n\gamma)$ 1986Ke12 (continued) $\gamma(^{83}\text{Kr})$ (continued)

E γ	E(level)	I $\gamma^{\dagger}$	Mult. ‡	Comments
552.2 2	2290.26	110 6	(D+Q)	$A_2=-0.27$ 3, $A_4=+0.07$ 4; POL=+0.18 7.
559 1	4585.3	$\approx 24^{\#}$		
580.1 5	5683.5	38 6	(D+Q)	$A_2=-0.6$ 1, $A_4=0.0$ 2.
599.4 3	1721.38	49 3	(D+Q)	$A_2=+0.32$ 4, $A_4=-0.09$ 6.
606.6 5	3157.49	$\approx 15^{\#}$		
615.3 2	4218.4	110 20	(D+Q)	$A_2=-0.36$ 5, $A_4=-0.08$ 8.
618.6 5	1721.38	$\approx 40^{\#}$		
635.3 2	1738.04	26 2	(D+Q)	$A_2=-0.43$ 4, $A_4=+0.08$ 7.
648.6 3	690.0	27 3	(Q)	$A_2=+0.2$ 1.
651.4 3	4869.9	34 3		$A_2=-0.6$ 2.
687.2 3	3157.49	26 3		$A_2=-0.29$ 9.
690 1	6373.5	29 5	(D+Q)	$A_2=-0.53$ 10.
709.6 2	1721.38	90 5	(D+Q)	$A_2=-0.70$ 4, $A_4=+0.06$ 6; POL=-0.24 13.
761 ^a	3603.0	$\approx 40^{\#a}$		
	4172.4	$\approx 20^{\#a}$		
771 1	5641.2	$\approx 30^{\#}$		
772 1	2510.08	$\approx 25^{\#}$		
829.5 3	2550.94	59 6	E2	$A_2=+0.40$ 4, $A_4=-0.06$ 7; POL=+0.9 4.
860.7 2	3411.66	41 2	(Q)	$A_2=+0.26$ 3, $A_4=-0.09$ 6.
896.6 2	3367.02	170 5	E2	$A_2=+0.33$ 4, $A_4=-0.12$ 6; POL=+0.31 15.
919.2 3	2640.58	20 2	(D+Q)	$A_2=-0.34$ 9, $A_4=0.0$ 2.
927.7 2	3411.66	103 3	(Q)	$A_2=+0.31$ 4, $A_4=-0.07$ 5.
1002.3 5	1011.72	9 2	Q	$A_2=+0.3$ 1.
1011.7 2	1011.72	170 20	(D+Q)	$A_2=-0.83$ 4, $A_4=+0.07$ 6.
1026.7 4	4629.7	17 2	(D+Q)	$A_2=-0.5$ 2, $A_4=+0.2$ 3.
1041.4 3	5736.0	25 5		$A_2=+0.3$ 1.
1060.8 5	4218.4	$\approx 25^{\#}$		
1093.3 2	1102.75	83 $\S$ 20		
1122.1 1	1122.09	1000	E2	Mult.: E2 character used for normalization of $\gamma(\theta)$ and γ -lin pol measurements.
1143.7 1	2265.81	330 7	(D+Q)	$A_2=-0.84$ 4, $A_4=+0.04$ 6; POL=+0.25 7.
1161.0 2	1170.45	35 3		$A_2=+0.29$ 6.
1168 [@] 1	2271.3	84 [@] 8		$A_2=+0.19$ 3, $A_4=+0.03$ 5.
	2337.99	84 [@] 8		$A_2=+0.19$ 3, $A_4=+0.03$ 5.
1170.5 3	1170.45	26 3	(E1)	$A_2=-0.10$ 6, $A_4=-0.07$ 10; POL=+0.8 6.
1235.3 4	2337.99	12 1		$A_2=-0.04$ 10, $A_4=+0.1$ 2.
1267.1 4	4869.9	54 5	(Q)	$A_2=+0.41$ 10, $A_4=-0.23$ 15.
1327.6 3	4694.6	83 4	(Q)	$A_2=+0.30$ 5, $A_4=-0.14$ 9.
1356.1 5	2478.2	31 8		$A_2=-0.7$ 2.
1361.9 2	2483.99	260 15	E2	$A_2=+0.36$ 4, $A_4=-0.17$ 6; POL=+0.9 2.
1422.5 [@] 4	3906.5	29 [@] 4		$A_2=-0.61$ 16, $A_4=+0.2$ 2 including contribution from 1423 γ .
1423 [@] &	5641.2	29 [@] 4		$A_2=-0.61$ 16, $A_4=+0.2$ 2 including contribution from 1422.5 γ .
1428.4 3	3906.5	54 8	(Q)	$A_2=+0.35$ 6, $A_4=-0.16$ 10.
1466.7 5	2478.2	13 3	Q	$A_2=+0.33$ 10, $A_4=-0.12$ 16.
1519 1	2640.58	20 [#] 5	(D+Q)	$A_2=-0.33$ 7, $A_4=0.09$ 12.
1541.8 3	4025.8	69 7	(Q)	$A_2=+0.36$ 7, $A_4=-0.05$ 9.
1621.3 4	4172.4	21 2	(Q)	$A_2=+0.47$ 10, $A_4=+0.08$ 14.
1721.3 2	1721.38	87 6	E2	$A_2=+0.35$ 5, $A_4=-0.18$ 7; POL=+0.7 4.
1728.6 3	1738.04	48 5	E2	$A_2=+0.41$ 4, $A_4=-0.12$ 5; POL=+0.8 5.
1738.0 3	1738.04	53 3	(D+Q)	$A_2=-0.60$ 4, $A_4=+0.23$ 6.
1772.3 4	5184.0	9 2	(D+Q)	$A_2=-0.82$ 8, $A_4=+0.3$ 1.
1863.8 3	2985.9	45 4	(D+Q)	$A_2=-0.13$ 6, $A_4=+0.02$ 10.
1957.6 3	5778.5	50 5	(Q)	$A_2=+0.30$ 10, $A_4=+0.02$ 15.
2371 ^{&}	3493.3?			E γ : From Figure 5 of 1986Ke12 only, not included in the authors Table 1.

[†] Relative intensities at E(α)=42 MeV, derived from the A_0 term of the angular distribution.[‡] From $\gamma(\theta)$ and γ -ray linear polarization measurements.[§] I γ at $\theta=90^\circ$.[#] Unresolved doublet. I γ estimated from $\gamma\gamma$ -coin measurement.[@] Multiply placed; undivided intensity given.[&] Placement of transition in the level scheme is uncertain.^a Multiply placed; intensity suitably divided.^x γ ray not placed in level scheme.

$^{82}\text{Kr}(\text{d},\text{p})$ 1975Ch11

E(d)=11 MeV. Measured $\sigma(\theta)$ from 20° to 160° in 5° steps using four Si(Li) detectors (FWHM=30 keV); DWBA analysis.

 ^{83}Kr Levels

Levels without L are only weakly excited. Above 1 MeV, these are flagged as questionable and not included in the adopted levels. A level at 35 keV is also only weakly excited, but likely corresponds to the well-known 42-keV isomeric state.

E(level)	L [†]	S [‡]	Comments
0.0 35	4	0.458	d σ /d Ω (max)=0.941 mb/sr. L: from shell model arguments, if the 569-keV level is the L=1, 3/2- state, then the 35-keV level is likely the L=1, 1/2- level.
569	1	0.084	d σ /d Ω (max)=0.784 mb/sr.
796	2	0.146	d σ /d Ω (max)=1.861 mb/sr.
1085?			
1214	2	0.283	d σ /d Ω (max)=3.988 mb/sr.
1271	0	0.336	d σ /d Ω (max)=4.009 mb/sr.
1460?			
1614?			
1773?			
2183?			
2236	2	0.0581	d σ /d Ω (max)=1.027 mb/sr.
2379	0	0.0487	d σ /d Ω (max)=0.637 mb/sr.
2588	2	0.0601	d σ /d Ω (max)=1.028 mb/sr.
2944	2	0.0268	d σ /d Ω (max)=0.520 mb/sr.
3140	0	0.139	d σ /d Ω (max)=1.624 mb/sr.
3718	2	0.0830	d σ /d Ω (max)=1.389 mb/sr.
3772	4	0.356	d σ /d Ω (max)=0.835 mb/sr.

[†] From DWBA analysis.

[‡] $S = \sigma_{\text{exp}} / [(2J+1)\sigma_{\text{DWBA}}]$.

Coulomb Excitation 1981Ca01

($\alpha, \alpha'\gamma$): E(α)=6–8 MeV on natural and enriched targets. Measured E γ , I γ using two Ge(Li) detectors positioned at 55° and 125° to the beam direction.

 ^{83}Kr Levels

Relative B(E2) normalized using excitations of the first excited 2+ levels with known half-lives in ^{78}Kr , ^{80}Kr , and ^{82}Kr , present in the natural target.

E(level)	J π [†]	Comments
0.0	9/2+	
9.0	7/2+	
798.0	5/2+	B(E2) $\uparrow$ =0.015 1.
1012.0	11/2+	B(E2) $\uparrow$ =0.038 2.
1103.0	(9/2)+	B(E2) $\uparrow$ =0.0084 5.
1122.0	13/2+	B(E2) $\uparrow$ =0.045 3.

[†] From the Adopted Levels.

 $\gamma(^{83}\text{Kr})$

E γ	E(level)
789	798.0
798	798.0
1012	1012.0
1094	1103.0
1122	1122.0

$^{84}\text{Kr}(^3\text{He},\alpha)$ 1976Me01

$E(^3\text{He})=18$ MeV. Measured $\sigma(\theta)$ in 3.75° steps starting at 7.5° using a multi-angle spectrograph and Ilford K-1 emulsion plates (FWHM=25 keV); DWBA analysis.

 ^{83}Kr Levels

E(level)	$L^\dagger$	$C^2S^\ddagger$	E(level)	$L^\dagger$	$C^2S^\ddagger$	E(level)	$L^\dagger$
0.0	4	(8)	1668 [§] 15	(3)	1.9	2495 20	(1)
561 5	(3)	2.8	2035 15	(3)	1.4	2585 20	(3, 2)
694 5	(3)	0.8	2121 15	(3, 2)	0.6, 0.4	2733 20	(3)
811 8	1	2.2	2188 15	(3, 2)	0.2, 0.1		
1100 10	(1)	4.2	2261 20	(3, 2)	0.5, 0.3		

[†] From DWBA analysis. Most states have rather structureless angular distributions. The calculated distributions for $L=3$ and $L=4$ were too similar to make definite spin assignments to most states. Furthermore, some angular distributions are well fitted with $L=2$ curves. However, it is unlikely that ^{84}Kr contains appreciable population of either the $2d_{5/2}$ or $2d_{3/2}$ neutron orbitals. All L -values, except those for the g.s. and 811-keV states, must thus be regarded as questionable.

[‡] C^2S from DWBA analysis, derived from $d\sigma/d\Omega = N \times C^2S \times \sigma_{\text{DWBA}}/(2J+1)$. Normalization, N , is chosen to give the shell-model value $C^2S=8$ for the g.s. C^2S is given for the most probable configuration, consistent with L -assignment. See 1976Me01 for additional S -values for other possibilities if L -assignment is uncertain.

[§] Possible doublet.

Adopted Levels, Gammas

$Q(\beta^-) = -2273.6$; $S(n) = 10954.4$; $S(p) = 5769.3$ 25; $Q(\alpha) = -5427.3$ 2012Wa38.
 $S(2n) = 19757.5$; $S(2p) = 15673.3$ (2012Wa38).

 ^{83}Rb Levels

Cross Reference (XREF) Flags

A ^{83}Sr ϵ Decay
 B $^{68}\text{Zn}(^{18}\text{O}, p2n\gamma)$
 C $^{76}\text{Ge}(^{11}\text{B}, 4n\gamma)$, $^{76}\text{Ge}(^{10}\text{B}, 3n\gamma)$
 D $^{80}\text{Se}(^6\text{Li}, 3n\gamma)$

E $^{80}\text{Kr}(\alpha, p)$
 F $^{82}\text{Kr}(p, \gamma)$, $^{83}\text{Kr}(p, n\gamma)$
 G $^{82}\text{Kr}(^3\text{He}, d)$
 H $^{82}\text{Kr}(p, p')$ IAR

E(level) [†]	J π	XREF	T _{1/2} [‡]	Comments
0.0 [@]	5/2-	ABCD ^e Fg	86.2 d 1	% $\epsilon = 100$; $Q = +0.196$ 22; $\mu = +1.4249$ 8. μ : from Atomic Beam Laser Spectroscopy (1981Th04, 2011StZZ), value relative to $\mu = +2.751818$ 2 for ^{87}Rb . Q : from Atomic Beam Laser Spectroscopy (1981Th04); value includes polarization correction. Other: $+0.27$ 5 in optical double resonance (1973Ac02). $J\pi$: $J = 5/2$ from atomic beam (1976Fu06). $\pi = -$ from comparison of experimental μ with Schmidt values. $T_{1/2}$: 86.2 d 1 is reported by 1972Br37 and 2000Hu20. Others: 86.0 d 4 (1976Gi14), 85.7 d 13 (1973Li02). $\delta < r^2 >^{83,87}\text{Rb} = 0.0512$ fm ² 15 (1981Th04). $J\pi$: $M1$ 5.2 γ to 5/2-, $L = 1$ component of $L(^3\text{He}, d) = 3+1$ doublet (g.s. + 5.24). $T_{1/2}$: from $\text{cey}(t)$ in ^{83}Sr ϵ decay. $J\pi$: $M2$ 42 γ to 5/2-, $L(^3\text{He}, d) = 4$. $T_{1/2}$: from RUL of $B(M2)(W.u.) \leq 1$. 1968Et01 report an unpublished value of $T_{1/2} = 7.8$ ms 7 for this level. $J\pi$: $L(^3\text{He}, d) = 1$ limits $J\pi$ to 1/2-, 3/2-; 1649.5 γ from 1748 level, which decays also to 9/2+ and 9/2-, excludes 1/2-. $T_{1/2}$: $T_{1/2} < 150$ ps from delayed coincidence (1973Br32) in ^{83}Sr ϵ decay is inconsistent with δ for the 94.11 γ since $B(E2)(W.u.)$ would be > 300 . 1968Et01 report an unpublished value of $T_{1/2} = 1.2$ ns for the 94.11 γ , which is in agreement with $M1 + E2$ multipolarity. $J\pi$: 3/2 from excitation function in $^{80}\text{Se}(^6\text{Li}, 3n\gamma)$, $\pi = -$ from $E2(+M1)$ 389 γ to 5/2-. $T_{1/2}$: from DSAM in $^{82}\text{Kr}(p, \gamma)$, $^{83}\text{Kr}(p, n\gamma)$. Other: < 130 ps from delayed coincidence in ^{83}Sr ϵ decay. XREF: g(439). $J\pi$: $E2$ 381.5 γ to 9/2+, $E1$ 418 γ to 3/2-. $T_{1/2}$: from DSAM in $^{82}\text{Kr}(p, \gamma)$, $^{83}\text{Kr}(p, n\gamma)$. Other: < 150 ps from delayed coincidence in ^{83}Sr ϵ decay. E(level): the 439 level seen in ($^3\text{He}, d$) with $L = 1+2$ is likely a doublet of the 423 level and 440 level. XREF: g(439). E(level): from (α, p). The 439 level seen in ($^3\text{He}, d$) with $L = 1+2$ is likely a doublet of the 423 level and the 440 level. $J\pi$: J -dependence of (α, p), $L(^3\text{He}, d) = 1$ component of the $L = 1+2$ doublet.
5.2357 [#] 8	3/2-	A CDeFg	71.5 ns 8	
42.0780 ^{&} 20	9/2+	ABCDEFG	> 0.3 ms	
99.36 7	3/2-	A DE G		
389.42 6	3/2-	A D F	8 ps 3	
423.612 16	5/2+	A D Fg	74 ps +21-14	
440	(3/2-)	E g		
466.7 4		A		
564.59 5	(3/2-, 5/2, 7/2-)	A D F	1.0 ps +8-4	
737.14 [#] 3	7/2-	A CD	10.4 ps [§] 69	
793.63 ^{&} 8	13/2+	ABCD	4.2 ps [§] 7	
804.77 3	(7/2)+	A CD F	0.76 ps 14	

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Adopted Levels, Gammas (continued)

⁸³Rb Levels (continued)

E(level) [†]	J π	XREF	T _{1/2} [‡]	Comments
821.62 15	(3/2)-	A E G		XREF: E(823)G(834). J π : L(³ He,d)=1, J-dependence of (α ,p).
853.98 11	(3/2-, 5/2, 7/2-)	A		J π : log ft=8.8 from J π =7/2+ parent, 849 γ to 3/2-.
908.00 11	(3/2, 5/2, 7/2-)	A		J π : 484.5 γ to 5/2+, 903 γ to 3/2-, 908 γ to 5/2-.
1010.34 14	(3/2-, 5/2, 7/2-)	A		J π : log ft=8.5 from J π =7/2+ parent, 1005 γ to 3/2-.
1035.14 10	(3/2-, 5/2, 7/2-)	A		J π : 298 γ to 7/2-, 646 γ to 3/2-.
1037.92 12	11/2+	ABCD	0.55 ps 21	J π : M1+E2 245 γ to 13/2+, M1+E2 995 γ to 9/2+.
1083.19 8		A		
1096.53 8	(7/2+, 9/2+)	A CDE G	2.1 ps 7	XREF: G(1116). J π : L(³ He,d)=4, J-dependence of (α ,p).
1102.66 [@] 13	9/2-	A CD	0.83 ps 21	J π : E2 1102 γ to 5/2-; band assignment.
1202.04 6	(5/2, 7/2, 9/2+)	A		J π : M1,E2 778 γ to 5/2+, 1160 γ to 9/2+.
1242.90 4	(5/2)+	A		J π : M1+(E2) 438 γ to (7/2)+, 1238 γ to 3/2-.
1277.5 4	(3/2-, 5/2, 7/2-)	A		J π : log ft=8.6 from J π =7/2+ parent, 888 γ to 3/2-.
1296.07 10	(5/2, 7/2-)	A		log ft=7.7 from J π =7/2+ parent, 907 γ to 3/2-.
1343	(3/2, 5/2)-	E G		E(level): average of 1340 keV (α ,p) and 1345 keV (³ He,d). J π : L(³ He,d)=3+1, J dependence of (α ,p). log ft=7.7 from J π =7/2+ parent, 328 γ to 11/2+.
1366.1 4	(7/2+, 9/2)	A		
1374.6 6		A		
1424.6 3		A		
1586.9 7	(9/2, 13/2)	CD	1.9 ps 6	J π : D+Q 549 γ to 11/2+, excitation function in ⁸⁰ Se(⁶ Li,3n γ) favors the lower spin.
1597.68 10	(5/2, 7/2-)	A		J π : log ft=7.5 from 7/2+ parent, 1208 γ to 3/2-.
1606.2 5	(3/2, 5/2, 7/2-)	A		J π : log ft=7.9 from J π =7/2+ parent, 1601 γ to 3/2-.
1614.8 4	(5/2+, 7/2, 9/2+)	A		J π : 1191 γ to 5/2+, 1573 γ to 9/2+.
1629?	3/2+, 5/2+	G		J π : L(³ He,d)=2.
1649.4 5	(3/2-, 5/2, 7/2-)	A		J π : log ft=7.7 from J π =7/2+ parent, 828 γ to (3/2)-.
1695.45 13	(7/2, 9/2+)	A E G		XREF: G(1702). J π : L(³ He,d)=4, 658 γ to 11/2+, 1272 γ to 5/2+.
1749.33 8	(5/2+, 7/2)	A		J π : 1326 γ to 5/2+, 1707 γ to 9/2+, 1749 γ to 5/2-.
1753.64 [#] 16	11/2-	CD	0.69 ps 14	J π : E2 1016 γ to 7/2-, band assignment.
1780.4 7		CD	1.7 ps 6	
1798.56 8	(5/2)+	A E G		XREF: G(1811). J π : log ft=6.6 from J π =7/2+ parent, 1757 γ to 9/2+, 1793 γ to 3/2-, L(³ He,d)=2.
1889.21 ^{&} 12	17/2+	BCD	1.05 ps 12	J π : E2 1095.5 γ to 13/2+.
1916.41 19	(5/2, 7/2-)	A E G		XREF: E(1926). J π : log ft=7.4 from J π =7/2+ parent, 1911 γ to 3/2-.
1942.66 12	15/2+	BCD	1.25 ps 42	J π : 15/2 from excitation and γ (0) in ⁸⁰ Se(⁶ Li,3n γ), π from 905 γ to 11/2+.
1952.04 6	5/2+	A		J π : log ft=5.3 from 7/2+ parent, 1563 γ to 3/2-.
2036.5 5	(5/2, 7/2-)	A		J π : log ft=7.1 from 7/2+ parent, 1647 γ to 3/2-.
2057.23 10	(7/2+, 9/2)	A g		J π : log ft=6.6 from 7/2+ parent, 1019 γ to 11/2+.
2062?	1/2-, 3/2-	g		J π : L(³ He,d)=1 component of the L(³ He,d)=1+4 doublet.
2067.3 ^b 3	11/2-	C		J π : (M1) 247 γ from 13/2-, 966 γ to 9/2-, 2025 γ to 9/2+, band assignment.
2073.5 4	13/2-	CD	0.55 ps 14	J π : (M1) 340 γ from 15/2-, (13/2) from excitation function in ⁸⁰ Se(⁶ Li,3n γ).
2089.90 8	(5/2+, 7/2+)	A E		XREF: E(2083). J π : log ft=5.8 from 7/2+ parent, 2090 γ to 5/2-.
2095.0 6	(5/2+, 7/2, 9/2)	A		J π : log ft=7.0 from 7/2+ parent, 2053 γ to 9/2+.
2101.72 [@] 14	13/2-	CD	1.18 ps 28	J π : E2 999 γ to 9/2-; band assignment.
2134.86 11	(5/2+, 7/2)	A		J π : log ft=6.0 from 7/2+ parent, 1711 γ to 5/2+, 2092 γ to 9/2+, 2135 γ to 5/2-.
2189.72 14	9/2+	A		J π : log ft=5.1 from 7/2+ parent, 1396 γ to 13/2+.
2206.24 23	(13/2)	CD		J π : (11/2,13/2) from excitation function in ⁸⁰ Se(⁶ Li,3n γ), D 208 γ from 15/2-, D 1168.5 γ to 11/2+.
2310.0 10		D		
2313.54 ^b 13	13/2-	CD	0.69 ps 21	J π : E2 1210.5 γ to 9/2-, assumption of increasing spin in (HI,xn) reactions.

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Adopted Levels, Gammas (continued) ^{83}Rb Levels (continued)

E(level) [†]	J π	XREF	T _{1/2} [‡]	Comments
2318.17 19	(17/2+)	BCD	1.4 ps 7	J π : 1525 γ to 13/2+, 542 γ from 21/2+.
2334	1/2+, 3/2+, 5/2+	E G		E(level): average of 2327 keV in (α ,p) and 2341 keV in (^3He ,d).
2413.75 ^b 12	15/2-	CD	4.2 ns [§] 21	J π : L(^3He ,d)=0+2 (doublet).
2442?		E		J π : E2 660 γ to 11/2-, band assignment.
2568?		E		
2576.44 [#] 21	15/2-	CD	0.62 ps 14	J π : E2 823 γ to 11/2-, band assignment.
2584?	3/2+, 5/2+	G		J π : L(^3He ,d)=2.
2595.89 ^b 13	17/2-	CD	70 ps [§] 35	J π : D(+Q) 182 γ to 15/2-, 964 γ from 21/2-.
2691?	1/2+	G		J π : L(^3He ,d)=0.
2699.50 [#] 13	17/2-	CD		J π : M1 286 γ to 15/2-, band assignment.
2772.42 ^c 20	17/2-	CD		J π : D+Q 359 γ to 15/2-, 787 γ from 21/2-.
2782?		E		
2859.67 ^{&} 25	21/2+	BCD	1.45 ps 14	J π : E2 970 γ to 17/2+, band assignment.
2906	(5/2)+	E G		E(level): average of 2904 keV (^3He ,d) and 2907 keV (α ,p).
2957.84 ^b 15	19/2-	CD	6.9 ps +69-35	J π : L(^3He ,d)=0+2 (doublet), J dependence of (α ,p).
3016.1 5		C		J π : M1+E2 362 γ to 17/2-, band assignment.
3059	1/2+	G		J π : L(^3He ,d)=0.
3139.2 6	(19/2)	C		J π : D+Q 543.5 γ to 17/2-, assumption of increasing spin in (HI,xn) reactions.
3147	3/2+, 5/2+	G		J π : L(^3He ,d)=2.
3194.98 19	19/2-	BC	<0.90 ps	J π : D 1305 γ to 17/2+, 939 γ from 23/2-.
3242	1/2+, 3/2+, 5/2+	G		J π : L(^3He ,d)=0+2 (doublet).
3329.71 19	21/2+	BC	<0.90 ps	J π : E2 1440.5 γ to 17/2+, assumption of increasing spin in (HI,xn) reactions.
3362.95 ^b 17	21/2-	CD	1.9 ps 5	J π : M1+E2 405 γ to 19/2-, band assignment.
3421	(5/2)+	E G		E(level): from (α ,p) and (^3He ,d).
3440.27 ^c 19	21/2-	C		J π : L(^3He ,d)=0+2 (doublet), J dependence of (α ,p).
3536.9 4		C		J π : E2 668 γ to 17/2-, band assignment.
3559.30 18	21/2-	CD	0.24 ps +14-10	J π : D+Q 601 γ to 19/2-, E2 1127 γ from 25/2-.
3601.06 ^d 20	21/2-	C	0.28 ps 6	J π : M1 643 γ to 19/2-.
3616	1/2+, 3/2+, 5/2+	G		J π : L(^3He ,d)=0+2 (doublet).
3726.78 ^{&} 25	23/2+	BCD	0.17 ps 6	J π : M1 867 γ to 21/2+, band assignment.
3765.5 3	(21/2+)	C		J π : 1448 γ to (17/2+), D 400 γ from 23/2-.
3783?	1/2+, 3/2+, 5/2+	G		J π : L(^3He ,d)=0+2 (doublet).
3915?	1/2+, 3/2+, 5/2+	G		J π : L(^3He ,d)=0+2 (doublet).
3992.2 ^e 3	25/2+	BC	0.67 ps 6	J π : E2 1132 γ to 21/2+, M1 265 γ to 23/2+.
4084.55 ^d 20	23/2-	C	0.229 ps 21	J π : M1 483.5 γ to 21/2-, band assignment.
4129.6 4		C		
4134.65 ^b 22	23/2-	C		J π : E2 939 γ to 19/2-, M1 534 γ to 21/2-, band assignment.
4163.9 3	23/2-	BC		J π : E1 272 γ from 25/2+, 970 γ to 19/2-.
4406.8 10		C		
4435.37 ^{&} 23	25/2+	BC	0.31 ps 10	J π : M1 708.5 γ to 23/2+, band assignment.
4461.1 ^a 4	(25/2+)	BC	0.29 ps 8	J π : 1603 γ to 21/2+, M1+E2 734 γ to 23/2+.
4641.94 ^d 21	25/2-	C	0.270 ps 35	J π : E2 1279 γ to 21/2-, band assignment.
4686.27 ^c 19	25/2-	C	0.33 ps 4	J π : E2 1246 γ to 21/2-, band assignment.
4715.1 4		C		
4963.5 ^a 3	(27/2+)	BC		J π : M1 503 γ to (25/2+), band assignment.
5050.9 7		C		
5216.2 ^{&} 3	(27/2+)	BC		J π : 781 γ to 25/2+, band assignment.
5316.1 ^e 3	29/2+	BC	0.236 ps 35	J π : E2 1324 γ to 25/2+, band assignment.
5349.4 ^b 3	27/2-	C		J π : E2 1215 γ to 23/2-, band assignment.
5421.8 14	(25/2-)	C		
5448.1 ^d 3	(27/2-)	C	0.035 ps 14	J π : (M1) 806 γ to 25/2-, 1363 γ to 23/2-, band assignment.
5577.20 25		C		
5666.9 ^a 3	(29/2+)	BC	<0.40 ps	J π : M1 703 γ to (27/2+), band assignment.
5869.1 ^c 3	29/2-	C	0.39 ps 6	J π : E2 1183 γ to 25/2-, band assignment.
5970.6 ^d 3	29/2-	C	0.312 ps 35	J π : E2 1329 γ to 25/2-, band assignment.
6088.0 6		C		
6249.9 7		C		

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Adopted Levels, Gammas (continued)

⁸³Rb Levels (continued)

E(level) [†]	J π	XREF	T _{1/2} [‡]	Comments
6356.5 ^f 5	(29/2-)	C		J π : 1670 γ to 25/2-, D+Q 577 γ from (31/2-), band assignment.
6423.3 7		C		
6438.2 ^a 4	(31/2+)	C		J π : 1474 γ to (27/2+), band assignment.
6470.3 5	(31/2+)	C		J π : M1 697 γ from 33/2+, 803 γ to 29/2+.
6556.9 ^b 4	(31/2-)	C		J π : 1207 γ to 27/2-, band assignment.
6668.8 5		BC		
6687.8 ^d 4	(31/2-)	C	0.111 ps 21	J π : 717 γ to 29/2-, 1239.5 γ to (27/2-), band assignment.
6912.2 8		C		
6913.1 ^e 5	(33/2+)	BC	0.125 ps 14	J π : 1597 γ to 29/2+, band assignment.
6933.7 5	(31/2-)	C		J π : 514 γ from (33/2-), band assignment.
7068.0 ^c 4	33/2-	C	0.19 ps 6	J π : E2 1199 γ to 29/2-, band assignment.
7167.3 ^a 4	(33/2+)	C		J π : 729 γ to (31/2+), 1501 γ to 29/2+, band assignment.
7372.3 ^d 5	(33/2-)	C	0.062 ps 21	J π : 684 γ to (31/2-), 1402 γ to 29/2-, band assignment.
7447.3 ^f 4	(33/2-)	C		J π : 458 γ from (35/2-), band assignment.
7633.2 8		C		
7906.1 ^f 4	(35/2-)	C		J π : 1349.5 γ to (31/2-), D 514 γ from 37/2-.
8032.6 ^b 5	(35/2-)	C		J π : 1476 γ to (31/2-), band assignment.
8094.3 ^d 6	(35/2-)	C	0.17 ps 6	J π : 721 γ to (33/2-), 1407 γ to (31/2-), band assignment.
8193.5 ^a 5	(35/2+)	C		J π : 1027 γ to (33/2+), 1754 γ to (31/2+), band assignment.
8419.5 ^c 5	37/2-	C		J π : E2 1351 γ to 33/2-, band assignment.
8671.9 ^d 6	(37/2-)	C	0.166 ps 28	J π : D 577 γ to (35/2-), 1300 γ to (33/2-), band assignment.
8837.5 ^e 8	(37/2+)	BC		J π : 1924 γ to (33/2+), band assignment.
8962.4 9		C		
9341.2 ^d 6	(39/2-)	C		J π : 669 γ to (37/2-), 1247 γ to (35/2-), band assignment.
9633.6 ^b 8	(39/2-)	C		J π : 1601 γ to (35/2-), band assignment.
9910.2 ^c 6	41/2-	C		J π : E2 1491 γ to 37/2-, band assignment.
11714.9 ^c 9	(45/2-)	C		J π : 1805 γ to 41/2-, band assignment.
13926.3 ^c 12	(49/2-)	C		J π : 2211 γ to (45/2-), band assignment.

[†] From a least-squares fit to E γ , by evaluator, except where noted.

[‡] From Doppler Shift Attenuation Method (DSAM) in ⁷⁶Ge(¹¹B,4n γ), ⁷⁶Ge(¹⁰B,3n γ), except where noted.

[§] From Recoil Distance Doppler-shift Method (RDDM) in ⁷⁶Ge(¹¹B,4n γ), ⁷⁶Ge(¹⁰B,3n γ).

(A): Band based on 3/2-.

@ (B): Band based on 5/2-.

& (C): Band based on 9/2+.

^a (D): $\Delta J=1$ band based on (25/2+).

^b (E): Band based on 11/2-. $\Delta J=1$ up to 23/2-, $\Delta J=2$ above this spin.

^c (F): Band based on 17/2-.

^d (G): $\Delta J=1$ band based on 21/2-.

^e (H): Band based on 25/2+.

^f (I): Band based on (29/2-).

$\gamma(^{83}\text{Rb})$

E(level)	E γ [†]	I γ [†]	Mult. [‡]	$\delta^{\ddagger}$	α	Comments
5.2357	5.2357 [§] 8	100 [§]	M1+E2#	2.6 $\times 10^{-5}$ 2	100 6	B(M1)(W.u.)=0.0213 17.
42.0780	42.078 [§] 2	100 [§]	M2#		38.7 8	
99.36	94.11 [§] 10	100 [§]	M1+E2#	0.29# 5	0.25 3	Mult.: $\alpha(K)\text{exp}=0.22$ 2 from ⁸³ Sr ϵ decay suggests multipolarity is a mixture of M1 and E2. However, B(E2)(W.u.) $>1.5\times 10^3$ is deduced from T _{1/2} <150 ps (1973Br32) and δ . Therefore, 1973Br32 exclude any E2 component. If T _{1/2} =1.2 ns (see comment with 99-keV level), B(M1)(W.u.) and B(E2)(W.u.) are in agreement with M1+E2 multipolarity.

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Rb})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. ‡	$\delta^{\ddagger}$	α	Comments
389.42	290.04\$ 10	24\$ 4	M1+E2#	1.3# +8-6	0.016 4	B(E2)(W.u.)=190 120; B(M1)(W.u.)=0.008 7. I γ : from ^{83}Sr ϵ decay. However, I γ =96 3 from ($^6\text{Li}, 3n\gamma$). Evaluator adopts the first value, since B(E2)(W.u.)>300 if I γ >38.
	384.18\$	3.4\$ 4				
	389.37\$ 10	100\$ 5	E2(+M1)#	4.3# 25	0.0074 6	B(E2)(W.u.)=15 6; B(M1)(W.u.)=0.034 13.
423.612	381.53\$ 3	100\$ 4	E2#		0.00806	B(E2)(W.u.)=31 +7-7.
	418.37\$ 3	30.0\$ 10	E1#		1.64×10^{-3}	B(E1)(W.u.)= 1.4×10^{-5} +3-4.
	423.63\$ 3	10.3\$ 4	E1#		1.58×10^{-3}	B(E1)(W.u.)= 4.6×10^{-6} +11-10.
466.7	461.82	100				
564.59	559.35\$ 10	100\$ 4				
	564.45\$ 20	40\$ 4				
737.14	172.5\$	6.8\$ 7				
	695.06\$ 4	2.18\$ 23	[E1]		4.88×10^{-4}	B(E1)(W.u.)= 1.6×10^{-6} 11.
	731.95\$ 10	34\$ 3	E2@		1.16×10^{-3}	B(E2)(W.u.)=2.9 20.
	737.13\$ 10	100\$ 3	M1+E2&	+0.82 18	1.05×10^{-3} 2	B(E2)(W.u.)=3.3 22; B(M1)(W.u.)=0.0022 15.
793.63	751.7 1	100	E2@		1.08×10^{-3}	B(E2)(W.u.)=26 5.
804.77	381.17\$ 3	6.7\$ 7	E2(+M1)#	$\geq 2.9^{\#}$	0.00790 22	B(E2)(W.u.)=28 6.
	762.65\$ 10	100\$ 5	E2(+M1)#	$\geq 2.0^{\#}$	1.03×10^{-3} 2	B(E2)(W.u.)=25 5. δ : others: $1.6 \leq \delta \leq 16$ from $\gamma\gamma(\theta)$ in ^{83}Sr ϵ decay, +0.4 +4-2 from $\gamma(\theta)$ in $^{76}\text{Ge}(^{11}\text{B}, 4n\gamma)$, $^{76}\text{Ge}(^{10}\text{B}, 3n\gamma)$.
	804.65\$ 15	0.31\$ 3	[E1]		3.57×10^{-4}	B(E1)(W.u.)= 2.6×10^{-6} 6.
821.62	722.28\$	26\$ 3				
	816.34\$	100\$ 12				
	821.59\$	13.5\$ 12				
853.98	289.53\$	20\$ 3				
	754.56\$	16.9\$ 17				
	848.66\$	100\$ 10				
	853.98\$	46\$ 5				
908.00	343.4\$	4.2\$ 4				
	440.85\$	5.8\$ 6				
	484.5\$	2.8\$ 3				
	518.5\$	15.3\$ 14				
	808.7\$ 3	24\$ 3				
	902.64\$	25\$ 3				
	907.94\$	100\$ 10				
1010.34	445.69\$	45\$ 5				
	1005.1\$ 2	72\$ 8				
	1010.35\$ 20	100\$ 15				
1035.14	298.02\$	51\$ 6				
	470.69\$	14.4\$ 17				
	568.00\$	7.2\$ 11				
	611.4\$	11.1\$ 11				
	645.8\$ 2	100\$ 11				
	935.8\$ 4	29\$ 3				
	1029.63\$	6.1\$ 6				
	1035.04\$	72\$ 11				
1037.92	245.0 2	26.3 11	M1+E2&		0.025 12	I γ : other: 9.3 9 from ^{83}Sr ϵ decay.
	995.2 3	100 4	M1+E2	-0.8 +3-7	5.26×10^{-4} 11	B(E2)(W.u.)=15 6; B(M1)(W.u.)=0.020 8. Mult.: D+Q from $\gamma(\theta)$ in $^{76}\text{Ge}(^{11}\text{B}, 4n\gamma)$, $^{76}\text{Ge}(^{10}\text{B}, 3n\gamma)$, E1+M2 is excluded by comparison to RUL.
1083.19	659.53\$	100\$				
1096.53	291.61\$	12.1\$ 13				
	673.04\$	10.3\$ 11				

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Rb})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. [‡]	$\delta^{\ddagger}$	α	Comments
1096.53	1054.45\$ 10	100\$ 6				
1102.66	366.0 3	18.6 5				
	1102.4 2	100 3	E2@		4.30×10^{-4}	B(E2)(W.u.)=16 5.
1202.04	637.39\$	0.89\$ 9				
	737.3\$	0.30\$ 3				
	778.44\$ 10	100\$ 5	M1, E2#		0.00093 6	
	1159.97\$ 10	77\$ 3				
	1201.94\$ 15	6.4\$ 6				
1242.90	159.75\$ 10	14.1\$ 17				
	438.16\$ 10	100\$ 5	M1 (+E2) #	$\leq 0.4^{\#}$	0.00337 15	
	678.31\$ 3	5.3\$ 6				
	775.77\$	0.72\$ 7				
	819.29\$ 10	97\$ 3	M1, E2#		0.00082 5	
	853.42\$ 10	6.9\$ 7				
	1200.75\$	4.8\$ 7				
	1237.72\$ 15	26.2\$ 10				
	1242.87\$ 15	9.3\$ 5				
1277.5	713.00\$	17.3\$ 15				
	887.90\$	38\$ 4				
	1272.39\$	46\$ 5				
	1277.49\$	100\$ 11				
1296.07	906.55\$	66\$ 7				
	1296.06\$ 10	100\$ 4				
1366.1	269.5\$	8.3\$ 8				
	328.4\$	4.2\$ 4				
	561.22\$	15.2\$ 17				
	1323.78\$	100\$ 10				
1374.6	907.6\$	72\$ 7				
	1275.34\$	100\$ 10				
1424.6	630.9\$ 3	67\$ 7				
	1382.73\$	100\$ 15				
1586.9	549.0	78 6	D+Q	-0.3 1		
	1544.8 ^d	100 6				
1597.68	395.62\$	100\$ 10				
	792.97\$	57\$ 10				
	1174.08\$ 15	81\$ 10				
	1208.17	30 3				
	1592.31\$	19\$ 3				
	1597.64\$ 15	53\$ 4				
1606.2	1506.91\$	11.0\$ 10				
	1600.97\$	100\$ 10				
	1606.07\$	4.0\$ 5				
1614.8	371.9\$	6.3\$ 6				
	877.63\$	26\$ 3				
	1050.24\$	100\$ 13				
	1191.10\$	4.4\$ 6				
	1572.70\$	13.4\$ 14				
1649.4	639.13\$	59\$ 6				
	795.34\$	88\$ 9				
	827.81\$	17.4\$ 23				
	1084.76\$	47\$ 5				
	1649.40\$	100\$ 12				
1695.45	270.8\$	6.7\$ 7				
	493.45\$	33\$ 4				
	599.12\$	4.0\$ 4				
	657.68\$	71\$ 9				
	890.8\$ 3	100\$ 11				
	1271.81\$	51\$ 7				
	1653.31\$ 15	56.2\$ 22				
1749.33	506.4\$	59\$ 7				
	547.3\$	6.8\$ 7				
	652.81\$ 10	64\$ 7				
	944.56\$ 10	100\$ 9				

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Rb})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. [‡]	$\delta^{\ddagger}$	α	Comments
1749.33	1184.54\$	4.1\$ 5				
	1325.62\$	58\$ 6				
	1707.15\$	17.5\$ 14				
	1749.25\$ 25	20.7\$ 23				
1753.64	651.2 5	23.6 6				
	1016.4 3	100 3	E2@		5.16×10^{-4}	B(E2)(W.u.)=28 6.
1780.4	986.6	100 8				
	1738.5 ^d	121 14				
1798.56	555.63\$	2.25\$ 25				
	715.34\$ 10	28.1\$ 17				
	993.78\$	100\$ 17	M1+E2	3.4 22	5.42×10^{-4} 12	Mult.: D+Q from $\gamma\gamma(\theta)$ in ^{83}Sr ϵ decay, $\Delta\pi$ =no from level scheme. δ : from $\gamma\gamma(\theta)$ in ^{83}Se ϵ decay.
	1233.94\$	5.6\$ 6				
	1374.97\$ 15	15.0\$ 17				
	1756.5\$ 2	6.3\$ 5				
	1793.23\$	3.2\$ 5				
	1798.55\$ 15	8.4\$ 8				
1889.21	1095.5 1	100	E2@		4.35×10^{-4}	B(E2)(W.u.)=15.9 19.
1916.41	1492.78\$	58\$ 6				
	1911.15\$ 20	100\$ 9				
	1916.4\$	8.9\$ 9				
1942.66	904.8 3	16.6 5	[E2]		6.80×10^{-4}	B(E2)(W.u.)=4.9 17. I γ : other: 33 3 in $^{80}\text{Se}(^6\text{Li}, 3n\gamma)$.
	1149.0 1	100 3	M1 ^a		3.84×10^{-4}	B(M1)(W.u.)=0.010 4.
1952.04	153.55\$	0.72\$ 7				
	345.80\$	0.50\$ 5				
	354.32\$	3.3\$ 3				
	577.18\$	0.50\$ 5				
	674.41\$	2.7\$ 3				
	709.1\$ 4	0.90\$ 8				
	749.96\$	2.3\$ 3				
	868.6\$ 4	1.05\$ 10				
	916.91\$ 10	7.8\$ 8				
	941.94\$	0.52\$ 5				
	1044.03\$ 10	19.5\$ 17				
	1098.05\$ 10	14.5\$ 5				
	1130.41\$ 15	2.33\$ 17				
	1147.33\$ 10	71.3\$ 18	M1+E2	4.7 24	3.95×10^{-4}	Mult.: D+Q from $\gamma\gamma(\theta)$ in ^{83}Sr ϵ decay, $\Delta\pi$ =no from level scheme. δ : from $\gamma\gamma(\theta)$ in ^{83}Sr ϵ decay.
	1214.88\$ 15	14.2\$ 8				
	1387.38\$	1.42\$ 15				
	1528.33\$ 15	5.50\$ 25				
	1562.51\$ 15	100\$ 3				
	1946.66\$	1.08\$ 10				
	1952.06\$ 15	45.0\$ 17				
2036.5	1231.85\$	10.0\$ 10				
	1612.70\$	43\$ 5				
	1647.21\$	100\$ 10				
	2030.99\$	15.0\$ 15				
2057.23	1019.45\$ 15	100\$ 11				
	1252.45\$ 20	27\$ 4				
	1319.84\$	7.2\$ 11				
	2014.98\$ 15	79\$ 6				
2067.3	965.8 5	100 4				
	2025.1 6	38 4				

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Rb})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. ‡	$\delta^{\ddagger}$	α	Comments
2073.5	1036.0 6	100	E1		2.16×10^{-4}	B(E1)(W.u.)=0.00058 15. Mult.: D from $\gamma(0)$ in $^{80}\text{Se}(^6\text{Li}, 3n\gamma)$, $\Delta\pi=\text{yes}$ from level scheme. δ : $-9 +3-13$ from $^{76}\text{Ge}(^{11}\text{B}, 4n\gamma)$, $^{76}\text{Ge}(^{10}\text{B}, 3n\gamma)$ would result in too large a B(M2) strength, assuming E1+M2 multipolarity for the transition as derived from the level scheme.
2089.90	394.47\$ 723.72\$ 812.32\$ 846.87\$ 993.22\$ 1285.02\$ 1352.46\$ 1525.22\$ 1666.20\$ 15 2047.81\$ 15 2089.94\$ 15	6.5\$ 7 4.0\$ 5 5.3\$ 5 48\$ 5 43\$ 5 75\$ 8 8.5\$ 10 1.25\$ 13 70\$ 5 80\$ 3 100\$ 5				
2095.0	892.96\$ 1290.23\$ 2052.93\$	100\$ 10 33\$ 4 58\$ 13				
2101.72	348.4 4 998.9 3	12.2 7 100 3	M1 ^a E2 [@]		0.00561 5.37×10^{-4}	B(M1)(W.u.)=0.048 12. B(E2)(W.u.)=20 5.
2134.86	537.12\$ 768.90\$ 838.78\$ 1038.23\$ 1330.03\$ 1397.56\$ 1711.15\$ 20 2092.46\$ 2134.89\$ 15	11.3\$ 13 8.7\$ 10 6.0\$ 7 100\$ 10 8.7\$ 10 13.7\$ 13 37\$ 3 1.67\$ 17 31.0\$ 23				
2189.72	494.1\$ 764.82\$ 987.60\$ 1086.67\$ 1151.97\$ 1384.83\$ 1395.96\$ 1452.50\$ 1765.84\$ 2147.64\$ 15	8.9\$ 9 34\$ 4 5.7\$ 5 17.5\$ 18 3.0\$ 4 61\$ 7 5.5\$ 5 4.8\$ 13 10.5\$ 11 100\$ 7				
2206.24	1168.5 3	100	D ^c			
2310.0	1272.1 ^b	100 ^b	Q ^c			
2313.54	211.2 3 246.6 3 559.8 2 1210.5 3 1275.6 5	9.7 14 36.1 14 100 3 100 30 41.7 14	(M1) E2 [@] [E1]		0.01324 3.59×10^{-4} 2.42×10^{-4}	B(M1)(W.u.)=0.27 9. Mult.: (D) from R(DCO) in $^{76}\text{Ge}(^{11}\text{B}, 4n\gamma)$, $^{76}\text{Ge}(^{10}\text{B}, 3n\gamma)$, $\Delta\pi=\text{no}$ from level scheme. B(E2)(W.u.)=5.1 23. B(E1)(W.u.)= 3.6×10^{-5} 12. I γ : other: 27 3 in $^{80}\text{Se}(^6\text{Li}, 3n\gamma)$.
2318.17	428.4 1524.7 2	47.1 20 100 4	[E2]		3.10×10^{-4}	B(E2)(W.u.)=1.6 8.
2413.75	100.1 1	100 3	M1 (+E2)	+0.01 4	0.144 3	B(E2)(W.u.)=0.018 9; B(M1)(W.u.)=0.0015 8. Mult.: D(+Q) from R(DCO) in $^{76}\text{Ge}(^{11}\text{B}, 4n\gamma)$, $^{76}\text{Ge}(^{10}\text{B}, 3n\gamma)$, $\Delta\pi=\text{no}$ from level scheme.

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Rb})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. ‡	$\delta^{\ddagger}$	α	Comments
2413.75	207.7 3	13.2 7	(D)			
	312.1 1	77 3	M1 ^a		0.00735	B(M1)(W.u.)=4.2×10 ⁻⁵ 21.
	340.5 5	11.2 7	(M1)		0.00593	B(M1)(W.u.)=4.7×10 ⁻⁶ 24.
						Mult.: (D) from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =no from level scheme.
	471.0 4	9.2 7	[E1]		1.21×10 ⁻³	B(E1)(W.u.)=2.3×10 ⁻⁸ 12.
	660.2 3	27.6 7	E2 [@]		1.53×10 ⁻³	B(E2)(W.u.)=0.0043 22.
	1620.2 2	66.4 20	E1+M2	+0.02 1	4.42×10 ⁻⁴	B(E1)(W.u.)=4.3×10 ⁻⁹ 21; B(M2)(W.u.)=3.0×10 ⁻⁶ 15. Mult.: D+Q from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =yes from level scheme.
2576.44	263.2 4	44.8 17	M1 ^a		0.01123	B(M1)(W.u.)=0.60 14.
	822.6 5	100 3	E2 [@]		8.60×10 ⁻⁴	B(E2)(W.u.)=78 18.
2595.89	181.9 1	100 3	M1 (+E2)	+0.01 2	0.0290 5	B(E2)(W.u.)=0.14 7; B(M1)(W.u.)=0.039 19.
						Mult.: D(+Q) from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =no from level scheme.
	653.2 2	31.1 9	E1+M2	+0.05 4	5.67×10 ⁻⁴ 19	B(E1)(W.u.)=4.3×10 ⁻⁶ 21; B(M2)(W.u.)=0.12 6. Mult.: D+Q from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =yes from level scheme.
2699.50	103.3 1	42.1 18	M1 ^a		0.1324	
	123.1 2	100 4	M1+E2&		0.27 19	
	286.0 1	82.5 18	M1 ^a		0.00912	I γ : other: 27.1 12 in ⁸⁰ Se(⁶ Li,3n γ).
	598.2 ^d	26 4				
2772.42	176.5 2	27.1 21	(M1)		0.0314	Mult.: (D) from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =no from level scheme.
	358.7 4	100 4	M1+E2&		0.0076 24	
2859.67	542.3 8	1.19 17	[E2]		0.00269	B(E2)(W.u.)=4.5 8.
	969.9 15	100 3	E2 [@]		5.76×10 ⁻⁴	B(E2)(W.u.)=20.9 22.
2957.84	258.3 1	31.2 8	M1+E2&	-0.20 6	0.0125 5	B(E2)(W.u.)=30 +30-24; B(M1)(W.u.)=0.042 +42-22.
	362.2	100 3	M1+E2	-0.02 1	0.00511	B(M1)(W.u.)=0.05 +5-3. Mult.: D+Q from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), M1+E2 from assumed band structure.
3016.1	420.3 6	100				
3139.2	366.4 10					
	543.5 10		D+Q			
3194.98	237.2 3	13.2 13	(M1)		0.01461	B(M1)(W.u.)>0.10.
						Mult.: (D) from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =no from level scheme.
	599.5 5	68 3				
	877.5 ^d 10	50 25	[E1]		2.99×10 ⁻⁴	B(E1)(W.u.)>0.00013. I γ : from ⁶⁸ Zn(¹⁸ O,p2n γ).
	1305.2 3	100 3	E1		2.56×10 ⁻⁴	B(E1)(W.u.)>7.7×10 ⁻⁵ . Mult.: D from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =yes from level scheme.
3329.71	470.5 4	16.8 9	(M1)		0.00274	B(M1)(W.u.)>0.029.
						Mult.: (D) from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =no from level scheme.
	1011.2 5	18.7 9	[E2]		5.22×10 ⁻⁴	B(E2)(W.u.)>3.8.
	1440.5 2	100 3	E2 [@]		3.07×10 ⁻⁴	B(E2)(W.u.)>3.5.
3362.95	223.5 ^d					

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Adopted Levels, Gammas (continued)
 $\gamma(^{83}\text{Rb})$ (continued)

E(level)	E $\gamma^{\dagger}$	I $\gamma^{\dagger}$	Mult. ‡	$\delta^{\ddagger}$	α	Comments
3362.95	405.1 1	100.0 4	M1+E2	-0.03 1	0.00390	B(E2)(W.u.)=1.1 8; B(M1)(W.u.)=0.16 5. Mult.: D+Q from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), M1+E2 from assumed band structure.
3440.27	663.3 ^e 5 668.0 5	6.7 ^e 4 18.9 7	[E2] E2		1.51 $\times 10^{-3}$ 1.49 $\times 10^{-3}$	B(E2)(W.u.)=6.7 19. Mult.: Q from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), E2 from assumed band structure.
	741.1 5 844.5 2	12.8 7 100 3	E2		8.05 $\times 10^{-4}$	Mult.: Q from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =no from level scheme.
3536.9 3559.30	1218.6 5 196.5 2 543.4 8 601.3 2 699.8 ^d 10 786.6 6 963.7 ^d 10	100 11.0 6 7.7 6 100 3 3.9 6	M1+E2& [E1] [E2] [E2]	-0.03 2	1.55 $\times 10^{-3}$ 4.80 $\times 10^{-4}$ 9.64 $\times 10^{-4}$ 5.85 $\times 10^{-4}$	B(M1)(W.u.)=0.34 +20-15. B(E2)(W.u.)=12 +8-4.
3601.06	238.1 2 643.3 3	15.2 10 100 3	M1 ^a		1.33 $\times 10^{-3}$	B(M1)(W.u.)=0.26 6.
3726.78	396.9 4 867.0 2	12.3 3 100 3	M1 ^a M1		0.00409 6.91 $\times 10^{-4}$	B(M1)(W.u.)=0.23 8. B(M1)(W.u.)=0.18 7. Mult.: D from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), M1 from assumed band structure.
3765.5	437.0 4 1448.2 5	86 14 100 14	M1 ^a		0.00326	
3992.2	265.4 2 1132.4 1	30.8 9 100 3	M1 ^a E2@		0.01100 4.06 $\times 10^{-4}$	B(M1)(W.u.)=0.41 4. B(E2)(W.u.)=16.1 16.
4084.55	483.5 1	49.4 12	M1		0.00257	B(M1)(W.u.)=0.28 3. Mult.: D from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), M1 from assumed band structure.
4129.6	721.5 2 1269.9 3	100 4 100	M1 ^a		1.03 $\times 10^{-3}$	B(M1)(W.u.)=0.171 18.
4134.65	533.6 8 576.8 5 771.9 4 939.4 2	41 3 31 3 51 5 100 3	M1 ^a E2		0.00204 6.21 $\times 10^{-4}$	Mult.: Q from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), assumed E2.
4163.9	400.3 4 834.0 5 969.8 5 1304.0 ^d 10	23.7 17 42.4 17 100 3	E1		0.00183	Mult.: D from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =yes from level scheme.
4406.8 4435.37	847.5 10 272.0 2 443.0 4 708.5 2	100 13.8 7 4.7 7 100 3	E1 (M1) M1		0.00521 0.00315 1.07 $\times 10^{-3}$	B(E1)(W.u.)=0.0050 17. Mult.: D from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =yes from level scheme. B(M1)(W.u.)=0.025 9. Mult.: (D) from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =no from level scheme. B(M1)(W.u.)=0.13 5. Mult.: D from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), M1 from assumed band structure.

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Adopted Levels, Gammas (continued)
 $\gamma(^{83}\text{Rb})$ (continued)

E(level)	E $\gamma^{\dagger}$	I $\gamma^{\dagger}$	Mult. ‡	α	Comments
4435.37	1104.5 5	24.8 7	[E2]	4.28 $\times 10^{-4}$	B(E2)(W.u.)=8 3.
	1576.1 6	12.4 7	[E2]	3.17 $\times 10^{-4}$	B(E2)(W.u.)=0.69 23.
4461.1	734.0 6	100 33	M1+E2&	0.00107 9	
	1602.9 4	31.0 14	[E2]	3.22 $\times 10^{-4}$	B(E2)(W.u.)=2.0 8.
4641.94	557.4 4	100 3	M1+E2&	0.0022 4	
	1082.7 4	30.4 14	[E2]	4.47 $\times 10^{-4}$	B(E2)(W.u.)=9.1 13.
	1278.8 2	87 3	E2@	3.33 $\times 10^{-4}$	B(E2)(W.u.)=11.4 16.
4686.27	606.2 50	37.8 11			
	1126.9 1	88.9 22	E2@	4.10 $\times 10^{-4}$	B(E2)(W.u.)=17.2 22.
	1246.2 2	100 3	E2@	3.44 $\times 10^{-4}$	B(E2)(W.u.)=11.7 15.
4715.1	1178.1 5	15 3			
	1385.5 4	100 3			
4963.5	502.9 8	37.8 12	M1	0.00234	Mult.: D from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), M1 from assumed band structure.
	528.2 4	19.5 12	M1	0.00209	Mult.: D from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), $\Delta\pi$ =no from level scheme.
	971.1 2	100 4			
	1235.7 ^d 10	<12			
5050.9	1058.7 6	100			
5216.2	756.3 4	31.5 14			
	780.5 5	100 3			
	1223.5 5	17.8 14			
5316.1	352.6 3	37.9 11	M1 ^a	0.00545	B(M1)(W.u.)=0.58 9.
	1323.8 3	100 3	E2@	3.22 $\times 10^{-4}$	B(E2)(W.u.)=20 3.
5349.4	663.3 ^e 5	9.1 ^e 15			
	707.6 6	16.7 15			
	1214.8 3	100 30	E2	3.57 $\times 10^{-4}$	Mult.: Q from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), E2 from assumed band structure.
5421.8	1015.0 10				
5448.1	806.3 3	100 3	(M1)	8.08 $\times 10^{-4}$	B(M1)(W.u.)=1.0 5.
					Mult.: (D) from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), (M1) from assumed band structure.
	1363.0 5	17 3	[E2]	3.14 $\times 10^{-4}$	B(E2)(W.u.)=23 11.
5577.20	935.0 2	44 4			
	1142.4 3	100 4			
5666.9	451.1 3	84.8 22	M1 ^a	0.00302	B(M1)(W.u.)>0.18.
	703.2 3	100.0 22	M1	1.09 $\times 10^{-3}$	B(M1)(W.u.)>0.055.
					Mult.: D from R(DCO) in ⁷⁶ Ge(¹¹ B,4n γ), ⁷⁶ Ge(¹⁰ B,3n γ), M1 from assumed band structure.
	1232.0 6	100 30	[E2]	3.49 $\times 10^{-4}$	B(E2)(W.u.)>8.1.
5869.1	520.0 4	10.6 11			
	1182.7 2	100 3	E2@	3.73 $\times 10^{-4}$	B(E2)(W.u.)=26 5.
5970.6	522.5 4	51 2			
	1328.7 3	100 4	E2@	3.21 $\times 10^{-4}$	B(E2)(W.u.)=13.5 17.
6088.0	1372.8 5	100			
6249.9	1033.7 6	100			
6356.5	1670.4 5	100			
6423.3	1207.1 6	100			
6438.2	771.4 4	100 8	M1+E2&	0.00095 7	
	1474.3 4	30 2			
6470.3	803.4 4	100			
6556.9	688.4 8	34 2			
	1207.3 5	100 30			
6668.8	1351.9 ^d 6	56 6			
	1706.0 6	100 6			
6687.8	717.2 3	100 4			
	1239.5 7	7.7 19	[E2]	3.47 $\times 10^{-4}$	B(E2)(W.u.)=5.8 19.
6912.2	1696.0 7	100			
6913.1	243.9 ^d	<25			
	1597.0 4	100 20	[E2]	3.21 $\times 10^{-4}$	B(E2)(W.u.)=18 6.
6933.7	577.3 4	100	M1+E2&	0.0020 3	
7068.0	1198.8 3	100	E2@	3.65 $\times 10^{-4}$	B(E2)(W.u.)=56 18.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Rb})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. [‡]	α	Comments
7167.3	697.1 5 729.2 6 1500.7 4	71 5 100 5 86 5	M1 ^a	1.11×10^{-3}	
7372.3	684.2 5 1402.1 7	100 4 50 4	[E2]	3.09×10^{-4}	B(E2)(W.u.)=26 10.
7447.3	513.7 5 890.0 4	100 6 94 6			
7633.2	1545.2 5	100			
7906.1	458.4 5 838.1 3	17.0 21 100 4	(M1)		Mult.: (D) from R(DCO) in $^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$, $\Delta\pi=\text{no}$ from level scheme.
	1349.5 4	42.6 21			
8032.6	585.3 5 1476.0 5	100 10 70 10			
8094.3	721.0 5 1406.5 6	100 5 27 5	[E2]	3.09×10^{-4}	B(E2)(W.u.)=6.0 24.
8193.5	1026.8 5 1754.3 6	100 8 75 8			
8419.5	387.0 4 513.6 8 1351.3 5	34 3 93 3 100 3	M1 ^a E2	0.00223 3.16×10^{-4}	Mult.: Q from R(DCO) in $^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$, E2 from assumed band structure.
8671.9	576.9 4 1300.4 5	100 4 21 4	M1 ^a [E2]	1.71×10^{-3} 3.27×10^{-4}	B(M1)(W.u.)=0.57 11. B(E2)(W.u.)=7.4 20.
8837.5	1924.4 6	100			
8962.4	2049.3 8	100			
9341.2	669.0 6 1247.1 4	100 11 21 11			
9633.6	1601.0 6	100			
9910.2	1490.7 4	100	E2	3.07×10^{-4}	Mult.: Q from R(DCO) in $^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$, E2 from assumed band structure.
11714.9	1804.6 7	100			
13926.3	2211.4 8	100			

[†] From $^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$, except where noted.[‡] From R(DCO) in $^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$, except where noted.[§] From ^{83}Se ε decay.# From ce data in ^{83}Se ε decay.@ Q from R(DCO) in $^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$, M2 excluded by comparison to RUL.& D+Q from R(DCO) in $^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$, $\Delta\pi=\text{no}$ from level scheme.^a D from R(DCO) in $^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$, $\Delta\pi=\text{no}$ from level scheme.^b From $^{80}\text{Se}(^6\text{Li},3n\gamma)$.^c From $\gamma(\theta)$ in $^{80}\text{Se}(^6\text{Li},3n\gamma)$.^d Placement of transition in the level scheme is uncertain.^e Multiply placed; intensity suitably divided.

Adopted Levels, Gammas (continued)(A) Band based on $3/2^-$.(B) Band based on $5/2^-$.(C) Band based on $9/2^+$.

Adopted Levels, Gammas (continued)(D) $\Delta J=1$ band based on (25/2+).(E) Band based on 11/2-. $\Delta J=1$ up to 23/2-, $\Delta J=2$ above this spin.

(F) Band based on 17/2-.

$^{83}_{37}\text{Rb}_{46}$

Adopted Levels, Gammas (continued)(G) $\Delta J=1$ band based on
21/2-.

(H) Band based on 25/2+.

(I) Band based on (29/2-).

^{83}Sr ϵ Decay 2000Sh49

Parent ^{83}Sr : $E=0.0$; $J\pi=7/2+$; $T_{1/2}=32.41$ h 3; $Q(\text{g.s.})=2273$ 6; $\% \epsilon + \% \beta^+ \text{ decay}=100$.

2014In02: ^{83}Sr activity produced by proton spallation on a metallic Y target with $E(p)=300$ MeV followed by chemical separation. Measured E_e , I_e using a combined electrostatic electron spectrometer consisting of a retarding sphere followed by a double-pass cylindrical mirror energy analyzer.

2000Sh49,2000Yu03: ^{83}Sr activity produced in the $^{85}\text{Rb}(p,3n)$ reaction with $E(p)=27.1$ MeV followed by chemical separation. Target consisted of high-purity RbCl powder. Measured E_γ , I_γ using a Compton-suppressed HPGe detector and $\gamma\gamma$ using a planar Ge detector and a coaxial Ge detector.

1982Gr07: ^{83}Sr activity produced in the irradiation of RbCl pellets with 72-MeV protons. Stacks of targets and aluminum degraders were used and ^{83}Sr was observed down to a mean proton energy of 29 MeV. Measured E_γ , I_γ , $\gamma(t)$ using a Ge(Li) detector for the energy range 80 – 2250 keV and a planar Ge detector for energies below 800 keV.

1973Br32: ^{83}Sr activity produced first through the production of ^{83}Y in the $^{65}\text{Cu}(^{22}\text{Ne},4n)$, $E(^{22}\text{Ne})=85$ MeV followed by β decay to ^{83}Sr . Measured E_γ , I_γ , $\gamma(t)$, $\gamma\gamma$, $\beta\gamma$ coincidences using Ge(Li) detectors and a plastic NE102 scintillator.

Others: 1968Et01, 1972Mo16, 1972Mo40, 1982Po04.

The level scheme is that of 2000Sh49. Precise energies and intensities are reported by 1982Gr07, however, they did not construct a level scheme. There is good agreement between 1973Br32 and 2000Sh49 concerning the placement of strong transitions, however, considerable disagreement in the placement of weak transitions. These are indicated in the comments. Eight levels (760, 1044, 1054.5, 1085.5, 1808, 2020, 2147, and 2178 keV) proposed by 1973Br32 are not observed in 2000Sh49. For the most part, transitions depopulating these levels are given alternative placements in the level scheme by 2000Sh49.

A total energy release of 2270 keV 90 is calculated for this decay using the RADLST code, in good agreement with the Q value of 2273 keV 6.

^{83}Rb Levels

$E(\text{level})^\dagger$	$J\pi^\S$	$T_{1/2}^\ddagger$	Comments
0.0	5/2-	86.2 d 1	$T_{1/2}$: from the Adopted Levels.
5.2357 8	3/2-	71.5 ns 8	$T_{1/2}$: from $\text{ce}\gamma(t)$ in 1972Mo16.
42.0780 20	9/2+	7.8 ms 7	$T_{1/2}$: unpublished value reported by 1968Et01, considered questionable.
99.35 8	3/2-	<150 ps	$T_{1/2}$: considered questionable, see the Adopted Levels.
			$T_{1/2}$: other: 1.2 ns, unpublished value reported by 1968Et01, considered questionable.
389.40 7	3/2-	<130 ps	
423.613 16	5/2+	<150 ps	
466.7 4			
564.57 9	(3/2-, 5/2, 7/2-)		
737.16 6	7/2-		
793.8 4	13/2+		
804.77 3	(7/2)+	<60 ps	
821.62 15	(3/2)-		
853.98 11	(3/2-, 5/2, 7/2-)		
908.00 11	(3/2, 5/2, 7/2-)		
1010.34 14	(3/2-, 5/2, 7/2-)		
1035.13 10	(3/2-, 5/2, 7/2-)		
1037.68 18	11/2+		
1083.21 9			
1096.53 8	(7/2+, 9/2+)		
1102.90 19	9/2-		
1202.07 7	(5/2, 7/2, 9/2)+		
1242.93 6	(5/2)+		
1277.5 4	(3/2-, 5/2, 7/2-)		
1296.07 10	(5/2, 7/2-)		
1366.0 4	(7/2+, 9/2)		
1374.6 6			
1424.7 4			
1597.68 10	(5/2, 7/2-)		
1606.2 5	(3/2, 5/2, 7/2-)		
1614.8 4	(5/2+, 7/2, 9/2+)		
1649.4 5	(3/2-, 5/2, 7/2-)		
1695.45 13	(7/2, 9/2)+		
1749.33 8	(5/2+, 7/2)		
1798.57 8	(5/2)+		
1916.41 19	(5/2, 7/2-)		
1952.04 6	5/2+		
2036.5 5	(5/2, 7/2-)		
2057.14 12	(7/2+, 9/2)		

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^{83}Sr ϵ Decay 2000Sh49 (continued) **^{83}Rb Levels (continued)**

E(level) [†]	$J\pi^{\S}$
2089.90 8	(5/2+, 7/2+)
2095.0 6	(5/2+, 7/2, 9/2)
2134.86 11	(5/2+, 7/2)
2189.73 14	9/2+

[†] From a least-squares fit to $E\gamma$, by evaluator.[‡] From delay coincidence timing in $^{1973}\text{Br}32$, except where noted.[§] From the Adopted Levels. **β^+, ϵ Data**

$E\epsilon$	E(level)	$I\beta^{+\ddagger}$	$I\epsilon^{\ddagger}$	Log ft	$I(\epsilon+\beta^+)^{\ddagger\ddagger}$	Comments
(83 6)	2189.73		0.38 3	5.11 9	0.38 3	
(138 6)	2134.86		0.175 15	5.95 6	0.175 15	
(178 6)	2095.0		0.025 3	7.04 7	0.025 3	
(183 6)	2089.90		0.47 4	5.79 5	0.47 4	
(216 6)	2057.14		0.103 10	6.60 5	0.103 10	
(237 6)	2036.5		0.036 4	7.14 6	0.036 4	
(321 6)	1952.04		4.7 4	5.31 4	4.7 4	
(357 6)	1916.41		0.050 5	7.37 5	0.050 5	
(474 6)	1798.57		0.53 7	6.61 6	0.53 7	
(524 6)	1749.33		0.39 4	6.83 5	0.39 4	
(578 6)	1695.45		0.37 4	6.94 5	0.37 4	
(624 6)	1649.4		0.072 6	7.72 4	0.072 6	
(658 6)	1614.8		0.128 14	7.51 5	0.128 14	
(667 6)	1606.2		0.053 7	7.91 6	0.053 7	
(675 6)	1597.68		0.128 15	7.54 6	0.128 15	
(898 6)	1374.6		0.0053 13	9.17 11	0.0053 13	
(907 6)	1366.0		0.152 17	7.72 5	0.152 17	
(977 6)	1296.07		0.197 17	7.68 4	0.197 17	
(996 6)	1277.5		0.023 8	8.62 16	0.023 8	
(1030 6)	1242.93		1.90 14	6.74 4	1.90 14	
(1071 6)	1202.07		3.10 23	6.56 4	3.10 23	
(1170 6)	1102.90		0.010 3	9.13 13	0.010 3	
(1176 6)	1096.53		0.019 17	8.9 4	0.019 17	
(1235 [§] 6)	1037.68	$<5 \times 10^{-5}$	<0.03	>8.7	<0.03	
(1238 [§] 6)	1035.13	$<5 \times 10^{-5}$	<0.03	>8.7	<0.03	
(1263 6)	1010.34	0.00015 3	0.053 8	8.47 7	0.053 8	
(1365 [§] 6)	908.00	<0.0008	<0.07	>8.4	<0.07	
(1419 6)	853.98	0.0007 4	0.035 20	8.75 25	0.036 20	
(1451 6)	821.62	0.00057 18	0.021 7	8.99 14	0.022 7	
(1468 6)	804.77	0.78 8	25.1 21	5.93 4	25.9 22	
(1479 [§] 6)	793.8	<0.00039	<0.012	>9.3	<0.012	
(1536 6)	737.16	0.0011 9	0.021 18	9.0 4	0.022 19	
(1849 6)	423.613	3.2 3	11.5 9	6.47 4	14.7 12	
(1884 [§] 6)	389.40	<0.044	<0.14	>8.4	<0.18	
(2231 6)	42.0780	11 3	12 4	6.63 14	23 7	
(2273 6)	0.0	12.4 11	11.1 10	6.66 4	23.5 20	$I(\epsilon+\beta^+)$: from $I\gamma(\gamma^{\pm})$.

[†] From an intensity balance at each level, except where noted.[‡] Absolute intensity per 100 decays.[§] Existence of this branch is questionable.

^{83}Sr ϵ Decay 2000Sh49 (continued) $\gamma(^{83}\text{Rb})$

I_γ normalization, $I(\gamma+\text{ce})$ normalization: From $I_\gamma(\gamma^\pm)=160.5$ (2000Sh49) taking $I_\gamma(762\gamma)=100$. Other: $I_\gamma(\gamma^\pm)=163.16$ (1968Et01).

$E\gamma^\dagger$	E(level)	$I_\gamma\text{§g}$	Mult. $\ddagger$	$\delta^\ddagger\text{f}$	α	$I(\gamma+\text{ce})\text{g}$	Comments
5.2357 8	5.2357		M1+E2	2.6×10^{-5} 2	99.5	21.1 5	ce(L)/($\gamma+\text{ce}$)=0.836 7; ce(M)/($\gamma+\text{ce}$)=0.138 3; ce(N)/($\gamma+\text{ce}$)=0.0154 3; ce(O)/($\gamma+\text{ce}$)=0.000633 13. L1/L2=9.1 2 (2014In02); L1/L3=16.8 4 (2014In02); L1/(L2+L3)=5.9 1 (2014In02), 9.6 16 (1972Mo16); L/M=6.3 2 (2014In02), 5.5 5 (1972Mo16); M1/(M2+M3)=24.0 23 (2014In02). E γ : from 2014In02. Other: 5.23 9 (1972Mo16). I($\gamma+\text{ce}$): from intensity balance assuming no direct population of the 5.2-keV level. From $\Delta J=2, \Delta\pi=\text{yes}$, $I\beta(5.2)<0.25$.
42.078 2	42.0780	6.2 6	M2		38.7 8		K/L=5.2 2, L/M=5.5 6 (1972Mo16), $\alpha(\text{K})_{\text{exp}}=29.3$ 35, K/L=5.5 1, L1/(L2+L3)=2.8 2, K/M=30 2 (1968Et01). E γ : from 2014In02. Other: 42.33 15 1972Mo16. I γ : deduced from I($\gamma+\text{ce}$)=247 (2000Sh49) and α . Others: 5.3 5 (1973Br32). $\alpha(\text{K})_{\text{exp}}=0.22$ 2 (1968Et01). I γ : deduced from I($\gamma+\text{ce}$)=1.77 (2000Sh49) and α . Others: 1.52 6 (1982Gr07), 1.37 10 (1973Br32).
94.11 ^d 10	99.35	1.42 10	M1+E2	0.29 5	0.25 3		I γ : others: 0.37 3 (1982Gr07), 0.51 8 (1973Br32).
153.55	1952.04	0.043 4					
^x 156.8 ^e 3		0.13 ^e 6					
159.75 ^d 10	1242.93	0.41 5					
172.5	737.16	0.059 6					
243.9	1037.68	0.050 5					
269.5	1366.0	0.040 4					
270.8	1695.45	0.030 3					
289.53	853.98	0.12 2					
290.04 ^d 10	389.40	1.36 20	M1+E2	1.3 +8-6	0.016 4		$\alpha(\text{K})_{\text{exp}}=0.014$ 2, K/(L+M)=10 2 (1968Et01). I γ : others: 1.46 11 (1982Gr07), 1.78 24 (1973Br32).
291.61	1096.53	0.087 9					
298.02	1035.13	0.092 10					
328.4	1366.0	0.020 2					
343.4	908.00	0.030 3					
345.80	1952.04	0.030 3					
354.32	1952.04	0.20 2					

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^{83}Sr ϵ Decay 2000Sh49 (continued) $\gamma(^{83}\text{Rb})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S g}$	Mult. ‡	$\delta^{\ddagger f}$	α	Comments
365.5	1102.90	0.025 3				
371.9	1614.8	0.020 2				
381.17 ^{b c} 3	804.77	6.7 ^b 7	M1+E2	>2.9	0.00790 22	$\alpha(K)\text{exp}=0.0071$ 3, $K/(L+M)=7.4$ for 381.2 and 381.5-keV doublet transitions (1968Et01). I γ : other: 8.3 8 (1982Po04).
381.53 ^{b c} 3	423.613	52.3 ^b 20	E2		0.00806	$\alpha(K)\text{exp}=0.0071$ 3, $K/(L+M)=7.4$ for 381.2 and 381.5-keV doublet transitions (1968Et01). I γ : other: 46.9 16 (1982Po04).
384.18	389.40	0.19 2				
389.37 ^d 10	389.40	5.6 3	E2 (+M1)	4.3 25	0.0074 6	$\alpha(K)\text{exp}=0.0065$ 5, $K/(L+M)=8$ 2 (1968Et01). I γ : others: 5.52 20 (1982Gr07), 5.2 4 (1973Br32).
394.47	2089.90	0.026 3				
395.62	1597.68	0.21 2				
418.37 ^c 3	423.613	15.7 5	E1		1.64×10^{-3}	$\alpha(K)\text{exp}=0.0014$ 2 (1968Et01). I γ : others: 14.7 5 (1982Po04), 15.4 4 (1982Gr07), 16.9 12 (1973Br32).
423.63 ^c 3	423.613	5.4 2	E1		1.58×10^{-3}	$\alpha(K)\text{exp}=0.0016$ 4 (1968Et01). I γ : others: 5.3 2 (1982Po04), 5.41 12 (1982Gr07), 5.25 38 (1973Br32).
438.16 ^d 10	1242.93	2.90 15	M1 (+E2)	<0.40	0.00337 15	$\alpha(K)\text{exp}=0.0027$ 4 (1968Et01). I γ : others: 2.85 11 (1982Gr07), 3.02 21 (1973Br32). Mult., δ : D+Q from $\gamma\gamma(\theta)$ with $A_2=+0.35$ 6, $A_4=+0.08$ 11 for 438 γ -762 γ cascade (1973Br32). Mult., δ : other: from $\gamma\gamma(\theta)$ in 1973Br32, $0.03\leq \delta\leq 0.37$.
440.85	908.00	0.042 4				
445.69	1010.34	0.058 6				
461.82	466.7	0.072 7				
470.69	1035.13	0.026 3				
484.5	908.00	0.020 2				
493.45	1695.45	0.15 2				
494.1	2189.73	0.050 5				
506.4	1749.33	0.26 3				
518.5	908.00	0.11 1				
537.12	2134.86	0.034 4				
547.3	1749.33	0.030 3				
555.63	1798.57	0.027 3				
559.35 ^d 10	564.57	0.73 3				I γ : others: 0.74 3 (1982Gr07), 0.64 9 (1973Br32).
561.22	1366.0	0.073 8				
564.45 ^d 20	564.57	0.29 3				I γ : others: 0.32 6 (1982Gr07), 0.40 9 for multiply placed transition, also placed as depopulating a 1808-keV level (1973Br32).
568.00	1035.13	0.013 2				
577.18	1952.04	0.030 3				
599.12	1695.45	0.018 2				
611.4	1035.13	0.020 2				
630.9 ^d 3	1424.7	0.087 9				E γ ,I γ : 1982Gr07 observe E γ =630.9 3 with I γ =0.10 2, while 1973Br32 place a 630.8 6 transition with I γ =0.12 4 as depopulating a 1054-keV level.

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^{83}Sr ϵ Decay 2000Sh49 (continued) $\gamma(^{83}\text{Rb})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S g}$	Mult. ‡	$\delta^{\ddagger f}$	α	Comments
637.39	1202.07	0.057 6				I γ : others: 0.13 4 (1982Gr07), 0.18 5 for multiply placed transition, also placed as tentatively depopulating the 737-keV level (1973Br32).
639.13	1649.4	0.051 5				E γ ,I γ : 1982Gr07 observe E γ =645.8 2 with I γ =0.160 15, while 1973Br32 place a 645.5 4 transition with I γ =0.27 6 as depopulating the 1749-keV level.
645.8 ^d 2	1035.13	0.18 2				
652.81 ^d 10	1749.33	0.28 3				E γ ,I γ : 1982Gr07 observe E γ =652.8 with I γ =0.25 3, while 1973Br32 place a 652.5 4 transition with I γ =0.33 8 as depopulating the 1695-keV level.
657.68	1695.45	0.32 4				E γ ,I γ : likely corresponds to E γ =657.73 15 with I γ =0.29 5 observed in 1982Gr07.
659.53	1083.21	0.81 6				E γ ,I γ : likely corresponds to E γ =659.6 4 with I γ =0.80 6 observed in 1982Gr07. 1973Br32 observe a 659.1 3 transition with I γ =1.21 14 which they multiply place from 760-, 1083-, and 1695-keV levels.
673.04	1096.53	0.074 8				E γ ,I γ : 1982Gr07 observe E γ =674.0 3 with I γ =0.23 2, while 1973Br32 place a E γ =673.9 4 transition with I γ =0.23 3 as depopulating the 1916-keV level.
674.41	1952.04	0.16 2				
678.31	1242.93	0.154 17				I γ : others: 0.164 17 (1982Gr07), 0.18 2 (1973Br32).
^x 682.9 ^e 4		0.07 ^e 6				E γ ,I γ : 1982Gr07 observe E γ =709.1 4 with I γ =0.050 8, while 1973Br32 place a E γ =710.6 6 transition with I γ =0.09 2 as depopulating the 1749-keV level.
695.06	737.16	0.019 2	[E1]		4.88 $\times 10^{-4}$	
709.1 ^d 4	1952.04	0.054 5				
713.00	1277.5	0.023 2				I γ : others: 0.340 15 (1982Gr07), 0.33 3 (1973Br32).
715.34 ^d 10	1798.57	0.337 20				
722.28	821.62	0.044 4				E γ ,I γ : 1982Gr07 observe E γ =722.7 5 with I γ =0.053 15, while 1973Br32 place a 722.4 6 transition with I γ =0.05 2 as depopulating a 1808-keV level.
723.72	2089.90	0.016 2				I γ : others: 0.278 11 (1982Gr07), 0.27 3 (1973Br32).
731.95 ^d 10	737.16	0.30 3	[E2]		1.16 $\times 10^{-3}$	
737.13 ^d 10	737.16	0.87 3				I γ : others: 0.850 25 (1982Gr07), 0.71 5 (1973Br32).
737.3	1202.07	0.020 2				1.08 $\times 10^{-3}$
749.96	1952.04	0.14 2				
751.71	793.8	0.19 2	[E2]			
^x 753.3 ^e 4		0.30 ^e 10				
754.56	853.98	0.10 1				1.03 $\times 10^{-3}$ 2
^x 759.1 ^e 4		1.38 ^e 25				
762.65 ^c 10	804.77	100 5	E2 (+M1)	≥ 2.0		$\alpha(K)\text{exp}=0.00095 5$ (1968Et01). δ : other: $1.6 \leq \delta \leq 16$ from $\gamma\gamma(\theta)$ in 1973Br32.
764.82	2189.73	0.22 2				
768.90	2134.86	0.026 3				

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^{83}Sr ϵ Decay 2000Sh49 (continued) $\gamma(^{83}\text{Rb})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S g}$	Mult. ‡	$\delta^{\ddagger f}$	α	Comments
775.77	1242.93	0.021 2				
778.44 ^d 10	1202.07	6.6 3	M1, E2		0.00093 6	$\alpha(K)\text{exp}=0.00096$ 20 (1968Et01). I γ : others: 6.62 25 (1982Gr07), 6.5 5 (1973Br32).
792.97	1597.68	0.12 2				E γ , I γ : likely corresponds to E γ =793.4 4 with I γ =0.14 2 observed in 1982Gr07.
795.34	1649.4	0.076 8				
804.65 ^d 15	804.77	0.31 3	[E1]		3.57×10^{-4}	I γ : others: 0.284 14 (1982Gr07), 0.24 4 (1973Br32).
808.7 ^d 3	908.00	0.17 2				E γ , I γ : 1982Gr07 observe E γ =808.7 3 with I γ =0.136 10, 808.5 8 transition with I γ =0.08 4 unplaced by 1973Br32.
812.32	2089.90	0.021 2				
816.34	821.62	0.17 2				
819.29 ^d 10	1242.93	2.8 1	M1, E2		0.00082 5	$\alpha(K)\text{exp}=0.0011$ 4 (1968Et01). I γ : others: 2.80 7 (1982Gr07), 2.80 16 (1973Br32).
821.59	821.62	0.023 2				
827.81	1649.4	0.015 2				
^x 831 ^e 1		0.02 ^e 2				
^x 838 ^e 1		0.03 ^e 3				
838.78	2134.86	0.018 2				E γ , I γ : 1973Br32 tentatively place a 838 1 transition with I γ =0.03 3 as depopulating the 1598-keV level.
846.87 ^a	2089.90	0.19 ^a 2				
848.66 ^a	853.98	0.59 ^a 6				
853.42 ^{&}	1242.93	0.20 ^{&} 2	[E1]		3.16×10^{-4}	
853.98 ^{&}	853.98	0.27 ^{&} 3				
868.6 ^d 4	1952.04	0.063 6				I γ : others: 0.049 15 (1982Gr07), 0.09 2 (1973Br32).
877.63	1614.8	0.082 8				E γ , I γ : 1973Br32 place a 879.1 4 transition with I γ =0.12 2 as depopulating the 1916-keV level.
887.90	1277.5	0.050 5				E γ , I γ : 888.1 9 transition with I γ =0.07 4 unplaced by 1973Br32.
890.8 ^d 3	1695.45	0.45 5				I γ : others: 0.46 5 (1982Gr07), 0.56 6 for multiply placed transition, also placed as depopulating the level at 2135 keV (1973Br32).
892.96	2095.0	0.048 5				
902.64	908.00	0.18 2				E γ , I γ : 1982Gr07 observe E γ =902.95 30 with I γ =0.24 13, while 1973Br32 place a 903.2 4 transition with I γ =0.21 2 as depopulating a 2147-keV level.
906.55 [@]	1296.07	0.30 [@] 3				
907.6 [@]	1374.6	0.021 [@] 2				
907.94 [@]	908.00	0.72 [@] 7				
916.91 10	1952.04	0.47 5				E γ , I γ : 1982Gr07 observe E γ =916.91 4 with I γ =0.441 13, while 1973Br32 place a 916.9 3 transition with I γ =0.43 4 as depopulating a 2020-keV level.
^x 930.0 ^d 2		0.166 ^d 12				
935.8 ^d 4	1035.13	0.052 5				E γ , I γ : 1982Gr07 observe E γ =935.8 4 with I γ =0.095 20, while 1973Br32 place a 935.4 4 transition with I γ =0.15 3 as depopulating a 2178-keV level.
941.94	1952.04	0.031 3				

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⁸³Sr ε Decay 2000Sh49 (continued)

^γ(⁸³Rb) (continued)

E ^{γ†}	E(level)	I ^{γ§}	Mult.‡	δ‡f	α	Comments
944.56 ^d 10	1749.33	0.44 4				I ^γ : others: 0.460 15 (1982Gr07), 0.49 4 (1973Br32), for a multiply placed transition, also placed as depopulating 1044- and 2147-keV levels.
987.60	2189.73	0.032 3				
993.22	2089.90	0.17 2				
993.78	1798.57	1.2 2	M1+E2	3.4 22	5.42×10 ⁻⁴ 12	I ^γ : others: <2.04 (1982Gr07) and <2.08 (1973Br32) for doublet transition, also placed from the 1038-keV level. Mult.: D+Q from A ₂ =+0.35 4, A ₄ =-0.08 7 for 994 ^γ -762 ^γ cascade (1973Br32); Δπ=no from level scheme. δ: from ^{γγ} (θ) in 1973Br32, 1.2 ≤ δ ≤ 5.6.
995.55	1037.68	0.54 5				I ^γ : others: <2.04 (1982Gr07) and <2.08 (1973Br32) for doublet transition, also placed from the 1799-keV level.
1005.1 ^d 2	1010.34	0.094 10				E ^γ : 1982Gr07 observe E ^γ =1005.1 2 with I ^γ =0.073 7, while 1973Br32 place a 1005.4 5 transition with I ^γ =0.08 3 as depopulating the 2090-keV level.
1010.35 ^d 20	1010.34	0.13 2				E ^γ ,I ^γ : 1982Gr07 observe E ^γ =1010.35 20 with I ^γ =0.093 7, while 1973Br32 place a 1010.8 4 transition with I ^γ =0.11 3 as depopulating the 1749-keV level.
1019.45 ^d 15	2057.14	0.18 2				I ^γ : others: 0.16 3 (1982Gr07), 0.23 3 (1973Br32).
1029.63	1035.13	0.011 1				
1035.04	1035.13	0.13 2				E ^γ ,I ^γ : 1982Gr07 observe E ^γ =1035.4 4 with I ^γ =0.12 2, while 1973Br32 place a 1035.3 4 transition with I ^γ =0.15 4 as depopulating the 2090-keV level.
1038.23	2134.86	0.30 3				E ^γ ,I ^γ : 1982Gr07 observe E ^γ =1038.55 25 with I ^γ =0.29 3, while 1973Br32 place a 1038.8 3 transition with I ^γ =0.20 7 as depopulating a 1044-keV level.
1044.03 ^d 10	1952.04	1.17 10				E ^γ ,I ^γ : 1982Gr07 observe E ^γ =1044.0 with I ^γ =1.16 4, while 1973Br32 multiply place a 1044.3 3 transition with I ^γ =1.20 16 as depopulating 1044-, 1085.5, and 2147-keV levels.
1050.24	1614.8	0.32 4				E ^γ ,I ^γ : 1982Gr07 observe E ^γ =1050.6 3 with I ^γ =0.375 15, while 1973Br32 place a 1050.7 4 transition with I ^γ =0.35 5 as depopulating the 2135-keV level.
1054.45 ^d 10	1096.53	0.72 4				E ^γ ,I ^γ : 1982Gr07 observe E ^γ =1054.45 with I ^γ =0.68 2, while 1973Br32 place a 1054.7 3 transition with I ^γ =0.72 7 as depopulating a 1054-keV level.
^x 1078.8 ^e 14		0.02 ^e 2				
1084.76	1649.4	0.040 4				

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^{83}Sr ϵ Decay 2000Sh49 (continued) $\gamma(^{83}\text{Rb})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S g}$	Mult. ‡	$\delta^{\ddagger f}$	α	Comments
1086.67	2189.73	0.098 10	[E1]		1.97×10^{-4}	$E\gamma, I\gamma$: 1982Gr07 observe $E\gamma=1086.3$ 3 with $I\gamma=0.116$ 18, while 1973Br32 place a 1086.5 4 transition with $I\gamma=0.13$ 2 as depopulating a 1085.5-keV level.
1098.05 ^d 10	1952.04	0.87 3				$E\gamma, I\gamma$: 1982Gr07 observe $E\gamma=1098.1$ with $I\gamma=0.86$ 3, while 1973Br32 place a 1098.4 3 transition with $I\gamma=0.89$ 6 as depopulating the 1103-keV level.
1102.9 ^d 2	1102.90	0.11 2	E2		4.29×10^{-4}	$I\gamma$: others: 0.096 7 (1982Gr07), 0.09 2 for multiply placed transition, also placed as tentatively depopulating a level at 2147 keV (1973Br32). Mult.: from the Adopted Levels.
^x 1125.6 ^d 3		0.055 ^d 8				
1130.41 ^d 15	1952.04	0.14 1				$E\gamma$: 1982Gr07 observe $E\gamma=1130.41$ 15 with $I\gamma=0.133$ 8, while 1973Br32 place a 1130.7 4 transition with $I\gamma=0.13$ 3 as depopulating a 1695-keV level.
1147.33 ^d 10	1952.04	4.28 11	M1+E2	4.7 24	3.95×10^{-4}	$I\gamma$: others: 4.28 11 (1982Gr07), 4.13 22 (1973Br32). δ : from $\gamma\gamma(0)$ in 1973Br32, $2.3 \leq \delta \leq 7.0$. Mult.: D+Q from $A_2=+0.203$ 11, $A_4=+0.103$ 24 for 1147 γ -762 γ cascade (1973Br32); $\Delta\pi$ =no from level scheme.
1151.97	2189.73	0.017 2				
1159.97 ^d 10	1202.07	5.1 2				$I\gamma$: others: 4.94 15 (1982Gr07), 5.14 26 (1973Br32).
1174.08 ^d 15	1597.68	0.17 2				$I\gamma$: others: 0.135 7 (1982Gr07), 0.19 2 (1973Br32).
^x 1178.6 ^d 4		0.032 ^d 8				
1184.54	1749.33	0.018 2				
1191.10	1614.8	0.014 2				
1200.75	1242.93	0.14 2	[E2]		3.64×10^{-4}	
1201.94	1202.07	0.42 4				$I\gamma$: others: 0.529 16 (1982Gr07), 0.57 4 (1973Br32).
1208.17	1597.68	0.062 7				$I\gamma$: others: 0.068 7 (1982Gr07), 0.02 1 (1973Br32).
1214.88 ^d 15	1952.04	0.85 5	[E1]		2.15×10^{-4}	$I\gamma$: others: 0.80 3 (1982Gr07), 0.76 4 for multiply placed transition, also placed as depopulating a level at 2020 keV (1973Br32).
1231.85	2036.5	0.0080 8				
1233.94	1798.57	0.067 7				$I\gamma$: others: 0.125 20 (1982Gr07), 0.09 2 (1973Br32).
1237.72 ^d 15	1242.93	0.76 3	[E1]		2.24×10^{-4}	$I\gamma$: others: 0.70 3 (1982Gr07), 0.75 5 (1973Br32).
1242.87 ^d 15	1242.93	0.270 15	[E1]		2.27×10^{-4}	$I\gamma$: others: 0.241 10 (1982Gr07), 0.26 2 (1973Br32).
1252.45 ^d 20	2057.14	0.049 7				$I\gamma$: others: 0.048 7 (1982Gr07), 0.05 2 (1973Br32).
1271.81	1695.45	0.23 3				$I\gamma$: others: 0.22 3 (1982Gr07), 0.27 2 (1973Br32).
1272.39	1277.5	0.061 6				
1275.34	1374.6	0.029 3				

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^{83}Sr ϵ Decay 2000Sh49 (continued) $\gamma(^{83}\text{Rb})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S g}$	Mult. ‡	α	Comments
1277.49	1277.5	0.133 15			$E\gamma, I\gamma$: 1982Gr07 observe $E\gamma=1277.8$ 4 with $I\gamma=0.095$ 15, 1277.8 4 transition with $I\gamma=0.15$ 2 unplaced by 1973Br32.
1285.02	2089.90	0.30 3			$E\gamma, I\gamma$: likely corresponds to $E\gamma=1285.11$ 15 with $I\gamma=0.261$ 14 observed in 1982Gr07.
1290.23	2095.0	0.016 2			
1296.06 10	1296.07	0.457 20			$E\gamma, I\gamma$: 1982Gr07 observe $E\gamma=1296.1$ with $I\gamma=0.435$ 14, while 1973Br32 place a 1296.5 3 transition with $I\gamma=0.46$ 4 as depopulating the 2056-keV level.
1319.84	2057.14	0.013 2			
1323.78 [#]	1366.0	0.48 [#] 5			
1325.62 [#]	1749.33	0.256 [#] 25			
1330.03	2134.86	0.026 3			$E\gamma, I\gamma$: 1973Br32 place a 1331.6 8 transition with $I\gamma=0.05$ 3 as depopulating the 2090-keV level.
1352.46	2089.90	0.034 4			
1374.97 ^d 15	1798.57	0.180 20			$I\gamma$: others: 0.154 7 (1982Gr07), 0.21 3 (1973Br32).
1382.73	1424.7	0.13 2			$E\gamma, I\gamma$: 1982Gr07 observe a doublet $E\gamma=1382.6$ 6 and $E\gamma=1384.9$ with combined $I\gamma=0.512$ 20, $E\gamma=1382.6$ 6 with $I\gamma=0.16$ 4 unplaced by 1973Br32.
1384.83	2189.73	0.34 4			$E\gamma, I\gamma$: 1982Gr07 observe a doublet $E\gamma=1382.6$ 6 and $E\gamma=1384.9$ with combined $I\gamma=0.512$ 20, while 1973Br32 place a 1385.4 4 transition with $I\gamma=0.35$ 7 as depopulating a 1808-keV level.
1387.38	1952.04	0.085 9			
1395.96	2189.73	0.031 3	[E2]	3.10×10^{-4}	$E\gamma, I\gamma$: 1982Gr07 observe a single 1396.7 8 transition with $I\gamma=0.061$ 8 which could correspond to the closely spaced 1396.0- and 1397.6- keV transitions observed by 2000Sh49.
1397.56	2134.86	0.041 4			$E\gamma, I\gamma$: 1982Gr07 observe a single 1396.7 8 transition with $I\gamma=0.061$ 8 which could correspond to the closely spaced 1396.0- and 1397.6- keV transitions observed by 2000Sh49.
$\times 1440.9^d$ 3		0.095 ^d 7			
1452.50	2189.73	0.027 7	[E1]	3.29×10^{-4}	$E\gamma, I\gamma$: likely corresponds to $E\gamma=1452.5$ 4 with $I\gamma=0.027$ 7 observed in 1982Gr07.
1492.78	1916.41	0.065 7			$E\gamma, I\gamma$: 1982Gr07 observe $E\gamma=1492.1$ 3 with $I\gamma=0.053$ 7.
1506.91	1606.2	0.022 2			
1525.22	2089.90	0.0050 5			
1528.33 ^d 15	1952.04	0.330 15			$I\gamma$: others: 0.308 13 (1982Gr07), 0.32 3 (1973Br32).
1562.51 ^d 15	1952.04	6.0 2	[E1]	4.02×10^{-4}	$I\gamma$: others: 5.88 14 (1982Gr07), 6.6 4 (1973Br32).
1572.70	1614.8	0.043 4			
1592.31	1597.68	0.039 6			$I\gamma$: others: 0.046 6 (1982Gr07), 0.08 2 (1973Br32).
1597.64 ^d 15	1597.68	0.111 8			$I\gamma$: others: 0.107 8 (1982Gr07), 0.12 3 (1973Br32).
1600.97	1606.2	0.20 2			
1606.07	1606.2	0.0080 10			$E\gamma, I\gamma$: 1606.0 7 transition with $I\gamma=0.03$ 2 unplaced by 1973Br32.
1612.70	2036.5	0.034 4			$E\gamma, I\gamma$: 1973Br32 place a 1612.7 5 transition with $I\gamma=0.05$ 2 as depopulating a 2178-keV level.
$\times 1624.7^e$ 8		0.03 ^e 2			
1647.21	2036.5	0.080 8			
1649.40	1649.4	0.086 10			$E\gamma, I\gamma$: 1982Gr07 observe $E\gamma=1649.5$ 5 with $I\gamma=0.120$ 10, while 1973Br32 place a 1648.8 5 transition with $I\gamma=0.07$ 1 as depopulating the 1749-keV level.
1653.31 ^d 15	1695.45	0.253 10			$I\gamma$: others: 0.225 10 (1982Gr07), 0.27 3 (1973Br32).
1666.20 ^d 15	2089.90	0.28 2			$I\gamma$: others: 0.260 8 (1982Gr07), 0.27 3 for multiply placed transition, also placed as tentatively depopulating the level at 2056 keV (1973Br32).
1707.15	1749.33	0.077 6			$I\gamma$: others: 0.077 6 (1982Gr07), 0.10 2 (1973Br32).
1711.15 ^d 20	2134.86	0.111 10			$I\gamma$: others: 0.100 7 (1982Gr07), 0.13 2 (1973Br32).
1749.25 ^d 25	1749.33	0.091 10			$I\gamma$: others: 0.077 6 (1982Gr07), 0.09 2 (1973Br32).
1756.5 ^d 2	1798.57	0.075 6	[E2]	3.58×10^{-4}	$I\gamma$: others: 0.066 6 (1982Gr07), 0.08 2 (1973Br32).

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^{83}Sr ϵ Decay 2000Sh49 (continued) $\gamma(^{83}\text{Rb})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\S}$	Mult. ‡	α	Comments
1765.84	2189.73	0.059 6	[E2]	3.60×10^{-4}	$E\gamma, I\gamma$: 1982Gr07 observe $E\gamma=1765.7$ 4 with $I\gamma=0.050$ 6, while 1973Br32 place a 1765.2 5 transition with $I\gamma=0.08$ 3 as depopulating a 1808-keV level.
$^{*}1777.9^{\text{d}}$ 3		0.077 ^d 8			
1793.23	1798.57	0.038 6	[E1]	5.58×10^{-4}	$E\gamma, I\gamma$: 1982Gr07 observe $E\gamma=1793.25$ 25 with $I\gamma=0.042$ 6.
1798.55 ^d 15	1798.57	0.101 9	[E1]	5.62×10^{-4}	$I\gamma$: others: 0.091 7 (1982Gr07), 0.14 4 (1973Br32).
$^{*}1873.74^{\text{d}}$ 15		0.094 ^d 7			
1911.15 ^d 20	1916.41	0.112 10			$I\gamma$: others: 0.100 6 (1982Gr07), 0.14 2 (1973Br32).
1916.4	1916.41	0.010 1			
1946.66	1952.04	0.065 6	[E1]	6.61×10^{-4}	$I\gamma$: others: 0.24 4 (1982Gr07), 0.19 2 (1973Br32).
1952.06 ^d 15	1952.04	2.70 10	[E1]	6.65×10^{-4}	$I\gamma$: others: 2.58 7 (1982Gr07), 2.90 16 (1973Br32).
2014.98 ^d 15	2057.14	0.143 10			$E\gamma, I\gamma$: 1982Gr07 observe $E\gamma=2015.0$ with $I\gamma=0.153$ 10, while 1973Br32 place a 2015.0 4 transition with $I\gamma=0.15$ 2 as depopulating a 2020-keV level.
2030.99	2036.5	0.0120 12			
2047.81 ^d 15	2089.90	0.320 10			$I\gamma$: others: 0.316 10 (1982Gr07), 0.36 3 for multiply placed transition, also placed as tentatively depopulating a level at 2147 keV (1973Br32).
2052.93	2095.0	0.028 6			$E\gamma, I\gamma$: likely corresponds to $E\gamma=2053.4$ 3 with $I\gamma=0.022$ 6 observed in 1982Gr07.
2089.94 ^d 15	2089.90	0.400 20			$I\gamma$: others: 0.405 20 (1982Gr07), 0.47 3 (1973Br32).
2092.46	2134.86	0.0050 5			
2134.89 15	2134.86	0.093 7			$I\gamma$: others: 0.090 7 (1982Gr07), 0.10 2 (1973Br32).
2147.64 ^d 15	2189.73	0.56 4			$E\gamma, I\gamma$: 1982Gr07 observe $E\gamma=2147.64$ with $I\gamma=0.570$ 17, while 1973Br32 place a 2147.6 4 transition with $I\gamma=0.62$ 4 as depopulating a 2147-keV level.

† From 2000Sh49, except where noted. 2000Sh49 give no indication of uncertainty on γ -ray energies.

‡ From $\alpha(K)\text{exp}$ and ce ratios, except where noted.

§ From 2000Sh49, except where noted. 2000Sh49 quote $I(\gamma+\text{ce})$ values, however, as the experimental setup only measured γ -rays, and for many transitions, the multipolarity is unknown, the evaluator assumes that values correspond to $I\gamma$ values. A few exceptions for the low energy transitions are noted in the comments. 2000Sh49 provide no information on $\Delta I\gamma$. In cases where $I\gamma$ is consistent with the measurements of 1982Gr07, the uncertainty is taken from 1982Gr07. For all other transitions, an $\approx 10\%$ uncertainty is added by the evaluator.

A single transition with $E\gamma=1324.45$ 20, $I\gamma=0.68$ 3 and $E\gamma=1324.6$ 4, $I\gamma=0.85$ 9 is observed by 1982Gr07 and 1973Br32, respectively, and placed from the 1749-keV level by 1973Br32. 2000Sh49 observe a closely spaced doublet of $E\gamma=1323.8$, $I\gamma=0.478$ from the 1366-keV level and $E\gamma=1325.62$, $I\gamma=0.258$ from the 1749-keV level. The sum of the two intensities from 2000Sh49 is in good agreement with the intensities of the single transitions measured in 1982Gr07, 1973Br32, suggesting the possibility of doublet transitions in those works.

@ A single transition with $E\gamma=907.7$, $I\gamma=1.01$ 4 and $E\gamma=907.8$ 3, $I\gamma=1.10$ 8 is observed by 1982Gr07 and 1973Br32, respectively, and placed from the 1952-keV level by 1973Br32. 2000Sh49 observe a closely spaced triplet of $E\gamma=907.94$, $I\gamma=0.722$ from the 908-keV level, $E\gamma=907.6$, $I\gamma=0.021$ from the 1375-keV level, and $E\gamma=906.6$, $I\gamma=0.30$ from the 1296-keV level. The sum of the intensities from 2000Sh49 is in good agreement with the intensities of the single transitions measured in 1982Gr07, 1973Br32, suggesting the possibility of triplet transitions in those works.

& A single transition with $E\gamma=853.8$, $I\gamma=0.431$ 15 and $E\gamma=853.8$ 3, $I\gamma=0.45$ 5 is observed by 1982Gr07 and 1973Br32, respectively, and multiply placed from the 1243- and 2057-keV levels by 1973Br32. 2000Sh49 observe a closely spaced doublet of $E\gamma=854.0$, $I\gamma=0.27$ from the 854-keV level and $E\gamma=853.4$, $I\gamma=0.20$ from the 1243-keV level. The sum of the two intensities from 2000Sh49 is in good agreement with the intensities of the single transitions measured in 1982Gr07, 1973Br32, suggesting the possibility of doublet transitions in those works.

^a A single transition with $E\gamma=848.4$, $I\gamma=0.765$ 20 and $E\gamma=848.4$ 3, $I\gamma=0.72$ 7 is observed by 1982Gr07 and 1973Br32, respectively, and placed from the 1952-keV level by 1973Br32. 2000Sh49 observe a closely spaced doublet of $E\gamma=846.9$, $I\gamma=0.19$ from the 2090-keV level and $E\gamma=848.7$, $I\gamma=0.59$ from the 854-keV level. The sum of the two intensities from 2000Sh49 is in good agreement with the intensities of the single transitions measured in 1982Gr07, 1973Br32, suggesting the possibility of doublet transitions in those works.

^b A single transition with $E\gamma=381.5$, $I\gamma=58.2$ 13 and $E\gamma=381.6$ 3, $I\gamma=66$ 3 is observed by 1982Gr07 and 1973Br32, respectively, and placed from the 424-keV level by 1973Br32. 2000Sh49 observe a closely spaced doublet of $E\gamma=381.09$, $I\gamma=6.7$ from the 805-keV level and $E\gamma=381.52$, $I\gamma=53$ from the 424-keV level. The sum of the two intensities from 2000Sh49 is in good agreement with the intensities of the single transitions measured in 1982Gr07, 1973Br32, suggesting the possibility of doublet transitions in those works.

^c From 1982Po04.

^d From 1982Gr07. Authors provide a general statement that $\Delta E\gamma \leq 0.1$ keV for $E\gamma$ below 1500 keV and ≤ 0.15 keV for higher energies, for cases where no uncertainty is given.

^e From 1973Br32. Not observed in the subsequent works of 1982Gr07 or 2000Sh49. Assignment to ^{83}Sr ϵ decay is questionable.

Footnotes continued on next page

 ^{83}Sr ϵ Decay 2000Sh49 (continued)

 $\gamma(^{83}\text{Rb})$ (continued)

^f If no value given it was assumed $\delta=1.00$ for E2/M1, $\delta=1.00$ for E3/M2 and $\delta=0.10$ for the other multipolarities.

^g For absolute intensity per 100 decays, multiply by 0.267 *IS*.

^x γ ray not placed in level scheme.

Decay Scheme

7/2+ 0.0 32.41 h

$^{88}_{38}\text{Sr}_{45}$

%ε+%β+=100

$Q^+=22736$

^{83}Sr ϵ Decay 2000Sh49 (continued)

Decay Scheme (continued)

 Intensities: I(γ +ce) per 100 parent decays

$^{83}\text{Sr}_{45}$ 32.41 h
 $7/2+$ 0.0
 $Q^+=2273^6$
 $\% \epsilon + \% \beta^+ = 100$

^{83}Sr ϵ Decay 2000Sh49 (continued)

Decay Scheme (continued)

 Intensities: I(γ +ce) per 100 parent decays

$^{83}_{38}\text{Sr}_{45}$ 32.41 h
 $7/2+$ 0.0
 $Q^+=2273^6$
 $\% \epsilon + \% \beta^+ = 100$

Decay Scheme (continued)

Intensities: I(γ +ce) per 100 parent decays

Energy level diagram for $^{83}\text{Rb}_{46}$ showing various nuclear states and transitions. The diagram includes energy levels in keV, half-lives in seconds (s), milliseconds (ms), microseconds (μs), and minutes (min), and decay modes (α , β^+ , β^- , γ).

State	Energy (keV)	Half-life	Decay Mode
$9/2^+$	2189.73		
$(5/2^+, 7/2)$	2134.86		
$(5/2^+, 7/2^+)$	2089.90		
$(5/2, 7/2^-)$	2036.5		
$(5/2, 7/2^-)$	1916.41		
$(5/2)^+$	1798.57		
$(5/2^+, 7/2)$	1749.33		
$(7/2, 9/2)^+$	1695.45		
$(3/2^-, 5/2, 7/2^-)$	1649.4		
$(5/2, 7/2^-)$	1597.68		
$(7/2^+, 9/2)$	1374.6		
$(5/2, 7/2^-)$	1296.07		
$(3/2^-, 5/2, 7/2^-)$	1277.5		
$(5/2)^+$	1242.93		
$(5/2, 7/2, 9/2)^+$	1202.07		
$9/2^-$	1102.90		
$(7/2^+, 9/2^+)$	1096.53		
$11/2^+$	1083.21		
$(3/2, 5/2, 7/2^-)$	908.00		
$(7/2)^+$	804.77		
$13/2^+$	793.8		
$7/2^-$	737.16		
$(3/2^-, 5/2, 7/2^-)$	564.57		
$5/2^+$	466.7		
$3/2^-$	423.613		
$3/2^-$	389.40		
$3/2^-$	99.35		
$9/2^+$	42.0780		
$3/2^-$	5.2357		
$5/2^-$	0.0		

^{83}Sr ϵ Decay 2000Sh49 (continued)

Decay Scheme (continued)

 Intensities: I(γ +ce) per 100 parent decays

$^{83}_{38}\text{Sr}_{45}$ 32.41 h
 $7/2+$ 0.0
 $Q^+=2273^6$
 $\% \epsilon + \% \beta^+ = 100$

^{83}Sr ϵ Decay 2000Sh49 (continued)

Decay Scheme (continued)

 Intensities: I(γ +ce) per 100 parent decays

$^{83}_{38}\text{Sr}_{45}$ 7/2+ 0.0 32.41 h
 $\% \epsilon + \% \beta^+ = 100$
 $Q^+ = 2273^6$

$^{68}\text{Zn}(^{18}\text{O}, \text{p}2\text{n}\gamma)$ 1999Do13E=56 MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, $\gamma\gamma(0)(\text{DCO})$ using Pitt-FSU array consisting of eight Compton-suppressed HPGe detectors. ^{83}Rb Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	Comments
0.0	5/2-	
42.1 §	9/2+	
794.00 $^\#$ 10	13/2+	
1037.71 10	11/2+	
1890.02 $^\#$ 14	17/2+	
1943.31 16	15/2+	
2318.3 3	(17/2+)	
2860.21 $^\#$ 17	21/2+	
3196.9 5	19/2-	$J\pi$: assigned as (19/2) in 1999Do13.
3330.69 23	21/2+	
3727.62 19	23/2+	
3992.93 $^\#$ 21	25/2+	
4164.3 4	23/2-	$J\pi$: assigned as $J\pi=(23/2+)$ in 1999Do13.
4436.2 4	25/2+	
4461.1 4	(25/2+)	
4963.3 3	(27/2+)	
5216.9 5	(27/2+)	
5316.1 $^\#$ 4	29/2+	
5668.2 5	(29/2+)	
6669.1 9		$J\pi$: assigned as (31/2+) in 1999Do13.
6913.1 $^\#$ 9	(33/2+)	
8834.1 $^\#$ 22	(37/2+)	

 † From a least-squares fit to $E\gamma$, by evaluator. ‡ From the Adopted Levels. Differences with assignments proposed by 1999Do13 are noted in the comments. § Energy held fixed in least-squares fit. $^\#$ (A): Yrast sequence. $\gamma(^{83}\text{Rb})$

Expected R(DCO) values when Q transitions are used as gating transitions are 0.5 for stretched dipole transitions, 1.0 for stretched Q transitions, and between 0.3 and 1.9 for mixed $\Delta J=1$ transitions. All values are deduced from gates on the Q 752 γ and Q 1096 γ .

$E\gamma$	$E(\text{level})$	$I\gamma^\dagger$	Mult. ‡	Comments
(42.33 15)	42.1			$E\gamma$: from the Adopted Levels.
244 1	6913.1	<1		
265.3 1	3992.93	4 1	D	Mult.: R(DCO)=0.55 7.
271.8 4	4436.2	≈ 1		
352.7 2	5316.1	2 1		
397.0 2	3727.62	2 1		
428 1	2318.3	2 1		
451.3 3	5668.2	2 1		
470.7 3	3330.69	2 1		
502.5 6	4963.3	2 1		
708.6 3	4436.2	8 1	D	Mult.: R(DCO)=0.45 6.
733.5 3	4461.1	3 1	D	Mult.: R(DCO)=0.48 11.
751.9 1	794.00	100 5	Q	Mult.: R(DCO)=1.04 6.
780.7 3	5216.9	3 1		
867.4 1	3727.62	18 2	D	Mult.: R(DCO)=0.61 6.
879 § 1	3196.9	2 1		
905.6 2	1943.31	5 2		
970.2 1	2860.21	50 5	Q	Mult.: R(DCO)=0.94 5 for 970.2+970.3.
970.3 3	4963.3	6 3		Mult.: R(DCO)=0.94 5 for 970.2+970.3.
995.6 1	1037.71	20 4		
1096.0 1	1890.02	63 4	Q	Mult.: R(DCO)=0.91 6.
1132.7 2	3992.93	16 2	Q	Mult.: R(DCO)=0.97 9.
1149.3 2	1943.31	13 2	D	Mult.: R(DCO)=0.54 6.
1232 1	5668.2	2 1		
1303.9 5	4164.3	≈ 1		

Continued on next page (footnotes at end of table)

⁶⁸Zn(¹⁸O,p2n γ) 1999Do13 (continued)

 $\gamma(^{83}\text{Rb})$ (continued)

E γ	E(level)	I $\gamma^{\dagger}$	Mult. ‡	Comments
1306.8 5	3196.9	4 1		
1323.2 4	5316.1	7 1	Q	Mult.: R(DCO)=1.1 2.
1353 $\S$ 1	6669.1	<1		
1440.5 4	3330.69	8 1	(Q)	Mult.: R(DCO)=0.87 14.
1524.4 3	2318.3	6 1		
1597 1	6913.1	4 1		
1706 2	6669.1	2 1		
1921 2	8834.1	$\approx$ 1		

$\dagger$ Relative intensity normalized to I γ (752 γ)=100.

$\ddagger$ From R(DCO) analysis.

$\S$ Placement of transition in the level scheme is uncertain.

⁷⁶Ge(¹¹B,4n γ),⁷⁶Ge(¹⁰B,3n γ) 2009Sc22,2006Ga10,1985Zh09

2009Sc22: ⁷⁶Ge(¹¹B,4n γ), E(¹¹B)=45,50 MeV. Measured E γ , I γ , $\gamma\gamma$, $\gamma\gamma$ (θ)(DCO) using the GASP spectrometer consisting of 40 Compton-suppressed HPGe detectors and an inner ball of 80 BGO elements; deduced T_{1/2} using Doppler Shift Attenuation Method (DSAM) at E(¹¹B)=45 MeV. Earlier preliminary results by same group reported in 2000Sc17, 1998ScZN, and 1998ScZW.

2006Ga10: ⁷⁶Ge(¹¹B,4n γ), E(¹¹B)=50 MeV. Measured E γ , I γ , $\gamma\gamma$, $\gamma\gamma$ (θ)(DCO) using 12 Compton-suppressed HPGe detectors and a 14 element BGO multiplicity filter; deduced T_{1/2} using Doppler Shift Attenuation Method (DSAM).

1985Zh09: ⁷⁶Ge(¹⁰B,3n γ), E(¹⁰B)=30 MeV. Measured E γ , I γ , γ (θ) using a HPGe detector; deduced T_{1/2} using Doppler Shift Attenuation Method (DSAM) and Recoil Distance Doppler Shift (RDDS) method. Subset of results published in 1985ZhZY.

The level schemes of 2009Sc22 and 2006Ga10 are for the most part consistent. The level scheme of 2009Sc22 is more extensive, and as such, is adopted here. Differences between 2009Sc22 and 2006Ga10 are noted. When T_{1/2} measurements overlap, the values of 2009Sc22 and 1985Zh09 are generally consistent, whereas, those from 2006Ga10 are usually considerably smaller. In those cases, weighted averages of 2009Sc22 and 1985Zh09 are adopted, and the values from 2006Ga10 are provided in the comments.

⁸³Rb Levels

E(level) †	J $\pi^{\ddagger}$	T _{1/2} §	Comments
0.0 ^d	5/2-		
5.23 ^c 9	3/2-		
42.20 ^e 13	9/2+		
736.99 ^c 15	7/2-	10.4 ps & 69	
793.77 ^e 15	13/2+	4.2 ps & 7	
805.0 [@] 10	(7/2)+	0.76 ps 14	
1038.16 19	11/2+	0.55 ps 21	
1096.7 [@] 10	(7/2+, 9/2+)	2.1 ps 7	J π : proposed as (9/2+) in 2009Sc22.
1102.66 ^d 15	9/2-	0.83 ps 21	
1587.2 [@] 10	(9/2, 13/2)	1.94 ps 55	
1753.67 ^c 18	11/2-	0.69 ps 14	
1780.7 [@] 10		1.73 ps 55	
1889.36 ^e 17	17/2+	1.05 ps 12	T _{1/2} : weighted average of 1.07 ps 12 (2009Sc22) and 0.97 ps 21 (1985Zh09), both from DSAM. Other: 0.40 ps +14-10 (2006Ga10) also from DSAM.
1942.78 16	15/2+	1.25 ps 42	
2067.4 ^g 3	11/2-		
2073.7 4	13/2-	0.55 ps 14	
2101.79 ^d 17	13/2-	1.18 ps 28	
2206.4 3	(13/2)		J π : proposed as 15/2+ in 2009Sc22 and 2006Ga10.
2313.61 ^g 16	13/2-	0.69 ps 21	
2318.31 22	(17/2+)	1.4 ps 7	T _{1/2} : other: <3.5 ps (2009Sc22) from DSAM, deduced from the effective lifetime without feeding corrections.
2413.84 ^g 16	15/2-	4.2 ns & 21	
2576.55 ^c 23	15/2-	0.62 ps 14	
2595.93 ^g 17	17/2-	70 ps & 35	T _{1/2} : other: 1.5 ps +6-4 from DSAM in 2006Ga10; value not adopted as it leads to a rather large B(M1)=1.9 W.u. for the 182 γ -ray transition.

Continued on next page (footnotes at end of table)

$^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$ 2009Sc22,2006Ga10,1985Zh09 (continued)

 ^{83}Rb Levels (continued)

E(level) [†]	J π [‡]	T _{1/2} [§]	Comments
2699.63 ^c 17	17/2-		E(level): observed only by 2006Ga10, not included in the Adopted Levels.
2733.3? 7	(19/2)+		
2772.49 ^h 23	17/2-		
2859.8 ^e 3	21/2+	1.45 ps 14	
2958.12 ^g 17	19/2-	6.9 ps +69-35	T _{1/2} : weighted average of 1.41 ps 13 (2009Sc22) and 2.0 ps 5 (1985Zh09), both from DSAM. Other: 0.64 ps +26-12 (2006Ga10), also from DSAM. T _{1/2} : other: 0.69 ps 21 from DSAM in 2006Ga10; value is not adopted as it leads to a rather large B(E2)=310 W.u. for the 362 γ -ray transition.
3016.2 5			
3139.3 ^b 6	(19/2)		
3195.17 22	19/2-	<0.90 ps [#] a	J π : other: (19/2) in 2006Ga10.
3329.84 22	21/2+	<0.90 ps [#] a	
3363.20 ^g 19	21/2-	1.9 ps 5	
3440.38 ^h 22	21/2-		
3537.0 4			
3559.51 20	21/2-	0.24 ps +14-10	T _{1/2} : from DSAM in 2006Ga10.
3601.31 ⁱ 22	21/2-	0.28 ps [#] 6	
3726.9 ^e 3	23/2+	0.17 ps 6	T _{1/2} : weighted average of 0.159 ps 28 (2009Sc22) and 0.62 ps 21 (1985Zh09), both from DSAM.
3765.6 3	(21/2+)		J π : proposed as 21/2- in 2009Sc22.
3803.0? 7	(23/2-)		E(level): observed only by 2006Ga10, not included in the Adopted Levels.
3992.3 ^j 3	25/2+	0.67 ps [#] 6	T _{1/2} : other: 0.39 ps +15-11 (2006Ga10).
4084.81 ⁱ 22	23/2-	0.229 ps [#] 21	
4129.7 4			
4134.85 ^g 24	23/2-		
4164.1 3	23/2-		J π : proposed as 23/2+ in 2006Ga10.
4407.1 ^b 8			J π : proposed as (23/2-) in 2006Ga10.
4435.5 ^e 3	25/2+	0.31 ps [#] 10	
4461.2 ^f 4	(25/2+)	0.29 ps [#] 8	
4642.17 ⁱ 23	25/2-	0.270 ps [#] 35	
4686.47 ^h 21	25/2-	0.33 ps [#] 4	
4715.3 4			
4963.6 ^f 3	(27/2+)		
5051.0 7			
5216.3 ^e 3	(27/2+)		
5316.2 ^j 3	29/2+	0.236 ps [#] 35	
5349.6 ^g 3	27/2-		
5422.1 ^b 13	(25/2-)		
5448.3 ⁱ 3	(27/2-)	0.035 ps [#] 14	
5577.4 3			
5667.0 ^f 3	(29/2+)	<0.40 ps	T _{1/2} : from DSAM in 2006Ga10.
5869.3 ^h 3	29/2-	0.39 ps [#] 6	
5970.8 ⁱ 3	29/2-	0.312 ps [#] 35	
6088.1 6			
6250.0 7			
6356.7 ^k 5	(29/2-)		
6423.4 7			
6438.3 ^f 4	(31/2+)		
6470.4 5	(31/2+)		
6557.1 ^g 4	(31/2-)		
6668.9 5			J π : proposed as (31/2)+ in 2009Sc22 and 2006Ga10.
6688.1 ⁱ 4	(31/2-)	0.111 ps [#] 21	
6912.3 8			
6913.2 ^j 5	(33/2+)	0.125 ps [#] 14	
6933.9 ^k 5	(31/2-)		
7068.2 ^h 4	33/2-	0.19 ps [#] 6	
7167.4 ^f 4	(33/2+)		
7372.5 ⁱ 5	(33/2-)	0.062 ps [#] 21	
7447.5 ^k 4	(33/2-)		
7633.3 8			
7906.3 ^k 4	(35/2-)		
8032.8 ^g 5	(35/2-)		
8094.5 ⁱ 6	(35/2-)	0.17 ps [#] 6	
8193.6 ^f 5	(35/2+)		

Continued on next page (footnotes at end of table)

$^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$ 2009Sc22,2006Ga10,1985Zh09 (continued) **^{83}Rb Levels (continued)**

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\S$	Comments
8419.7 ^h 5	37/2-		
8672.1 ⁱ 6	(37/2-)	0.166 ps [#] 28	$T_{1/2}$: from line shape analysis of 576.9 γ , may have small contribution from 577.3 γ (2009Sc22).
8837.6 ^j 8	(37/2+)		
8962.5 ^g 9			
9341.4 ⁱ 6	(39/2-)		
9633.9 ^g 8	(39/2-)		
9910.4 ^h 6	41/2-		
11715.1 ^h 9	(45/2-)		
13926.5 ^h 12	(49/2-)		

[†] From least-squares fit to E_γ , by evaluator. Two E_γ 's (400.3 and 602.2) were omitted from the fit due to energy mismatching by 2-4 keV. Several other γ rays are also poorly fitted; E_γ derived from level energy difference is included in the comments for these transitions.

[‡] From the Adopted Levels. $J\pi$ assignments mainly follow those of 2009Sc22, except that additional parentheses have been added by the evaluator, particularly at high spin. Cases where there are disagreements between the $J\pi$'s in the Adopted Levels and those proposed in 2009Sc22 or 2006Ga10, are indicated in the comments.

[§] From DSAM in 1985Zh09, except where noted.

[#] From DSAM in 2009Sc22. Statistical, side feeding and stopping power uncertainties are included, except where noted.

[@] Observed only by 1985Zh09.

[&] From RDDS method in 1985Zh09.

^a Upper limit deduced from the effective lifetime without feeding corrections.

^b Observed only in 2006Ga10.

^c (A): Band based on 3/2-.

^d (B): Band based on 5/2-.

^e (C): Band based on 9/2+.

^f (D): $\Delta J=1$ band based on (25/2+).

^g (E): Band based on 11/2-. $\Delta J=1$ up to 23/2-, $\Delta J=2$ above this spin.

^h (F): Band based on 17/2-.

ⁱ (G): $\Delta J=1$ band based on 21/2-.

^j (H): Band based on 25/2+.

^k (I): Band based on (29/2-).

 $\gamma(^{83}\text{Rb})$

DCO ratios correspond to 35°/145° and 90° geometry in 2009Sc22 and 144° and 98° geometry in 2006Ga10. For both setups expected values are 1.0 if the gating transition is of a similar character, ≈ 0.5 for a $\Delta J=1$, dipole transition gated on stretched quadrupole, ≈ 2 for a $\Delta J=2$, quadrupole transition if the gate is on a $\Delta J=1$, dipole transition, and 0 to 2 for $\Delta J=1$ D+Q transition depending on the value of the mixing ratio. Gating transitions are specified in the comments.

$E_\gamma^\dagger$	$E(\text{level})$	$I_\gamma^\#$	Mult. [‡]	$\delta^\S$	$I_\gamma^\@$	Comments
(5.23 ^{&} 9)	5.23					
(42.33 ^{&} 15)	42.20					
100.1 ⁱ 1	2413.84	15.2 ⁵	D(+Q)	+0.01 ⁴	11.7 ⁹	Mult.: R(DCO)=1.07 ⁷ gated on D 182 γ /362 γ (2009Sc22), R(DCO)=0.98 ⁷ gated on D 182 γ (2006Ga10).
						δ : from $\delta=+0.02$ ³ or -0.01 ² (2006Ga10).
103.3 ⁱ 1	2699.63	2.4 ¹	D		1.7 ⁴	E_γ : level-energy difference=103.7. Other: 104.2 (2006Ga10).
						Mult.: R(DCO)=2.7 ¹⁰ gated on D 182 γ /362 γ (2009Sc22), R(DCO)=1.6 ⁴ gated on D 182 γ (2006Ga10).
123.1 ⁱ 2	2699.63	5.7 ²	D+Q		5.0 ⁸	Mult.: R(DCO)=0.82 ¹² gated on Q 752 γ (2009Sc22), R(DCO)=1.02 ⁶ gated D+Q 258 γ (2006Ga10).
176.5 ⁱ 2	2772.49	1.3 ¹	(D)		0.5 ¹	Mult.: R(DCO)=1.1 ⁴ gated on D 182 γ /362 γ (2009Sc22).
181.9 ⁱ 1	2595.93	43.8 ¹³	D(+Q)	+0.01 ²	18.9 ²⁵	Mult.: R(DCO)=0.60 ⁴ gated on Q 752 γ (2009Sc22), R(DCO)=0.98 ¹² gated on D 1620 γ (2006Ga10).
196.5 ⁱ 2	3559.51	2.0 ¹			<1	
207.7 ⁱ 3	2413.84	2.0 ¹	(D)		1.5 ²	Mult.: R(DCO)=0.87 ⁸ gated on D 182 γ /362 γ (2009Sc22).

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⁷⁶Ge(¹¹B,4nγ), ⁷⁶Ge(¹⁰B,3nγ) 2009Sc22, 2006Ga10, 1985Zh09 (continued)

^γ(⁸³Rb) (continued)

Eγ [†]	E(level)	Iγ [#]	Mult. [‡]	δ [§]	Iγ [@]	Comments
211.2 3	2313.61	0.7 1				
223.5 ^{ac}	3363.20					Eγ: from 2006Ga10, γ not observed in 2009Sc22.
237.2 3	3195.17	1.0 1	(D)			Mult.: R(DCO)=2.17 24 gated on D 182γ/362γ (2009Sc22).
238.1 2	3601.31	1.5 1				
243.3 ^{ac} 10	3803.0?					Eγ: from 2006Ga10, γ not observed in 2009Sc22.
243.9 ^{ac}	6913.2				<1	Eγ: from 2006Ga10, γ not observed in 2009Sc22.
245.0 2	1038.16	2.5 1	D+Q		<1	Eγ: level-energy difference=244.4.
246.6 3	2313.61	2.6 1	(D)		1.8 2	Mult.: R(DCO)=0.84 12 gated on Q 752γ (2009Sc22).
258.3 1	2958.12	11.0 3	D+Q	−0.20 6	4.1 3	Mult.: R(DCO)=1.25 11 gated on D 182γ/362γ (2009Sc22).
263.2 4	2576.55	2.6 1	D		2.4 3	Mult.: R(DCO)=0.52 7 gated on Q 752γ (2009Sc22), R(DCO)=1.06 7 gated on D 405γ (2006Ga10).
265.4 2	3992.3	6.5 2	D		3.4 4	Mult.: R(DCO)=1.4 9 gated on D 124γ (2006Ga10).
272.0 2	4435.5	2.0 1	D			Mult.: R(DCO)=0.54 4 gated on Q 752γ (2009Sc22), R(DCO)=0.53 8 gated on Q 1096γ (2006Ga10).
286.0 1	2699.63	4.7 1	D		1.4 2	Mult.: R(DCO)=0.58 11 gated on Q 752γ (2009Sc22).
312.1 1	2413.84	11.7 4	D		6.9 5	Mult.: R(DCO)=0.45 15 gated on Q 752γ (2009Sc22).
340.5 5	2413.84	1.7 1	(D)		1.4 3	Mult.: R(DCO)=1.07 3 gated on D 182γ/362γ (2009Sc22), R(DCO)=0.99 7 gated on D 182γ (2006Ga10).
348.4 4	2101.79	1.8 1	D		1.0 2	Mult.: R(DCO)=1.17 12 gated on D 182γ/362γ (2009Sc22).
352.6 3	5316.2	3.6 1	D		2.2 2	Mult.: R(DCO)=1.11 15 gated on D 182γ/362γ (2009Sc22).
358.7 4	2772.49	4.8 2	D+Q		3.2 4	Mult.: R(DCO)=0.49 5 gated on Q 752γ (2009Sc22).
362.4 1	2958.12	35.3 11	D+Q	−0.02 1	12.5 5	Mult.: R(DCO)=1.0 3 gated on Q 752γ (2009Sc22), R(DCO)=1.28 15 gated on D 100γ (2006Ga10).
366.0 3	1102.66	3.4 1			1.9 11	Mult.: R(DCO)=0.55 3 gated on Q 752γ (2009Sc22), R(DCO)=0.96 4 gated on D 182γ (2006Ga10).
366.4 10	3139.3				<1	
387.0 4	8419.7	1.0 1				
396.9 4	3726.9	3.6 1	D		<1	Mult.: R(DCO)=0.64 9 gated on Q 752γ (2009Sc22).
400.3 4	4164.1	1.4 1	D			Eγ: poor fit, not used in the fitting procedure.
405.1 1	3363.20	22.4 1	D+Q	−0.03 1	6.0 4	Level-energy difference=396.6.
420.3 6	3016.2	0.7 1				Mult.: R(DCO)=0.60 10 gated on Q 752γ (2009Sc22).
428.4	2318.31	2.4 1				Mult.: R(DCO)=0.51 3 gated on Q 752γ (2009Sc22), R(DCO)=0.98 6 gated on D 362γ (2006Ga10).
437.0 4	3765.6	0.6 1	D			Eγ: from 2006Ga10. Eγ=425.4 4 in 2009Sc22 is 3 keV different from Eγ derived from level energy difference.
440.0 ^{ac} 10	3803.0?					Mult.: R(DCO)=0.46 11 gated on Q 752γ (2009Sc22).
443.0 4	4435.5	0.7 1	(D)			Eγ: from 2006Ga10, γ not observed in 2009Sc22.
451.1 3	5667.0	3.9 1	D			Mult.: R(DCO)=0.9 4 gated on Q 752γ (2009Sc22).
458.4 5	7906.3	0.8 1				Mult.: R(DCO)=0.49 6 gated on Q 752γ (2009Sc22).
470.5 4	3329.84	1.8 1	(D)			
471.0 4	2413.84	1.4 1			1.4 3	Mult.: R(DCO)=1.07 13 gated on Q 752γ (2009Sc22).
483.5 1	4084.81	4.2 1	D			Mult.: R(DCO)=0.39 8 gated on Q 752γ (2009Sc22).
502.9 8	4963.6	3.1 1	D			Mult.: R(DCO)=0.49 5 gated on Q 752γ (2009Sc22).
513.6 8	8419.7	2.7 1	D			Mult.: R(DCO)=1.1 3 gated on D 182γ/362γ (2009Sc22).
513.7 5	7447.5	1.8 1				
520.0 4	5869.3	1.0 1				
522.5 4	5970.8	2.6 1				
528.2 4	4963.6	1.6 1	D			Mult.: R(DCO)=0.47 23 gated on Q 752γ (2009Sc22).
533.6 8	4134.85	1.6 1	D			Mult.: R(DCO)=1.1 3 gated on D 182γ/362γ (2009Sc22).
542.3 8	2859.8	0.7 1			<1	
543.4 8	3559.51	1.4 1				
543.5 10	3139.3		D+Q		1.4 3	Mult.: R(DCO)=0.63 14 gated on D 182γ (2006Ga10).

Continued on next page (footnotes at end of table)

$^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$ 2009Sc22,2006Ga10,1985Zh09 (continued) $\gamma(^{83}\text{Rb})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\#}$	Mult. ‡	$\delta^{\S}$	$I\gamma^{\oplus}$	Comments
549.0 ^a	1587.2		D+Q ^b	-0.3 ^b 1		
557.4 4	4642.17	6.9 2	D+Q			Mult.: R(DCO)=0.70 11 gated on Q 752 γ (2009Sc22).
559.8 2	2313.61	7.2 2			5.8 6	
576.8 5	4134.85	1.2 1				E γ : level-energy difference=575.3.
576.9 4	8672.1	2.4 1	D			Mult.: R(DCO)=1.3 3 gated on D 182 γ /362 γ (2009Sc22).
577.3 4	6933.9	1.0 1	D+Q			Mult.: R(DCO)=0.70 13 gated on Q 752 γ (2009Sc22).
585.3 5	8032.8	1.0 1				
598.2 ^{a,c}	2699.63				1.3 2	E γ : from 2006Ga10, γ not observed in 2009Sc22.
599.5 5	3195.17	5.2 2				E γ : from 2006Ga10. E γ =597.3 5 in 2009Sc22 is 1.9 keV different from E γ derived from level energy difference.
601.3 2	3559.51	18.1 6	D+Q	-0.03 2	4.2 3	Mult.: R(DCO)=0.45 24 gated on Q 752 γ (2009Sc22), R(DCO)=0.98 7 gated on D 362 γ (2006Ga10).
604.2 10	4407.1				<1	E γ : from 2006Ga10, γ not observed in 2009Sc22.
606.2 50	4686.47	3.4 1				E γ : poor fit, not used in the fitting procedure. Level-energy difference=601.7.
643.3 3	3601.31	9.9 3	D			Mult.: R(DCO)=0.38 7 gated on Q 752 γ (2009Sc22).
651.2 5	1753.67	3.9 1			3.4 3	
653.2 2	2595.93	13.6 4	D+Q	+0.05 4	6.0 4	Mult.: R(DCO)=0.58 4 gated on Q 752 γ (2009Sc22), R(DCO)=0.62 22 gated on Q 752 γ (2006Ga10).
660.2 3	2413.84	4.2 1	Q		4.0 4	Mult.: R(DCO)=2.06 13 gated on D 182 γ /362 γ (2009Sc22).
663.3 ^d 5	3363.20	1.5 ^d 1				
	5349.6	0.6 ^d 1				
668.0 5	3440.38	2.8 1	Q		<1	Mult.: R(DCO)=1.8 4 gated on D 182 γ /362 γ (2009Sc22).
669.0 6	9341.4	0.9 1				
684.2 5	7372.5	2.4 1				
688.4 8	6557.1	1.6 1				
697.1 5	7167.4	1.5 1	D			Mult.: R(DCO)=0.46 9 gated on Q 752 γ (2009Sc22).
699.8 ^{a,c} 10	3559.51				<1	E γ : from 2006Ga10, γ not observed in 2009Sc22.
703.2 3	5667.0	4.6 1	D			Mult.: R(DCO)=0.53 8 gated on Q 752 γ (2009Sc22).
707.6 6	5349.6	1.1 1				
708.5 2	4435.5	14.5 4	D			Mult.: R(DCO)=0.41 3 gated on Q 752 γ (2009Sc22).
717.2 3	6688.1	5.2 2				
721.0 5	8094.5	2.2 1				
721.5 2	4084.81	8.5 3	D			Mult.: R(DCO)=0.43 16 gated on Q 752 γ (2009Sc22).
729.2 6	7167.4	2.1 1				
731.8 4	736.99	10.0 10	Q		6.4 3	Mult.: R(DCO)=1.01 4 gated on Q 1017 γ (2006Ga10).
734.0 6	4461.2	7.1 2	D+Q			Mult.: R(DCO)=0.87 14 gated on Q 752 γ (2009Sc22).
737.0 2	736.99	28.7 9	D+Q	+0.82 18	18.1 17	Mult.: R(DCO)=1.40 9 gated on Q 1017 γ (2006Ga10). δ : other: +1.5 +10-8 (1985Zh09).
741.1 5	3440.38	1.9 1			1.8 3	
751.7 1	793.77	100.0 2	Q		100 4	Mult.: R(DCO)=1.04 8 gated on Q 1096 γ (2006Ga10).
756.3 4	5216.3	2.3 1				E γ : level-energy difference=755.1.
762.8 ^a	805.0		D+Q ^b	+0.4 ^b +4-2		
771.4 4	6438.3	5.0 4	D+Q			Mult.: R(DCO)=0.79 14 gated on Q 752 γ (2009Sc22).
771.9 4	4134.85	2.0 2				
780.5 5	5216.3	7.3 2				
786.6 6	3559.51	0.7 1				
803.4 4	6470.4	3.3 2				
806.3 3	5448.3	2.9 1	(D)			Mult.: R(DCO)=0.67 13 gated on D 182 γ /362 γ (2009Sc22).
822.6 5	2576.55	5.8 2	Q		5.2 4	Mult.: R(DCO)=1.02 8 gated on Q 1017 γ (2006Ga10).
834.0 5	4164.1	2.5 1				
838.1 3	7906.3	4.7 2	(D)			Mult.: R(DCO)=1.4 4 gated on D 182 γ /362 γ (2009Sc22).
844 ^{a,c} 1	2733.3?					E γ : from 2006Ga10, γ not observed in 2009Sc22.
844.5 2	3440.38	14.8 5	Q		6.6 11	Mult.: R(DCO)=1.28 10 gated on D 182 γ /362 γ (2009Sc22), R(DCO)=2.11 16 gated on D 182 γ (2006Ga10).
847.5 10	4407.1				2.6 3	E γ : from 2006Ga10, γ not observed in 2009Sc22.

Continued on next page (footnotes at end of table)

$^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$ 2009Sc22,2006Ga10,1985Zh09 (continued) $\gamma(^{83}\text{Rb})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\#}$	Mult. ‡	$\delta^{\S}$	$I\gamma^{\oplus}$	Comments
867.0 2	3726.9	29.3 9	D		13.8 8	Mult.: R(DCO)=0.45 2 gated on Q 752 γ (2009Sc22), R(DCO)=0.57 9 gated on Q 970 γ (2006Ga10). E γ : from 2006Ga10, γ not observed in 2009Sc22.
877.5 ^{ac} 10	3195.17					
890.0 4	7447.5	1.7 1				
904.8 3	1942.78	3.2 1			4.4 6	
935.0 2	5577.4	1.2 1				
939.4 2	4134.85	3.9 1	Q			Mult.: R(DCO)=1.16 25 gated on Q 752 γ (2009Sc22). E γ : from 2006Ga10, γ not observed in 2009Sc22.
963.7 ^{ac} 10	3559.51				<1	
965.8 5	2067.4	2.4 1				
969.8 5	4164.1	5.9 2				
969.9 5	2859.8	58.6 18	Q		43.2 18	Mult.: R(DCO)=0.97 4 gated on Q 752 γ (2009Sc22), R(DCO)=0.97 9 gated on Q 1096 γ (2006Ga10).
971.1 2	4963.6	8.2 3			5.1 5	
993.7 ^{ac} 10	3726.9				≈ 1	E γ : from 2006Ga10, γ not observed in 2009Sc22. E γ : questionable placement, as $\Delta\pi$ of levels would indicate E3 or M4 multipolarity, both of which result in transition probabilities well above RUL. Not included in Adopted Gammas.
995.2 3	1038.16	9.5 4	D+Q ^b	-0.8 ^b +3-7	17.0 21	
998.9 3	2101.79	14.8 5	Q		9.4 6	Mult.: R(DCO)=1.89 15 gated on D 312 γ (2006Ga10).
1011.2 5	3329.84	2.0 1				
1015.0 10	5422.1				0.8 3	E γ : from 2006Ga10, γ not observed in 2009Sc22.
1016.4 3	1753.67	16.5 5	Q		15.2 8	Mult.: R(DCO)=1.27 8 gated on D 182 γ /362 γ (2009Sc22), R(DCO)=1.11 9 gated on Q 823 γ (2006Ga10).
1026.8 5	8193.6	1.2 1				
1033.7 6	6250.0	1.3 1				
1036.0 6	2073.7	2.3 1				δ : -0.9 +3-13 from 1985Zh09 would result in too large a B(M2) strength, assuming E1+M2 multipolarity for the transition derived from the level scheme.
1054.5 ^a	1096.7					
1058.7 6	5051.0	1.5 1				
1082.7 4	4642.17	2.1 1				
1095.5 1	1889.36	88 3	Q		70 3	Mult.: R(DCO)=1.08 4 gated on Q 752 γ (2009Sc22), R(DCO)=1.00 9 gated on Q 752 γ (2006Ga10).
1102.4 2	1102.66	18.3 6	Q		24.2 9	Mult.: R(DCO)=1.73 7 gated on D 182 γ /362 γ (2009Sc22), R(DCO)=0.93 9 gated on Q 999 γ (2006Ga10).
1104.5 5	4435.5	3.6 1				
1126.9 1	4686.47	8.0 2	Q		2.8 3	Mult.: R(DCO)=2.06 14 gated on D 182 γ /362 γ (2009Sc22), R(DCO)=1.8 6 gated on D 362 γ (2006Ga10).
1132.4 1	3992.3	21.1 6	Q		14.2 12	Mult.: R(DCO)=1.1 5 gated on Q 752 γ (2009Sc22), R(DCO)=0.99 10 gated on Q 1096 γ (2006Ga10).
1142.4 3	5577.4	2.7 1				
1149.0 1	1942.78	19.3 6	D		12.5 14	Mult.: R(DCO)=0.31 2 gated on Q 752 γ (2009Sc22), R(DCO)=0.44 5 gated on Q 752 γ (2006Ga10). δ : -0.9 +3-4 from 1985Zh09 is calculated assuming $J\pi=13/2+$ for 1943-keV level (adopted $J\pi=15/2+$).
1168.5 3	2206.4	1.7 1				
1178.1 5	4715.3	0.5 1				
1182.7 2	5869.3	9.4 3	Q		<1	Mult.: R(DCO)=2.38 18 gated on D 182 γ /362 γ (2009Sc22).
1198.8 3	7068.2	8.5 3	Q		<1	Mult.: R(DCO)=2.6 3 gated on D 182 γ /362 γ (2009Sc22).
1207.1 6	6423.4	1.5 1				
1207.3 5	6557.1	4.7 15				
1210.5 3	2313.61	6.9 22	Q		5.2 5	Mult.: R(DCO)=1.83 13 gated on D 182 γ /362 γ (2009Sc22), R(DCO)=1.05 9 gated on Q 1103 γ (2006Ga10).

Continued on next page (footnotes at end of table)

⁷⁶Ge(¹¹B,4nγ), ⁷⁶Ge(¹⁰B,3nγ) 2009Sc22,2006Ga10,1985Zh09 (continued)

γ(⁸³Rb) (continued)

Eγ [†]	E(level)	Iγ [#]	Mult. [‡]	δ [§]	Iγ [@]	Comments
1214.8 3	5349.6	6.6 21	Q			Initial level energy of 6422.6 in table I of 2009Sc22 is incorrect. Mult.: R(DCO)=2.2 6 gated on D 182γ/362γ (2009Sc22).
1218.6 5	3537.0	1.8 1				
1223.5 5	5216.3	1.3 1				
1232.0 6	5667.0	4.6 14				
1235.7 ^{ac} 10	4963.6				<1	Eγ: from 2006Ga10, γ not observed in 2009Sc22.
1239.5 7	6688.1	0.4 1				
1246.2 2	4686.47	9.0 3	Q		3.4 5	Mult.: R(DCO)=1.14 17 gated on Q 752γ (2009Sc22), R(DCO)=1.9 3 gated on D 182γ (2006Ga10).
1247.1 4	9341.4	0.2 1				
1269.9 3	4129.7	1.3 1				
1275.6 5	2313.61	3.0 1			1.4 2	
1278.8 2	4642.17	6.0 2	Q			Mult.: R(DCO)=1.78 12 gated on D 182γ/362γ (2009Sc22).
1300.4 5	8672.1	0.5 1				
1304.0 ^{ac} 10	4164.1					Eγ: from 2006Ga10, γ not observed in 2009Sc22.
1305.2 3	3195.17	7.6 2	D			Mult.: R(DCO)=0.58 8 gated on Q 752γ (2009Sc22).
1323.8 3	5316.2	9.5 3	Q		7.0 1	Mult.: R(DCO)=1.20 8 gated on Q 970γ/1133γ (2006Ga10).
1328.7 3	5970.8	5.1 2	Q			Mult.: R(DCO)=1.84 15 gated on D 182γ/362γ (2009Sc22).
1349.5 4	7906.3	2.0 1				
1351.3 5	8419.7	2.9 1	Q			Mult.: R(DCO)=0.91 16 gated on Q 752γ (2009Sc22).
1351.9 6	6668.9	0.9 1			<1	
1363.0 5	5448.3	0.5 1				
1372.8 5	6088.1	1.4 1				
1385.5 4	4715.3	3.3 1				
1402.1 7	7372.5	1.2 1				
1406.5 6	8094.5	0.6 1				
1440.5 2	3329.84	10.7 3	Q			Mult.: R(DCO)=1.19 11 gated on Q 752γ (2009Sc22).
1448.2 5	3765.6	0.7 1				
1474.3 4	6438.3	1.5 1				
1476.0 5	8032.8	0.7 1				
1490.7 4	9910.4	1.7 1	Q			Mult.: R(DCO)=2.1 4 gated on D 182γ/362γ (2009Sc22).
1500.7 4	7167.4	1.8 1				
1524.7 2	2318.31	5.1 2				
1545.2 5	7633.3	0.6 1				
1576.1 6	4435.5	1.8 1				
1597.0 4	6913.2	5.8 2			4.1 8	
1601.0 6	9633.9	0.6 1				
1602.9 4	4461.2	2.2 1				Eγ: level–energy difference=1601.5.
1620.2 2	2413.84	10.1 3	D+Q	+0.02 1	4.8 8	Mult.: R(DCO)=0.77 5 gated on Q 752γ (2009Sc22), R(DCO)=0.56 8 gated on Q 752γ (2006Ga10).
1670.4 5	6356.7	0.8 1				
1696.0 7	6912.3	0.9 1				
1706.0 6	6668.9	1.6 1			<1	
1738.5 ^a	1780.7					
1754.3 6	8193.6	0.9 1				
1804.6 7	11715.1	0.6 1				
1924.4 6	8837.6	1.2 1			<1	
2025.1 6	2067.4	0.9 1				
2049.3 8	8962.5	0.6 1				
2211.4 8	13926.5	0.2 1				

[†] From 2009Sc22, except where noted.

[‡] From R(DCO) in 2009Sc22 and 2006Ga10, except where noted. R(DCO) values are included in the comments.

[§] From R(DCO) analysis in 2006Ga10, except where noted.

[#] From 2009Sc22.

[@] From 2006Ga10.

[&] From the Adopted Gammas.

$^{76}\text{Ge}(^{11}\text{B},4n\gamma), ^{76}\text{Ge}(^{10}\text{B},3n\gamma)$ 2009Sc22,2006Ga10,1985Zh09 (continued) **$\gamma(^{83}\text{Rb})$ (continued)**

- ^a From 1985Zh09, not observed in 2009Sc22,2006Ga10.
^b From $\gamma(\theta)$ in 1985Zh09.
^c Placement of transition in the level scheme is uncertain.
^d Multiply placed; intensity suitably divided.

 $^{80}\text{Se}(^6\text{Li},3n\gamma)$ 1980Ga17

$E(^6\text{Li})=23$ MeV to 29 MeV. Includes data on $^{81}\text{Br}(\alpha,2n\gamma)$ with $E(\alpha)=19$ MeV to 25 MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, $\gamma(\theta)$ and excitation function using three Ge(Li) detectors.

 ^{83}Rb Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	Comments
0.0	5/2-	
5.23	3/2-	
42.32	9/2+	
99.4	3/2-	
389.2	3/2-	$J\pi$: 3/2 from excitation function.
423.5	5/2+	
564.7	(3/2-, 5/2, 7/2-)	
737.2	7/2-	
794.1	13/2+	$J\pi$: 13/2 from excitation function and $\gamma(\theta)$ data.
805.0	(7/2+)	
1037.9	11/2+	$J\pi$: 11/2 from excitation function and $\gamma(\theta)$ data.
1096.6	(7/2+, 9/2+)	
1103.0	9/2-	
1586.9	(9/2, 13/2)	$J\pi$: 9/2,13/2 from $\gamma(\theta)$; excitation function favors the lower spin.
1754.1	11/2-	$J\pi$: 11/2 from excitation function.
1780.8		
1890.2	17/2+	$J\pi$: 17/2 from excitation function and $\gamma(\theta)$ data.
1943.3	15/2+	$J\pi$: 15/2 from excitation function and $\gamma(\theta)$ data.
2074.0	13/2-	$J\pi$: (13/2) from excitation function.
2102.3	13/2-	$J\pi$: (11/2,13,2) from excitation function.
2206.6	(13/2)	$J\pi$: (13/2,11/2) from excitation function.
2310.0		
2313.8	13/2-	$J\pi$: 9/2,13/2 from excitation function.
2318.7	(17/2+)	
2414.4	15/2-	$J\pi$: (15/2) from excitation function and $\gamma(\theta)$ data.
2576.8	15/2-	
2596.4	17/2-	
2700.3	17/2-	
2773.1	17/2-	
2860.4	21/2+	
2958.5	19/2-	
3363.4	21/2-	
3559.6		
3727.7	23/2+	

[†] From a least-squares fit to $E\gamma$, by evaluator.

[‡] From the Adopted Levels. Specific arguments for $J\pi$ assignments based on excitation function and $\gamma(\theta)$ data in 1980Ga17 are included in the comments.

 $\gamma(^{83}\text{Rb})$

$E\gamma^\dagger$	$E(\text{level})$	$I\gamma$	Mult. [‡]	Comments
(5.23 [#] 9)	5.23			
(42.33 [#] 15)	42.32			
94.1	99.4	1.97 14		
100.5	2414.4	10.4 3	D	Mult.: $A_2/A_0=-0.235$ 12, $A_4/A_0=-0.013$ 16.
123.5 [§]	2700.3	10.4 4	D	Mult.: $A_2/A_0=-0.224$ 11, $A_4/A_0=-0.007$ 16.

Continued on next page (footnotes at end of table)

$^{80}\text{Se}(^6\text{Li},3n\gamma)$ 1980Ga17 (continued) $\gamma(^{83}\text{Rb})$ (continued)

$E\gamma^\dagger$	E(level)	I_γ	Mult. ‡	Comments
176.7	2773.1	0.66 6		
182.0	2596.4	18.6 5	D	Mult.: $A_2/A_0=-0.289$ 8, $A_4/A_0=-0.005$ 11.
207.7	2414.4	1.99 8		
258.1 §	2958.5	3.81 12	D	Mult.: $A_2/A_0=-0.347$ 21, $A_4/A_0=-0.02$ 3.
285.9	2700.3	2.82 12	D	Mult.: $A_2/A_0=-0.274$ 14, $A_4/A_0=0.023$ 17.
289.8 §	389.2	4.87 15		
291.5 §&	1096.6	0.77 7		
312.0	2414.4	6.39 19	D	Mult.: $A_2/A_0=-0.34$ 3, $A_4/A_0=0.04$ 4.
340.3	2414.4	1.21 10		
348.3	2102.3	1.43 15		
358.7	2773.1	3.43 14	D	Mult.: $A_2/A_0=-0.31$ 5, $A_4/A_0=0.00$ 6.
362.2	2958.5	10.9 3	D	Mult.: $A_2/A_0=-0.398$ 15, $A_4/A_0=+0.014$ 22.
365.7 §	1103.0	2.5 12		
381.3 §@	423.5			
	805.0			
389.2 §	389.2	5.10 18		
404.9	3363.4	4.50 19	D	Mult.: $A_2/A_0=-0.57$ 4, $A_4/A_0=0.06$ 5.
418.1	423.5	1.67 18		
549.0	1586.9	3.9 3	D	Mult.: $A_2/A_0=-0.63$ 5, $A_4/A_0=0.09$ 7.
559.5 §&&	564.7			
	2313.8			
564.7	564.7	0.24 22		
601.1 &	3559.6			
637.8	737.2	<0.02		$E\gamma, I_\gamma$: γ ray not observed in 1980Ga17, which estimate intensity as smaller than 0.1% that of the 737 γ intensity.
651.1	1754.1	3.16 18		
653.3	2596.4	6.0 3		
660.2 §	2414.4	3.33 17		
731.9	737.2	5.63 24	Q	Mult.: $A_2/A_0=0.315$ 19, $A_4/A_0=-0.065$ 24.
737.1	737.2	16.2 5		Mult.: $A_2/A_0=0.450$ 7, $A_4/A_0=0.081$ 8.
751.9	794.1	100	Q	Mult.: $A_2/A_0=0.299$ 10, $A_4/A_0=-0.069$ 14.
762.8	805.0	2.9 3		
822.6 §	2576.8	5.3 8		
867.3	3727.7	3.1 3		
905.5	1943.3	3.7 3		
970.2	2860.4	16.3 6	Q	Mult.: $A_2/A_0=0.333$ 12, $A_4/A_0=-0.092$ 14.
986.6	1780.8	2.58 20		
995.6	1037.9	17.0 9	D	Mult.: $A_2/A_0=-0.755$ 16, $A_4/A_0=0.110$ 23.
999.2	2102.3	13.7 16		
1016.8	1754.1	14.5 5	Q	Mult.: $A_2/A_0=0.256$ 19, $A_4/A_0=0.003$ 24.
1036.1	2074.0	2.49 17	D	Mult.: $A_2/A_0=-0.74$ 10, $A_4/A_0=0.21$ 14.
1054.5 &	1096.6	4.55 21		
1096.0	1890.2	46.0 16	Q	Mult.: $A_2/A_0=0.331$ 12, $A_4/A_0=-0.040$ 15.
1103.0	1103.0	26.4 19	Q	Mult.: $A_2/A_0=0.319$ 21, $A_4/A_0=-0.08$ 3.
1149.2	1943.3	11.2 4	D	Mult.: $A_2/A_0=-0.903$ 14, $A_4/A_0=0.157$ 21.
1168.7	2206.6	3.03 23	D	Mult.: $A_2/A_0=-0.42$ 6, $A_4/A_0=-0.07$ 8.
1211.1	2313.8	5.8 3		
1272.1	2310.0	2.22 17	Q	Mult.: $A_2/A_0=0.32$ 3, $A_4/A_0=-0.11$ 4.
1275.9	2313.8	1.59 16		
1524.5	2318.7	4.60 24		
1544.8 &	1586.9	5.0 3		
1620.2	2414.4	5.0 3		
1738.5 &	1780.8	3.1 4		

† Relative intensities from $^{80}\text{Se}(^6\text{Li},3n\gamma)$ at $E(^6\text{Li})=25$ MeV normalized to $I_\gamma(752\gamma)$, except where noted.

‡ From $\gamma(\theta)$.

§ From $^{81}\text{Br}(\alpha,2n\gamma)$.

From the Adopted Gammas.

@ Multiply placed.

& Placement of transition in the level scheme is uncertain.

$^{80}\text{Kr}(\alpha, p)$ 1983StZQ

E(d)=26 MeV. Measured $\sigma(\theta)$ using multi-angle magnetic spectrograph and Ilford K-2 nuclear emulsion plates (FWHM=65 keV); DWBA analysis.

 ^{83}Rb Levels

E(level)	$J\pi^\dagger$	$S^\ddagger$	Comments
0.0	$5/2-, 3/2-$	<3.8, 3.6	
38	$9/2+$	<3.0	
100	$1/2-, 3/2-$	9.1, 4.5	
440	$3/2-$	1.56	
823	$3/2-$	2.12	
1092	$9/2+, 7/2+$	0.67, 1.14	
1340	$3/2-, 5/2-$	1.01, 0.83	
1699	$9/2+, 7/2+$	0.51, 0.90	
1804	$5/2+$	0.13	
1926	$5/2+$	0.50	
2083	$9/2+, 7/2+, 7/2-$		S: 0.76, 1.43, 1.40.
2327	$5/2+, 5/2-, 7/2-$		S: 1.10, 1.98, 1.02.
2442	$9/2+, 7/2+, 7/2-$		S: 0.19, 0.33, 0.30.
2568	$5/2+, 7/2+$	1.37, 1.31	
2782	$9/2+, 7/2+, 7/2-$		S: 0.34, 0.65, 0.63.
2907	$5/2+$	0.79	
3421	$5/2+$	1.60	

† From J-dependence of DWBA. Levels with angular distributions characteristic of a sum of J-values are assumed to be unresolved doublets. Many assignments must be considered very tentative as data are of very low quality.

‡ $S=\sigma(\text{exp})/\sigma(\text{DWBA})$. Authors provide a general statement that uncertainties are 20%.

 $^{82}\text{Kr}(p, \gamma), ^{83}\text{Kr}(p, n\gamma)$ 1982Fa12

E(p)=2.83 MeV on natural gas target. Measured E_γ , I_γ , $\gamma\gamma$; deduced $T_{1/2}$ using Doppler Shift Attenuation Method (DSAM) in two setups: singles spectra taken with a 25% Ge(Li) detector and $\gamma\gamma$ spectra taken with the Ge(Li) detector in coincidence with $E>2$ MeV γ rays in a NaI(Tl) detector. Kr gas served as both target and stopping medium.

 ^{83}Rb Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
0.0	$5/2-$		
5.3	$3/2-$		
42.1	$9/2+$		
389.4	$3/2-$	8 ps 3	$T_{1/2}$: from coincidence DSAM. Other: 9 ps +6-4 from singles DSAM.
423.6	$5/2+$	74 ps +21-14	$T_{1/2}$: from singles DSAM. Other: 83 ps +80-35 from coincidence DSAM.
564.7	$(3/2-, 5/2, 7/2-)$	1.0 ps +8-4	$T_{1/2}$: from coincidence DSAM. Other: 0.8 ps +7-6 from singles DSAM.
804.7	$(7/2)+$	<1.0 ps	$T_{1/2}$: from singles DSAM. Other: <0.6 ps from coincidence DSAM, however, this analysis contains a contribution of up to 80% from the 763 γ in ^{85}Rb .

† From the Adopted Levels.

 $\gamma(^{83}\text{Rb})$

E_γ	E(level)
(5.2)	5.3
(42.3)	42.1
381.5	423.6
389.4	389.4
418.3	423.6
559.5	564.7
762.7	804.7

$^{82}\text{Kr}(\text{p},\text{p}') \text{ IAR } 1969\text{Ki14}$

1969Ki14: $E(\text{p})=3.7$ to 5.4 MeV. Measured $\sigma(\theta)$, excitation function using Si surface barrier detectors.

The first excited state ($J\pi=2+$) was observed to resonate at a bombarding energy of 5.34 MeV, indicating the presence of an analog state in ^{83}Rb . Assuming this resonance is a manifestation of an analog of a low-lying state of ^{83}Kr , the corresponding state in ^{83}Kr would have an excitation energy of 1.89 MeV *I*. No resonance was observed for the yield to the 1470 -keV, second excited state in ^{82}Kr .

 $^{82}\text{Kr}(^3\text{He},\text{d}) 1987\text{St11}, 1983\text{StZQ}$

$E(^3\text{He})=18$ MeV. Measured $\sigma(\theta)$ in 7.5° steps using multi-angle magnetic spectrograph and Ilford K-2 nuclear emulsion plates (FWHM=50 keV); DWBA analysis.

 ^{83}Rb Levels

E(level)	$L^\dagger$	$S^\ddagger$	E(level)	$L^\dagger$	$S^\ddagger$	E(level)	$L^\dagger$	$S^\ddagger$
4	3+1	0.37+0.27	1702	4	0.075	3059	0	0.0065
38	4	1.00	1811	2	0.0097	3147	2	0.015
100	1	1.04	1916	0+2	0.043+0.027	3242	0+2	0.012+0.028
439	1+2	0.14+0.10	2062	4+1	0.082+0.025	3421	0+2	0.050+0.037
834	1	0.23	2341	0+2	0.012+0.037	3616	0+2	0.0072+0.031
1116	4	0.075	2584	2	0.050	3783	0+2	0.019+0.021
1345	3+1	0.080+0.035	2691	0	0.018	3915	0+2	0.027+0.030
1629	2	0.0064	2904	0+2	0.027+0.028			

† From DWBA fits to $\sigma(\theta)$. Many angular distributions are characteristic of a sum of L values and due to the high density of states and poor energy resolution of the measurement, there is a high probability that these are unresolved doublets.

‡ From $S=\sigma(\text{exp})/\sigma(\text{DWBA})$. Authors make a general statement that the uncertainties are 20%.

Adopted Levels, Gammas

$Q(\beta^-)=-4593\ 20$; $S(n)=8859\ 9$; $S(p)=7899\ 7$; $Q(\alpha)=-4780\ 8\ 2012\text{Wa}38$.
 $S(2n)=21412\ 8$; $S(2p)=13681\ 7\ (2012\text{Wa}38)$.

 ^{83}Sr Levels

Cross Reference (XREF) Flags

A ^{83}Y ϵ Decay (7.08 min)
 B ^{83}Y ϵ Decay (2.85 min)
 C ^{83}Sr IT Decay
 D $^{58}\text{Ni}(^{29}\text{Si},4p\gamma)$
 E $^{68}\text{Zn}(^{19}\text{F},p3n\gamma)$

F $^{74}\text{Ge}(^{12}\text{C},3n\gamma)$
 G $^{80}\text{Kr}(\alpha,n\gamma), ^{82}\text{Kr}(\alpha,3n\gamma)$
 H $^{84}\text{Sr}(^3\text{He},\alpha)$
 I $^{84}\text{Sr}(d,t)$
 J (HI,xn γ): SD

E(level) [†]	$J\pi^{\ddagger}$	XREF	$T_{1/2}^{\S}$	Comments
0.0	7/2+	ABCDEFGF	32.41 h 3	$\%e+\% \beta^+=100$; $Q=+0.781\ 67$; $\mu=-0.829\ 2$. $J\pi$: $J=7/2$ from collinear fast-beam spectroscopy (1987Bu11,1990Li28). π from E3 259 γ from 1/2-. $T_{1/2}$: from 1982Gr07. Others: 32.4 h 2 (1964Do02), 31.4 h (1972Ch13), 32.9 h (1961Ku08). μ : from collinear fast-beam LASER spectroscopy (1990Bu12, 2011StZZ), relative to $\mu=-1.092828\ 65$ for ^{87}Sr . Others: $\mu=-0.8286\ 12$, (CFBLS, 1990Li28); $\mu=-0.8298\ 3$ (LASER induced fluorescence spectroscopy in thermal atomic beam, 1987An02). Q : from collinear fast-beam LASER spectroscopy (1990Bu12, 2011StZZ), relative to $Q=0.335\ 20$ for ^{87}Sr . Others: $Q=0.823\ 50$ (LASER induced fluorescence spectroscopy in thermal atomic beam, 1987An02); $Q=+0.761\ 12$ (re-evaluation of 1990Bu12 result with theoretical calculations by 2002Ma09). XREF: H(X)I(X). $T_{1/2}$: from pulsed beam measurement reported as a private communication in $^{80}\text{Kr}(\alpha,n\gamma), ^{82}\text{Kr}(\alpha,3n\gamma)$. $J\pi$: M1 35.5 γ to 7/2+, $L(^3\text{He},\alpha)=L(d,t)=4$, DWBA analysis of $\sigma(\theta)$ in (d,t). XREF: H(X+233)I(X+250). $\%IT=100$; $\mu=+0.581\ 4$. $J\pi$: $J=1/2$ from collinear fast-beam laser spectroscopy (1987Bu11,1990Li28), π from $L(^3\text{He},\alpha)=1$. $T_{1/2}$: from 1972Tu07. μ : from collinear fast-beam LASER spectroscopy (1990Bh03, 2011StZZ), relative to $\mu=-1.09282\ 65$ for ^{87}Sr . Other: $\mu=0.5809\ 12$ (CFBLS, 1990Li28). XREF: H(X+487)I(X+470). $J\pi$: $L(d,t)=L(^3\text{He},\alpha)=3$, 454 γ to 9/2+.
35.47 ^a 6	9/2+	A DEFGHI	<15 ns	
259.15 9	1/2-	ABC E GHI	4.95 s 12	
489.92 8	(7/2-)	A HI		
545.4 3		A		
650.81 14	(3/2+, 5/2-)	A		
681.11 22	(3/2-)	AB HI		
717.53 8	(7/2, 9/2)	A		
753.72 15	(5/2-)	AB E		
790.83 17		A H		
800.41 10	11/2+	A DEFG	3.7 ps +35-14	
835.2 6		E		
846.3 3	(7/2, 9/2-)	A		
894.15 11	11/2+	A DEFG	1.6 ps 6	
910.5 ^a 5	13/2+	DEFG	3.5 ps [#] 2	$J\pi$: $\log ft=7.8$ ($\log f^{1u}t=9.1$) from 9/2+ parent, 195 γ to (3/2+, 5/2-). $J\pi$: M1+E2 859 γ to 9/2+; $\gamma(\theta)$ and excitation function in $^{80}\text{Kr}(\alpha,n\gamma), ^{82}\text{Kr}(\alpha,3n\gamma)$. $T_{1/2}$: given as a range with 1.0 ps < $T_{1/2}$ < 2.1 ps. $J\pi$: E2 875 γ to 9/2+, excitation function in $^{80}\text{Kr}(\alpha,n\gamma), ^{82}\text{Kr}(\alpha,3n\gamma)$, band assignment. $T_{1/2}$: other: 2.6 ps 10 from DSAM in $^{80}\text{Kr}(\alpha,n\gamma), ^{82}\text{Kr}(\alpha,3n\gamma)$.

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Adopted Levels, Gammas (continued) ^{83}Sr Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	XREF	$T_{1/2}^{\S}$	Comments
951.77 8	(5/2+, 7/2-)	A	h	XREF: h(X+928). $J\pi$: 271 γ to (3/2-), 917 γ to 9/2+.
962.79 7	(7/2, 9/2, 11/2+)	A	h	XREF: h(X+928). $J\pi$: log ft =6.5 from 9/2+ parent, 963 γ to 7/2+.
1092.8 3		A		
1098.06 11		A		
1140.71 25		A		
1233.40 11	(7/2, 9/2)	A	hi	XREF: h(X+1206)i(X+1230). $J\pi$: log ft =6.3 from 9/2+ parent, 744 γ to (7/2-), 1233 γ to 7/2+.
1239.19 19	(7/2, 9/2, 11/2+)	A	hi	XREF: h(X+1206)i(X+1230). $J\pi$: log ft =6.7 from 9/2+ parent, 1239 γ to 7/2+.
1365.9 3	(7/2, 9/2)	A		$J\pi$: log ft =7.0 from 9/2+ parent, 876 γ to (7/2-), 1366 γ to 7/2+.
1371.98 6	(7/2+)	A		$J\pi$: see comment on 754-keV level.
1434.12 19	(7/2, 9/2)	A	HI	XREF: H(X+1375)I(X+1410). $J\pi$: log ft =6.9 from 9/2+ parent, 944 γ to (7/2-), 1434 γ to 7/2+.
1447.8 8	(9/2-)		E	$J\pi$: 694 γ to (5/2-), 659 γ from (13/2-).
1498.83 15	(7/2, 9/2)	A		$J\pi$: log ft =6.2 from 9/2+ parent, 547 γ to (5/2+, 7/2-), 1499 γ to 7/2+.
1574.7 8	(9/2+)	EF		$J\pi$: M1+E2 680 γ to 11/2+, excitation function in $^{80}\text{Kr}(\alpha, n\gamma)$, $^{82}\text{Kr}(\alpha, 3n\gamma)$. However, (13/2-) is assigned in $^{68}\text{Zn}(^{19}\text{F}, p3n\gamma)$.
1590.0 8			E	
1604.8 4	(7/2, 9/2)	A		$J\pi$: log ft =7.1 from 9/2+ parent, 1115 γ to (7/2-), 1605 γ to 7/2+.
1745.4 8	(7/2, 9/2, 11/2+)	A		$J\pi$: log ft =7.2 from 9/2+ parent, 1745 γ to 7/2+.
1752.6 4	(7/2, 9/2, 11/2+)	A	HI	XREF: H(X+1740)I(X+1750). $J\pi$: log ft =6.7 from 9/2+ parent, 1753 γ to 7/2+.
1856.8 5	15/2+	DE		$J\pi$: M1+E2 946 γ to 13/2+, excitation function in $^{80}\text{Kr}(\alpha, n\gamma)$, $^{82}\text{Kr}(\alpha, 3n\gamma)$.
1882.50 23	(7/2, 9/2)	A		$J\pi$: log ft =6.4 from 9/2+ parent, 1392 γ to (7/2-), 1882 γ to 7/2+.
1915.4 3	(7/2, 9/2-)	A	h	XREF: h(X+1903). $J\pi$: log ft =6.1 from 9/2+ parent, 1264 γ to (3/2+, 5/2-), 1916 γ to 7/2+.
1964.1 4	(7/2, 9/2)	A	h	XREF: h(X+1903). $J\pi$: log ft =6.6 from 9/2+ parent, 1474 γ to (7/2-), 1965 γ to 7/2+.
1987.6 ^a 8	17/2+	DE	0.8 ps 2	$T_{1/2}$: weighted average of 0.7 ps 2 from RDDM in $^{74}\text{Ge}(^{12}\text{C}, 3n\gamma)$ and 1.0 ps 3 from DSAM in $^{80}\text{Kr}(\alpha, n\gamma)$, $^{82}\text{Kr}(\alpha, 3n\gamma)$.
2017.0 5	(7/2, 9/2)	A	H	$J\pi$: E2 1077 γ to 13/2+, band assignment. XREF: H(X+1963). $J\pi$: log ft =6.7 from 9/2+ parent, 1527 γ to (7/2-), 2017 γ to 7/2+.
2044.8 6	(13/2-)		DE	$J\pi$: 1244 γ to 11/2+, 598 γ from 17/2-.
2074.0 8	(7/2, 9/2)	A		$J\pi$: log ft =6.9 from 9/2+ parent, 1584 γ to (7/2-), 2074 γ to 7/2+.
2089.7 8	(7/2, 9/2, 11/2+)	A		$J\pi$: log ft =6.9 from 9/2+ parent, 2090 γ to 7/2+.
2106.8 5	(13/2-)		DE	$J\pi$: D 1213 γ to 11/2+, 536 γ from 17/2-.
2373.2 6	(7/2, 9/2, 11/2+)	A		$J\pi$: log ft =6.5 from 9/2+ parent, 1001 γ to (7/2+).
2539.3 6	(15/2)		DE	$J\pi$: 433 γ to (13/2-), 1629 γ to 13/2+, assumption of increasing spin in (HI, xn) reactions.
2643.0 ^{&} 6	(17/2-)		DE	$J\pi$: 598 γ to (13/2-), similar to 3 quasi-particle $J\pi$ =17/2- bandheads in ^{81}Kr and ^{83}Rb .
2847.6 8	(17/2-)		E	$J\pi$: 308 γ to (15/2), 199 γ from (19/2-).
2905.2 3	(7/2+, 9/2+, 11/2+)	A		$J\pi$: log ft =5.2 from 9/2+ parent.
2943.9 8	(7/2+, 9/2+, 11/2+)	A		$J\pi$: log ft =5.6 from 9/2+ parent.
3009.2 9	(19/2+)		E	$J\pi$: 1022 γ to 17/2+, 1152 γ to 15/2+.
3046.5 ^{&} 9	(19/2-)		DE	$J\pi$: 404 γ to (17/2-), band assignment.

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Adopted Levels, Gammas (continued) ^{83}Sr Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	XREF	$T_{1/2}^{\S}$	Comments
3116.8 ^a 11	21/2+	DEFG	<0.7 ps	$T_{1/2}$: from RDDM in $^{74}\text{Ge}(^{12}\text{C}, 3n\gamma)$. $J\pi$: E2 1129 γ to 17/2+, band assignment.
3349.9 11	(21/2+)	E		$J\pi$: 1362 γ to 17/2+, 294 γ from 23/2+.
3469.8 ^{&} 11	(21/2-)	DE		$J\pi$: 424 γ to (19/2-), band assignment.
3525.7 9	(21/2-)	DE		$J\pi$: 480 γ to (19/2-), 882 γ to (17/2-).
3644.3 ^b 12	23/2+	DEFG	8.7 ps 4	$J\pi$: M1+E2 528 γ to 21/2+, excitation function in $^{80}\text{Kr}(\alpha, n\gamma), ^{82}\text{Kr}(\alpha, 3n\gamma)$. $T_{1/2}$: from RDDM in $^{74}\text{Ge}(^{12}\text{C}, 3n\gamma)$.
4043.8 ^{&} 12	(23/2-)	DE		$J\pi$: 573 γ to (21/2-), band assignment.
4168.8 ^a 13	25/2+	DE		$J\pi$: 525 γ to 23/2+, 1052 γ to 21/2+, band assignment.
4195.4 10	(23/2-)	DE		$J\pi$: 726 γ to (21/2-), 1148 γ to (19/2-).
4396.7 13	(25/2+)	E		$J\pi$: 752 γ to 23/2+, 1280 γ to 21/2+.
4633.7 11	(25/2-)	DE		$J\pi$: 590 γ to (23/2-), 1108 γ to (21/2-).
4753.3 ^b 13	27/2+	DE		$J\pi$: 585 γ to 25/2+, 1109 γ to 23/2+, band assignment.
4948.2? 13	(-)	E		$J\pi$: from 1990DoZT, based on feeding and decay pattern from and to only negative parity levels.
5091.8 14	(27/2+)	E		$J\pi$: 695 γ to (25/2+).
5208.6 ^{&} 12	(27/2-)	DE		$J\pi$: 575 γ to (25/2-), 1164 γ to (23/2-), band assignment.
5380.0 ^a 14	29/2+	DE		$J\pi$: 627 γ to 27/2+, 1211 γ to 25/2+, band assignment.
5394.6 12	(-)	E		$J\pi$: from 1990DoZT, based on decay pattern to only negative parity levels.
5612.9 14	(29/2+)	E		$J\pi$: 860 γ to 27/2+, possible 1216 γ to (25/2+).
5856.6 13	(29/2-)	DE		$J\pi$: 647 γ to (27/2-), 1224 γ to (25/2-).
6205.8 ^b 14	31/2+	DE		$J\pi$: 826 γ to 29/2+, 1452 γ to 27/2+, band assignment.
6428.6 ^{&} 16	(31/2-)	DE		$J\pi$: 1220 γ to (27/2-), band assignment.
6753.9 ^a 15	33/2+	DE		$J\pi$: 548 γ to 31/2+, 1374 γ to 29/2+, band assignment.
7102.9? 17		E		
7235.7? 17		E		
7740.0 ^{&} 18	(35/2-)	DE		$J\pi$: 1312 γ to (31/2-), band assignment.
7771.6 19		D		
7798.0 18		D		
7806.8 [@] 18	(35/2-)	D		$J\pi$: 1378 γ to (31/2-).
7854.8 ^b 16	35/2+	D		$J\pi$: 1649 γ to 31/2+, band assignment.
8120.8 ^a 16	37/2+	DE		$J\pi$: 266 γ to 35/2+, 1367 γ to 33/2+, band assignment.
9190.0 21		D		
9277.4 ^{&} 18	(39/2-)	DE		$J\pi$: 1538 γ to (35/2-), band assignment.
9290.4 [@] 18	(39/2-)	D		$J\pi$: 1484 γ to (35/2-), band assignment.
9352.6 21		D		
9468.6 21		D		
9650.9 ^a 19	41/2+	DE		$J\pi$: 1530 γ to 37/2+, band assignment.
9782.8 ^b 19	39/2+	D		$J\pi$: 1928 γ to 35/2+, band assignment.
10860.4 [@] 20	(43/2-)	D		$J\pi$: 1570 γ to (39/2-), band assignment.
10952.4 ^{&} 20	(43/2-)	D		$J\pi$: 1675 γ to (39/2-), band assignment.
11104.6 23		D		
11462.9 ^a 22	45/2+	DE		$J\pi$: 1812 γ to 41/2+, band assignment.
11857.9 22		D		
12567.4 [@] 20	(47/2-)	D		$J\pi$: 1707 γ to (43/2-), band assignment.
12847.5 ^{&} 22	(47/2-)	D		$J\pi$: 1895 γ to (43/2-), band assignment.
13426.9 ^a 24	49/2+	D		$J\pi$: 1964 γ to 45/2+, band assignment.
14131.9 24		D		
14296.9 24		D		
14344.5 [@] 23	(51/2-)	D		$J\pi$: 1777 γ to (47/2-), band assignment.
14899.5 ^{&} 24	(51/2-)	D		$J\pi$: 2052 γ to (47/2-), band assignment.
15540 3		D		
15756 ^a 3	53/2+	D		$J\pi$: 2329 γ to 49/2+, band assignment.
16224 3		D		
16612.5 [@] 25	(55/2-)	D		$J\pi$: 2268 γ to (51/2-), band assignment.
18116 3		D		
19437 [@] 3	(59/2-)	D		$J\pi$: 2824 γ to (55/2-), band assignment.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) ^{83}Sr Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	XREF	Comments
x ^c	J=(41/2)	J	$J\pi$: =(41/2) estimated (1995Ba26,1995La21,2003Le08) (within one unit of spin) from depopulation into the highest spin states (45/2+,39/2-) of normal-deformed bands in ^{83}Sr (see 1995La21 and 1992WiZU for normal high-spin states above 23/2). E(level): 13.0 MeV 15 (1995La21).
x+1305.0 ^c 10	J+2	J	
x+2766.0 ^c 14	J+4	J	
x+4379.0 ^c 17	J+6	J	
x+6141.1 ^c 20	J+8	J	
x+8053.1 ^c 22	J+10	J	
x+10113.1 ^c 24	J+12	J	
x+12318 ^c 3	J+14	J	
x+14665 ^c 3	J+16	J	
x+17156 ^c 3	J+18	J	
x+19802? ^c 3	J+20	J	

[†] From a least-squares fit to $E\gamma$, by evaluator. An uncertainty of $\Delta E\gamma=1$ keV is assumed when not explicitly given.

[‡] For levels populated in (HI,xn) reactions, $J\pi$ assignments include the assumption of increasing spin with increasing excitation energy, except where noted.

§ From DSAM in $^{80}\text{Kr}(\alpha,n\gamma)$, $^{82}\text{Kr}(\alpha,3n\gamma)$, except where noted.

From RDDM in $^{74}\text{Ge}(^{12}\text{C},3n\gamma)$.

@ (A): Rotational band based on 7807-keV, (35/2-) level.

& (B): Rotational band based on 2643-keV, (17/2-) level.

a (C): Rotational band based on 35.5-keV, 9/2+ level.

b (D): Rotational band based on 3644-keV, 23/2+ level.

c (E): SD band (2003Le08,1995Ba26,1995La21). Q(transition)=3.60 +20-18 (2003Le08), 3.5 +8-6 (1997De51, reanalyzed data of 1995La21). Configuration= $\nu 5^1\pi 5^0$ (2003Le08); $\nu 5^3\pi 5^1$; $\pi=+$, $\alpha=+1/2$; $\beta_2=0.57$, $\gamma=0^\circ$ (from experimental values of moments of inertia,1995La21). Percent population=1.36 (2003Le08), 1.4 5 (1995Ba26).

 $\gamma(^{83}\text{Sr})$

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult.&	$\delta\&$	α	Comments
35.47	35.5 1	100	M1 [‡]		3.13	B(M1)(W.u.)>0.0078.
259.15	259.1 1	100	E3		0.1416	B(E3)(W.u.)=0.00670 17. Mult.: from $\alpha(\text{K})\text{exp}$ in ^{83}Sr IT decay.
489.92	454.4 2	43.3 11				
	489.9 ^a 2	100.0 ^a 22				
545.4	545.4 3	100				
650.81	391.6 2	100				
681.11	421.8 3	100				
717.53	227.5 2	9.1 10				
	682.1 1	100 5				
	717.6 2	36.5 15				
753.72	494.5 2	100				
790.83	790.8 2	100				
800.41	764.9 6	80 10				I γ : other: 47 in $^{80}\text{Kr}(\alpha,n\gamma)$, $^{82}\text{Kr}(\alpha,3n\gamma)$.
	800.4 1	100 6	E2		9.93×10^{-4}	B(E2)(W.u.)=12 +7-6.
835.2	800 [#]					
	835 [#]					
846.3	195.4 4	100				
894.15	858.7 1	100 4	M1+E2	-0.83 13	7.99×10^{-4}	B(E2)(W.u.)=14 6; B(M1)(W.u.)=0.012 5. δ : other: -0.78 30 from $^{74}\text{Ge}(^{12}\text{C},3n\gamma)$.
	893.9 4	3.5 8	[E2]		7.55×10^{-4}	B(E2)(W.u.)=1.0 5.
910.5	875.0 [@]	100	E2		7.96×10^{-4}	B(E2)(W.u.)=14.6 9.
951.77	234.4 3	3.2 6				
	270.5 3	3.9 5				
	916.5 5	4.2 10				
	951.8 1	100 5				
962.79	245.3 4	7.2 22				
	927.3 1	100 5				
	962.8 1	61 4				

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Sr})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult.&	$\delta\&$	α	Comments
1092.8	603.0 3	100 20				
	1092.4 6	100 30				
1098.06	1062.6 1	100 33				
	1097.2 8	80 40				
1140.71	489.9 ^a 2	100 ^a				
1233.40	743.5 1	100 5				
	1197.9 2	30 3				
	1233.3 6	5.1 10				
1239.19	1203.6 5	12.1 22				
	1239.2 2	100 4				
1365.9	875.8 3	100 17				
	1366.4 6	34 10				
1371.98	138.8 4	1.6 2				
	409.3 4	1.1 2				
	420.3 3	29.2 20				
	525.6 4	1.2 3				
	581.1 3	2.3 3				
	618.2 2	9.7 7				
	654.5 2	3.1 3				
	721.2 2	16.8 7				
	827					
	882.1 1	100.0 25				
	1336.5 1	49.0 20				
	1371.9 1	16.0 8				
1434.12	943.6 5	26 8				
	1434.2 2	100 9				
1447.8	694 [#]	100				
1498.83	547.1 3	62 12				
	1463.4 3	100 12				
	1498.8 2	93 8				
1574.7	679.9 [@]	100	M1+E2	+1.9 4	0.00147 3	δ : other: +1.1 +5-10 in $^{74}\text{Ge}(^{12}\text{C}, 3n\gamma)$.
1590.0	755 [#]	100				
1604.8	1115.0 5	100 30				
	1604.6 8	72 20				
1745.4	1710.0 15	56 28				
	1745.3 9	100 29				
1752.6	1717.0 8	22 7				
	1752.6 4	100 16				
1856.8	945.9 [@]		M1+E2	+0.9 6	6.43×10^{-4} 14	δ : from $\gamma(\theta)$ in $^{74}\text{Ge}(^{12}\text{C}, 3n\gamma)$. Mult.: D+Q from $\gamma(\theta)$ in $^{74}\text{Ge}(^{12}\text{C}, 3n\gamma)$ and $^{80}\text{Kr}(\alpha, n\gamma)$, $^{82}\text{Kr}(\alpha, 3n\gamma)$, non-zero value of δ makes E1+M2 unlikely.
	963 ^{\\$}					
	1056 ^{\\$}					
1882.50	931.5 5	68 18				
	1392.4 3	100 9				
	1846.8 5	55 14				
	1882.2 8	32 14				
1915.4	1264.3 4	36 6				
	1879.8 7	48 10				
	1915.7 4	100 12				
1964.1	1473.8 6	87 16				
	1928 2	32 16				
	1964.5 6	100 16				
1987.6	1077.1 [@]	100	E2		4.88×10^{-4}	B(E2)(W.u.)=23 6.
2017.0	1527.2 10	34 10				
	2016.9 6	100 16				
2044.8	1134 ^{\\$}					
	1151 ^{\\$}					
	1244 ^{\\$}					
2074.0	1584.3 10	70 30				
	2073.6 12	100 40				
2089.7	2054.1 12	100 30				

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Sr})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Mult.&	$\delta\&$	α	Comments
2089.7	2089.8 10	60 30				
2106.8	517#					
	659#					
	1197#					
	1213.3@		(E1)		2.26×10^{-4}	Mult.: D from $\gamma(\theta)$ in $^{74}\text{Ge}(^{12}\text{C},3n\gamma)$, $\Delta\pi=\text{yes}$ from level scheme.
2373.2	1001.2 6	100				
2539.3	433§					
	964#b					
	1629§					
2643.0	104§					
	537§					
	598§					
	655§					
	786§					
2847.6	205#					
	308#					
2905.2	1407.1 10	15 4				
	1532.2 10	9 4				
	1942.3 10	13 4				
	2011.1 5	56 9				
	2104.9 8	29 5				
	2187 1	15 6				
	2869.6 15	20 6				
	2905.3 9	100 12				
2943.9	2049.0 15	17 8				
	2909 2	16 8				
	2944.0 10	100 12				
3009.2	1022#					
	1152#					
3046.5	199#					
	404§					
3116.8	1129.4@	100	E2		4.41×10^{-4}	B(E2)(W.u.)>20. Mult.: Q from $\gamma(\theta)$ in $^{74}\text{Ge}(^{12}\text{C},3n\gamma)$ and $^{80}\text{Kr}(\alpha,n\gamma)$, $^{82}\text{Kr}(\alpha,3n\gamma)$, M2 excluded by comparison to RUL.
3349.9	233#					
	1362#					
3469.8	424§	100				
3525.7	480§					
	882§					
3644.3	294§					
	527.9@		M1+E2	-0.14 4	0.00233	Mult.: D+Q from $\gamma(\theta)$ in $^{74}\text{Ge}(^{12}\text{C},3n\gamma)$ and $^{80}\text{Kr}(\alpha,n\gamma)$, $^{82}\text{Kr}(\alpha,3n\gamma)$; E1+M2 excluded by comparison to RUL. δ : from $\gamma(\theta)$ in $^{74}\text{Ge}(^{12}\text{C},3n\gamma)$.
4043.8	573§	100				
4168.8	525§					
	1052§					
4195.4	670§					
	726§					
	1148§					
4396.7	752#					
	1280#					
4633.7	590§					
	1108§					
	1165#b					
4753.3	585§					
	1109§					
4948.2?	904#					
5091.8	695#					
5208.6	260#					
	575§					

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Sr})$ (continued)

E(level)	$E\gamma^{\dagger}$	$I\gamma^{\dagger}$	Comments
5208.6	1164§		
5380.0	627§		
	1211§		
5394.6	1199#		
	1351#		
5612.9	521#		
	860#		
	1216#b		
5856.6	647§		
	1224§		
6205.8	593#		E γ : other: 1220 in $^{68}\text{Zn}(^{19}\text{F},\text{p}3\text{n}\gamma)$.
	826§		
	1114#b		
	1452§		
6428.6	1220§	100	
6753.9	548§		
	1374§		
7102.9?	1490#b	100	
7235.7?	1379#b	100	
7740.0	1312§	100	
7771.6	1343§	100	
7798.0	1369§	100	
7806.8	1378§	100	
7854.8	1649§	100	
8120.8	266§		
	1367§		
9190.0	1392§	100	
9277.4	1470§		
	1538§		
9290.4	1484§		
	1492§		
9352.6	1581§	100	
9468.6	1697§	100	
9650.9	1530§	100	
9782.8	1928§	100	
10860.4	1570§	100	
10952.4	1675§	100	
11104.6	1752§	100	
11462.9	1812§		
11857.9	2207§	100	
12567.4	1615§		
	1707§		
12847.5	1895§	100	
13426.9	1964§	100	
14131.9	2274§	100	
14296.9	2834§	100	
14344.5	1777§	100	
14899.5	2052§	100	
15540	2113§	100	
15756	2329§	100	
16224	2797§	100	
16612.5	2268§	100	
18116	2576§	100	
19437	2824§	100	
x+1305.0	1306 <i>I</i>	100	
x+2766.0	1461 <i>I</i>	100	
x+4379.0	1613 <i>I</i>	100	
x+6141.1	1762 <i>I</i>	100	
x+8053.1	1912 <i>I</i>	100	
x+10113.1	2060 <i>I</i>	100	
x+12318	2205 <i>I</i>	100	
x+14665	2347 <i>I</i>	100	
x+17156	2491 <i>I</i>	100	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)
 $\gamma(^{83}\text{Sr})$ (continued)

E(level)	$E\gamma^\dagger$	$I\gamma^\dagger$
x+19802?	2646 ^b	100

[†] From ^{83}Y ϵ decay (7.08 min), except where noted.

[‡] From ce data in ^{83}Y ϵ decay (7.08 min).

[§] From $^{58}\text{Ni}(^{29}\text{Si},4p\gamma)$.

[#] From $^{68}\text{Zn}(^{19}\text{F},p3n\gamma)$.

[@] From $^{80}\text{Kr}(\alpha,n\gamma)$, $^{82}\text{Kr}(\alpha,3n\gamma)$.

[&] From $\gamma(\theta)$ and linear polarization measurements in $^{80}\text{Kr}(\alpha,n\gamma)$, $^{82}\text{Kr}(\alpha,3n\gamma)$, except where noted.

^a Multiply placed; intensity suitably divided.

^b Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas (continued)

Note: For bands flagged by †, interband transitions are not shown.

**(A) Rotational band based
on 7807-keV, (35/2-) level.****(B)† Rotational band based
on 2643-keV, (17/2-) level.****(C) Rotational band based
on 35.5-keV, 9/2+ level.****(D) Rotational band based
on 3644-keV, 23/2+ level.** $^{83}_{38}\text{Sr}_{45}$

Adopted Levels, Gammas (continued)

(E) SD band (2003Le08,
1995Ba26,1995La21).
Q(transition)=3.60

⁸³Sr IT Decay 1973Si16,1976Li27

Parent ⁸³Sr: E=259.15 9; J π =1/2-; T_{1/2}=4.95 s 12; %IT decay=100.

⁸³Sr-%IT: since no β^+ decay from the isomeric 259-keV level has been observed, the evaluator assumes IT decay branching=100%.

1976Li27: Measured E γ , I γ , γ (t) using 2 coaxial Ge(Li) detectors and a low-energy Ge(Li) detector.

1973Si16: Measured E γ , I γ , γ (t) using two Ge(Li) detectors and a Ge(Li) x-ray detector, measured Ece, Ice using a cooled Si detector.

⁸³Sr Levels

E(level) [†]	J π [†]	T _{1/2} [†]
0.0	7/2+	32.41 h 3
259.15 9	1/2-	4.95 s 12

[†] From the Adopted Levels.

γ (⁸³Sr)

I γ normalization: from %IT=100.

E γ [†]	E(level)	I γ [‡]	Mult.	α	Comments
259.1 1	259.15	100	E3	0.1416 20	α (K)exp=0.16 (1973Si16). Mult.: from α (K)exp.

[†] From 1976Li27.

[‡] For absolute intensity per 100 decays, multiply by 0.876 3.

Decay Scheme

Intensity: I(γ +ce)
per 100 parent decays
%IT=100

⁸³Y ϵ Decay (7.08 min) 1976Li27

Parent ⁸³Y: E=0.0; J π =9/2+; T_{1/2}=7.08 min 8; Q(g.s.)=4593 20; % ϵ + β^+ decay=100.

1976Li27: ⁸³Y activity from proton spallation on a Mo target with E(p)=660 MeV followed by electromagnetic mass separation. Measured E γ , I γ , γ , and γ (t) using 2 coaxial Ge(Li) detectors and a low-energy Ge(Li) detector.

1973Si16: ⁸³Y activity from ⁸⁴Sr(p,2n) with E(p)=31 MeV followed by chemical separation. Measured E γ , I γ , γ , γ (t) using two Ge(Li) detectors and a Ge(Li) x-ray detector; measured Ece, Ice using a cooled Si detector.

A total energy release of 4900 keV 400 is calculated for this decay scheme using the RADLST code, in general agreement with the Q value of 4593 keV 20. However, there are a large number of unplaced γ rays and a $\approx$ 1.5 MeV gap between the highest observed energy level and the Q value, suggesting that the decay scheme is incomplete.

⁸³Sr Levels

E(level) [†]	J π [†]	T _{1/2} [‡]
0.0	7/2+	32.41 h 3
35.47 6	9/2+	
259.15 9	1/2-	4.95 s 12

Continued on next page (footnotes at end of table)

⁸³Y ϵ Decay (7.08 min) ¹⁹⁷⁶Li27 (continued)

⁸³Sr Levels (continued)

E(level) [†]	J $\pi^{\ddagger}$	E(level) [†]	J $\pi^{\ddagger}$	E(level) [†]	J $\pi^{\ddagger}$
489.92 8	(7/2-)	962.79 7	(7/2, 9/2, 11/2+)	1745.4 8	(7/2, 9/2, 11/2+)
545.4 3		1092.8 3		1752.6 4	(7/2, 9/2, 11/2+)
650.81 14	(3/2+, 5/2-)	1098.06 11		1882.50 23	(7/2, 9/2)
681.11 22	(3/2-)	1140.71 25		1915.4 3	(7/2, 9/2-)
717.53 8	(7/2, 9/2)	1233.40 11	(7/2, 9/2)	1964.1 4	(7/2, 9/2)
753.72 15	(5/2-)	1239.19 19	(7/2, 9/2, 11/2+)	2017.0 5	(7/2, 9/2)
790.83 17		1365.9 3	(7/2, 9/2)	2074.0 8	(7/2, 9/2)
800.40 10	11/2+	1371.98 6	(7/2+)	2089.7 8	(7/2, 9/2, 11/2+)
846.3 3	(7/2, 9/2-)	1434.12 19	(7/2, 9/2)	2373.2 6	(7/2, 9/2, 11/2+)
894.16 11	11/2+	1498.83 15	(7/2, 9/2)	2905.2 3	(7/2+, 9/2+, 11/2+)
951.77 8	(5/2+, 7/2-)	1604.8 4	(7/2, 9/2)	2943.9 8	(7/2+, 9/2+, 11/2+)

[†] From a least-squares fit to E γ , by evaluator.

[‡] From the Adopted Levels.

β^+, ϵ Data

E ϵ	E(level)	I β^+ [†]	I ϵ [†]	Log f_t	I($\epsilon+\beta^+$) [†]	Comments
(1649 20)	2943.9	0.018 7	0.19 7	5.75 17	0.21 8	
(1688 20)	2905.2	0.057 20	0.48 16	5.37 15	0.54 18	
(2220 20)	2373.2	0.04 2	0.04 2	6.66 22	0.08 4	
(2503 20)	2089.7	0.04 2	0.02 1	7.05 22	0.06 3	
(2519 20)	2074.0	0.04 2	0.02 1	7.07 22	0.06 3	
(2576 20)	2017.0	0.09 3	0.043 17	6.79 17	0.13 5	
(2629 20)	1964.1	0.12 4	0.053 19	6.72 16	0.17 6	
(2678 20)	1915.4	0.35 11	0.14 5	6.30 15	0.49 16	
(2711 20)	1882.50	0.25 9	0.10 3	6.48 15	0.35 12	
(2840 20)	1752.6	0.18 7	0.056 21	6.76 17	0.24 9	
(2848 20)	1745.4	0.05 2	0.02 1	7.30 19	0.07 3	
(2988 20)	1604.8	0.09 4	0.021 10	7.23 20	0.11 5	
(3094 20)	1498.83	0.9 3	0.19 7	6.31 16	1.1 4	
(3159 20)	1434.12	0.21 8	0.039 14	7.01 16	0.25 9	
(3221 20)	1371.98	12 4	2.0 7	5.31 16	14 5	
(3227 20)	1365.9	0.21 8	0.035 13	7.08 17	0.24 9	
(3354 20)	1239.19	0.55 18	0.08 3	6.76 15	0.63 21	
(3360 20)	1233.40	1.3 4	0.19 6	6.39 15	1.5 5	
(3452 20)	1140.71	0.23 8	0.029 10	7.22 16	0.26 9	
(3495 20)	1098.06	0.07 4	0.008 4	7.76 22	0.08 4	
(3500 20)	1092.8	0.11 4	0.013 5	7.59 19	0.12 5	
(3630 20)	962.79	1.3 5	0.13 5	6.62 16	1.4 5	
(3699 20)	894.16	2.8 10	0.26 9	6.32 16	3.1 11	
(3747 20)	846.3	0.07 4	0.006 3	7.94 22	0.08 4	
(3793 20)	800.40	0.7 3	0.06 2	6.97 17	0.8 3	
(3802 20)	790.83	0.27 10	0.022 8	7.42 17	0.29 11	
(3875 20)	717.53	1.3 5	0.10 4	6.78 16	1.4 5	
(4048 20)	545.4	0.31 11	0.020 7	7.52 16	0.33 12	
(4558 20)	35.47	63 21	2.6 9	5.51 15	66 22	
(4593 20)	0.0	10 30	0.2 12	6.6 24	6 32	I($\epsilon+\beta^+$): from I $\gamma(\gamma^{\pm})$; other 6 26 from intensity balance.

[†] Absolute intensity per 100 decays.

⁸³Y ε Decay (7.08 min) 1976Li27 (continued)

 $\gamma(^{83}\text{Sr})$

I γ normalization: from annihilation intensity I $\gamma(\gamma^\pm)=2.98\times 10^4$ 95 for I $\gamma(882\gamma)=1000$.

E γ	E(level)	I $\gamma^\pm$	Mult. [†]	$\delta^\dagger$	α	Comments
35.5 1	35.47	3070 200	M1		3.13	$\alpha(\text{exp})=3.2$ 3. $\alpha(\text{exp})$: from intensity balance (1976Li27). Mult.: from $\alpha(\text{exp})$.
138.8 4	1371.98	16 2				
195.4 4	846.3	25 3				
227.5 2	717.53	18 2				
234.4 3	951.77	10 2				
245.3 4	962.79	10 3				
259.1 1	259.15	330 20	E3		0.1416	I γ : equilibrium transition rate is I $\gamma=320$ 20.
270.5 3	951.77	12.0 15				
391.6 2	650.81	230 15				
409.3 4	1371.98	11 2				
420.3 3	1371.98	292 20				
421.8 3	681.11	12				
^x 434.6 5		12 3				
454.4 2	489.92	380 10				
489.9 [§] 2	489.92	878 19				I γ : from intensity ratio in Fig. 5 of 1976Li27; I $\gamma=920$ 20 for the doublet.
	1140.71	42.2 9				
494.5 2	753.72	116 15				
525.6 4	1371.98	12 3				
545.4 3	545.4	53 9				
547.1 3	1498.83	45 9				
581.1 3	1371.98	23 3				
603.0 3	1092.8	10 2				
618.2 2	1371.98	97 7				
654.5 2	1371.98	31 3				
682.1 1	717.53	197 9				
717.6 2	717.53	72 3				
721.2 2	1371.98	168 7				
743.5 1	1233.40	195 9				
764.9 6	800.40	64 8				
^x 781.5						
790.8 2	790.83	70 7				
800.4 1	800.40	80 5	[E2]		9.93×10^{-4}	
827	1371.98					
858.7 1	894.16	510 20	M1+E2	-0.83 13	7.99×10^{-4}	
875.8 3	1365.9	29 5				
882.1 1	1371.98	1000 25				
893.9 4	894.16	18 4	[E2]		7.55×10^{-4}	
916.5 5	951.77	13 3				
927.3 1	962.79	139 7				
931.5 5	1882.50	15 4				
943.6 5	1434.12	8.2 25				
951.8 1	951.77	310 15				
962.8 1	962.79	85 5				
1001.2 6	2373.2	13 3				
1062.6 1	1098.06	7.5 25				
1092.4 6	1092.8	10 3				
1097.2 8	1098.06	6 3				
1115.0 5	1604.8	10 3				
^x 1154.4						
^x 1165						
1197.9 2	1233.40	58 5				
1203.6 5	1239.19	11 2				
1233.3 6	1233.40	10 2				
1239.2 2	1239.19	91 4				
1264.3 4	1915.4	15.0 25				
1336.5 1	1371.98	490 20				
1366.4 6	1365.9	10 3				
1371.9 1	1371.98	160 8				
^x 1378.8 8		5.0 18				

Continued on next page (footnotes at end of table)

⁸³Y ε Decay (7.08 min) 1976Li27 (continued)

γ(⁸³Sr) (continued)

E _γ	E(level)	I _γ [†]	E _γ	E(level)	I _γ [†]	E _γ	E(level)	I _γ [†]
1392.4 3	1882.50	22 2	1879.8 7	1915.4	20 4	*2224.5 15		5 2
1407.1 10	2905.2	5.1 15	1882.2 8	1882.50	7 3	*2250 1		4 2
1434.2 2	1434.12	32 3	*1909.6			*2260.4 9		5.4 20
1463.4 3	1498.83	73 9	1915.7 4	1915.4	42 5	*2317.4 6		9.4 16
1473.8 6	1964.1	11 2	1928 2	1964.1	4 2	*2368 1		2 1
1498.8 2	1498.83	68 6	1942.3 10	2905.2	4.3 15	*2393.8 9		6.5 32
*1508.2 6		11.0 15	1964.5 6	1964.1	12.6 20	*2400.0 16		3.6 18
1527.2 10	2017.0	5.2 15	*1973.0 9		5.6 18	*2694.0 12		3.9 18
1532.2 10	2905.2	3.2 15	2011.1 5	2905.2	19 3	*2729 2		4.5 20
*1540.1 7		4.7 15	2016.9 6	2017.0	15.3 24	*2734 2		2 1
1584.3 10	2074.0	4.2 20	2049.0 15	2943.9	4.2 20	*2829.8 17		5 2
1604.6 8	1604.8	7.2 20	2054.1 12	2089.7	6.3 20	2869.6 15	2905.2	6.7 21
*1640.1 1		9.7 21	*2068.0 6		9.3 17	*2879.2 15		12.1 23
1710.0 15	1745.4	4 2	2073.6 12	2074.0	6.0 24	2905.3 9	2905.2	34 4
1717.0 8	1752.6	6.7 23	2089.8 10	2089.7	4 2	2909 2	2943.9	4 2
1745.3 9	1745.4	7.2 21	*2096.3 10		5.5 22	2944.0 10	2943.9	25 3
1752.6 4	1752.6	31 5	2104.9 8	2905.2	9.7 18	*2973 2		2.7 15
*1811			*2112.2 7		10.7 18	*2981 2		5.4 20
*1819.9			*2126.1 10		6.2 18	*3060 2		2.5 10
*1826.3			*2147.0 25		3.5 16	*3220.0 25		3.5 16
1846.8 5	1882.50	12 3	*2153.9			*3251 3		3.8 18
*1855.0 4		16.6 23	*2178.7 8		12.1 22	*3297 2		5.5 18
*1872			2187 1	2905.2	5 2	*3420 4		2 1

[†] From the Adopted Gammas, except where noted.

[‡] For absolute intensity per 100 decays, multiply by 0.0062 20.

[§] Multiply placed.

^x γ ray not placed in level scheme.

^{83}Y ϵ Decay (7.08 min) 1976Li27 (continued)

Decay Scheme

 Intensities: I(γ +ce) per 100 parent decays
 * Multiply placed

 $^{83}_{39}\text{Y}_{44}$
 $9/2+$ 0.0 7.08 min
 $\% \epsilon + \% \beta^+ = 100$
 $Q^+ = 4593^{20}$

⁸³Y ε Decay (7.08 min) 1976Li27 (continued)

Decay Scheme (continued)

Intensities: I(γ+ce) per 100 parent decays
* Multiply placed

9/2+ 0.0 7.08 min
⁸³Y₄₄
%ε+%β⁺=100
Q⁺=4593²⁰

⁸³Y ε Decay (7.08 min) 1976Li27 (continued)

Decay Scheme (continued)

Intensities: I(γ+ce) per 100 parent decays
 * Multiply placed

9/2+ 0.0 7.08 min
⁸³Y₄₄
 %ε+%β⁺=100
 Q⁺=4593²⁰

⁸³Y ε Decay (2.85 min) 1976Li27

Parent ⁸³Y: E=62.04 10; Jπ=3/2-; T_{1/2}=2.85 min 2; Q(g.s.)=4593 20; %ε+%β⁺ decay=60 5.
 1976Li27: ⁸³Y activity from proton spallation on a Mo target with E(p)=660 MeV followed by electromagnetic mass separation. Measured Eγ, Iγ, γγ, and γ(t) using 2 coaxial Ge(Li) detectors and a low-energy Ge(Li) detector.
 1973Si16: ⁸³Y activity from ⁸⁴Sr(p,2n) with E(p)=31 MeV followed by chemical separation. Measured Eγ, Iγ, γγ, γ(t) using two Ge(Li) detectors and a Ge(Li) x-ray detector, measured Ece, Ice using a cooled Si detector.
 A total energy release of 2830 keV 210 is calculated for this decay scheme using the RADLST code, in general agreement with the effective Q value of 2790 keV 230.

⁸³Sr Levels

E(level) [†]	Jπ [‡]	T _{1/2} [‡]
0.0	7/2+	32.41 h 3
259.10 10	1/2-	4.95 s 12
680.9 3	(3/2-)	
753.60 22	(3/2-)	

[†] From a least-squares fit to Eγ, by evaluator.

[‡] From the Adopted Levels.

β⁺,ε Data

Eε	E(level)	Iβ ⁺ [†]	Iε [†]	Log ft	I(ε+β ⁺) [†]
(3901 20)	753.60	7.4 13	0.55 10	5.65 10	7.9 14
(3974 20)	680.9	18 3	1.2 2	5.3 1	19 3
(4396 20)	259.10	32 7	1.5 3	5.33 10	33 7

[†] For intensity per 100 decays, multiply by 1.00 9.

γ(⁸³Sr)

Iγ normalization: from ΣI(γ+ce) to g.s.= 60 5 since β transition to g.s. is highly forbidden (ΔJ=2, Δπ=yes). The equilibrium intensity (Iγ=103 6) of the 259.1-keV γ has been corrected for the half-life of the 259 level.

Eγ [†]	E(level)	Iγ [†] §	Mult. [‡]	α	Comments
259.1 1	259.10	100 6	E3	0.1416	Iγ: equilibrium transition rate is Iγ=103 6.
421.8 3	680.9	36 3			Iγ: other: 30 6 (1973Si16).
494.5 2	753.60	15 2			

[†] From 1976Li27.

[‡] From the Adopted Gammas.

§ For absolute intensity per 100 decays, multiply by 0.53 5.

Decay Scheme

$^{58}\text{Ni}(^{29}\text{Si}, 4\text{p}\gamma)$ 1995La21

1995La21: E(^{29}Si)=128 MeV. Measured E γ , I γ , $\gamma\gamma$, γ -light charged particle coincidence using the Gammasphere array consisting of 36 Compton-suppressed HPGe detectors and the Microball array consisting of 95 CsI(Tl) detectors.

Information on superdeformed bands is also given, see (HI,xn γ):SD dataset.

Other: 1990GaZN: $^{52}\text{Cr}(^{34}\text{S}, 2\text{pn}\gamma)$, E(^{34}S)=130 MeV.

 ^{83}Sr Levels

E(level) [†]	J $\pi^{\ddagger}$	E(level) [†]	J $\pi^{\ddagger}$	E(level) [†]	J $\pi^{\ddagger}$
0.0	7/2+	4632.7	(25/2-)	9782.8 ^a	39/2+
35.47 ^{§@} 6	9/2+	4753.4 ^a	27/2+	10859.7 ^b	(43/2-)
799.9	11/2+	5207.8 ^{&}	(27/2-)	10951.7 ^{&}	(43/2-)
893.2	11/2+	5379.9 [@]	29/2+	11103.9	
910.4 [@]	13/2+	5855.8	(29/2-)	11462.8 [@]	45/2+
1856.0	15/2+	6205.7 ^a	31/2+	11857.8	
1987.5 [@]	17/2+	6427.9 ^{&}	(31/2-)	12566.7 ^b	(47/2-)
2044.3	(13/2-)	6753.8 [@]	33/2+	12846.7 ^{&}	(47/2-)
2106.0	(13/2-)	7739.3 ^{&}	(35/2-)	13427 [@]	49/2+
2539.0	(15/2)	7770.9		14132	
2642.6 ^{&}	(17/2-)	7797.3		14297	
3046.1 ^{&}	(19/2-)	7806.1 ^b	(35/2-)	14343.7 ^b	(51/2-)
3116.5 [@]	21/2+	7854.7 ^a	35/2+	14899 ^{&}	(51/2-)
3350? [#]	21/2+	8120.8 [@]	37/2+	15540	
3469.7 ^{&}	(21/2-)	9189.3		15756 [@]	53/2+
3525.1	(21/2-)	9276.7 ^{&}	(39/2-)	16224	
3644.2 ^a	23/2+	9289.7 ^b	(39/2-)	16612 ^b	(55/2-)
4043.1 ^{&}	(23/2-)	9351.9		18116	
4168.7 [@]	25/2+	9467.9		19436 ^b	(59/2-)
4194.9	(23/2-)	9650.8 [@]	41/2+		

[†] From a least-squares fit to E γ , by evaluator, except where noted.

[‡] From the Adopted Levels.

[§] From the Adopted Levels.

[#] From 1990GaZN only. Not included in the Adopted Levels.

[@] (A): Band based on 35.5-keV, 9/2+ level.

[&] (B): Band based on 2643-keV, (17/2-) level.

^a (C): Band based on 3644-keV, 23/2+ level.

^b (D): Band based on 7806-keV, (35/2-) level.

 $\gamma(^{83}\text{Sr})$

E $\gamma^{\ddagger}$	E(level)	E $\gamma^{\ddagger}$	E(level)	E $\gamma^{\ddagger}$	E(level)
104	2642.6	800	799.9	1312	7739.3
266	8120.8	826	6205.7	1343	7770.9
294 [‡]	3644.2	858	893.2	1363 [‡]	3350?
404	3046.1	875	910.4	1367	8120.8
424	3469.7	882	3525.1	1369	7797.3
433	2539.0	945	1856.0	1374	6753.8
480	3525.1	963	1856.0	1378	7806.1
525	4168.7	1052	4168.7	1392	9189.3
528	3644.2	1056	1856.0	1452	6205.7
537	2642.6	1077	1987.5	1470	9276.7
548	6753.8	1108	4632.7	1484	9289.7
573	4043.1	1109	4753.4	1492	9289.7
575	5207.8	1129	3116.5	1530	9650.8
585	4753.4	1134	2044.3	1538	9276.7
590	4632.7	1148	4194.9	1570	10859.7
598	2642.6	1151	2044.3	1581	9351.9
627	5379.9	1164	5207.8	1615	12566.7
647	5855.8	1196	2106.0	1629	2539.0
655	2642.6	1211	5379.9	1649	7854.7
670	4194.9	1213	2106.0	1675	10951.7
726	4194.9	1220	6427.9	1697	9467.9
764	799.9	1224	5855.8	1707	12566.7
786	2642.6	1244	2044.3	1752	11103.9

Continued on next page (footnotes at end of table)

$^{58}\text{Ni}(^{29}\text{Si},4\text{p}\gamma)$ 1995La21 (continued) $\gamma(^{83}\text{Sr})$ (continued)

$E\gamma^\dagger$	E(level)	$E\gamma^\dagger$	E(level)	$E\gamma^\dagger$	E(level)
1777	14343.7	2113	15540	2797	16224
1812	11462.8	2207	11857.8	2824	19436
1895	12846.7	2268	16612	2834	14297
1928	9782.8	2274	14132		
1964	13427	2329	15756		
2052	14899	2576	18116		

 † From 1995La21, except where noted. ‡ From 1990GaZN only. **$^{68}\text{Zn}(^{19}\text{F},\text{p}3\text{n}\gamma)$ 1990DoZX,1990DoZT**

$E(^{19}\text{F})=72$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, γ -particle coincidences using the NORDBALL array consisting of 18 Compton-suppressed HPGe detectors, 10 BaF₂ detectors, and the HYSTRIX system for charged particles. 1990DoZX and 1990DoZT report results from the same experiment; 1990DoZX provides only information on the positive parity levels whereas 1990DoZT focuses on the negative parity excitations.

 ^{83}Sr Levels

E(level) †	$J\pi^\ddagger$	Comments
0.0	7/2+	
35.47 § 6	9/2+	
259.0	1/2-	
754.1	(5/2-)	
800.2	11/2+	
835.2		$J\pi$: (9/2-) proposed by 1990DoZT.
894.0	11/2+	
910.0	13/2+	
1448.1	(9/2-)	
1574.7	(9/2)+	$J\pi$: (13/2-) proposed by 1990DoZT.
1590.2		$J\pi$: (11/2-) proposed by 1990DoZT.
1856.5	15/2+	
1987.0	17/2+	
2046.1	(13/2-)	
2107.2	(13/2-)	
2539.5	(15/2)	$J\pi$: (15/2-) proposed by 1990DoZT.
2643.4	(17/2-)	
2848.0	(17/2-)	
3008.8	(19/2+)	
3047.2	(19/2-)	
3115.9	21/2+	
3349.2	(21/2+)	
3470.2	(21/2-)	
3526.3	(21/2-)	
3643.7	23/2+	
4044.1	(23/2-)	
4167.8	25/2+	
4196.2	(23/2-)	
4395.8	(25/2+)	
4634.5	(25/2-)	
4751.8	(27/2+)	
4947.9?	(-)	
5090.7	(27/2+)	
5207.8	(27/2-)	
5377.7	29/2+	
5395.2	(-)	
5611.6	(29/2+)	
5854.6	(29/2-)	
6204.3	31/2+	

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⁶⁸Zn(¹⁹F,p3n γ) 1990DoZX,1990DoZT (continued)

⁸³Sr Levels (continued)

E(level) [†]	J π [‡]	Comments
6428.8	(31/2-)	
6751.5	33/2+	
7101.6?	(+)	J π : π =(+) proposed by 1990DoZT,1990DoZX.
7233.6?	(-)	J π : π =(-) proposed by 1990DoZT.
7739.8	(35/2-)	
8119.5	37/2+	
9278.8	(39/2-)	
9649.5	41/2+	
11461.6	45/2+	

[†] From a least-squares fit to E γ , by the evaluator, except where noted.

[‡] From the Adopted Levels. Differences with the assignments of 1990DoZX and 1990DoZT are indicated in the comments.

[§] From the Adopted Levels.

 $\gamma(^{83}\text{Sr})$

E γ	E(level)	Comments
104	2643.4	
199	3047.2	
205	2848.0	
233	3349.2	E γ : 223 keV in figure 1 of 1990DoZX is incorrect because it does not fit the level diagram. Evaluator assumes 223 is typographical error.
259	259.0	
260	5207.8	
294	3643.7	
308	2848.0	
404	3047.2	
423	3470.2	
432	2539.5	
479	3526.3	
495	754.1	
517	2107.2	
521	5611.6	
524	4167.8	
528	3643.7	
536	2643.4	
547	6751.5	
573	5207.8	
574	4044.1	
584	4751.8	
590	4634.5	
593	6204.3	
598	2643.4	
626	5377.7	
647	5854.6	
656	2643.4	
659	2107.2	
670	4196.2	
680	1574.7	
694	1448.1	
695	5090.7	
726	4196.2	
752	4395.8	
755	1590.2	
765	800.2	
787	2643.4	
800	800.2	
	835.2	
827 [‡]	6204.3	
835	835.2	
858	894.0	

Continued on next page (footnotes at end of table)

⁶⁸Zn(¹⁹F,p3n γ) 1990DoZX,1990DoZT (continued)

 $\gamma(^{83}\text{Sr})$ (continued)

E γ	E(level)	E γ	E(level)	E γ	E(level)
860	5611.6	1137	2046.1	1280	4395.8
875	910.0	1149	4196.2	1311	7739.8
883	3526.3	1152 [†]	2046.1	1351	5395.2
904	4947.9?		3008.8	1362	3349.2
946	1856.5	1164	5207.8	1368	8119.5
963	1856.5	1165 [‡]	4634.5	1374	6751.5
964	2539.5	1197	2107.2	1379 [‡]	7233.6?
1022	3008.8	1199	5395.2	1452	6204.3
1052	4167.8	1210	5377.7	1490 [‡]	7101.6?
1077	1987.0	1213	2107.2	1530	9649.5
1108 [†]	4634.5	1216 [‡]	5611.6	1539	9278.8
	4751.8	1220	5854.6	1630	2539.5
1114 [‡]	6204.3	1221	6428.8	1812	11461.6
1129	3115.9	1246	2046.1		

[†] Multiply placed.

[‡] Placement of transition in the level scheme is uncertain.

⁷⁴Ge(¹²C,3n γ) 1981Bu02,1978Iv02

1980Bu02: E(¹²C)=43 and 45 MeV. Measured E γ , I γ , $\gamma(\theta)$ using a Ge(Li) detector; deduced T_{1/2} from Recoil Distance Doppler Shift (RDDS) measurement. Level scheme presented in 1980Bu02 is based on that from ⁸²Kr(α ,3n γ) (1980Ar02).
1978Iv02: E(¹²C)=35 to 45 MeV. Measured E γ , I γ , excitation function. Identified transitions belonging to ⁸³Sr based on excitation function, however, did not place transitions into a level scheme.

⁸³Sr Levels

E(level) [†]	J π [‡]	T _{1/2} [§]	Comments
0.0	7/2+		
35	9/2+		
800	11/2+		
894	11/2+		
910	13/2+	3.5 ps 2	
1574	(9/2)+		
1856	15/2+		
1987	17/2+	0.7 ps 2	
2107	(13/2-)		J π : (13/2+) proposed in 1980Bu02.
3116	21/2+	<0.7 ps	
3644	23/2+	8.7 ps 8	

[†] From a least squares fit to E γ , by evaluator.

[‡] From the Adopted Levels.

[§] From Recoil-distance Doppler shift measurements (RDDM) in 1981Bu02.

 $\gamma(^{83}\text{Sr})$

E γ [†]	E(level)	I γ [†]	Mult. [‡]	δ [‡]	Comments
(35)	35				
528	3644	157 4	D+Q	-0.14 4	Mult.: A ₂ =-0.39 5, A ₄ =-0.08 6 (1981Bu02).
680	1574	97 3	D+Q	+1.1 +5-10	Mult.: A ₂ =-0.73 5, A ₄ =+0.07 5 (1981Bu02).
765	800				
800	800	107 2	(Q)		Mult.: A ₂ =+0.14 3, A ₄ =-0.08 4 (1981Bu02).
859	894	256 3	D+Q	-0.78 30	Mult.: A ₂ =-0.85 3, A ₄ =+0.20 3 (1981Bu02).
875	910	1000 19	Q		Mult.: A ₂ =+0.28 3, A ₄ =-0.08 5 (1981Bu02).
946	1856	128 1	D+Q	+0.87 +73-42	Mult.: A ₂ =-0.82 2, A ₄ =+0.06 1 (1981Bu02).
1077	1987	576 10	Q		Mult.: A ₂ =+0.22 3, A ₄ =-0.06 4 (1981Bu02).
1129	3116	=360	Q		Mult.: A ₂ =+0.21 4, A ₄ =-0.19 6 (1981Bu02).

Continued on next page (footnotes at end of table)

⁷⁴Ge(¹²C,3n γ) 1981Bu02,1978Iv02 (continued)

 $\gamma(^{83}\text{Sr})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\dagger$	Mult. [‡]	Comments
1213	2107	92 4	D	Mult.: $A_2=-0.18$ 8, $A_4=+0.11$ 10 (1981Bu02).

[†] From 1981Bu02. $I\gamma$'s are measured at $E(^{12}\text{C})=43$ MeV and given relative to $I\gamma(875\gamma)=1000$.

[‡] From γ -ray angular distributions, using adopted $J\pi$ where angular distribution results are not unique.

⁸⁰Kr(α ,n γ), ⁸²Kr(α ,3n γ) 1980Ar02,1980Ek03

1980Ek03: ⁸⁰Kr(α ,n γ), $E(\alpha)=14$ and 18 MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, excitation function $\gamma(\theta)$, linear polarization using an escape suppression spectrometer and a three-Ge(Li) Compton polarimeter; deduced $T_{1/2}$ from Doppler Shift Attenuation method (DSAM) measurements. Earlier results given in 1980EkZW and 1979TwZT.

1980Ar02: ⁸⁰Kr(α ,n), $E(\alpha)=16-21$ MeV and ⁸²Kr(α ,3n), $E(\alpha)=45$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, $\gamma(\theta)$, excitation function using a large coaxial and a small planar Ge(Li) detector. Early results given in 1979ArZX, 1978ArZK, 1977ArZO, 1976ArZK.

⁸³Sr Levels

E(level) [†]	$J\pi^\ddagger$	$T_{1/2}^\S$	Comments
0.0	7/2+		
35.6	9/2+	<15 ns	$T_{1/2}$: from pulsed beam measurement, quoted in 1980Ek03 as a private communication from E. Wallander.
259.1	1/2-		
800.2	11/2+	3.7 ps +35-14	$J\pi$: $\gamma(\theta)$ gives 7/2+ or 11/2+, $\gamma(\theta)$ for 800 γ in 1980Ar02 favors J to J-2 transition.
894.1	11/2+	1.6 ps 6	$T_{1/2}$: given as a range with 1.0 ps < $T_{1/2}$ < 2.1 ps. $J\pi$: $\gamma(\theta)$ gives 7/2+ or 11/2+, $\gamma(\theta)$ for 858.5 γ in 1980Ar02 favors J to J-1 transition and excitation function in 1980Ek03 favors the higher spin.
910.6	13/2+	2.6 ps 10	$J\pi$: $\gamma(\theta)$ gives 9/2+ or 13/2+, excitation function favors the higher spin.
1573.9	(9/2)+		$J\pi$: $\gamma(\theta)$ gives 9/2+ or 13/2+, excitation function favors the lower spin.
1856.5	15/2+		$J\pi$: $\gamma(\theta)$ gives 11/2+ or 15/2+, excitation function favors the higher spin.
1987.7	17/2+	1.0 ps 3	$J\pi$: $\gamma(\theta)$ gives 9/2+ or 17/2+, excitation function favors the higher spin.
2107.4?	(13/2-)		$J\pi$: (13/2+) proposed in 1980Ar02.
3117.1	21/2+		$J\pi$: $\gamma(\theta)$ gives 13/2+ or 21/2+, observation in only the (α ,3n γ) reaction favors the higher spin.
3645.0	23/2+		$J\pi$: $\gamma(\theta)$ gives 19/2+ or 23/2+, observation in only the (α ,3n γ) reaction favors the higher spin.

[†] From a least-squares fit to $E\gamma$, by the evaluator.

[‡] From the Adopted Levels. Arguments for $J\pi$ assignments specific to this dataset are indicated in the comments.

[§] From DSAM measurements in 1980Ek03.

 $\gamma(^{83}\text{Sr})$

$E\gamma^\dagger$	E(level)	$I\gamma^\ddagger$	Mult. [§]	$\delta^\S$	Comments
35.4	35.6				
259.1	259.1	5			
527.9	3645.0	1	D+Q [#]		Mult.: $A_2=-0.95$ 8, $A_4=0$ (1980Ar02).
679.8	1573.9	10	M1+E2	+1.9 4	Mult.: $A_2=-0.91$ 6, $A_4=0.02$ 2 (1980Ar02); $A_2=-0.83$ 3, $A_4=+0.13$ 3, POL=-0.12 6 for $E(\alpha)=14$ MeV (1980Ek03).
764.4	800.2	7			
800.4	800.2	15	E2		Mult.: $A_2=+0.47$ 7, $A_4=-0.12$ 11 (1980Ar02); $A_2=+0.41$ 4, $A_4=-0.14$ 3, POL=+0.46 15 for $E(\alpha)=14$ MeV (1980Ek03).
858.5	894.1	31	M1+E2	-0.83 13	Mult.: $A_2=-0.95$ 9, $A_4=+0.12$ 6 (1980Ar02); $A_2=-1.00$ 3, $A_4=+0.12$ 3, POL=+0.13 7 for $E(\alpha)=14$ MeV and $A_2=-0.94$ 3, $A_4=+0.10$ 3, POL=0.00 11 for $E(\alpha)=18$ MeV (1980Ek03).
875.0	910.6	100	E2		Mult.: $A_2=+0.30$ 4, $A_4=-0.08$ 6 (1980Ar02); $A_2=+0.38$ 3, $A_4=-0.14$ 3, POL=+0.52 10 for $E(\alpha)=14$ MeV and $A_2=+0.32$ 4, $A_4=-0.08$ 5, POL=+0.55 6 for $E(\alpha)=18$ MeV (1980Ek03).
945.9	1856.5	7	D+Q [#]		Mult.: $A_2=-0.77$ 10, $A_4=0.21$ 13 (1980Ar02).

Continued on next page (footnotes at end of table)

⁸⁰Kr(α,nγ), ⁸²Kr(α,3nγ) 1980Ar02, 1980Ek03 (continued)

⁸³Sr (continued)

Eγ [†]	E(level)	Iγ [‡]	Mult. [§]	Comments
1077.1	1987.7	55	E2	Mult.: A ₂ =+0.39 4, A ₄ =-0.13 6 (1980Ar02); A ₂ =+0.46 3, A ₄ =-0.13 4, POL=+0.31 19 for E(α)=18 MeV (1980Ek03).
1129.4	3117.1	27	Q [#]	Mult.: A ₂ =+0.25 6, A ₄ =-0.26 8 (1980Ar02).
1213.3@	2107.4?	10		

[†] From 1980Ar02.

[‡] From 1980Ar02 in the ⁸²Kr(α,3nγ) reaction with E(α)=45 MeV, normalized to Iγ(875γ)=100.

[§] From angular distribution and linear polarization measurements in 1980Ek03, except where noted.

[#] From angular distribution in 1980Ar02.

[@] Placement of transition in the level scheme is uncertain.

⁸⁴Sr(d,t) 1970Be24

E(d)=20.65 MeV. Measured σ(θ) for θ=16° to 100° using a Si(Li) detector telescope (FWHM=90–100 keV); DWBA analysis.

⁸³Sr Levels

Authors state that the lowest state populated in the (d,t) reaction is not necessarily the ground state. Given the L=4 assignment, the lowest populated state most likely corresponds to the 9/2+, 35.5-keV level (see Adopted Levels). The evaluator has indicated this offset in the energy scale as x, however, its not clear that the offset is linear, and in fact, the correspondence suggested by higher energy levels suggests that it is not. Probable correspondence between energy levels observed in other reactions is indicated in the comments. Given the uncertainty in the offset, these should be taken as tentative.

E(level) [†]	Jπ [‡]	L [‡]	S [§]	Comments
x	(9/2+)	4	6.10	E(level): possible correspondence with E=35.5-keV level in Adopted Levels.
x+250 3	(1/2-)	1	0.96	E(level): possible correspondence with E=259-keV level in Adopted Levels.
x+470 5	(5/2-)	3	3.66	E(level): possible correspondence with E=490-keV level in Adopted Levels.
x+680 7	(3/2-)	1	1.34	E(level): possible correspondence with E=681-keV level in Adopted Levels.
x+960 10	(3/2-)	(1)	0.87	E(level): no likely corresponding level in Adopted Levels.
x+1230 12				E(level): possible correspondence with E=1233- or 1239-keV level in Adopted Levels.
x+1410 14				E(level): possible correspondence with E=1434-keV level in Adopted Levels.
x+1750 18				E(level): possible correspondence with E=1753-keV level in Adopted Levels.

[†] Authors quote a general uncertainty of 1%, which is 0.6% from statistical uncertainty and the rest from energy calibration uncertainty. Energies are obtained from an average of spectra at several angles.

[‡] From a DWBA analysis of the angular dependence of the measured cross sections.

[§] From dσ/dΩ_{exp}=CSdσ/dΩ_{DWBA}, with C=3.33 to account for the internal structure of the triton.

⁸⁴Sr(³He,α) 1978Me01

E(³He)=18 MeV. Measured σ(θ) (steps of 3.75° starting at 3.75°) using multiangle spectrograph and Ilford K-1 emulsion plates (FWHM=35 keV); DWBA analysis.

⁸³Sr Levels

Authors assume that the highest-energy α group (E=x, L=4) populates 35.5-keV level (see Adopted Levels). They offset their level energies to match the E=259-keV, Jπ=1/2- level, giving x=26 keV. Thus, there is a 10 keV discrepancy in the correspondence with levels observed in other datasets, even at the lowest energies. This worsens with increasing excitation energy, as indicated in the comments. The uncertainties in the level energies may be underestimated.

E(level)	L [‡]	C ² S [§]	Comments
x	4	[6]	E(level): corresponds to the E=35.5-keV level in the Adopted Levels.
x+233 5	1	1.5	E(level): corresponds to the E=259-keV level in the Adopted Levels.
x+487 5	3	3.4	E(level): probable correspondence to the E=490-keV level in the Adopted Levels.
x+649 5	1	1.6	E(level): corresponds to the E=681-keV level in the Adopted Levels.

Continued on next page (footnotes at end of table)

$^{84}\text{Sr}(^3\text{He},\alpha)$ 1978Me01 (continued) **^{83}Sr Levels (continued)**

E(level)	$L^{\ddagger}$	$C^2S^{\S}$	Comments
x+768 5	(3)	0.34	E(level): probable correspondence to the E=791-keV level in the Adopted Levels.
x+928 5	(3+1)	(1.9+1.1)	E(level): doublet; one component corresponds the E=952- or 963-keV levels in the Adopted Levels. No corresponding level for the L=1 component in any data set.
x+1206? 5			E(level): probable correspondence to the E=1233- or 1239-keV levels in the Adopted Levels.
x+1375 5	(3)	(0.27)	E(level): probable correspondence to the E=1434-keV level in the Adopted Levels.
x+1482 [†] 5	(1)	(0.34)	
x+1740 5	3	1.5	E(level): doublet; one component corresponds perhaps to the E=1753-keV level in the Adopted Levels.
x+1903 5	(3)	(0.30)	E(level): probable correspondence to the E=1915- or 1964-keV levels in the Adopted Levels.
x+1963 5	(3)	(0.42)	E(level): probable correspondence to the E=2017-keV level in the Adopted Levels.
x+2151 [†] 5	(4)	(0.47)	
x+2301 [†] 5	(1)	(0.44)	
x+3371? [†] 5			
x+8205 5	1+3		E(level): possible isobaric analog state to ground state and 5.2-keV level of ^{83}Rb .
x+8275 5	1		E(level): possible isobaric analog state to 99.5-keV level of ^{83}Rb .
x+8658 5	1+2		E(level): possible isobaric analog state to 390- and 424-keV levels of ^{83}Rb .
x+9038 5			

[†] No corresponding level in the Adopted Levels.

[‡] From comparison of measured $\sigma(\theta)$ to DWBA calculations. Angular distributions for $L \neq 1$ are quite similar and structureless, so most assignments are not definite.

[§] From DWBA, derived from $d\sigma/d\Omega_{\text{exp}} = N \times C^2S \times \sigma_{\text{DWBA}} / (2J+1)$. Normalization is determined by fixing $C^2S=6.0$ for the E=x, L=4 state (the expected $1g_{9/2}$ strength for neutron pickup from a target with 46 neutrons) which yields $N=14$.

(HI,xn γ): SD 1995La21,1995Ba26,2003Le08

2003Le08: $^{58}\text{Ni}(^{29}\text{Si},4p\gamma)$, E(^{29}Si)=130 MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma\gamma$, $p\gamma$ coin, lifetimes by DSAM using GAMMASPHERE array with 100 Compton-suppressed HPGe detectors and MICROBALL particle array of CsI(Tl) detectors. Deduced SD band and quadrupole moment.

1995La21, 1999Le56: $^{58}\text{Ni}(^{29}\text{Si},4p\gamma)$, E(^{29}Si)=128 MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma\gamma$, $p\gamma$ coin using Gammasphere and Microball array. The assignment of the SD band to ^{83}Sr is confirmed. 1995La21 give many additional normal deformed states (extended to $J=59/2$) which are given in the $^{58}\text{Ni}(^{29}\text{Si},4p\gamma)$ dataset. Data of 1995La21 reanalyzed by 1997De51 to deduce lifetimes and Q(intrinsic). 1999Le56 also deduced lifetimes by the Doppler Shift Attenuation Method and Q(intrinsic).

1995Ba26: $^{56}\text{Fe}(^{30}\text{Si},2pn\gamma)$, E(^{30}Si)=128 MeV. Measured $E\gamma$, $\gamma\gamma$; EUROGAM array. Deduced SD band, tentatively assigned to ^{83}Sr on the basis of observation of several γ rays in $\gamma\gamma$ spectra which belong to normal deformed bands in ^{83}Sr .

But according to the authors, assignment to ^{83}Y or ^{80}Rb cannot be ruled out.

 ^{83}Sr Levels

E(level)	$J\pi$	Comments
x [†]	$J=(41/2)$	$J\pi:=(41/2)$ estimated (1995Ba26,1995La21,2003Le08) (within one unit of spin) from depopulation into the highest spin states (45/2+,39/2-) of normal-deformed bands in ^{83}Sr (1995La21,1992WiZU). E(level): x=13.0 MeV 15 (1995La21).
1306.0+x [†] 10	J+2	
2767.0+x [†] 15	J+4	
4380.0+x [†] 18	J+6	
6142.1+x [†] 20	J+8	
8054.1+x [†] 23	J+10	
10114.1+x [†] 25	J+12	
12319+x [†] 3	J+14	
14666+x [†] 3	J+16	
17157+x [†] 3	J+18	
19803+x? [†] 3	J+20	

[†] (A): SD band (2003Le08,1995Ba26,1995La21). Q(transition)=3.60 +20-18 (2003Le08), 3.5 +8-6 (1997De51, reanalyzed data of 1995La21). Configuration= $v5^1\pi5^0$ (2003Le08); $v5^3\pi5^1$; $\pi=+$, $\alpha=+1/2$; $\beta_2=0.57$, $\gamma=0^\circ$ (1995La21, from experimental values of moments of inertia). Percent population=1.36 (2003Le08), 1.4 5 (1995Ba26).

(HI,xn γ): SD 1995La21,1995Ba26,2003Le08 (continued)

$\gamma(^{83}\text{Sr})$

$E\gamma^{\dagger}$	E(level)	Comments
1306 1	1306.0+x	E γ : other: 1303 2 (1995Ba26).
1461 1	2767.0+x	
1613 1	4380.0+x	
1762 1	6142.1+x	E γ : other: 1764 (1995La21).
1912 1	8054.1+x	
2060 1	10114.1+x	
2205 1	12319+x	E γ : other: 2203 (1995La21).
2347 1	14666+x	
2491 1	17157+x	
2646 ‡	19803+x?	E γ : from 1995La21. Other: 2641 2 (1995Ba26). γ not reported by 2003Le08.

† From 2003Le08, unless otherwise stated. Corresponding values from 1995La21 and 1995Ba26 are in general agreement.

‡ Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

$Q(\beta^-) = -6294.20$; $S(n) = 12213.19$; $S(p) = 3483.20$; $Q(\alpha) = -3826.19$ 2012Wa38.
 $S(2n) = 22635.19$; $S(2p) = 11326.19$ (2012Wa38).

 ^{83}Y Levels

Cross Reference (XREF) Flags

A ^{83}Zr ϵ Decay
 B ^{83}Y IT Decay (2.85 min)
 C (HI,xn γ)
 D $^{58}\text{Ni}(^{28}\text{Si},3p\gamma)$: SD

E(level) [†]	J π	XREF	T _{1/2} [§]	Comments
0.0 [#]	9/2+	ABC	7.08 min 8	$\% \epsilon + \% \beta^+ = 100$. $J\pi$: heavier odd-A Y isotopes possess a 9/2+ isomeric state which decreases in energy with decreasing neutron number, (E(9/2+)-E(gs)= 909 keV in ^{89}Y , 381 keV in ^{87}Y and 19.8 keV in ^{85}Y). Strong ϵ feeding of the 62-keV isomeric level in ^{83}Y from ^{83}Zr with $J\pi=(1/2-)$ suggests that the isomeric state has low spin, and the 9/2+ has become the ground state in ^{83}Y . T _{1/2} : weighted average of 7.06 min 8 (1972Tu07) and 7.1 min 1 (1976Li27).
62.04 ^a 10	3/2-	ABC	2.85 min 2	$\% \epsilon + \% \beta^+ = 60.5$; $\% \text{IT} = 40.5$. T _{1/2} : from 1972Tu07. Others: 2.7 min 3 (1976Li27), 2.5 min 3 (1987Ra06). $J\pi$: E3 62 γ to 9/2+; log ft=5.3 from ^{83}Zr parent with $J\pi=(1/2-)$. $\% \epsilon + \% \beta^+$: from 1987Ra06.
97.11 15	5/2+	A	9.8 ns 10	T _{1/2} : from delayed coincidence of 243 γ -97 γ (centroid shift) in ^{83}Zr ϵ decay. $J\pi$: E2 97 γ to 9/2+; log f ^{Iu} t=8.7 from ^{83}Zr parent with $J\pi=(1/2-)$.
117.60 10	(1/2-)	A		$J\pi$: M1 55.6 γ to 3/2-; log ft=6.1 from ^{83}Zr parent with $J\pi=(1/2-)$.
144.99 [@] 4	7/2+	A C	119 ps 28	$\mu = +2.16$. $J\pi$: M1+E2 145 γ to 9/2+. μ : from IMPAD technique in 1990Bh03.
167.01 ^b 9	5/2-	A C	<0.76 ns	$J\pi$: M1 105 γ to 3/2-.
331.66 14	(5/2+)	A		$J\pi$: M1 234 γ to 5/2+, 187 γ to 7/2+; log f ^{Iu} t=9.0 from ^{83}Zr parent with $J\pi=(1/2-)$.
421.81 10	(3/2-)	A		$J\pi$: log ft=5.9 from ^{83}Zr parent with $J\pi=(1/2-)$; 324 γ to 5/2+.
436.57 12	(5/2)	A C		$J\pi$: D 101 γ from 7/2-, 375 γ to 3/2-.
537.12 ^a 9	7/2-	A C	8.0 ps 28	$J\pi$: E2 475 γ to 3/2-.
564.59 16	(1/2-, 3/2, 5/2-)	A		$J\pi$: 398 γ to 5/2-, 447 γ to (1/2-).
565.56 18	(3/2-)	A		$J\pi$: 398.5 γ to 5/2-, 448 γ to (1/2-).
570.53 23	(3/2+, 5/2)	A		$J\pi$: 239 γ to (5/2+), 425.5 γ to 7/2+.
594.98 [#] 7	13/2+	C	5.4 ps 5	$\mu = +8.4526$. μ : from IMPAD technique in 1990Bh03. $J\pi$: E2 595 γ to 9/2+.
642.42 15	(3/2, 5/2-)	A		$J\pi$: 310.5 γ to (5/2+), 475 γ to 5/2-, 525 γ to (1/2-).
722.28 15	(3/2-, 5/2)	A		$J\pi$: 186 γ to 7/2-, 660 γ to 3/2-.
736.64 [@] 7	11/2+	C	4.6 ps 10	$J\pi$: E2 592 γ to 7/2+.
813.99 ^b 8	9/2-	C	3.2 ps 6	$J\pi$: E2 647 γ to 5/2-.
855.59 13	(3/2)	A		$J\pi$: log ft=6.1 from ^{83}Zr parent with $J\pi=(1/2-)$, 319 γ to 7/2-, 688 γ to 5/2-, 758.5 γ to 5/2+.
882.5 3		A		
1137.4 6		C		
1223.68 ^a 10	11/2-	C	0.9 ps 3	$J\pi$: E2 686.5 γ to 7/2-.
1249.82 16	(3/2-)	A		$J\pi$: 713 γ to 7/2-, 1132 γ to (1/2-).
1406.50 [#] 12	17/2+	C	0.96 ps 14	$\mu = +8.2$. $J\pi$: E2 811.5 γ to 13/2+.
1532.04 [@] 20	15/2+	C	1.3 ps 3	μ : from transient field technique (1998LuZU,2011StZZ). $J\pi$: E2 795 γ to 11/2+.
1566.18 ^b 11	13/2-	C	0.80 ps 28	$J\pi$: E2 752 γ to 9/2-.
1708.5 3		C		

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Adopted Levels, Gammas (continued) ^{83}Y Levels (continued)

E(level) [†]	J π	XREF	T _{1/2} [§]	Comments
1848.9 5		C		
1955.7 3		A		
2010.60 ^a 12	15/2-	C	0.97 ps 35	J π : E2 787 γ to 11/2-.
2083.13 16	(3/2-)	A		J π : log ft=6.1 from ^{83}Zr parent with J π =(1/2-), 1547 γ to 7/2-, 1751 γ to (5/2+), 1916 γ to 5/2-.
2136.91 17	(3/2)	A		J π : log ft=6.1 from ^{83}Zr parent with J π =(1/2-), 1600.5 γ to 7/2-.
2145.1 6		C		
2260.0 4		A		
2371.06 [#] 22	21/2+	C	0.43 ps 7	μ =+11 2. J π : E2 964.5 γ to 17/2+.
				μ : from transient field technique (1998LuZU,2011StZZ).
2405.84 ^b 12	17/2-	C	<1.3 ps	J π : E2 840 γ to 13/2-.
2429.5 [@] 3	19/2+	C	<0.83 ps	J π : E2 897.5 γ to 15/2+.
2551.9 11		C		
2559.54 ^d 16	17/2-	C	46 ps 4	μ =+2.5 5. J π : E2 993 γ to 13/2-.
				μ : from IMPAD technique in 1990Bh06.
2738.1 5		A		
2822.77 ^a 20	(19/2-)	C		J π : 812 γ to 15/2-; band assignment.
2887.84 ^e 19	(19/2-)	C	<3.9 ps	J π : (M1+E2) 328 γ to 17/2-.
2937.6 6		C		
3308.14 ^d 21	(21/2-)	C		J π : (M1+E2) 420 γ to (19/2-); band assignment.
3314.54 ^b 16	(21/2-)	C		J π : (E2) 909 γ to 17/2-; band assignment.
3397.1 [@] 4	(23/2+)	C	0.43 ps +11-9	J π : 968 γ to 19/2+, 1025 γ to 21/2+; band assignment.
3420.1 14		C		
3450.6 [#] 3	(25/2+)	C		μ =+7.0 12. J π : (E2) 1079.5 γ to 21/2+; band assignment.
				μ : from transient field technique (1998LuZU,2011StZZ).
3731.0 ^a 7	(23/2-)	C		J π : 908 γ to (19/2-), 1361 γ to 21/2-; band assignment.
3830.33 ^e 22	(23/2-)	C	0.91 ps +23-25	J π : (M1+E2) 522 γ to (21/2-), 942.5 γ to (19/2-).
3916.9 6		C		
4177.2 8		C		
4340.6 ^b 3	(25/2-)	C	0.34 ps +8-4	J π : 1026 γ to (21/2-), band assignment.
4385.8 ^d 5	(25/2-)	C	0.48 ps +12-18	J π : 556 γ to (23/2-), 1078 γ to (21/2-); band assignment.
4421.9 5	(27/2+)	C		J π : 1025 γ to (23/2+).
4472.8 18		C		
4487.9 [@] 4	(27/2+)	C	0.20 ps +6-8	J π : D 1037 γ to (25/2+), 1092 γ to (23/2+); band assignment.
4643.6 [#] 4	(29/2+)	C	0.19 ps +4-3	μ =+8 2. J π : E2 1193 γ to (25/2+).
				μ : from transient field technique (1998LuZU,2011StZZ).
4796.0 ^a 8	(27/2-)	C		J π : 1065 γ to (23/2-); band assignment.
4992.3 ^e 7	(27/2-)	C		J π : 607 γ to (25/2-), 1162 γ to (23/2-); band assignment.
5176.6 6		C		
5244.0 18		C		
5346.6 11		C		
5502.3 ^b 9	(29/2-)	C	0.19 ps +3-6	J π : 1161 γ to (25/2-), band assignment.
5562.3 ^d 11	(29/2-)	C		J π : 1177 γ to (25/2-), band assignment.
5564.8 21		C		
5668.6 12		C		
5747.5 [@] 8	(31/2+)	C	0.20 ps +8-7	J π : 1103 γ to (29/2+), 1260.5 γ to (27/2+), band assignment.
5950.0 ^a 15	(31/2-)	C		J π : 1154 γ to (27/2-).
5983.5 [#] 6	(33/2+)	C	0.22 ps +9-7	μ =+8 2. J π : E2 1340 γ to (29/2+), band assignment.
				μ : from transient field technique (1998LuZU,2011StZZ).
6334.3 ^e 21	(31/2-)	C	<0.26 ps	J π : 1342 γ to (27/2-), band assignment.
6676.5 ^b 14	(33/2-)	C	<0.46 ps	J π : 1174 γ to (29/2-), band assignment.
6780.9 ^c 11	(33/2-)	C		J π : 1278 γ to (29/2-), band assignment.
6782.3 ^d 15	(33/2-)	C	0.13 ps +6-3	J π : 1220 γ to (29/2-), band assignment.
7179.0 [@] 10	(35/2+)	C	<0.24 ps	J π : 1196 γ to (33/2+), 1431 γ to (31/2+), band assignment.
7238.2 ^a 20	(35/2-)	C		J π : 1288 γ to (31/2-), band assignment.
7450.8 16		C		
7468.3 [#] 9	(37/2+)	C	0.05 ps +3-2	J π : E2 1485 γ to (33/2+), band assignment.

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Adopted Levels, Gammas (continued) ^{83}Y Levels (continued)

E(level) [†]	J π	XREF	T _{1/2} [§]	Comments
7819 ^e 3	(35/2-)	C	<0.28 ps	J π : 1485 γ to (31/2-), band assignment.
7918.7 ^b 18	(37/2-)	C		J π : 1242 γ to (33/2-), band assignment.
8070.4 ^d 20	(37/2-)	C		J π : 1288 γ to (33/2-), band assignment.
8108.9 ^c 15	(37/2-)	C		J π : 1328 γ to (33/2-), band assignment.
8442.2 12		C		
8708.8 ^a 25	(39/2-)	C	0.014 ps +55-7	J π : 1471 γ to (35/2-), band assignment.
8712.9 [@] 14	(39/2+)	C		J π : 1534 γ to (35/2+), band assignment.
9074.9 [#] 19	(41/2+)	C		J π : E2 1607 γ to (37/2+), band assignment.
9331.9 ^b 21	(41/2-)	C		J π : 1413 γ to (37/2-), band assignment.
9598.0 14		C		
9639.9 ^c 18	(41/2-)	C	0.014 ps +55-7	J π : 1531 γ to (37/2-), band assignment.
10001.4 14		C		
10358.9 [@] 22	(43/2+)	C		J π : 1646 γ to (39/2+), band assignment.
10396 3	(43/2-)	C		J π : 1687 γ to (39/2-), band assignment.
10452 3	(43/2-)	C		J π : 1743 γ to (39/2-), band assignment.
10824 [#] 3	(45/2+)	C		J π : E2 1749 γ to (41/2+), band assignment.
10926.5 ^b 23	(45/2-)	C		J π : 1595 γ to (41/2-), band assignment.
11266.9 ^{?c} 20	(45/2-)	C		J π : 1627 γ to (41/2-), band assignment.
12243.8 [@] 24	(47/2+)	C		J π : 1885 γ to (43/2+), band assignment.
12726 ^b 3	(49/2-)	C		J π : 1799 γ to (45/2-), band assignment.
12787 [#] 3	(49/2+)	C		J π : 1959 γ to (45/2+), band assignment.
13022 3	(47/2+)	C		J π : D 2198 γ to (45/2+).
13035 ^{&} 3	(47/2+)	C		J π : (D) 2212 γ to (45/2+); band assignment.
14028 [@] 3	(51/2+)	C		J π : 1784 γ to (47/2+), band assignment.
14767 ^b 3	(53/2-)	C		J π : 2041 γ to (49/2-), band assignment.
14881 [#] 3	(53/2+)	C		J π : 2094 γ to (49/2+), band assignment.
14947 ^{&} 3	(51/2+)	C		J π : 1913 γ to (47/2+), band assignment.
17101 ^{&} 3	(55/2+)	C		J π : 2154 γ to (51/2+), band assignment.
19466 ^{&} 3	(59/2+)	C		J π : 2365 γ to (55/2+), band assignment.
x ^f	J=(45/2) [‡]	D		
x+1892.0 ^f 10	J+2	D		
x+3914.0 ^f 14	J+4	D		
x+6070.1 ^f 17	J+6	D		
x+8368.1 ^f 20	J+8	D		
x+10812.2 ^f 22	J+10	D		
x+13398.2 ^f 24	J+12	D		
x+16120 ^f 3	J+14	D		
x+18959 ^{?f} 3	J+16	D		
y ^g	J ₁ =(43/2) [‡]	D		
y+1756.0 ^g 10	J ₁ +2	D		
y+3677.0 ^g 14	J ₁ +4	D		
y+5749.1 ^g 17	J ₁ +6	D		
y+7973.1 ^g 20	J ₁ +8	D		
y+10357.1 ^g 22	J ₁ +10	D		
y+12908.2 ^g 24	J ₁ +12	D		
y+15628 ^g 3	J ₁ +14	D		
z ^h	J ₂ =(43/2) [‡]	D		
z+1737.0 ^h 10	J ₂ +2	D		
z+3608.0 ^h 14	J ₂ +4	D		
z+5646.1 ^h 17	J ₂ +6	D		
z+7859.1 ^h 20	J ₂ +8	D		
z+10237.1 ^h 22	J ₂ +10	D		
z+12772.2 ^h 24	J ₂ +12	D		
z+15490 ^h 3	J ₂ +14	D		
u ⁱ	J ₃ =(45/2) [‡]	D		
u+1919.0 ⁱ 10	J ₃ +2	D		
u+3981.1 ⁱ 14	J ₃ +4	D		
u+6192.1 ⁱ 17	J ₃ +6	D		
u+8566.1 ⁱ 20	J ₃ +8	D		
u+11097.2 ⁱ 22	J ₃ +10	D		
u+13791.2 ⁱ 24	J ₃ +12	D		

[†] From a least-squares fit to E γ , by evaluator.

Adopted Levels, Gammas (continued)

⁸³Y Levels (continued)

- ‡ Estimated from observed feeding into known spin levels in the normal-deformed region and checked by fitting measured dynamic moments of inertia as a function of rotational frequency.
- § From (HI,xnγ), except where noted. Methods include both Recoil Distance Doppler Shift (RDDS) and Doppler Shift Attenuation method (DSAM).
- # (A): [422]5/2+ band, α=+1/2.
- @ (B): [422]5/2+ band, α=-1/2.
- & (C): Band based on (47/2+), 13035-keV level.
- a (D): [301]3/2- band, α=-1/2.
- b (E): [301]3/2- band, α=+1/2.
- c (F): Band based on (33/2-), 6781-keV level.
- d (G): Band based on the 17/2-, 2560-keV level, α=+1/2.
- e (H): Band based on the 17/2-, 2560-keV level, α=-1/2.
- f (I): SD-1 band. Percent population=4.20. Q(transition)=4.4 7 (2003Le08,1999Le56). Other: 4.7 7 (quoted by 2003Le08 from C.-H. Yu, priv. comm.). Configuration=v5¹π5¹; non-intruder orbitals: v(f_{5/2},p_{3/2}(3/2[301])).
- g (J): SD-2 band. Percent population=2.94. Q(transition)=3.6 +8-5 (2003Le08). Configuration=v5¹π5⁰; non-intruder orbitals: π(f_{5/2},p_{3/2}(1/2[310])). This band is isospectral with SD band in ⁸²Sr.
- h (K): SD-3 band. Percent population=2.90. Q(transition)=3.6 +4-3 (2003Le08). Tentative configuration=v5⁰π5⁰.
- i (L): SD-4 band. Percent population=2.73.

γ(⁸³Y)

E _γ [†]	E(level)	I _γ [†]	Mult. [‡]	δ [‡]	α	Comments
55.55 [#] 4	117.60	100 [#]	M1 §		0.957	δ: <0.2 from α(exp) measured in ⁸³ Zr ε decay.
(62.1 [#] 3)	62.04	100 [#]	E3 §		90.8 25	B(E3)(W.u.)=0.021 3.
70.0 [#] 3	167.01	1.28 [#] 12	[E1]		0.305 6	B(E1)(W.u.)>1.30×10 ⁻⁵ .
97.1 [#] 3	97.11	100 [#]	E2 §		1.185 22	B(E2)(W.u.)=142 15.
100.8 1	537.12	3.8 4	D			Mult.: from comparison to RUL.
104.97 5	167.01	100 [#] 11	M1 §		0.1587	B(M1)(W.u.)>0.0213.
114.5 [#] 3	537.12		[E2]		0.649 11	
133.0 [#] 3	855.59	<3 [#]				
141.67 5	736.64	8.7 7	(M1+E2)	+0.12 8	0.073 6	B(E2)(W.u.)=70 17; B(M1)(W.u.)=0.081 19. Mult.: D+Q from γ(θ) in (HI,xnγ); Δπ=no from level scheme.
145.00 4	144.99	100	M1+E2	+0.13 4	0.069 3	B(E2)(W.u.)=54 13; B(M1)(W.u.)=0.056 13. Mult.: D+Q from γ(θ) in (HI,xnγ), E1+M2 excluded by comparison with RUL.
153.7 2	2559.54	9.5 14				
164.5 ^{#&} 3	331.66	<8 [#]				
185.9 [#] 3	722.28	<15 [#]				
186.7 [#] 3	331.66	<8 [#]				
213.2 [#] 3	855.59	13 [#] 2				
220.6 [#] 3	642.42	46 [#] 4				
234.5 [#] 3	331.66	100 [#] 10	M1 §		0.0186	
238.9 [#] 3	570.53					
254.76 [#] 4	421.81	93 [#] 9	M1 §		0.01506	
270.5 3	436.57	38 6				
276.9 1	813.99	37 3	(M1+E2)	+0.17 4	0.0126 3	B(E2)(W.u.)=25 5; B(M1)(W.u.)=0.055 12. Mult.: D+Q from γ(θ) in (HI,xnγ); Δπ=no from level scheme.
285.3 [#] 3	722.28	<15 [#]				
290.0 [#] 3	855.59	3.5 [#] 5				
291.0 [#] 3	855.59	2.7 [#] 3				
300.3 ^{#&} 2	722.28	<15 [#]				
302.0 3	1708.5	17.2 22				
304.21 [#] 4	421.81	100 [#] 9	M1 (+E2) §	<0.7	0.0113 17	
310.5 [#] 3	642.42	20 [#] 2				
319.2 [#] 3	855.59	17 [#] 2				
324.6 [#] 3	421.81	16 [#] 2				
328.3 1	2887.84	100	(M1+E2)	-0.24 6	0.00836 24	B(E2)(W.u.)>95.6; B(M1)(W.u.)>0.150. Mult.: D+Q from γ(θ) in (HI,xnγ), E1+M2 excluded by comparison to RUL.
342.5 1	1566.18	17 2	(M1+E2)	+0.06 6	0.00721 12	B(E2)(W.u.)=3.1 12; B(M1)(W.u.)=0.09 3. Mult.: D+Q from γ(θ) in (HI,xnγ); Δπ=no from level scheme.

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Y})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\dagger}$	Mult. ‡	$\delta^{\ddagger}$	α	Comments
359.80# 5 370.3 1	421.81 537.12	74# 7 100 90	(M1+E2)	+0.46 7	0.00667 21	B(E2)(W.u.)=50 50; B(M1)(W.u.)=0.03 3. Mult.: D+Q from $\gamma(\theta)$ in (HI,xn γ); $\Delta\pi$ =no from level scheme.
375.2 4 392.2 2 395.2 1	436.57 537.12 2405.84	100 6 10.3 13 15.5 18	[E1] (M1(+E2))	0.00 8	0.00223 0.00507	B(E1)(W.u.)=4. $\times 10^{-5}$ 3. B(M1)(W.u.)>0.0366. Mult.: D+Q from $\gamma(\theta)$ in (HI,xn γ); $\Delta\pi$ =no from level scheme.
397.6# 3 398.5# 3 409.7 1	564.59 565.56 1223.68	49# 5 32# 3 27 2	(M1+E2)	+0.25 7	0.00480 12	B(E2)(W.u.)=22 8; B(M1)(W.u.)=0.050 17. Mult.: D+Q from $\gamma(\theta)$ in (HI,xn γ); $\Delta\pi$ =no from level scheme.
417.0 4 418.7# 3 420.3 1	2822.77 855.59 3308.14	13 1 6# 1 100	(M1+E2)	-1.8 4	0.0062 3	Mult.: D+Q from $\gamma(\theta)$ in (HI,xn γ), large value of δ make E1+M2 less likely.
425.5# 3 433.7# 3 444.4 1	570.53 855.59 2010.60	6# 1 17.6 20	(M1(+E2))	+0.06 8	0.00383	B(E2)(W.u.)=0.50 19; B(M1)(W.u.)=0.023 9. Mult.: D+Q from $\gamma(\theta)$ in (HI,xn γ); $\Delta\pi$ =no from level scheme.
447.0# 2 448.0# 3 466.3 5 475.1 1	564.59 565.56 3916.9 537.12	24# 5 72# 7 100 56 5	E2		0.00459	B(E2)(W.u.)=40 30. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
475.4# 3 491.6 5 492 1 502.5# 3 503.5# 3 522.2 1	642.42 3314.54 5668.6 564.59 565.56 3830.33	100# 10 13 100 100# 10 100# 10 100 9	(M1+E2)	-0.8 2	0.00294 12	B(E2)(W.u.)=160 70; B(M1)(W.u.)=0.057 +21-20. Mult.: D+Q from $\gamma(\theta)$ in (HI,xn γ), E1+M2 excluded by comparison to RUL.
524.1# 3 524.8# 3 533.0 5 548.9 2	855.59 642.42 5176.6 2559.54	<3# 66# 6 100 36 3	(M1+E2)	-5.0 15	0.00295	B(E2)(W.u.)=2.7 4; B(M1)(W.u.)=2.7 $\times 10^{-5}$ 4. Mult.: D+Q from $\gamma(\theta)$ in (HI,xn γ); $\Delta\pi$ =no from level scheme.
550.8# 3 555.7 6 566.6 6 580.3 4 591.7 2	882.5 4385.8 2937.6 642.42 736.64	100# 61 7 12.8 11 40 4 100 9	E2		0.00240	B(E2)(W.u.)=47 12. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
595.0 1	594.98	100	E2		0.00236	B(E2)(W.u.)=65 6. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
600 1 606.6 6 613.1 6 625.6 6 647.0 1	1137.4 4992.3 2145.1 1848.9 813.99	32 3 100 33 3 100 8	E2		0.00187	B(E2)(W.u.)=34 8. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
660.2# 3	722.28	100# 10				

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Y})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\dagger}$	Mult. ‡	$\delta^{\ddagger}$	α	Comments
669.0 1	813.99	29 3	(E1)		6.15×10^{-4}	B(E1)(W.u.)= 5.1×10^{-5} 12. Mult.: D from $\gamma(\theta)$ in (HI,xn γ); $\Delta\pi$ =yes from level scheme.
686.5 2	1223.68	100 7	E2		1.59×10^{-3}	B(E2)(W.u.)=110 40. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
688.4 [#] 3	855.59	11 [#] 1				
700 1	1137.4					
703 ^a 1	2551.9	100 ^a				
	5346.6	100				
710.9 7	1848.9	100 9				
713.4 [#] 3	1249.82	39 [#] 4				
726.6 7	4177.2	100				
736.6 1	736.64	57 5	(M1+E2)	+1.2 4	0.00127 4	B(E2)(W.u.)=5.3 13; B(M1)(W.u.)=0.0017 4. Mult.: D+Q from $\gamma(\theta)$ in (HI,xn γ); $\Delta\pi$ =no from level scheme.
752.2 1	1566.18	100 7	E2		1.25×10^{-3}	B(E2)(W.u.)=100 40. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
758.5 [#] 3	855.59	7 [#] 1				
774.3 8	7450.8	100				
786.9 1	2010.60	100 8	E2		1.12×10^{-3}	B(E2)(W.u.)=45 18. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
793.5 [#] 3	855.59	100 [#] 11				
795.4 2	1532.04	100	E2		1.09×10^{-3}	B(E2)(W.u.)=64 15. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
811.5 1	1406.50	100	E2		1.03×10^{-3}	B(E2)(W.u.)=78 12. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
812.2 3	2822.77	100 11				
813.9 2	813.99	44 6	[E1]		4.04×10^{-4}	B(E1)(W.u.)= 4.3×10^{-5} 11.
827.8 [#] 2	1249.82	29 [#] 5				
830.1 8	1566.18	18 2	[E1]		3.88×10^{-4}	B(E1)(W.u.)= 1.0×10^{-4} 4.
839.7 1	2405.84	100 8	E2		9.48×10^{-4}	B(E2)(W.u.)>42. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
868.2 9	3420.1	100				
897.5 3	2429.5	100 8	E2		8.05×10^{-4}	B(E2)(W.u.)>50. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
908.1 9	3731.0	100 17				
908.7 1	3314.54	100 10	(E2)		7.82×10^{-4}	Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), E2 from assumed band structure.
937.4	1532.04					
942.5 2	3830.33	81 7	[E2]		7.16×10^{-4}	B(E2)(W.u.)=17 +7-4.
964.5 2	2371.06	100	E2		6.79×10^{-4}	B(E2)(W.u.)=73 12. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
967.7 2	3397.1	100 12	[E2]		6.73×10^{-4}	B(E2)(W.u.)=66 +18-14.
993.4 2	2559.54	100 8	E2		6.33×10^{-4}	B(E2)(W.u.)=0.41 6. Mult.: Q from $\gamma(\theta)$ in (HI,xn γ), M2 excluded by comparison to RUL.
1024.0	2429.5	9 4				
1024.8 3	4421.9	100				
1025.2	3397.1	8.7				
1026.0 3	4340.6	100	[E2]		5.88×10^{-4}	B(E2)(W.u.)=68 +9-13.
1037.3 3	4487.9	18 6	(M1)		5.69×10^{-4}	B(M1)(W.u.)=0.015 +10-3. Mult.: D from $\gamma(\theta)$ in (HI,xn γ), $\Delta\pi$ =no from level scheme.
1052.7 11	4472.8	100				
1065.3 11	4796.0					

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Y})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\dagger}$	Mult. ‡	α	Comments
1077.6 11	4385.8	100 14	[E2]	5.26×10^{-4}	B(E2)(W.u.)=23 +14-5.
1079.5 2	3450.6	100 5	(E2)	5.24×10^{-4}	Mult.: Q from $\gamma(0)$ in (HI,xn γ), E2 from assumed band structure.
1091.7 11	4487.9	100 12	[E2]	5.11×10^{-4}	B(E2)(W.u.)=72 +48-17.
1092.1	5564.8	100			
1103.1	5747.5	8.5 17			
1113.0 11	1708.5	100 9			
1132.1# 2	1249.82	100# 11			
1154.0 12	5950.0	100			
1161.3	5502.3	100	[E2]	4.49×10^{-4}	B(E2)(W.u.)=66 +30-9.
1161.7 12	4992.3	100 13			
1174.2	6676.5	100	[E2]	4.40×10^{-4}	B(E2)(W.u.)>26.
1177.0 12	5562.3	100			
1192.9 3	4643.6	100	E2	4.27×10^{-4}	B(E2)(W.u.)=57 +11-10. Mult.: Q from $\gamma(0)$ in (HI,xn γ), M2 excluded by comparison to RUL.
1195.7	7179.0				
1219	6780.9				
1220.1	6782.3	100	[E2]	4.12×10^{-4}	B(E2)(W.u.)=75 +22-24.
1224.1	1223.68	54 5	[E1]	2.42×10^{-4}	B(E1)(W.u.)=6.4 $\times 10^{-5}$ 23.
1242.2 12	7918.7	100			
1260.5 13	5747.5	100 14	[E2]	3.92×10^{-4}	B(E2)(W.u.)=38 +21-11.
1278.2	6780.9				
1288.1 13	8070.4	100	[E2]	3.81×10^{-4}	B(E2)(W.u.)>26.
1288.2 13	7238.2	100			
1328.0	8108.9	100			
1340.0 5	5983.5	100	E2	3.65×10^{-4}	B(E2)(W.u.)=28 +13-8. Mult.: Q from $\gamma(0)$ in (HI,xn γ), M2 excluded by comparison to RUL.
1342.2	6334.3	100	[E2]	3.64×10^{-4}	B(E2)(W.u.)>23.
1345	4796.0				
1361.0 14	3731.0	23 3			
1361.1# 3	2083.13	29# 6			
1413.2	9331.9	100			
1415.2	2010.60	80 12	[E1]	3.26×10^{-4}	B(E1)(W.u.)=5.2 $\times 10^{-5}$ 21.
1416.1 3	2822.77	83 15			
1430.9 14	7179.0				
1470.6 15	8708.8	100			
1484.8 7	7468.3	100	E2	3.45×10^{-4}	B(E2)(W.u.)=70 +50-30. Mult.: Q from $\gamma(0)$ in (HI,xn γ), M2 excluded by comparison to RUL.
1485.2	7819	100			
1494.3# 2	2136.91	54# 8			
1519.1# 3	1955.7	100#			
1531.0 15	2937.6	100			
1531	9639.9	100			
1533.9	8712.9	100			
1546.8# 4	2083.13	43# 9			
1594.6	10926.5	100			
1600.5# 3	2136.91	54# 6			
1606.6 16	9074.9	100	E2	3.55×10^{-4}	B(E2)(W.u.)=180 +180-140. Mult.: Q from $\gamma(0)$ in (HI,xn γ), M2 excluded by comparison to RUL.
1627&	11266.9?	100			
1646.0 17	10358.9	100			
1661.3# 3	2083.13	100# 11			
1687	10396	100			
1699.9# 5	2136.91	28# 4			
1714.8# 4	2136.91	<20#			
1738.1	z+1737.0				
1743	10452	100			

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Y})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\dagger$	Mult. ‡	α	Comments
1749.0 18	10824	100	E2	3.83×10^{-4}	B(E2)(W.u.)=110 +110-90. Mult.: Q from $\gamma(0)$ in (HI,xn γ), M2 excluded by comparison to RUL.
1751.3# 4	2083.13	<29#			
1757 1	y+1756.0	1.5@ 5			
1784.4	14028	100			
1793.4 18	5244.0	100			
1799.2	12726	100			
1838.1#& 7	2260.0	100# 25			
1871 1	z+3608.0				
1884.9	12243.8	100			
1893 1	x+1892.0	2.6@ 5			
1913	14947	50 45			
1915.8# 3	2083.13	37# 11			
1920 1	u+1919.0				
1921 1	y+3677.0	2.1@ 4			
1958.6 20	12787	100	[E2]	4.44×10^{-4}	B(E2)(W.u.)>23.
1964.9#& 5	2083.13	94# 11			
2020.8# 5	2083.13	86# 11			
2022 1	x+3914.0	4.2@ 6			
2038 1	z+5646.1				
2041	14767	100			
2062 1	u+3981.1				
2072 1	y+5749.1	3.0@ 5			
2074.8# 4	2136.91	100# 10			
2093.9	14881	100			
2129.6	9598.0	100			
2142.4# 4	2260.0	100# 25			
2154	17101	100			
2156 1	x+6070.1	4.0@ 6			
2159	14947	100 80			
2198	13022	100	D		
2211 1	u+6192.1				
2212	13035	100	(D)		
2213 1	z+7859.1				
2224 1	y+7973.1	2.0@ 5			
2298 1	x+8368.1	3.8@ 6			
2316.3# 5	2738.1	100#			
2365	19466	100			
2374 1	u+8566.1				
2378 1	z+10237.1				
2384 1	y+10357.1	2.8@ 6			
2444 1	x+10812.2	2.8@ 5			
2458.6	8442.2	100			
2531 1	u+11097.2				
2533	10001.4	100			
2535 1	z+12772.2				
2551 1	y+12908.2	1.5@ 5			
2586 1	x+13398.2	2.1@ 6			
2694 1	u+13791.2				
2718 1	z+15490				
2720 1	y+15628	0.6@ 4			
2722 1	x+16120	1.0@ 4			
2839& 1	x+18959?				

 † From (HI,xn γ), except where noted. ‡ From $\gamma(0)$ in (HI,xn γ), except where noted. § From conversion electron data in ^{83}Zr ϵ decay.# From ^{83}Zr ϵ decay.

@ Intensity within the SD band given relative to the sum of the intensities of the ground-state band transitions.

& Placement of transition in the level scheme is uncertain.

^a Multiply placed; intensity suitably divided.

Adopted Levels, Gammas (continued)

Note: For bands flagged by †, interband transitions are not shown.

(A) [422]5/2+ band,
 $\alpha=+1/2$ (C) Band based on
(47/2+), 13035-keV
level.(B) [422]5/2+ band, $\alpha=-1/2$ (D)† [301]3/2- band, $\alpha=-1/2$

Adopted Levels, Gammas (continued)

Note: For bands flagged by †, interband transitions are not shown.

(E)† [301]3/2- band, $\alpha=+1/2$ (F) Band based on (33/2-),
6781-keV level.(G) Band based on the 17/2-,
2560-keV level, $\alpha=+1/2$ (H) Band based on the
17/2-, 2560-keV level,
 $\alpha=-1/2$

Adopted Levels, Gammas (continued)

Adopted Levels, Gammas (continued)

(L) SD-4 band. Percent
population=2.73.

^{83}Y IT Decay (2.85 min)

Parent ^{83}Y : E=62.04 10; $J\pi=3/2^-$; $T_{1/2}=2.85$ min 2; %IT decay=40 5.

 ^{83}Y Levels

E(level) [†]	$J\pi^{\dagger}$	$T_{1/2}^{\dagger}$
0.0	9/2+	7.08 min 8
62.04 10	3/2-	2.85 min 2

[†] From the Adopted Levels.

 $\gamma(^{83}\text{Y})$

$E_{\gamma}^{\dagger}$	E(level)	$I_{\gamma}^{\ddagger}$	Mult. [†]	α	I(γ +ce) [§]	Comments
62.1 3	62.04	1.09 3	E3	90.8 25	100	ce(K)/(γ +ce)=0.497 14; ce(L)/(γ +ce)=0.411 13; ce(M)/(γ +ce)=0.073 3; ce(N)/(γ +ce)=0.0083 4; ce(O)/(γ +ce)= 6.07×10^{-5} 22. $\alpha(\text{K})_{\text{exp}}=73$ 18, ce(K)/(ce(L)+ce(M)+ce(N)) $_{\text{exp}}=1.06$ 37 (1987Ra06).

[†] From the Adopted Gammas.

[‡] Deduced by evaluator from I(γ +ce)=100 and α .

[§] For absolute intensity per 100 decays, multiply by 0.40 5.

Decay Scheme

Intensities: I(γ +ce)
per 100 parent decays
%IT=40 5

^{83}Zr ϵ Decay 1992Bu10,1987Ra06

Parent ^{83}Zr : E=0.0; $J\pi=(1/2^-)$; $T_{1/2}=42$ s 2; Q(g.s.)=6294 20; % ϵ +% β^+ decay=100.

1992Bu10, 1987Ra06: ^{83}Zr activity produced in the $^{nat}\text{Mo}(^3\text{He},\text{X})$ reaction with E(^3He)=280 MeV followed by mass separation. Measured E_{γ} , I_{γ} , $\gamma\gamma$, $\gamma\gamma(t)$, $\beta\gamma$ coin.

1982De36: ^{83}Zr activity produced in the $^{54}\text{Fe}(^{32}\text{S},2\text{pn})$ reaction with E(^{32}S)=100–160 MeV followed by separation in a β recoil time of flight mass spectrometer. Measured E_{β} , I_{β} , E_{γ} , I_{γ} , x-rays, $\beta\gamma$, $\gamma\gamma$, γ -x-ray coincidences, $\gamma(t)$ using a Ge(Li) detector, a thick plastic scintillator, and an x-ray detector.

Others: 1982Li17, 1981SaZO.

A total energy release of 6300 keV 300 is calculated for this decay scheme using the RADLST code, in good agreement with the Q value of 6294 keV 20.

 ^{83}Y Levels

1992Bu10 and 1987Ra06 report a level at 483.9 keV deexcited by a 324.6-keV γ ray to the 97.1 level, obviously a mistake. $\gamma\gamma$ -coin data in 1987Ra06 show the 324.6 and 97.1 γ rays to be in coincidence. Therefore, the 324.6 γ ray deexcites the 422.0 level.

E(level) [†]	$J\pi^{\dagger}$	$T_{1/2}^{\S}$	Comments
0.0	9/2+	7.08 min 8	
62.02 24	3/2-	2.85 min 2	

Continued on next page (footnotes at end of table)

^{83}Zr ϵ Decay 1992Bu10,1987Ra06 (continued) ^{83}Y Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	$T_{1/2}^{\S}$	Comments
97.1 3	5/2+	9.8 ns 10	$T_{1/2}$: from delayed coincidence of 234 γ -97 γ (centroid shift) in 1987Ra06.
117.58 24	(1/2-)		
144.88 24	7/2+		
167.03 24	5/2-		
331.60 25	(5/2+)		
421.80 24	(3/2-)		
436.8 3	(5/2)		
536.40 24	(7/2-)		
564.6 3	(1/2-, 3/2, 5/2-)		
565.5 3	(1/2-, 3/2, 5/2-)		
570.4 3	(3/2+, 5/2)		
642.4 3	(3/2, 5/2-)		
722.2 3	(3/2-, 5/2)		
855.5 3	(3/2)		
882.4 4			
1249.7 3	(3/2-)		
1955.9 4			
2083.0 3	(3/2-)		
2136.7 3	(3/2)		
2260.0 4			
2738.1 6			

[†] From a least-squares fit to $E\gamma$, by evaluator.[‡] From the Adopted Levels.[§] From the Adopted Levels, except where noted. β^+, ϵ Data

$E\epsilon$	E(level)	$I\beta^{+\ddagger}$	$I\epsilon^{\ddagger}$	Log ft	$I(\epsilon+\beta^+)^{\ddagger\ddagger}$
(3556 20)	2738.1	0.04 4	0.004 4	7.1 5	0.04 4
(4034 20)	2260.0	0.22 5	0.016 3	6.64 10	0.24 5
(4157 20)	2136.7	0.87 8	0.056 6	6.1 1	0.93 9
(4211 20)	2083.0	1.0 1	0.064 6	6.1 1	1.1 1
(4338 20)	1955.9	0.072 16	0.0039 9	7.32 10	0.076 17
(5044 20)	1249.7	0.94 10	0.029 3	6.6 1	0.97 10
(5412 20)	882.4	0.17 3	0.0039 7	7.5 1	0.17 3
(5439 20)	855.5	4.6 4	0.11 1	6.1 1	4.7 4
(5572 20)	722.2	0.51 11	0.011 2	7.10 10	0.52 11
(5652 20)	642.4	1.7 4	0.034 8	6.62 11	1.7 4
(5724 20)	570.4	0.08 5	0.003 2	9.7 ^{lu} 3	0.08 5
(5729 20)	565.5	1.8 2	0.034 4	6.6 1	1.8 2
(5729 20)	564.6	0.98 10	0.019 2	6.9 1	1.0 1
(5758 20)	536.40	3.4 7	0.065 13	6.4 1	3.5 7
(5857 20)	436.8	0.60 12	0.011 2	7.2 1	0.61 12
(5872 20)	421.80	10.3 9	0.181 16	5.9 1	10.5 9
(5962 20)	331.60	0.58 16	0.022 6	8.99 ^{lu} 13	0.60 17
(6127 20)	167.03	1.5 13	0.022 19	6.9 4	1.5 13
(6149 20)	144.88	0.30 8	0.0044 12	7.58 12	0.30 8
(6176 20)	117.58	8.2 18	0.12 3	6.14 10	8.3 18
(6197 20)	97.1	1.6 5	0.053 16	8.67 ^{lu} 13	1.7 5
(6232 20)	62.02	59 6	0.84 9	5.3 1	60 6

[†] Derived from an intensity imbalance at each level.[‡] Absolute intensity per 100 decays.

^{83}Zr ϵ Decay 1992Bu10,1987Ra06 (continued) $\gamma(^{83}\text{Y})$

$I\gamma$ normalization: deduced from decay scheme assuming $\Sigma I(\gamma+\text{ce})(\text{to g.s.})=100\%$. Ground state feeding is not expected with $\Delta J=4$, $\Delta\pi=\text{yes}$.

$E\gamma^\dagger$	E(level)	$I\gamma^\dagger@$	Mult.	α	Comments
55.55 $\frac{+}{-}$ 4	117.58	100 5	M1	0.957	$\alpha(\text{K})\text{exp}=1.2$ 3, $\alpha(\text{L}+\dots)\text{exp}=0.13$ 3 (1987Ra06); $\alpha(\text{exp})=1.1$ 2 (1982De36). $I\gamma$: $\Delta I\gamma$ estimated by evaluator.
62.1 $\frac{+}{-}$ 3	62.02	5.5 $\frac{+}{-}$ 6	E3	90.8 25	Mult.: from ce data. $\delta<0.2$ from $\alpha(\text{exp})$. $I\gamma$: corrected for $T_{1/2}=2.8$ -min isomer decay.
70.0 $\frac{+}{-}$ 3	167.03	1.1 $\frac{+}{-}$ 1			$\alpha(\text{K})\text{exp}=73$ 18, $\text{ce}(\text{K})/(\text{ce}(\text{L})+\text{ce}(\text{M})+\text{ce}(\text{N}))\text{exp}=1.06$ 37 (1987Ra06).
97.1 $\frac{+}{-}$ 3	97.1	21.4 $\frac{+}{-}$ 21	E2	1.185 22	Mult.: from $\alpha(\text{K})\text{exp}$ and subshell ratio.
105.01 $\frac{+}{-}$ 4	167.03	85 $\frac{+}{-}$ 9	M1	0.1585	$\alpha(\text{K})\text{exp}=1.00$ 25, $\alpha(\text{L}+\dots)\text{exp}=0.31$ 8 (1987Ra06). Mult.: from $\alpha(\text{K})\text{exp}$.
					$\alpha(\text{K})\text{exp}=0.5$ 1, $\alpha(\text{L}+\dots)\text{exp}=0.017$ 4 (1987Ra06); $\alpha(\text{exp})=0.9$ 6 (1982De36).
					$I\gamma$: other: 76 3 (1982De06).
					Mult.: from ce data in 1987Ra06. $\alpha(\text{exp})$ from 1982De36 suggests E2, however, uncertainty on the measurement is large.
114.5 $\frac{+}{-}$ 3	536.40	<1 $\frac{+}{-}$			
133.0 $\frac{+}{-}$ 3	855.5	<1 $\frac{+}{-}$			
144.8 $\frac{+}{-}$ 3	144.88	4.7 $\frac{+}{-}$ 5	M1	0.0660	$\alpha(\text{exp})=0.074$ 29 (1992Bu10). Mult.: from $\alpha(\text{exp})$.
164.5 $\frac{+}{-}$ 3	331.60	<1 $\frac{+}{-}$			
185.9 $\frac{+}{-}$ 3	722.2	<1 $\frac{+}{-}$			
186.7 $\frac{+}{-}$ 3	331.60	<1 $\frac{+}{-}$			
213.2 $\frac{+}{-}$ 3	855.5	4.7 $\frac{+}{-}$ 5			
220.6 $\frac{+}{-}$ 3	642.4	5.1 $\frac{+}{-}$ 5			
234.5 $\frac{+}{-}$ 3	331.60	12.6 $\frac{+}{-}$ 13	M1	0.0186	$\alpha(\text{exp})=0.020$ 6 (1992Bu10). Mult.: from $\alpha(\text{exp})$.
238.9 $\frac{+}{-}$ 3	570.4	<1 $\frac{+}{-}$			
254.76 $\frac{+}{-}$ 4	421.80	50 $\frac{+}{-}$ 5	M1	0.01506	$\alpha(\text{exp})=0.015$ 3 (1992Bu10). $I\gamma$: other: 63 3 (1982De06). Mult.: from $\alpha(\text{exp})$.
269.8 $\frac{+}{-}$ 3	436.8	3.8 $\frac{+}{-}$ 4			
285.4 $\frac{+}{-}$ 3	722.2	<1 $\frac{+}{-}$			
290.0 $\frac{+}{-}$ 3	855.5	1.3 $\frac{+}{-}$ 2			
291.0 $\frac{+}{-}$ 3	855.5	1.0 $\frac{+}{-}$ 1			
300.3 $\frac{+}{-}$ 2	722.2	<1 $\frac{+}{-}$			
304.21 $\frac{+}{-}$ 4	421.80	54 $\frac{+}{-}$ 5	M1 (+E2)	0.015 5	$\alpha(\text{exp})=0.011$ 2 (1992Bu10). $I\gamma$: other: 54 3 (1982De06). Mult.: from $\alpha(\text{exp})$; $\delta < 0.7$ from $\alpha(\text{exp})$.
310.5 $\frac{+}{-}$ 3	642.4	2.2 $\frac{+}{-}$ 2			
319.2 $\frac{+}{-}$ 3	855.5	6.2 $\frac{+}{-}$ 6			
324.6 $\frac{+}{-}$ 3	421.80	8.5 $\frac{+}{-}$ 9			$E\gamma$: transition was placed incorrectly from a 483.9 level by 1992Bu06 and 1987Ra06.
359.80 $\frac{+}{-}$ 5	421.80	40 $\frac{+}{-}$ 4			$I\gamma$: other: 36 2 (1982De06).
370.1 $\frac{+}{-}$ 3	536.40	<1 $\frac{+}{-}$			
374.8 $\frac{+}{-}$ 3	436.8	9.2 $\frac{+}{-}$ 9			
397.6 $\frac{+}{-}$ 3	564.6	4.0 $\frac{+}{-}$ 4			
398.5 $\frac{+}{-}$ 3	565.5	4.0 $\frac{+}{-}$ 4			
418.7 $\frac{+}{-}$ 3	855.5	2.1 $\frac{+}{-}$ 2			
418.8 $\frac{+}{-}$ 2	536.40	<1 $\frac{+}{-}$			
425.5 $\frac{+}{-}$ 3	570.4	<1 $\frac{+}{-}$			
433.7 $\frac{+}{-}$ 3	855.5	2.1 $\frac{+}{-}$ 2			
447.0 $\frac{+}{-}$ 2	564.6	2.0 $\frac{+}{-}$ 4			
448.0 $\frac{+}{-}$ 3	565.5	8.9 $\frac{+}{-}$ 9			
474.38 $\frac{+}{-}$ 6	536.40	58 $\frac{+}{-}$ 6			$I\gamma$: other: 68 5 (1982De06).
475.4 $\frac{+}{-}$ 3	642.4	11.2 $\frac{+}{-}$ 11			
502.5 $\frac{+}{-}$ 3	564.6	8.2 $\frac{+}{-}$ 8			
503.5 $\frac{+}{-}$ 3	565.5	12.4 $\frac{+}{-}$ 12			
524.1 $\frac{+}{-}$ 3	855.5	<1 $\frac{+}{-}$			
524.8 $\frac{+}{-}$ 3	642.4	7.4 $\frac{+}{-}$ 7			

Continued on next page (footnotes at end of table)

^{83}Zr ϵ Decay 1992Bu10,1987Ra06 (continued) $\gamma(^{83}\text{Y})$ (continued)

$E\gamma^\dagger$	E(level)	$I\gamma^\dagger@$	$E\gamma^\dagger$	E(level)	$I\gamma^\dagger@$
550.8# 3	882.4	2.2# 2	1546.8 4	2083.0	1.5 3
580.3# 3	642.4	4.4# 4	1600.5 3	2136.7	2.7 3
660.2# 3	722.2	6.8# 7	1661.3 3	2083.0	3.5 4
688.4# 3	855.5	3.9# 4	1699.9 5	2136.7	1.4 2
713.4# 3	1249.7	3.0# 3	1714.8 4	2136.7	<1
758.5# 3	855.5	2.6# 3	1751.3 4	2083.0	<1
793.5# 3	855.5	37# 4	1838.1& 7	2260.0	1.6 4
827.8 2	1249.7	2.2 4	1915.8 3	2083.0	1.3 4
1132.1 2	1249.7	7.6 8	1964.9& 5	2083.0	3.3 4
^x 1132.8‡ 3		=1	2020.8 5	2083.0	3.0 4
1361.1 3	2083.0	1.0 2	2074.8 4	2136.7	5.0 5
1494.3 2	2136.7	2.7 4	2142.4 4	2260.0	1.6 4
1519.1 3	1955.9	1.0 2	2316.3 5	2738.1	<1

† From 1992Bu10, except where noted.

‡ From 1982De36.

§ $I\gamma$ deduced from $\gamma\gamma$ coincidence data.# From 1987Ra06. Authors do not provide uncertainties. However, since 1992Bu10 are from the same set up and similar authors, the evaluator assumes the uncertainties are comparable and takes $\Delta E\gamma=0.3$ keV and $\Delta I\gamma=10\%$.

@ For absolute intensity per 100 decays, multiply by 0.076 8.

& Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

^{83}Zr ϵ Decay 1992Bu10,1987Ra06 (continued)

Decay Scheme

Intensities: I(γ +ce) per 100 parent decays

(1/2-) 0.0 42 s
 $^{83}_{40}\text{Zr}_{43}$
 $\% \epsilon + \% \beta^+ = 100$
 $Q^+ = 6294^{20}$

83Zr ϵ Decay 1992Bu10,1987Ra06 (continued)

Decay Scheme (continued)

Intensities: I(γ +ce) per 100 parent decays

(1/2-) 0.0 42 s
 $^{83}_{40}\text{Zr}_{43}$
 $\% \epsilon + \% \beta^+ = 100$
 $Q^+ = 6294^{20}$

$^{58}\text{Ni}(^{28}\text{Si}, 3\text{p}\gamma)$: SD 2003Le08

2003Le08: $E(^{28}\text{Si})=130$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ and particle- γ coincidences, lifetimes by DSAM using Gammasphere array with 100 Compton-suppressed HPGe detectors combined with Microball, a 95-element CsI(Tl) 4π charged-particle detector array; deduced superdeformed structures and associated transition quadrupole moments. Subset of results given in 2003ReZZ, 1999Le56, 1999LeZX.

 ^{83}Y Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$E(\text{level})^\dagger$	$J\pi^\ddagger$	$E(\text{level})^\dagger$	$J\pi^\ddagger$
$x^\S$	$J=(45/2)$	$y+3678.0^\#$ 15	J_1+4	$z+10238.1^\textcirc$ 23	J_2+10
$x+1893.0^\S$ 10	$J+2$	$y+5750.1^\#$ 18	J_1+6	$z+12773.2^\textcirc$ 25	J_2+12
$x+3915.0^\S$ 14	$J+4$	$y+7974.1^\#$ 20	J_1+8	$z+15491^\textcirc$ 3	J_2+14
$x+6071.1^\S$ 18	$J+6$	$y+10358.1^\#$ 23	J_1+10	u&	$J_3=(45/2)$
$x+8369.1^\S$ 20	$J+8$	$y+12909.2^\#$ 25	J_1+12	$u+1920.0^\&$ 10	J_3+2
$x+10813.1^\S$ 23	$J+10$	$y+15629^\#$ 3	J_1+14	$u+3982.1^\&$ 15	J_3+4
$x+13399.2^\S$ 25	$J+12$	$z^\textcirc$	$J_2=(43/2)$	$u+6193.1^\&$ 18	J_3+6
$x+16121^\S$ 3	$J+14$	$z+1738.0^\textcirc$ 10	J_2+2	$u+8567.1^\&$ 20	J_3+8
$x+18960?^\S$ 3	$J+16$	$z+3609.0^\textcirc$ 15	J_2+4	$u+11098.2^\&$ 23	J_3+10
$y^\#$	$J_1=(43/2)$	$z+5647.1^\textcirc$ 18	J_2+6	$u+13792.2^\&$ 25	J_3+12
$y+1757.0^\#$ 10	J_1+2	$z+7860.1^\textcirc$ 20	J_2+8		

† From a least-squares fit to $E\gamma$, by evaluator.

‡ Estimated from observed feeding into known spin levels in the normal-deformed region; and checked by a fitting of measured dynamic moments of inertia as a function of rotational frequencies (2003Le08).

§ (A): SD-1 band. Observed in 2003Le08,1999Le56. Percent population=4.20. $Q(\text{transition})=4.4\ 7$ (2003Le08,1999Le56). Other: 4.7 7 (quoted by 2003Le08 from C.-H. Yu, priv. comm.). Configuration= $v5^1\pi5^1$; non-intruder orbitals: $v(f_{5/2}, p_{3/2}(3/2[301]))$.

$^\#$ (B): SD-2 band. Observed in 2003Le08. Percent population=2.94. $Q(\text{transition})=3.6\ +8-5$ (2003Le08). Configuration= $v5^1\pi5^0$; non-intruder orbitals: $\pi(f_{5/2}, p_{3/2}(1/2[310]))$. This band is isospectral with SD band in ^{82}Sr .

$^\textcirc$ (C): SD-3 band. Observed in 2003Le08. Percent population=2.90. $Q(\text{transition})=3.6\ +4-3$ (2003Le08). Tentative configuration= $v5^0\pi5^0$.

$^\&$ (D): SD-4 band. Observed in 2003Le08. Percent population=2.73.

 $\gamma(^{83}\text{Y})$

$E\gamma$	$E(\text{level})$	$I\gamma^\dagger$	$E\gamma$	$E(\text{level})$	$I\gamma^\dagger$	$E\gamma$	$E(\text{level})$	$I\gamma^\dagger$
1738 1	$z+1738.0$		2156 1	$x+6071.1$	4.0 6	2535 1	$z+12773.2$	
1757 1	$y+1757.0$	1.5 5	2211 1	$u+6193.1$		2551 1	$y+12909.2$	1.5 5
1871 1	$z+3609.0$		2213 1	$z+7860.1$		2586 1	$x+13399.2$	2.1 6
1893 1	$x+1893.0$	2.6 5	2224 1	$y+7974.1$	2.4 5	2694 1	$u+13792.2$	
1920 1	$u+1920.0$		2298 1	$x+8369.1$	3.8 6	2718 1	$z+15491$	
1921 1	$y+3678.0$	2.1 4	2374 1	$u+8567.1$		2720 1	$y+15629$	0.6 4
2022 1	$x+3915.0$	4.2 6	2378 1	$z+10238.1$		2722 1	$x+16121$	1.0 4
2038 1	$z+5647.1$		2384 1	$y+10358.1$	2.8 6	2839 ‡ 1	$x+18960?$	
2062 1	$u+3982.1$		2444 1	$x+10813.1$	2.8 5			
2072 1	$y+5750.1$	3.0 5	2531 1	$u+11098.2$				

† Extracted from Figure 7 of 2003Le08 by the evaluator. Intensities are relative to the sum of the intensities of the ground-state band transitions.

‡ Placement of transition in the level scheme is uncertain.

(HI,xn γ) 1997Jo03,1992Cr03,1988Li07

2005Yu04: $^{58}\text{Ni}(^{28}\text{Si},3p\gamma)$, $E(^{28}\text{Si})=98$ MeV. Measured g-factor of positive parity levels using TMF-IMPAD method with four Compton-suppressed HPGe detectors. The authors do not state explicitly for which levels their measurements correspond to, and thus, the evaluator has not associated their measured values with particular excited states.

1997Jo03: $^{58}\text{Ni}(^{29}\text{Si},3p\gamma)$, $E(^{29}\text{Si})=110$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ coincidences, $\gamma\gamma(\theta)$ (R(DCO)) using Early Implementation Gammasphere array consisting of 33 Compton-suppressed HPGe detectors, deduced $T_{1/2}$ using Doppler Shift Attenuation method (DSAM).

1994Jo16: $^{58}\text{Ni}(^{28}\text{Si},3p\gamma)$, $E(^{28}\text{Si})=95$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ coincidences using 6 Compton-suppressed Ge detectors at 90° and one at 0° , deduced $T_{1/2}$ using the Doppler Shift Attenuation method (DSAM).

1992Cr03: $^{28}\text{Si}(^{58}\text{Ni},3p\gamma)$, $E(^{58}\text{Ni})=195$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ and recoil- γ coincidences using 20 Compton-suppressed HPGe detectors and the Daresbury Recoil Separator.

1990Bh03,1990Bh06: $^{54}\text{Fe}(^{32}\text{S},3p\gamma)$, $E(^{32}\text{S})=107$ MeV and $^{58}\text{Ni}(^{28}\text{Si},3p\gamma)$, $E(^{28}\text{Si})=90$ MeV. Measured g-factors using IMPAD technique with four Ge detectors.

1989Cr08: $^{54}\text{Fe}(^{32}\text{S},3p\gamma)$, $E(^{32}\text{S})=103\text{--}107$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$ coincidences using 4 Ge detectors (one positioned at 0° to the beam direction with Compton suppression); deduced $T_{1/2}$ using recoil-distance Doppler shift (RDDS) and Doppler Shift Attenuation method (DSAM).

1988Li07: $^{58}\text{Ni}(^{28}\text{Si},3p\gamma)$, $E(^{28}\text{Si})=80\text{--}130$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, γ -proton, and γ -neutron coincidences, $\gamma(\theta)$, γ -ray excitation function using a LEPS detector and two Compton-suppressed Ge(Li) detectors; deduced $T_{1/2}$ using the recoil-distance Doppler shift (RDDS) method.

 ^{83}Y Levels

$E(\text{level})^\dagger$	$J\pi^\ddagger$	$T_{1/2}^\S$	Comments
0.0@	9/2+		
62.04 ^b 10	3/2-	2.85 min 2	$E(\text{level}), T_{1/2}$: from the Adopted Levels.
145.00& 4	7/2+	119 ps 28	$g=+0.61$ 18 (1990Bh03).
			$T_{1/2}$: from RDDS in 1988Li07.
166.92 ^c 11	5/2-	<0.76 ns	$T_{1/2}$: from effective $T_{1/2}=0.69$ ps 7 (1988Li07), measured with RDDS, however, not corrected for side feeding.
436.53 ^g 14	(5/2)		
537.18 ^b 10	7/2-	8.0 ps 28	$T_{1/2}$: weighted average of 9.7 ps 3 (1988Li07) and 6.2 ps 28 (1989Cr08), both from RDDS.
594.98@ 7	13/2+	5.4 ps 5	$g=+1.3$ 4 (1990Bh03).
			$T_{1/2}$: weighted average of 5.3 ps 8 (1988Li07) and 5.4 ps 5 (1989Cr08), both from RDDS.
736.64& 7	11/2+	4.6 ps 10	$T_{1/2}$: weighted average of 5.8 ps 10 (1988Li07) and 3.8 ps 8 (1989Cr08), both from RDDS.
813.99 ^c 8	9/2-	3.2 ps 6	$T_{1/2}$: weighted average of 2.8 ps 7 (1988Li07) and 3.5 ps 6 (1989Cr08), both from RDDS.
1137.4 ^g 6			
1223.68 ^b 11	11/2-	0.9 ps 3	$T_{1/2}$: weighted average of 1.2 ps 4 (1988Li07) and 0.69 ps 35 (1989Cr08), both from RDDS.
1406.50@ 12	17/2+	0.96 ps 14	$T_{1/2}$: weighted average of 0.9 ps 3 (1988Li07) from RDDS, 0.90 ps 14 (1989Cr08) from RDDS, and 1.04 ps 14 (1989Cr08) from DSAM.
1532.04& 20	15/2+	1.3 ps 3	$T_{1/2}$: weighted average of 1.2 ps 3 (1988Li07) and 1.3 ps 3 (1989Cr08), both from RDDS.
1566.18 ^c 11	13/2-	0.80 ps 28	$T_{1/2}$: weighted average of 0.97 ps 3 (1988Li07) and 0.62 ps 28 (1989Cr08), both from RDDS.
1708.5 3			
1848.9 ^g 5			
2010.60 ^b 12	15/2-	0.97 ps 35	$T_{1/2}$: from RDDS in 1989Cr08. Other: 1.8 ps 3 (1988Li07) from RDDS, however, not corrected for side feeding.
2145.1 6			
2371.06@ 22	21/2+	0.43 ps 7	$T_{1/2}$: from DSAM in 1989Cr08. Others: 0.69 ps 14 (1988Li07) and 0.49 ps 14 (1989Cr08), both from RDDS, however, not corrected for side feeding.
2405.84 ^c 13	17/2-	<1.3 ps	$T_{1/2}$: from effective lifetime of $T_{1/2}=1.0$ ps 3 (1988Li07,1989Cr08), both from RDDS, however, not corrected for side feeding.
2429.5& 3	19/2+	<0.83 ps	$T_{1/2}$: from effective lifetime of $T_{1/2}=0.69$ ps 14 (1989Cr08) from RDDS, however, not corrected for side feeding. Other: effective $T_{1/2}=0.9$ ps 3 (1988Li07) from RDDS, also not corrected for side feeding.
2551.9 ^g 11			
2559.54 ^e 16	17/2-	46 ps 4	$g=+0.29$ 6 (1990Bh06).
			$T_{1/2}$: weighted average of 43 ps 13 (1988Li07) and 46 ps 4 (1989Cr08), both from RDDS.
2822.77 ^b 20	(19/2-)		

Continued on next page (footnotes at end of table)

(HI,xn γ) 1997Jo03,1992Cr03,1988Li07 (continued) **^{83}Y Levels (continued)**

E(level) [†]	$J\pi^{\ddagger}$	$T_{1/2}^{\S}$	Comments
2887.83 ^f 19	(19/2-)	<3.4 ps	$T_{1/2}$: from effective $T_{1/2}=3.1$ ps 3 (1989Cr08) from RDDS, however, not corrected for sidefeeding. Other: effective $T_{1/2}=4.8$ ps 3 (1988Li07) from RDDS also not corrected for sidefeeding.
2937.6 6			
3308.13 ^e 21	(21/2-)		
3314.54 ^c 16	(21/2-)		
3397.1 ^{&} 4	(23/2+)	0.43 ps +11-9	
3420.1 ^g 14			
3450.6 [@] 3	(25/2+)		
3731.0 ^b 7	(23/2-)		
3830.33 ^f 22	(23/2-)	0.91 ps [#] +23-25	
3916.9 6			
4177.2 8			
4340.6 ^c 3	(25/2-)	0.34 ps [#] +8-4	
4385.8 ^e 5	(25/2-)	0.48 ps [#] +12-18	
4421.9 5	(27/2+)		
4472.8 ^g 18			
4487.9 ^{&} 4	(27/2+)	0.20 ps +6-8	
4643.6 [@] 4	(29/2+)	0.19 ps +4-3	$T_{1/2}$: other: 0.25 ps +3-4 (1994Jo16) from DSAM.
4796.0 ^b 8	(27/2-)		
4992.3 ^f 7	(27/2-)		
5176.6 6			
5244.0 18			
5346.6 11			
5502.3 ^c 9	(29/2-)	0.19 ps [#] +3-6	
5562.3 ^e 11	(29/2-)		
5564.8 ^g 21			
5668.6 12			
5747.5 ^{&} 8	(31/2+)	0.20 ps +8-7	
5950.0 ^b 15	(31/2-)		
5983.5 [@] 6	(33/2+)	0.22 ps +9-7	$T_{1/2}$: other: 0.13 ps +3-4 (1994Jo16) from DSAM.
6334.3 ^f 21	(31/2-)	<0.26 ps [#]	$T_{1/2}$: from effective $T_{1/2}=0.26$ ps, not corrected for side feeding.
6676.5 ^c 14	(33/2-)	<0.46 ps [#]	$T_{1/2}$: from effective $T_{1/2}=0.46$ ps, not corrected for side feeding.
6780.9 ^d 11	(33/2-)		
6782.3 ^e 15	(33/2-)	0.13 ps [#] +6-3	
7179.0 ^{&} 10	(35/2+)	<0.24 ps	$T_{1/2}$: from effective $T_{1/2}=0.24$ ps, not corrected for side feeding.
7238.2 ^b 20	(35/2-)		
7450.8 16			
7468.3 [@] 9	(37/2+)	0.05 ps +3-2	$T_{1/2}$: other: <0.07 ps (1994Jo16) from DSAM.
7819 ^f 3	(35/2-)		
7918.7 ^c 18	(37/2-)		
8070.4 ^e 20	(37/2-)	<0.28 ps [#]	$T_{1/2}$: from effective $T_{1/2}=0.28$ ps, not corrected for side feeding.
8108.9 ^d 15	(37/2-)		
8442.2 12			
8708.8 ^b 25	(39/2-)		
8712.9 ^{&} 14	(39/2+)		
9074.9 [@] 19	(41/2+)	0.014 ps +55-7	$T_{1/2}$: other: <0.17 ps from DSAM in 1994Jo16, not corrected for side feeding.
9331.9 ^c 21	(41/2-)		
9598.0 14			
9639.9 ^d 18	(41/2-)		
10001.4 14			
10358.9 ^{&} 22	(43/2+)		
10396 3	(43/2-)		
10452 3	(43/2-)		
10824 [@] 3	(45/2+)	0.014 ps +55-7	
10926.5 ^c 23	(45/2-)		
11266.9 ^{?d} 20	(45/2-)		
12243.8 ^{&} 24	(47/2+)		
12726 ^c 3	(49/2-)		
12787 [@] 3	(49/2+)	<0.04 ps	$T_{1/2}$: given as $T_{1/2}=0.007$ ps +35-7 in 1997Jo03.
13022 3	(47/2+)		
13035 ^a 3	(47/2+)		
14028 ^{&} 3	(51/2+)		

Continued on next page (footnotes at end of table)

(HI,xn γ) 1997Jo03,1992Cr03,1988Li07 (continued) **^{83}Y Levels (continued)**

E(level) [†]	$J\pi^{\ddagger}$	Comments
14767 ^c 3	(53/2-)	E(level): Level energy given as 14770 in Figure 2 and 14779 in Table II of 1997Jo03.
14881 [@] 3	(53/2+)	
14947 ^a 3	(51/2+)	
17101 ^a 3	(55/2+)	
19466 ^a 3	(59/2+)	

[†] From a least-squares fit to E γ , by evaluator.[‡] From the Adopted Levels.[§] From DSAM in 1997Jo03, except where noted.

From DSAM in 1994Jo16.

[@] (A): [422]5/2+ band, $\alpha=+1/2$.[&] (B): [422]5/2+ band, $\alpha=-1/2$.^a (C): Band based on (47/2+), 13035-keV level.^b (D): [301]3/2- band, $\alpha=-1/2$.^c (E): [301]3/2- band, $\alpha=+1/2$.^d (F): Band based on (33/2-), 6781-keV level.^e (G): Band based on the 17/2-, 2560-keV level, $\alpha=+1/2$.^f (H): Band based on the 17/2-, 2560-keV level, $\alpha=-1/2$.^g (I): γ -ray sequence. Observed only in 1992Cr03. **$\gamma(^{83}\text{Y})$**

E $\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger}$	Mult. [§]	δ	Comments
(62.0)	62.04				
100.8 [@] 1	537.18	3.0 3			
104.97 5	166.92	79 6	D+Q		Mult.: $A_2=-0.12$ 2, $A_4=+0.02$ 4 (1988Li07).
141.67 5	736.64	13 1	D+Q	+0.12 8	Mult., δ : $A_2=-0.25$ 8, $A_4=-0.20$ 10 (1988Li07).
145.00 4	145.00	160 12	D+Q	+0.13 4	Mult., δ : $A_2=-0.25$ 2, $A_4=+0.04$ 3 (1988Li07).
153.7 [@] 2	2559.54	7 1			
167 ^{#&a}	166.92				E γ : from 1997Jo03 only, not included in Adopted Gammas.
270.5 [@] 3	436.53	6 1			
276.9 1	813.99	39 3	D+Q	+0.17 4	Mult., δ : $A_2=+0.00$ 4, $A_4=+0.04$ 4 (1988Li07).
302.0 [@] 3	1708.5	8 1			
328.3 1	2887.83	100 5	D+Q	-0.24 6	Mult., δ : $A_2=-0.51$ 3, $A_4=+0.08$ 3 (1988Li07).
342.5 1	1566.18	31 3	D+Q	+0.06 6	Mult., δ : $A_2=-0.12$ 7, $A_4=+0.07$ 7 (1988Li07).
370.3 1	537.18	78 69	D+Q	+0.46 7	Mult., δ : $A_2=+0.33$ 3, $A_4=+0.00$ 4 (1988Li07).
375.2 [@] 4	436.53	16 1			
392.2 2	537.18	8 1			Mult.: $A_2=+0.21$ 10, $A_4=+0.01$ 4 (1988Li07).
395.2 1	2405.84	17 2	D(+Q)	0.00 8	Mult., δ : $A_2=-0.20$ 10, $A_4=+0.18$ 10 (1988Li07).
409.7 1	1223.68	26 2	D+Q	+0.25 7	Mult., δ : $A_2=+0.13$ 7, $A_4=-0.07$ 7 (1988Li07).
417.0 [@] 4	2822.77	13 1			
420.3 1	3308.13	62 5	D+Q	-1.8 4	Mult., δ : $A_2=-0.69$ 4, $A_4=+0.17$ 4 (1988Li07).
444.4 1	2010.60	18 2	D(+Q)	+0.06 8	Mult., δ : $A_2=-0.13$ 10, $A_4=+0.12$ 10 (1988Li07).
466.3 [@] 5	3916.9	4 1			
475.1 1	537.18	44 4	Q		Mult.: $A_2=+0.36$ 4, $A_4=-0.04$ 4 (1988Li07).
491.6 [@] 5	3314.54	13			
492 [@] 1	5668.6	7 3			
522.2 1	3830.33	43 4	D+Q	-0.8 2	Mult., δ : $A_2=-0.93$ 7, $A_4=+0.32$ 7 (1988Li07).
533.0 [@] 5	5176.6	18 2			
538 ^{#&a}	537.18				E γ : from 1997Jo03 only, not included in Adopted Gammas.
548.9 2	2559.54	27 2	D+Q	-5.0 15	Mult., δ : $A_2=-0.35$ 7, $A_4=+0.14$ 7 (1988Li07).
555.7 [@] 6	4385.8	17 2			E γ : other: 555 1 (1988Li07).
566.6 [@] 6	2937.6	12 1			
591.7 2	736.64	149 14	Q		Mult.: $A_2=+0.31$ 3, $A_4=-0.1$ 5 (1988Li07).
595.0 1	594.98	962 70	Q		Mult.: $A_2=+0.28$ 2, $A_4=-0.03$ 2 (1988Li07).
600 [@] 1	1137.4				
606.6 [@] 6	4992.3	10 1			
613.1 [@] 6	2145.1	26 2			
625.6 [@] 6	1848.9	11 1			
647.0 1	813.99	106 8	Q		Mult., δ : $A_2=+0.28$ 3, $A_4=-0.05$ 3 (1988Li07).
669.0 1	813.99	31 3	D		Mult.: $A_2=-0.19$ 5, $A_4=+0.00$ 5 (1988Li07).

Continued on next page (footnotes at end of table)

(HI,xn γ) 1997Jo03,1992Cr03,1988Li07 (continued) $\gamma(^{83}\text{Y})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger}$	Mult. [§]	δ	Comments
686.5 2	1223.68	95 7	Q		Mult.: $A_2=+0.30$ 3, $A_4=-0.10$ 3 (1988Li07).
700 [@] 1	1137.4				
703 ^{@b} 1	2551.9	50 ^b			
	5346.6	12 ^b			
710.9 [@] 7	1848.9	33 3			
726.6 [@] 7	4177.2	27 2			
736.6 1	736.64	85 7	D+Q	+1.2 4	Mult., δ : $A_2=+0.60$ 3, $A_4=+0.14$ 3 (1988Li07).
752.2 1	1566.18	187 14	Q		Mult.: $A_2=+0.27$ 3, $A_4=-0.11$ 3 (1988Li07).
774.3 [@] 8	7450.8	33 3			
786.9 1	2010.60	102 8	Q		Mult.: $A_2=+0.43$ 5, $A_4=-0.05$ 5 (1988Li07).
795.4 2	1532.04	183 14	Q		Mult.: $A_2=+0.32$ 2, $A_4=-0.06$ 2 (1988Li07).
811.5 1	1406.50	800 70	Q		Mult.: $A_2=+0.29$ 2, $A_4=-0.10$ 3 (1988Li07).
812.2 3	2822.77	100 11			
813.9 2	813.99	47 6			$A_2=+0.40$ 8, $A_4=-0.01$ 8 (1988Li07).
830.1 [@] 8	1566.18	34 3			
839.7 1	2405.84	110 9	Q		Mult.: $A_2=+0.31$ 3, $A_4=-0.15$ 3 (1988Li07).
868.2 [@] 9	3420.1	56 5			
897.5 3	2429.5	132 10	Q		Mult.: $A_2=+0.22$ 3, $A_4=-0.08$ 3 (1988Li07).
908.1 [@] 9	3731.0	120 20			
908.7 1	3314.54	100 15	Q		I γ : other: 139 4 (1997Jo03). Mult.: $A_2=+0.20$ 3, $A_4=-0.05$ 3 (1988Li07).
937.4 ^{#&}	1532.04				
942.5 2	3830.33	35 3			
964.5 2	2371.06	626 [#] 26	Q		I γ : other: 618 60 (1992Cr03). Mult.: $R_{\text{DCO}}=1.05$ 7 (1997Jo03), $A_2=+0.14$ 2, $A_4=-0.08$ 2 (1988Li07).
967.7 2	3397.1	100 12			
993.4 2	2559.54	74 6	Q		Mult.: $A_2=+0.33$ 3, $A_4=-0.05$ 3 (1988Li07).
1024.0 [@]	2429.5	12 [#] 5			
1024.8 3	4421.9				
1025.2 [@]	3397.1	8.7 [#]			
1026.0 3	4340.6	119 9			I γ : other: 119 11 (1997Jo03).
1037.3 [@] 3	4487.9	12 [#] 4	D		I γ : other: 30 3 (1992Cr03). Mult.: $R_{\text{DCO}}=0.54$ 13 (1997Jo03).
1052.7 [@] 11	4472.8	42 4			
1065.3 [@] 11	4796.0	136 11			
1077.6 [@] 11	4385.8	28 4			E γ : other: 1178 1 (1988Li07).
1079.5 2	3450.6	433 [#] 22	Q		I γ : other: 437 35 (1992Cr03). Mult.: $R_{\text{DCO}}=0.97$ 8 (1997Jo03). I γ : other: 62 7 (1992Cr03).
1091.7 [@] 11	4487.9	68 [#] 8			
1092 [@] 1	5564.8	20			
1103.1 [#]	5747.5	5 [#] 1			
1113.0 [@] 11	1708.5	46 4			
1154.0 [@] 12	5950.0	76 7			
1161.3 [#]	5502.3	99 [#] 10			I γ : other: 115 (1992Cr03).
1161.7 [@] 12	4992.3	31 4			
1174.2 [#]	6676.5	43 [#] 7			E γ : other: 1176.5 12 (1992Cr03). I γ : other: 72 (1992Cr03).
1177.0 [@] 12	5562.3	17 4			
1192.9 3	4643.6	284 [#] 18	Q		I γ : other: 278 21 (1992Cr03). Mult.: $R_{\text{DCO}}=1.04$ 11 (1997Jo03).
1195.7 [#]	7179.0				
1219 ^{#&}	6780.9				
1220 [@] 1	6782.3	<11			
1224 [@] 1	1223.68	51 5			
1242.2 [@] 12	7918.7	24 2			E γ : other: 1244.7 (1997Jo03). I γ : other: 26 6 (1997Jo03).
1260.5 [@] 13	5747.5	59 [#] 8			I γ : other: 70 6 (1992Cr03).
1278.2 [#]	6780.9	29 [#] 6			I γ : other: 33 (1992Cr03).
1288.1 [@] 13	8070.4	<13			
1288.2 [@] 13	7238.2	62 5			
1328.0 [#]	8108.9	17 [#] 5			
1340.0 5	5983.5	171 [#] 14	Q		I γ : other: 169 13 (1992Cr03). Mult.: $R_{\text{DCO}}=0.94$ 8 (1997Jo03).

Continued on next page (footnotes at end of table)

(HI,xn γ) 1997Jo03,1992Cr03,1988Li07 (continued) $\gamma(^{83}\text{Y})$ (continued)

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger}$	Mult. [§]	Comments
1342@ 2	6334.3	12 5		
1345#&	4796.0			
1361.0@ 14	3731.0	28 3		
1413.2#	9331.9	22# 5		E γ : other: 1416 (1992Cr03). I γ : other: 15 (1992Cr03).
1415@ 2	2010.60	82 12		
1416.1 3	2822.77	83 15		
1430.9@ 14	7179.0	40# 8		I γ : other: 55 5 (1992Cr03).
1470.6@ 15	8708.8	33 3		
1484.8 7	7468.3	100 8	Q	Mult.: $R_{\text{DCO}}=1.04$ 11 (1997Jo03).
1485@ 2	7819			
1531.0@ 15	2937.6	94		
1531#	9639.9	5# 2		
1533.9#	8712.9	38# 3		
1594.6#	10926.5	10# 4		
1606.6@ 16	9074.9	68# 9	Q	I γ : other: 71 7 (1992Cr03). Mult.: $R_{\text{DCO}}=1.10$ 15 (1997Jo03).
1627#a	11266.9?			
1646.0@ 17	10358.9	19# 2		I γ : other: 12 4 (1997Jo03).
1687#&	10396			
1743#&	10452			
1749.0@ 18	10824	23# 2	Q	E γ : other: 1753.9 (1997Jo03). I γ : other: 23 5 (1997Jo03). Mult.: $R_{\text{DCO}}=1.15$ 30 (1997Jo03).
1784.4#	14028	9# 4		
1793.4@ 18	5244.0	20 2		
1799.2#	12726	2# 1		
1884.9#	12243.8	10# 4		
1913#	14947	1.0# 9		
1958.6@ 20	12787	9 1		E γ : other: 1965.7 (1997Jo03). I γ : other: 6 3 (1997Jo03).
2041#	14767	2# 1		
2093.9#	14881	1.0# 9		
2129.6#	9598.0	2.8# 18		
2154#	17101	1.3# 12		
2159#	14947	2.0# 15		
2198#	13022	2# 1	D	Mult.: $R_{\text{DCO}}=0.37$ 22 (1997Jo03).
2212#	13035	1.8# 14	(D)	Mult.: $R_{\text{DCO}}=0.8$ 4 (1997Jo03).
2365#	19466	1.0# 9		
2458.6#	8442.2	2.2# 19		
2533#	10001.4			

[†] From 1988Li07, except where noted.[‡] From 1992Cr03, except where noted.[§] From $\gamma(0)$ in 1988Li07 and R_{DCO} in 1997Jo03, as noted in the comments.

From 1997Jo03.

@ From 1992Cr03.

& Given in Figure 2 of 1997Jo03, but not included in their Table I or II.

a Placement of transition in the level scheme is uncertain.

b Multiply placed; intensity suitably divided.

Adopted Levels, Gammas

$Q(\beta^-) = -7.5 \times 10^3$ 3; $S(n) = 10039$ SY; $S(p) = 5137$ 8; $Q(\alpha) = -2859$ 11 2012Wa38.

$\Delta S(n) = 200$ (2012Wa38).

$S(2n) = 23660$ 16; $S(2p) = 8960$ 7; $Q(\epsilon p) = 2811$ 9 (2012Wa38).

1983Ha36 observed a β^+ -delayed proton activity decaying with $T_{1/2} = 6.0$ s 15, which 6% 4 of the total delayed protons populate the first excited state in ^{82}Sr . 1982De36 reported a β^+ activity decaying with $T_{1/2} = 8$ s 1. Both authors used the $^{54}\text{Fe}(^{32}\text{S}, 2pn)$ reaction, and tentatively assigned this activity to a ^{83}Zr isomeric state. No γ rays were detected. A more recent search for this isomer through detection of γ rays, x-rays, and conversion electrons gave negative results. The absence of these radiations suggested no isomer with an energy > 18 keV in ^{83}Zr (1987Ra06).

83Zr Levels

Cross Reference (XREF) Flags

A ^{83}Nb ϵ Decay
B $^{58}\text{Ni}(^{28}\text{Si}, 2pn\gamma)$
C $^{54}\text{Fe}(^{32}\text{S}, 2pn\gamma)$

E(level) [†]	J $\pi^{\ddagger}$	XREF	T _{1/2} [§]	Comments
0.0 [#]	(1/2-)	ABC	42 s 2	% ϵ +% β^+ =100; % ϵp =? T _{1/2} : weighted average of 44 s 1 (1982Li17), 45 s 4 (1981SaZO), 44 s 2 (1982De36) and 37.8 s 11 (1983Ha06). J π : from systematics; the g.s. of all other N=43 isotones (^{85}Mo , ^{81}Sr , ^{79}Kr) have J π =1/2-. However, J π =1/2+, 3/2, or 5/2- are also possible.
52.72 ^a 5	(5/2-)	ABC	0.53 μ s 12	T _{1/2} : from $\gamma\gamma(t)$ in $^{54}\text{Fe}(^{32}\text{S}, 2pn\gamma)$. Other: 0.50 μ s 25 from neutron- $\gamma(t)$ in $^{58}\text{Ni}(^{28}\text{S}, 2pn\gamma)$.
77.04 ^{&} 7	(7/2+)	ABC	1.8 μ s 1	J π : E2 52.7 γ to (1/2-). T _{1/2} : from neutron- $\gamma(t)$ in $^{58}\text{Ni}(^{28}\text{S}, 2pn\gamma)$ (1988Su15). Others: 2.0 μ s 2 from $\beta\gamma(t)$ in ^{83}Nb ϵ decay, 132 ns 55 from $\gamma\gamma(t)$ in $^{54}\text{Fe}(^{32}\text{S}, 2pn\gamma)$.
129.1 [#] 1	(3/2-)	BC		J π : E1 24.3 γ to (5/2-).
138.8 [@] 1	(9/2+)	BC		J π : M1+E2 129.5 γ to (1/2-).
328.5 ²		B		J π : M1(+E2) 62 γ to (7/2+), band assignment.
338.5 ^b 1	(7/2-)	BC	50 ps 4	J π : M1+E2 286 γ to (5/2-), band assignment.
372.6 [#] 1	(5/2-)	BC		J π : 243 γ to (3/2-), 373 γ to (1/2-), band assignment.
580.0 ³		B		
582.7 [#] 1	(7/2-)	BC	21.5 ps 55	J π : E2 453 γ to (3/2-), band assignment.
623.9 ³		B		
680.3 ^a 2	(9/2-)	BC	4.2 ps 8	J π : E2 628 γ to (5/2-), band assignment.
769.0 ^{&} 3	(11/2+)	BC	<2.3 ps	T _{1/2} : effective lifetime of 2.0 ps 3 from RDDS in $^{54}\text{Fe}(^{32}\text{S}, 2pn\gamma)$ (1989Fi06). J π : 682 γ to (7/2+), M1+E2 630 γ to (9/2+), band assignment.
880.3 [@] 3	(13/2+)	BC	2.3 ps 3	J π : E2 742 γ to (9/2+), band assignment.
983.2 [#] 2	(9/2-)	BC		J π : E2 610.5 γ to (5/2-), band assignment.
1013.4 ^b 2	(11/2-)	BC	1.9 ps 3	J π : E2 675 γ to (7/2-), band assignment.
1262.2 [#] 3	(11/2-)	BC	<2.1 ps	T _{1/2} : effective lifetime of 1.7 ps 4 from RDDS in $^{54}\text{Fe}(^{32}\text{S}, 2pn\gamma)$ (1989Fi06). J π : E2 679 γ to (7/2-), band assignment.
1345.8 ⁴		B		
1384.2 ⁶		B		
1475.8 ^a 3	(13/2-)	BC	0.76 ps 21	J π : E2 795 γ to (9/2-), band assignment.
1591.3 ⁴		B		
1662.9 ^{&} 4	(15/2+)	BC		J π : M1+E2 782 γ to (13/2+), 894 γ to (11/2+), band assignment.
1733.7 ⁶		B		
1771.4 [#] 4	(13/2-)	BC		J π : 509 γ to (11/2-), 788 γ to (9/2-), band assignment.
1817.4 [@] 4	(17/2+)	BC	0.42 ps 14	J π : E2 937 γ to (13/2+), band assignment.
1830.0 ^b 4	(15/2-)	BC	0.62 ps 21	J π : E2 817 γ to (11/2-), band assignment.
2021.3 ⁸		B		
2126.2 [#] 6	(15/2-)	BC		J π : E2 864 γ to (11/2-), band assignment.
2159.7 ⁷		B		
2258.3 ⁸		B		
2359.6 ⁸		B		
2398.3 ^a 5	(17/2-)	BC	<1.04 ps	T _{1/2} : effective lifetime of 0.83 ps 21 from RDDS in $^{54}\text{Fe}(^{32}\text{S}, 2pn\gamma)$ (1989Fi06). J π : E2 922 γ to (13/2-), band assignment.
2494.6 ⁷		B		
2674.9 [#] 7	(17/2-)	B		J π : 903.5 γ to (13/2-), band assignment.
2708.4 ^{&} 5	(19/2+)	BC		J π : 890.5 γ to (17/2+), 1045 γ to (15/2+), band assignment.

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Adopted Levels, Gammas (continued) ^{83}Zr Levels (continued)

E(level) [†]	J $\pi^{\ddagger}$	XREF	T _{1/2} [§]	Comments
2743.1 ^b 6	(19/2-)	BC	<1.04 ps	T _{1/2} : effective lifetime of 0.83 ps 21 from RDDS in $^{54}\text{Fe}(^{32}\text{S},2\text{pn}\gamma)$ (1989Fi06). J π : E2 913 γ to (15/2-), band assignment.
2913.0 [@] 6	(21/2+)	BC	0.37 ps 6	J π : E2 1096 γ to (17/2+), band assignment. T _{1/2} : weighted average of 0.38 ps 6 from RDDS and 0.35 ps 14 from DSAM in $^{54}\text{Fe}(^{32}\text{S},2\text{pn}\gamma)$ (1989Fi06).
2926.1		B		
3095.5 [#] 9	(19/2-)	B		J π : 969 γ to (15/2-), band assignment.
3138 ^c 1	(19/2-)	B		J π : 395 γ to (19/2-), 1307 γ to (15/2-).
3304.9 6		B		
3374.2 ^a 6	(21/2-)	BC		J π : E2 976 γ to (17/2-), band assignment.
3587.0 6		B		
3625.3 ^d 6	(21/2-)	B		J π : 1227 γ to (17/2-).
3689 [#] 1	(21/2-)	B		J π : 1014 γ to (17/2-), band assignment.
3726.1 ^{&} 6	(23/2+)	B		J π : 813.5 γ to (21/2+), 1019 γ to (19/2+), band assignment.
3730.9 ^b 7	(23/2-)	BC		J π : E2 988 γ to (19/2-), band assignment.
3955.3 [@] 7	(25/2+)	BC	0.40 ps 6	J π : E2 1042 γ to (21/2+), band assignment. T _{1/2} : from DSAM in $^{54}\text{Fe}(^{32}\text{S},2\text{pn}\gamma)$.
3981.7 ^c 6	(23/2-)	B		J π : 844 γ to (19/2-), (M1+E2) 607.5 γ to (21/2-), band assignment.
4092.0 8		B		
4188 [#] 1	(23/2-)	B		J π : 1092 γ to (19/2-), band assignment.
4283.0 9	(25/2+)	B		J π : (E2) 1370 γ to (21/2+).
4431.4 ^a 8	(25/2-)	BC		J π : (E2) 1057 γ to (21/2-).
4469.7 ^d 7	(25/2-)	B		J π : 488 γ to (23/2-), band assignment.
4767 ^{&} 1	(27/2+)	B		J π : 1041 γ to (23/2+), band assignment.
4839.1 ^b 8	(27/2-)	BC		J π : E2 1108 γ to (23/2-), band assignment.
4904.3 [@] 9	(29/2+)	BC	<0.42 ps	T _{1/2} : effective lifetime of 0.35 ps 7 from DSAM in $^{54}\text{Fe}(^{32}\text{S},2\text{pn}\gamma)$. J π : E2 949 γ to (25/2+).
4943.7 ^c 8	(27/2-)	B		J π : 961.5 γ to (23/2-), (M1+E2) 512 γ to (25/2-), band assignment.
5348 [#] 2	(27/2-)	B		
5460.4 ^d 8	(29/2-)	B		J π : 991 γ to (25/2-), 621.5 γ to (27/2-), band assignment.
5626 [?] 2		B		
5645 ^a 1	(29/2-)	BC		J π : E2 1214 γ to (25/2-), band assignment.
5934 ^{&} 1	(31/2+)	B		J π : 1167 γ to (27/2+), band assignment.
6022 ^c 1	(31/2-)	B		J π : 376 γ to (29/2-), 1079 γ to (27/2-), band assignment.
6028 [@] 1	(33/2+)	BC		J π : E2 1124 γ to (29/2+), band assignment.
6074 ^b 1	(31/2-)	BC		J π : E2 1235 γ to (27/2-), band assignment.
6570 ^d 2	(33/2-)	B		J π : 548 γ to (31/2-), 1111 γ to (29/2-), band assignment.
6949 ^a 1	(33/2-)	B		J π : E2 1304 γ to (29/2-), band assignment.
7195 ^{&} 2	(35/2+)	B		
7235 ^c 2	(35/2-)	B		J π : 1213 γ to (31/2-), band assignment.
7325 [@] 1	(37/2+)	BC		J π : E2 1297 γ to (33/2+), band assignment.
7380 ^b 1	(35/2-)	BC		J π : E2 1307 γ to (31/2-), band assignment.
7628.2	(37/2+)	B		
7817 ^d 2	(37/2-)	B		J π : 1247 γ to (33/2-), band assignment.
8275 ^a 2	(37/2-)	B		J π : 1326 γ to (33/2-), band assignment.
8586 ^{&} 2	(39/2+)	B		J π : 1391 γ to (35/2+), band assignment.
8611 ^c 2	(39/2-)	B		J π : 1376 γ to (35/2-), band assignment.
8758 ^b 2	(39/2-)	B		J π : 1378 γ to (35/2-), band assignment.
8812 [@] 2	(41/2+)	B		J π : E2 1487 γ to (37/2+), band assignment.
9229 ^d 2	(41/2-)	B		J π : 1412 γ to (37/2-), band assignment.
9689 ^a 2	(41/2-)	B		J π : 1414 γ to (37/2-), band assignment.
10137 ^c 2	(43/2-)	B		J π : 1526 γ to (39/2-), band assignment.
10224 ^{&} 2	(43/2+)	B		J π : 1638 γ to (39/2+), band assignment.
10310 ^b 2	(43/2-)	B		J π : 1552 γ to (39/2-), band assignment.
10516 [@] 2	(45/2+)	B		J π : 1704 γ to (41/2+), band assignment.
10810 ^d 2	(45/2-)	B		J π : 1581 γ to (41/2-), band assignment.
11786 ^c 2	(47/2-)	B		J π : 1649 γ to (43/2-), band assignment.
12080 [?] ^b 2	(47/2-)	B		J π : 1770 γ to (43/2-), band assignment.
12087 ^{&} 2	(47/2+)	B		J π : 1863 γ to (43/2+), band assignment.
12433 [@] 3	(49/2+)	B		J π : 1917 γ to (45/2+), band assignment.
12582 [?] ^d 3	(49/2-)	B		J π : 1772 γ to (45/2-), band assignment.
14510 [@] 3	(53/2+)	B		J π : 2077 γ to (49/2+), band assignment.

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Adopted Levels, Gammas (continued) ^{83}Zr Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	XREF	Comments
16736@ 3	(57/2+)	B	$J\pi$: 2226 γ to (53/2+), band assignment.
19217?@ 3	(61/2+)	B	$J\pi$: 2481 γ to (57/2+), band assignment.
0+x		B	
581+x		B	
1385+x		B	
2397+x?		B	E(level): ordering of 1192–1012 is not established.
3589+x?		B	E(level): ordering of 1192–1012 is not established.
3939+x		B	
4365+x		B	
y ^e	$J=(27/2)$	B	$J\pi$: from 2003Le08, 1996Ru16 proposed 31/2. E(level): y=5400 (1996Ru16).
1380.0+y ^e 10	J+2	B	
1574.0+y ^e 23	J+2	B	
2916.0+y ^e 15	J+4	B	
3001.0+y ^e 20	J+4	B	
4556.0+y ^e 18	J+6	B	
6305.1+y ^e 20	J+8	B	
8214.1+y ^e 23	J+10	B	
10288.1+y ^e 25	J+12	B	
12529+y ^e 3	J+14	B	
14939+y ^e 3	J+16	B	
17524+y ^e 3	J+18	B	
20285+y ^e 4	J+20	B	
23223+y ^e 4	J+22	B	
z ^f	$J=(29/2)$	B	$J\pi$: from 2003Le08, 1996Ru16 proposed 33/2. E(level): z=6300 (1996Ru16).
1444.0+z ^f 10	J+2	B	
3060.0+z ^f 15	J+4	B	
4851.0+z ^f 18	J+6	B	
6815.1+z ^f 20	J+8	B	
8947.1+z ^f 23	J+10	B	
11247.1+z ^f 25	J+12	B	
13713+z ^f 3	J+14	B	
16337+z ^f 3	J+16	B	

[†] From a least-squares fit to E γ , by evaluator.[‡] For levels populated in (HI,xn) reactions, the $J\pi$ assignments have the assumption of increasing spin with increasing excitation energy.[§] From Recoil Distance Doppler-shift measurements in $^{54}\text{Fe}(^{32}\text{S},2\text{pn}\gamma)$ (1989Fi06), except where noted.

(A): 1/2[301].

@ (B): 5/2[422], $\alpha=+1/2$.& (C): 5/2[422], $\alpha=-1/2$.a (D): 5/2[303], $\alpha=+1/2$.b (E): 5/2[303], $\alpha=-1/2$.c (F): Band 1, $\alpha=-1/2$.d (G): Band 1, $\alpha=+1/2$.e (H): SD-1 band (2003Le08,1996Ru16). Percent feeding=6.30 (2003Le08), 5.3 3 (1996Ru16). Q(transition)=5.8 +8-5 (2003Le08), 5 2 (1996Ru16); deduced from lifetime data. Configuration= $v5^2\pi5^1$ (2003Le08).

f (I): SD-2 band (2003Le08,1996Ru16). Percent feeding=2.69 (2003Le08), 1.2 2 (1996Ru16).

 $\gamma(^{83}\text{Zr})$

E(level)	E $\gamma^{\dagger}$	I $\gamma^{\dagger}$	Mult. [‡]	$\delta^{\ddagger}$	α	Comments
52.72	52.70 5	100	E2		11.19	B(E2)(W.u.)=10.0 23. E γ : from ^{83}Nb ϵ decay. Mult.: from $\alpha(K)\text{exp}=9.6$ 31 in $^{58}\text{Ni}(^{28}\text{S},2\text{pn}\gamma)$.
77.04	24.30 5	100	E1		6.28	B(E1)(W.u.)=1.89 $\times 10^{-6}$ 11. E γ : from ^{83}Nb ϵ decay. Mult.: from $\alpha(\text{exp})=5.4$ 8 in $^{58}\text{Ni}(^{28}\text{S},2\text{pn}\gamma)$.
129.1	129.5 1	100	M1+E2 [§]	+0.17 7	0.109 9	
138.8	61.7 1	100	M1(+E2) [§]	-0.02 7	0.79 5	δ : other: 0.05 from $\gamma(0)$ in $^{54}\text{Fe}(^{32}\text{S},2\text{pn}\gamma)$.

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Zr})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. [‡]	$\delta^{\ddagger}$	α	Comments
328.5	199.4 3	<100				
	328.4 2	100 10				
338.5	209.4 2	<6	[E2]		0.0762	B(E2)(W.u.)<60.
	261.3 1	15.8 11	E1		0.00710	B(E1)(W.u.)=5.2×10 ⁻⁵ 7. Mult.: D from $\gamma(\theta)$ and R_{DGO} in $^{58}\text{Ni}(^{28}\text{Si}, 2\text{pn}\gamma)$, $\Delta\pi$ =yes from level scheme.
	285.8 1	100 8	M1+E2	+2.5 7	0.0238 14	B(E2)(W.u.)=190 30; B(M1)(W.u.)=0.0021 3. Mult.: D+Q from $\gamma(\theta)$ in $^{58}\text{Ni}(^{28}\text{Si}, 2\text{pn}\gamma)$, E1+M2 excluded by comparison to RUL. δ : other: -0.51 from $\gamma(\theta)$ in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$.
372.6	243.1 1	100 8				
	372.8 2	74 5				
580.0	580.0 3	100				
582.7	210.1 1	26 3				
	453.3 2	100 7	E2 [#]		0.00564	B(E2)(W.u.)=51 14.
623.9	295.4 3					
	492.5 5					
680.3	341.7 2	13.9 11	M1+E2&	≤0.3	0.0082 3	B(E2)(W.u.)<16; B(M1)(W.u.)>0.012. δ : other: -0.47 from $\gamma(\theta)$ in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$.
	627.6 3	100 7	E2 [#]		0.00218	B(E2)(W.u.)=56 12.
769.0	630.0 4	100 7	M1+E2	0.11	0.00187	B(E2)(W.u.)>1.1; B(M1)(W.u.)>0.03. Mult.: D+Q from $\gamma(\theta)$ in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$, M1+E2 from assumed band structure. δ : from $\gamma(\theta)$ in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$.
	692.3 5	29.3 21	[E2]		1.67×10 ⁻³	B(E2)(W.u.)>16. I γ : other: <10 in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$.
880.3	111.3 2	<2	M1+E2	0.04	0.1516 23	B(E2)(W.u.)<18; B(M1)(W.u.)<0.12. Mult.: D+Q from $\gamma(\theta)$ in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$, $\Delta\pi$ =no from level scheme. δ : from $\gamma(\theta)$ in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$.
	741.6 4	100 5	E2 [#]		1.39×10 ⁻³	I γ : other: 2 1 in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$. B(E2)(W.u.)=50 8.
983.2	400.6 3	32.1 25				
	610.5 3	100 7	E2@		0.00235	
1013.4	333.2 2	<6				
	430.9 2	8.0 6	[E2]		0.00661	B(E2)(W.u.)=67 13.
	674.7 3	100 9	E2 [#]		0.00179	B(E2)(W.u.)=89 18.
1262.2	279.0 3	<16				
	679.4 4	100 8	E2 [#]		1.76×10 ⁻³	B(E2)(W.u.)>75.
1345.8	465.5 3	100	(D+Q)	≤0.3	0.00390 6	
1384.2	804.2 5	100				
1475.8	462.6 4	<8				
	795.3 4	100 11	E2 [#]		1.17×10 ⁻³	B(E2)(W.u.)=100 40.
1591.3	1011.3 3	100				
1662.9	782.4 4	99 8	M1+E2§	≤0.3	1.15×10 ⁻³	
	893.9 5	100 12				
1733.7	349.5 2	100				
1771.4	509.1 4	<44				
	788.4 5	100 9				
1817.4	154.5 3	<3				
	937.2 5	100 7	E2 [#]		7.81×10 ⁻⁴	B(E2)(W.u.)=90 30.
1830.0	816.6 4	100	E2 [#]		1.09×10 ⁻³	B(E2)(W.u.)=120 40.
2021.3	637.1 5	100				
2126.2	864.0 5	100	E2@		9.49×10 ⁻⁴	
2159.7	426.0 3	100				
2258.3	1244.9 8	100				
2359.6	768.3 6	100				
2398.3	922.3 5	100	E2 [#]		8.11×10 ⁻⁴	B(E2)(W.u.)>38.
2494.6	664.6 5	100				
2674.9	903.5 6	100				
2708.4	890.5 6	79 13				I γ : other: < 67 in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$.
	1045.2 6	100 15				
2743.1	913.2 5	100	E2 [#]		8.30×10 ⁻⁴	B(E2)(W.u.)>40.

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Zr})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. [‡]	$\delta^{\ddagger}$	α	Comments
2913.0	204.5 2	<3.4				
	1096.4 6	100 10	E2#		5.45×10^{-4}	B(E2)(W.u.)=44 10.
2926	1192.4 10	100				
3095.5	969.3 6	100				
3138	395					
	1307					
3304.9	391.8 2					
	597					
3374.2	975.7 6	100	E2		7.10×10^{-4}	Mult.: Q from $\gamma(0)$ in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$, E2 from assumed band structure.
3587.0	844.1 7	100				
3625.3	1227.2 7	100	(Q)			
3689	1014.0 7	100				
3726.1	421.0 3	77 7	D+Q	≤ 0.3		
	813.5 5	83 7				
	1018.8 7	100 13				
3730.9	987.9 5	100	E2		6.90×10^{-4}	Mult.: Q from $\gamma(0)$ in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$, E2 from assumed band structure.
3955.3	230.4 2	6.0 5	M1+E2&	≤ 0.3	0.0230 14	B(E2)(W.u.)<5.7; B(M1)(W.u.)>0.2.
	1042.1 5	100 10	E2#		6.11×10^{-4}	B(E2)(W.u.)=50 11.
3981.7	356.4 3					
	394.7 3					
	607.5 5		(M1+E2) §		0.00221 18	
	844					
	1239 ^b					
4092.0	136.9 2					
	365.2 3		D+Q	≤ 0.3		
4188	1092.3 7	100				
4283.0	331 ^b					
	1370.0 7		(E2)@		3.82×10^{-4}	
4431.4	1056.9 6	100	(E2)@		5.92×10^{-4}	
4469.7	488.2 5	<80				
	738.6 5	100 8				
4767	1041	100				
4839.1	1108.4 6	100	E2		5.33×10^{-4}	Mult.: Q from $\gamma(0)$ in $^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$, E2 from assumed band structure.
4904.3	949.0 5	100	E2#		7.58×10^{-4}	B(E2)(W.u.)>81.
4943.7	512.2 5	100 9	(M1+E2) §		0.0035 5	
	961.5 9	71 9				
5348	1160.2 8	100				
5460.4	516.2 6	<100				
	621.5 5	100 10				
	991.4 11	<100				
5626?	1343 ^b	100				
5645	1213.9 7	100	E2@		4.46×10^{-4}	
5934	1167	100				
6022	376					
	1079					
6028	1123.8 6	100	E2@		5.17×10^{-4}	
6074	1234.6 7	100	E2@		4.34×10^{-4}	
6570	548 ^b					
	1111					
6949	1304	100	E2@		4.03×10^{-4}	
7195	1261	100				
7235	1213	100				
7325	1297.2 7	100	E2@		4.05×10^{-4}	
7380	1306.7 7	100	E2@		4.02×10^{-4}	
7628	1600	100				
7817	1247	100				
8275	1326	100				
8586	1391	100				
8611	1376	100				
8758	1377.5 8	100				

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Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Zr})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$	Mult. [‡]	α
8812	1486.8 8	100	E2@	3.66×10^{-4}
9229	1412	100		
9689	1414	100		
10137	1526	100		
10224	1638	100		
10310	1552	100		
10516	1704	100		
10810	1581	100		
11786	1649	100		
12080?	1770 ^b	100		
12087	1863	100		
12433	1917	100		
12582?	1772 ^b	100		
14510	2077	100		
16736	2226	100		
19217?	2481 ^b	100		
581+x	581			
1385+x	804			
2397+x?	1012			
3589+x?	1192			
3939+x	350			
4365+x	426			
1380.0+y	1380 1	0.35 ^a 5		
2916.0+y	1536 1	0.80 ^a 10		
3001.0+y	1427 1			
4556.0+y	1555 1			
	1640 1	1.05 ^a 10		
6305.1+y	1749 1	1.00 ^a 10	(Q)	
8214.1+y	1909 1	1.00 ^a 10	(Q)	
10288.1+y	2074 1	1.00 ^a 10	(Q)	
12529+y	2241 1	0.85 ^a 10	(Q)	
14939+y	2410 1	0.45 ^a 10		
17524+y	2585 1	0.30 ^a 5		
20285+y?	2761 ^b 1	0.18 ^a 5		
23223+y?	2938 ^b	0.09 ^a 3		
1444.0+z	1444 1	0.20 ^a 5		
3060.0+z	1616 1	0.25 ^a 5		
4851.0+z	1791 1	0.30 ^a 5		
6815.1+z	1964 1	0.18 ^a 5		
8947.1+z	2132 1	0.20 ^a 5		
11247.1+z	2300 1	0.18 ^a 5		
13713+z	2466 1	0.13 ^a 5		
16337+z	2624 1	0.08 ^a 3		

[†] From $^{58}\text{Ni}(^{28}\text{S}, 2\text{pn}\gamma)$, except where noted.[‡] From R(DCO) and $\gamma(\theta)$ in $^{58}\text{Ni}(^{28}\text{S}, 2\text{pn}\gamma)$, except where noted.[§] D+Q from R(DCO) and $\gamma(\theta)$ in $^{58}\text{Ni}(^{28}\text{S}, 2\text{pn}\gamma)$, M1+E2 from assumed band structure.[#] Q from R(DCO) and $\gamma(\theta)$ in $^{58}\text{Ni}(^{28}\text{S}, 2\text{pn}\gamma)$, M2 excluded by comparison to RUL.@ Q from R(DCO) and $\gamma(\theta)$ in $^{58}\text{Ni}(^{28}\text{S}, 2\text{pn}\gamma)$, E2 from assumed band structure.& D+Q from R(DCO) and $\gamma(\theta)$ in $^{58}\text{Ni}(^{28}\text{S}, 2\text{pn}\gamma)$, $\Delta\pi=\text{no}$ from level scheme.^a Values for SD bands are relative intensities within each band normalized to 1.0 for the most intense transitions in SD-1 band. Values from $^{58}\text{Ni}(^{28}\text{S}, 2\text{pn}\gamma)$.^b Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas (continued)(A) $1/2[301]$.(B) $5/2[422]$, $\alpha=+1/2$.(C) $5/2[422]$, $\alpha=-1/2$.(D) $5/2[303]$, $\alpha=+1/2$.

Adopted Levels, Gammas (continued)(E) $5/2[303]$, $\alpha=-1/2$.(F) band 1, $\alpha=-1/2$.(G) band 1, $\alpha=+1/2$.

Adopted Levels, Gammas (continued)

(H) SD-1 band (2003Le08,
1996Ru16). Percent
feeding=6.30

(I) SD-2 band (2003Le08,
1996Ru16). Percent
feeding=2.69

^{83}Nb ϵ Decay 1988Ku14

Parent ^{83}Nb : $E=0.0$; $J\pi=(5/2+)$; $T_{1/2}=3.9$ s 2; $Q(\text{g.s.})=7500$ 300; $\% \epsilon + \% \beta^+ \text{ decay}=100$.

^{83}Nb activity produced by $^{58}\text{Ni}(^{28}\text{Si}, 2\text{pn})$, $E=95$ MeV. Measured $E\gamma$, $E\beta$, $\beta\gamma$ coincidence, $\gamma(t)$ using a Ge detector and a plastic scintillator.

β^+ endpoint energy of 6.4 MeV 3 measured in coincidence with Zr K x-rays, the 52.7 γ and the 24.3 γ .

 ^{83}Zr Levels

E(level)	$J\pi^\dagger$	$T_{1/2}$	Comments
0.0	(1/2-)	41.6 s † 24	
52.70 5	(5/2-)	0.53 μs † 12	
77.00 7	(7/2+)	2.0 μs 2	$T_{1/2}$: from $\beta\gamma(t)$ of 24.3 γ (1988Ku14).

† From the Adopted Levels.

 $\gamma(^{83}\text{Zr})$

$E\gamma$	E(level)	Mult. †	α
24.30 5	77.00	E1	6.28
52.70 5	52.70	E2	11.19

† From the Adopted Gammas.

Decay Scheme **$^{54}\text{Fe}(^{32}\text{S}, 2\text{pn}\gamma)$ 1988Hu01, 1989Fi06**

1988Hu01: $E(^{32}\text{S})=105\text{--}120$ MeV. Measured $E\gamma$, $I\gamma$, $\gamma\gamma$, recoil- γ , $n\gamma$, $\gamma\gamma(t)$, $\gamma(\theta)$ for $\theta=0^\circ$, 30° , 45° , 60° , and 90° . In recoil- γ experiment, reaction products were separated with the Rochester recoil mass separator and implanted in a planar, position sensitive Si detector. γ rays in coincidence with $A=83$ nuclei were detected with five Ge detectors. In neutron- γ experiment, γ rays were detected with a Compton-suppressed Ge detector and neutrons with an NE213 liquid scintillator. Prompt $\gamma\gamma$ coincidences measured with a Compton-suppressed intrinsic Ge detector and a Ge(Li) detector. Delayed $\gamma\gamma$ coincidences measured with a Compton-suppressed Ge detector and a LEPS.

1989Fi06: $E(^{32}\text{S})=103, 107$ MeV. Measured $T_{1/2}$ using Recoil Distance Doppler Shift (RDDS) method (at $E=107$ MeV) using four Ge(Li) detectors and with Doppler Shift Attenuation Method (DSAM) (at 103 MeV) using neutron-gated spectra collected at 0° with a Compton-suppressed Ge detector.

 ^{83}Zr Levels

E(level) †	$J\pi^\ddagger$	$T_{1/2}^\S$	Comments
0.0@	(1/2-)		
52.7 ^b	(5/2-)	0.53 μs 12	$T_{1/2}$: from $\gamma\gamma(t)$ in 1988Hu01.
77.1 ^a	(7/2+)	132 ns 55	$T_{1/2}$: from $\gamma\gamma(t)$ in 1988Hu01.
129.0	(3/2-)		
138.8&	(9/2+)		
338.5 ^c	(7/2-)	50 ps 4	

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$^{54}\text{Fe}(^{32}\text{S},2\text{pn}\gamma)$ 1988Hu01,1989Fi06 (continued) **^{83}Zr Levels (continued)**

E(level) [†]	$J\pi^{\ddagger}$	$T_{1/2}^{\S}$	Comments
373.0	(5/2-)		
582.0	(7/2-)	21.5 ps 55	
680.2 ^b	(9/2-)	4.2 ps 8	
769.0 ^a	(11/2+)	<2.3 ps	$T_{1/2}$: effective lifetime of 2.0 ps 3 from RDDS.
880.2 ^{&}	(13/2+)	2.3 ps 3	
984.0	(9/2-)		
1013.2 ^c	(11/2-)	1.9 ps 3	
1262.0	(11/2-)	<2.1 ps	$T_{1/2}$: effective lifetime of 1.7 ps 4 from RDDS.
1474.8 ^b	(13/2-)	0.76 ps 21	
1662.5 ^a	(15/2+)		
1772.0	(13/2-)		
1817.3 ^{&}	(17/2+)	0.42 ps 14	
1830.1 ^c	(15/2-)	0.62 ps 21	
2126.0	(15/2-)		
2397.5 ^b	(17/2-)	<1.04 ps	$T_{1/2}$: effective lifetime of 0.83 ps 21 from RDDS.
2707.8 ^a	(19/2+)		
2742.9 ^c	(19/2-)	<1.04 ps	$T_{1/2}$: effective lifetime of 0.83 ps 21 from RDDS.
2913.8 ^{&}	(21/2+)	0.37 ps 6	$T_{1/2}$: weighted average of 0.38 ps 6 from RDDS and 0.35 ps 14 from DSAM (1989Fi06).
3373.5 ^b	(21/2-)		
3731.0 ^c	(23/2-)		
3956.0 ^{&}	(25/2+)	0.40 ps [#] 6	
4431.5 ^b	(25/2-)		
4837.3 ^c	(27/2-)		
4905.1 ^{&}	(29/2+)	<0.42 ps [#]	$T_{1/2}$: effective lifetime of 0.35 ps 7 from DSAM.
5655.6 ^b	(29/2-)		
6029 ^{&}	(33/2+)		
6076 ^c	(31/2-)		
7325 ^{&}	(37/2+)		
7382 ^c	(35/2-)		

[†] From a least-squares fit to $E\gamma$, by evaluator.[‡] From the Adopted Levels.[§] From Recoil Distance Doppler shift measurement (1989Fi06), except where noted.[#] From Doppler Shift Attenuation measurement (1989Fi06).

@ (A): 1/2[301].

& (B): 5/2[422], $\alpha=+1/2$.^a (C): 5/2[422], $\alpha=-1/2$.^b (D): 5/2[303], $\alpha=+1/2$.^c (E): 5/2[303], $\alpha=-1/2$. $\gamma(^{83}\text{Zr})$

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger}$	Mult. [§]	$\delta^{\S}$	Comments
24.3	77.1	265 75	(E1)		$\alpha(\text{exp})=8.4$ from intensity balance (1988Hu01).
52.7	52.7	385 45	E2		Mult.: $\alpha(\text{exp})$ gives E1 or M1, the latter is excluded by comparison to RUL. $\alpha(\text{exp})=18.10$ from intensity balance (1988Hu01).
61.7	138.8	225 32	D+Q	0.05	Mult.: $\alpha(\text{exp})$ gives E2 or M2, the latter is excluded by comparison to RUL.
111.2	880.2	2 1	D+Q	0.04	Mult., δ : $A_2=-0.41$ 2, $A_4=0.00$ 2.
129 [#]	129.0				Mult., δ : $A_2=-0.35$ 9, $A_4=+0.04$ 9.
261.3	338.5	7 2	D		Mult.: $A_2=+0.30$ 5, $A_4=-0.01$ 5.
285.8	338.5	42 2	D+Q	-0.51	Mult., δ : $A_2=+0.55$ 2, $A_4=+0.11$ 2.
333.0	1013.2	<1			
341.7	680.2	5 2	D+Q	-0.47	Mult., δ : $A_2=+0.51$ 6, $A_4=+0.04$ 8.
373 [#]	373.0				
453 [#]	582.0				
461.6	1474.8	<1			
611 [#]	984.0				
627.5	680.2	29 3	Q		Mult.: $A_2=+0.33$ 5, $A_4=-0.16$ 6.
630.2	769.0	20 2	D+Q	0.11	Mult., δ : $A_2=-0.55$ 6, $A_4=+0.09$ 7.
674.7	1013.2	45 3	Q		Mult.: $A_2=+0.37$ 3, $A_4=-0.18$ 3.

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54Fe(32S,2pnγ) 1988Hu01,1989Fi06 (continued)γ(83Zr) (continued)

Eγ [†]	E(level)	Iγ [‡]	Mult. [§]	Comments
680 [#]	1262.0			
691.9	769.0	<2		
741.5	880.2	100 2	Q	Mult.: A ₂ =+0.24 4, A ₄ =-0.19 5.
^x 767.7				
782.2	1662.5	3 1		
788 [#]	1772.0			
794.6	1474.8	37 5		Eγ: doublet.
816.9	1830.1	40 5	Q	Mult.: A ₂ =+0.47 5, A ₄ =-0.25 5.
864 [#]	2126.0			
890.5	2707.8	<2		
893.5	1662.5	3 1		
912.8	2742.9	35 4	Q	Mult.: A ₂ =+0.41 5, A ₄ =-0.25 6.
922.7	2397.5	28 4	Q	Mult.: A ₂ =+0.35 3, A ₄ =-0.17 4.
937.0	1817.3	72 7		Eγ: doublet.
949.1	4905.1	21 4	Q	Mult.: A ₂ =+0.44 6, A ₄ =-0.15 7.
976.0	3373.5	14 4	Q	Mult.: A ₂ =+0.32 7, A ₄ =-0.08 7.
988.1	3731.0	9 2	Q	Mult.: A ₂ =+0.33 6, A ₄ =-0.05 7.
1042.2	3956.0	27 3	Q	Mult.: A ₂ =+0.32 4, A ₄ =-0.17 4.
1045.4	2707.8	3 1		
1058.0	4431.5	5 2		Eγ: doublet.
1096.5	2913.8	47 5	Q	Mult.: A ₂ =+0.26 5, A ₄ =-0.05 6.
1106.3	4837.3	8 2	Q	Mult.: A ₂ =+0.30 8, A ₄ =-0.04 9.
1123.6	6029	5 1	Q	Mult.: A ₂ =+0.27 7, A ₄ =-0.07 8.
1224.1	5655.6	<1	Q	
1239.1	6076	<2		
1296.2	7325	3 1		
1306.0	7382	<1		

[†] From 1988Hu01, except where noted.

[‡] From 1988Hu01, normalized to I_γ(742γ)=100.

[§] From γ(θ) in 1988Hu01, except where noted. A₂ and A₄ coefficients from 1988Hu01 are included in the comments.

[#] From 1989Fi06.

^x γ ray not placed in level scheme.

58Ni(28Si,2pnγ) 1996Ru16,1991Ru03,1988Su15

1996Ru16: ⁵⁸Ni(²⁸Si,2pnγ), E=130 MeV. Measured Eγ, Iγ, γγ, γγ(particle) coin, lifetimes by DSAM using Gammasphere array consisting of 57 Compton-suppressed HPGe detectors and the MICROBALL array consisting of 95 CsI(Tl) plastic scintillators. Deduced SD bands and many additional normal-deformed levels.

1991Ru03: ²⁸Si(⁵⁸Ni,2pnγ), E(⁵⁸Ni)=195 MeV. A=83 recoils separated with the Daresbury Recoil Separator and Z identification performed through energy loss in an ionization chamber at the focal plane. Measured Eγ, Iγ, γγ, γ-recoil and γγ(θ) (DCO) using 20 Compton-suppressed HPGe detectors.

1988Su15: ⁵⁸Ni(²⁸Si,2pnγ), E(²⁸Si)=85-100 MeV. Measured Eγ, Iγ, γ(θ), γγ, neutron-γ and particle-γ coincidences, γ(t), excitation function using intrinsic Ge detectors, a six-segmented Si(Au) detector, and two NE213 liquid scintillators.

83Zr Levels

E(level) [†]	Jπ [‡]	T _{1/2}	Comments
0.0 [§]	(1/2-)		
52.72 ^{&} 5	(5/2-)	0.50 μs 25	T _{1/2} : from neutron-γ(t) in 1988Su15.
77.04 [@] 7	(7/2+)	1.8 μs 1	T _{1/2} : from neutron-γ(t) in 1988Su15.
129.1 [§] 1	(3/2-)		
138.8 [#] 1	(9/2+)		
328.5 2			Jπ: proposed as (3/2-) in 1991Ru03.
338.5 ^a 1	(7/2-)		
372.6 [§] 1	(5/2-)		
580.0 3			
582.7 [§] 1	(7/2-)		

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$^{58}\text{Ni}(^{28}\text{Si},2\text{pn}\gamma)$ 1996Ru16,1991Ru03,1988Su15 (continued) ^{83}Zr Levels (continued)

E(level) [†]	$J\pi^{\ddagger}$	Comments
623.9 3		J π : proposed as (5/2-) in 1991Ru03.
680.3& 2	(9/2-)	
769.0@ 3	(11/2+)	
880.3# 3	(13/2+)	
983.2\$ 2	(9/2-)	
1013.4 ^a 2	(11/2-)	J π : proposed as (11/2+) in 1991Ru03.
1262.2\$ 3	(11/2-)	
1345.8 4		
1384.2 6		
1475.8& 3	(13/2-)	
1591.3 4		
1662.9@ 4	(15/2+)	
1733.7 6		
1771.4\$ 4	(13/2-)	
1817.4# 4	(17/2+)	
1830.0 ^a 4	(15/2-)	
2021.3 8		
2126.2\$ 6	(15/2-)	
2159.7 7		
2258.3 8		
2359.6 8		J π : proposed as (19/2-) in 1991Ru03.
2398.3& 5	(17/2-)	
2494.6 7		
2674.9\$ 7	(17/2-)	
2708.4@ 5	(19/2+)	
2743.1 ^a 6	(19/2-)	J π : proposed as (21/2+) in 1991Ru03,1996Ru16.
2913.0# 6	(21/2+)	
2926 1		
3095.5\$ 9	(19/2-)	
3138 ^b	(19/2-)	
3304.9 6	(21/2+)	
3374.2& 6	(21/2-)	
3587.0 6		
3625.3 ^c 6	(21/2-)	
3689\$ 1	(21/2-)	
3726.1@ 6	(23/2+)	
3730.9 ^a 7	(23/2-)	
3955.3# 7	(25/2+)	
3981.7 ^b 6	(23/2-)	
4092.0 8		J π : proposed as (23/2+) in 1991Ru03.
4188\$ 1	(23/2-)	
4283.0 9	(25/2+)	
4431.4& 8	(25/2-)	
4469.7 ^c 7	(25/2-)	
4767@ 1	(27/2+)	
4839.1 ^a 8	(27/2-)	
4904.3# 9	(29/2+)	
4943.7 ^b 8	(27/2-)	
5348\$ 2	(27/2-)	
5460.4 ^c 8	(29/2-)	
5626? 2		
5645& 1	(29/2-)	
5934@ 1	(31/2+)	
6022 ^b 1	(31/2-)	
6028# 1	(33/2+)	J π : proposed as (37/2+) in 1996Ru16.
6074 ^a 1	(31/2-)	
6570 ^c	(33/2-)	
6949& 1	(33/2-)	
7195@ 1	(35/2+)	
7235 ^b 2	(35/2-)	
7325# 1	(37/2+)	
7380 ^a 1	(35/2-)	
7628 2		

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$^{58}\text{Ni}(^{28}\text{Si}, 2\text{pn}\gamma)$ 1996Ru16, 1991Ru03, 1988Su15 (continued) **^{83}Zr Levels (continued)**

E(level) [†]	$J\pi^{\ddagger}$	Comments
7817 ^c 2	(31/2-)	
8275& 2	(37/2-)	
8586@ 2	(39/2+)	
8611 ^b 2	(39/2-)	
8758 ^a 2	(39/2-)	
8812# 2	(41/2+)	
9229 ^c 2	(41/2-)	
9689& 2	(41/2-)	
10137 ^b 2	(43/2-)	
10224@ 2	(43/2+)	
10310 ^a 2	(43/2-)	
10516# 2	(45/2+)	
10810 ^c 2	(45/2-)	
11786 ^b 2	(47/2-)	
12080? ^a 2	(47/2-)	
12087@ 2	(47/2+)	
12433# 3	(49/2+)	
12582? ^c 3	(49/2-)	
14510# 3	(53/2+)	
16736# 3	(57/2+)	
19217? [#] 3	(61/2+)	
0+x		
581+x		
1385+x		
2397+x?		E(level): ordering of 1192-1012 is not established.
3589+x?		E(level): ordering of 1192-1012 is not established.
3939+x		
4365+x		
y ^d	J=(27/2)	J π : from 2003Le08. 1996Ru16 proposed 31/2. E(level): y=5400 (1996Ru16).
1380.0+y ^d 10	J+2	
1574.0+y ^d 23	J+2	
2916.0+y ^d 15	J+4	
3001.0+y ^d 20	J+4	
4556.0+y ^d 18	J+6	
6305.1+y ^d 20	J+8	
8214.1+y ^d 23	J+10	
10288.1+y ^d 25	J+12	
12529+y ^d 3	J+14	
14939+y ^d 3	J+16	
17524+y ^d 3	J+18	
20285+y? ^d 4	J+20	
23223+y? ^d 4	J+22	
z ^e	J=(29/2)	J π : from 2003Le08. 1996Ru16 proposed 33/2. E(level): z=6300 (1996Ru16).
1444.0+z ^e 10	J+2	
3060.0+z ^e 15	J+4	
4851.0+z ^e 18	J+6	
6815.1+z ^e 20	J+8	
8947.1+z ^e 23	J+10	
11247.1+z ^e 25	J+12	
13713+z ^e 3	J+14	
16337+z ^e 3	J+16	

[†] From a least-squares fit to E γ , by evaluator.[‡] From the Adopted Levels.

(A): 1/2[301].

(B): 5/2[422], $\alpha=+1/2$.@ (C): 5/2[422], $\alpha=-1/2$.& (D): 5/2[303], $\alpha=+1/2$.^a (E): 5/2[303], $\alpha=-1/2$.^b (F): Band 1, $\alpha=-1/2$.^c (G): Band 1, $\alpha=+1/2$.

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⁵⁸Ni(²⁸Si,2pn γ) 1996Ru16,1991Ru03,1988Su15 (continued)

⁸³Zr Levels (continued)

^d (H): SD-1 band (2003Le08,1996Ru16). Percent feeding=6.30 (2003Le08), 5.3 3 (1996Ru16). Q(transition)=5.8 +8-5 (2003Le08), 5 2 (1996Ru16); deduced from lifetime data. Configuration= $\nu 5^2 \pi 5^1$ (2003Le08).

^e (I): SD-2 band (2003Le08,1996Ru16). Percent feeding=2.69 (2003Le08), 1.2 2 (1996Ru16).

 $\gamma(^{83}\text{Zr})$

$E\gamma^{\dagger}$	E(level)	$I\gamma^{\ddagger}$	Mult. [§]	$\delta^{\S}$	Comments
24.30@ 5	77.04	29.8& 26	E1		Mult.: from $\alpha(\text{exp})=5.4$ 8 (1988Su15), from intensity balance.
52.70@ 5	52.72	24.0& 19	E2		Mult.: from $\alpha(\text{K})\text{exp}=9.6$ 31 (1988Su15).
61.7 1	138.8	104.1& 16	D(+Q)	-0.02 7	Mult., δ : $A_2=-0.27$ 2, $A_4=+0.01$ 5 (1988Su15).
111.3 2	880.3	<2			
129.5 1	129.1	12 1	D+Q	+0.17 7	Mult., δ : $A_2=-0.11$ 2, $A_4=+0.02$ 5 (1988Su15).
136.9 2	4092.0	<2			
154.5 3	1817.4	<2			
199.4 3	328.5	<2			
204.5 2	2913.0	<2			
209.4 2	338.5	<2			
210.1 1	582.7	3.6 4			
230.4 2	3955.3	2.5 2	D+Q	≤ 0.3	Mult., δ : $R_{\text{DCO}}=0.65$ 13 (1991Ru03).
243.1 1	372.6	7.8 6			
261.3 1	338.5	5.7 4	D		Mult.: $R_{\text{DCO}}=0.83$ 8 (1991Ru03); $A_2=+0.19$ 8, $A_4=-0.02$ 18 (1988Su15).
279.0 3	1262.2	<2			
285.8 1	338.5	36 3	D+Q	+2.5 7	Mult., δ : $R_{\text{DCO}}=0.91$ 3 (1991Ru03); $A_2=+0.57$ 4, $A_4=+0.25$ 7 (1988Su15).
295.4 3	623.9	<2			
328.4 2	328.5	2.1 2			
331 ^a	4283.0				
333.2 2	1013.4	<2			$R_{\text{DCO}}=1.45$ 16 (1991Ru03).
341.7 2	680.3	3.9 3	D+Q	≤ 0.3	Mult., δ : $R_{\text{DCO}}=0.72$ 7 (1991Ru03).
349.5 2	1733.7	2.8 3			
350 ^a	3939+x				
356.4 3	3981.7	<2			
365.2 3	4092.0	<2	D+Q	≤ 0.3	Mult., δ : $R_{\text{DCO}}=0.69$ 10 (1991Ru03).
372.8 2	372.6	5.8 4			
376 ^a	6022				
391.8 2	3304.9	6.0 4			$R_{\text{DCO}}=1.14$ 13 (1991Ru03).
394.7 3	3981.7	<2			
395 ^a	3138				
400.6 3	983.2	2.6 2			
421.0 3	3726.1	2.3 2	D+Q	≤ 0.3	Mult., δ : $R_{\text{DCO}}=0.39$ 9 (1991Ru03).
426.0 3	2159.7	<2			
426 ^a	4365+x				
430.9 2	1013.4	2.8 2			
453.3 2	582.7	14 1	Q		Mult.: $A_2=+0.27$ 9, $A_4=-0.14$ 13 (1988Su15).
462.6 4	1475.8	<2			
465.5 3	1345.8	2.7 2	D+Q	≤ 0.3	Mult., δ : $R_{\text{DCO}}=0.48$ 7 (1991Ru03).
488.2 5	4469.7	<2			
492.5 5	623.9	<2			
509.1 4	1771.4	<2			
512.2 5	4943.7	3.4 3	(D+Q)		Mult.: $R_{\text{DCO}}=0.52$ 11 is not consistent with E2 assigned by 1991Ru03.
516.2 6	5460.4	<2			
548 ^{a,b}	6570				
580.0 3	580.0	6.8 5			
581 ^a	581+x				
597 ^a	3304.9				
607.5 5	3981.7	2.3 3	(D+Q)		Mult.: $R_{\text{DCO}}=0.64$ 7 is not consistent with E2 as assigned by 1991Ru03.
610.5 3	983.2	8.1 6	Q		Mult.: $A_2=+0.39$ 7, $A_4=-0.07$ 13 (1988Su15).
621.5 5	5460.4	2.0 2	(D+Q)		Mult.: $R_{\text{DCO}}=0.67$ 17 (1991Ru03).
627.6 3	680.3	28 2	Q		Mult., δ : $R_{\text{DCO}}=1.00$ 6 (1991Ru03); $A_2=+0.34$ 2, $A_4=-0.09$ 3 (1988Su15).
630.0 4	769.0	14 1	D(+Q)		Mult.: $A_2=-0.78$ 6, $A_4=-0.08$ 13 (1988Su15).
637.1 5	2021.3	2.2 2			
664.6 5	2494.6	<2			
674.7 3	1013.4	35 3	Q		Mult.: $R_{\text{DCO}}=1.06$ 7 (1991Ru03); $A_2=+0.35$ 1, $A_4=-0.09$ 1 (1988Su15).
679.4 4	1262.2	12 1	Q		Mult.: $R_{\text{DCO}}=0.98$ 9 (1991Ru03).

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58Ni(28Si,2pnγ) 1996Ru16,1991Ru03,1988Su15 (continued)

γ(83Zr) (continued)

Eγ [†]	E(level)	Iγ [‡]	Mult.§	δ§	Comments
692.3 5	769.0	4.1 3			
738.6 5	4469.7	2.5 2			R _{DCO} =0.80 24 (1991Ru03).
741.6 4	880.3	100 5	Q		Mult.: R _{DCO} =0.98 4 (1991Ru03); A ₂ =+0.34 3, A ₄ =-0.10 6 (1988Su15).
^x 767.7					
768.3 6	2359.6	2.5 3			
782.4 4	1662.9	6.6 5	D+Q	≤0.3	Mult.,δ: R _{DCO} =0.46 7 (1991Ru03).
788.4 5	1771.4	4.5 4			
795.3 4	1475.8	27 3	Q		Mult.: R _{DCO} =0.93 5 (1991Ru03); A ₂ =+0.32 4, A ₄ =-0.12 8 (1988Su15).
804 ^a	1385+x				
804.2 5	1384.2	5.1 6			
813.5 5	3726.1	2.5 2			
816.6 4	1830.0	39 3	Q		Mult.: R _{DCO} =1.07 5 (1991Ru03); A ₂ =+0.33 5, A ₄ =-0.08 8 (1988Su15).
844 ^a	3981.7				
844.1 7	3587.0	4.8 4			
864.0 5	2126.2	8.6 6	Q		Mult.: R _{DCO} =1.17 11 (1991Ru03).
890.5 6	2708.4	3.7 6			
893.9 5	1662.9	6.7 8			
903.5 6	2674.9	4.2 4			
913.2 5	2743.1	28 2	Q		Mult.: R _{DCO} =1.02 6 (1991Ru03); A ₂ =+0.30 11, A ₄ =+0.01 21 (1988Su15).
922.3 5	2398.3	25 2	Q		Mult.: R _{DCO} =1.01 6 (1991Ru03); A ₂ =+0.37 3, A ₄ =-0.09 6 (1988Su15).
937.2 5	1817.4	69 5	Q		Mult.: R _{DCO} =1.01 4 (1991Ru03); A ₂ =+0.34 3, A ₄ =-0.09 5 (1988Su15).
949.0 5	4904.3	21 2	Q		Mult.: R _{DCO} =1.04 8 (1991Ru03); A ₂ =+0.34 5, A ₄ =-0.13 8 (1988Su15).
961.5 9	4943.7	2.4 3			
969.3 6	3095.5	5.9 5			
975.7 6	3374.2	17 2	(Q)		Mult.: R _{DCO} =1.24 9 (1991Ru03); A ₂ =+0.38 16, A ₄ =+0.1 3 (1988Su15).
987.9 5	3730.9	18 3	(Q)		Mult.: R _{DCO} =1.13 8 is not consistent with M1+E2 assigned by 1991Ru03.
991.4 11	5460.4	<2			
1011.3 3	1591.3	3.9 3			
1012 ^a	2397+x?				
1014.0 7	3689	<2			
1018.8 7	3726.1	3.0 4			
1041 ^a	4767				
1042.1 5	3955.3	42 4	Q		Mult.: R _{DCO} =1.05 5 (1991Ru03).
1045.2 6	2708.4	4.7 7			
1056.9 6	4431.4	8.8 9	(Q)		Mult.: R _{DCO} =1.21 17 (1991Ru03).
1079 ^a	6022				
1092.3 7	4188	4.4 4			
1096.4 6	2913.0	59 6	Q		Mult.: R _{DCO} =1.05 5 (1991Ru03); A ₂ =+0.27 2, A ₄ =+0.03 3 (1988Su15).
1108.4 6	4839.1	15 1			Mult.: R _{DCO} =1.12 22 is not consistent with M1+E2 assigned by 1991Ru03.
1111 ^a	6570				
1123.8 6	6028	16 1	Q		Mult.: R _{DCO} =1.14 9 (1991Ru03).
1160.2 8	5348	<2			
1167 ^a	5934				
1192 ^a	3589+x?				
1192.4 10	2926	<2			
1213 ^a	7235				
1213.9 7	5645	4.8 5	Q		Mult.: R _{DCO} =0.99 16 (1991Ru03).
1227.2 7	3625.3	3.4 3	(Q)		Mult.: R _{DCO} =1.04 20 (1991Ru03).
1234.6 7	6074	6.9 6	Q		Mult.: R _{DCO} =1.23 19 (1991Ru03).
1239 ^{a,b}	3981.7				
1244.9 8	2258.3	3.1 3			
1247 ^a	7817				
1261 ^a	7195				
1297.2 7	7325	7.5 7	Q		Mult.: R _{DCO} =1.16 21 (1991Ru03).
1304 ^a	6949		Q		Eγ: other: 1294.0 8 (Iγ=2.8 3) in 1991Ru03. Mult.: R _{DCO} =1.05 18 (1991Ru03).
1306.7 7	7380	4.8 5	Q		Mult.: R _{DCO} =1.12 18 (1991Ru03).
1307 ^a	3138				
1326 ^a	8275				Eγ: other: 1412.9 10 (Iγ<2) in 1991Ru03.
1343 ^{a,b}	5626?				
1370.0 7	4283.0	5.5 4	(Q)		Mult.: R _{DCO} =1.04 15 (1991Ru03).

Continued on next page (footnotes at end of table)

⁵⁸Ni(²⁸Si,2pn γ) 1996Ru16,1991Ru03,1988Su15 (continued)

 $\gamma(^{83}\text{Zr})$ (continued)

E $\gamma^{\dagger}$	E(level)	I $\gamma^{\ddagger}$	Mult. [§]	Comments
1376 ^a	8611			
1377.5 8	8758	2.1 2		
1380 [#] 1	1380.0+y	0.35 5		E γ : other: 1378 (1996Ru16).
1391 ^a	8586			
1412 ^a	9229			
1414 ^a	9689			E γ : other: 1520.7 11 (I γ <2) in 1991Ru03.
1427 [#] 1	3001.0+y			E γ : other: 1433 (1996Ru16).
1444 [#] 1	1444.0+z	0.20 5		E γ : other: 1448 (1996Ru16).
1486.8 8	8812	5.7 5	Q	Mult.: R _{DCO} =1.2 3 (1991Ru03).
1526 ^a	10137			
1536 [#] 1	2916.0+y	0.80 10		E γ : other: 1534 (1996Ru16).
1552 ^a	10310			E γ : other: 1579.4 12 (I γ <2) in 1991Ru03.
1555 [#] 1	4556.0+y			
1581 ^a	10810			
1600 ^a	7628			
1616 [#] 1	3060.0+z	0.25 5		E γ : other: 1622 (1996Ru16).
1638 ^a	10224			
1640 [#] 1	4556.0+y	1.05 10		E γ : other: 1638 (1996Ru16).
1649 ^a	11786			
1704 ^a	10516			1599.1 γ shown by 1991Ru03 as populating the 8812-keV level is omitted by 1996Ru16.
1749 [#] 1	6305.1+y	1.00 10	(Q)	Mult.: DCO ratio (1996Ru16) consistent with $\Delta J=2$, quadrupole.
1770 ^{a,b}	12080?			
1772 ^{a,b}	12582?			
1791 [#] 1	4851.0+z	0.30 5		E γ : other: 1793 (1996Ru16).
1863 ^a	12087			
1909 [#] 1	8214.1+y	1.00 10	(Q)	Mult.: DCO ratio (1996Ru16) consistent with $\Delta J=2$, quadrupole.
1917 ^a	12433			
1964 [#] 1	6815.1+z	0.18 5		E γ : other: 1962 (1996Ru16).
2074 [#] 1	10288.1+y	1.00 10	(Q)	Mult.: DCO ratio (1996Ru16) consistent with $\Delta J=2$, quadrupole.
2077 ^a	14510			
2132 [#] 1	8947.1+z	0.20 5		
2226 ^a	16736			
2241 [#] 1	12529+y	0.85 10	(Q)	Mult.: DCO ratio (1996Ru16) consistent with $\Delta J=2$, quadrupole.
2300 1	11247.1+z	0.18 5		
2410 [#] 1	14939+y	0.45 10		
2466 [#] 1	13713+z	0.13 5		
2481 ^{a,b}	19217?			
2585 [#] 1	17524+y	0.30 5		
2624 [#] 1	16337+z	0.08 3		
2761 ^{#,b} 1	20285+y?	0.18 5		
2938 ^b	23223+y?	0.09 3		E γ : from 1996Ru16; not reported by 2003Le08.

[†] From 1991Ru03, except where noted.

[‡] From 1991Ru03, except where noted. Values for SD bands are from 1996Ru16 and are relative intensities within each band normalized to 1.0 for the most intense transitions in SD-1 band.

[§] From R(DCO) in 1991Ru03 and $\gamma(\theta)$ in 1988Su15, except where noted. R(DCO) ratios and A₂,A₄ coefficients are included in the comments.

[#] From 2003Le08.

[@] From the Adopted Gammas.

[&] From 1988Su15.

^a From 1996Ru16.

^b Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

Adopted Levels, Gammas

Q(β⁻)=-11724 SY; S(n)=14281 SY; S(p)=1757 SY; Q(α)=-2.5×10³ 5 2012Wa38.
ΔQ(β⁻)=500; ΔS(n)=423; ΔS(p)=361 (2012Wa38).
S(2n)=27606 syst 500; S(2p)=7.3×10³ 3; Q(εp)=2.4×10³ 3 (2012Wa38).

⁸³Nb Levels

Cross Reference (XREF) Flags

A ²⁸Si(⁵⁸Ni,p2nγ)

E(level) [†]	Jπ [‡]	XREF	T _{1/2}	Comments
0.0 §	(5/2+)	A	3.9 s 2	%ε+%β ⁺ =100. T _{1/2} : weighted average of 3.8 s 2 (2009St04) and 4.1 s 3 (1988Ku14). Jπ: expected allowed β ⁺ transition to the 77-keV, Jπ=(7/2+) level in ⁸³ Zr is consistent with Jπ=(5/2+,7/2+,9/2+). Systematics of N=41 isotones and comparison of the observed rotational bands with projected shell model calculations suggests Jπ=(5/2+).
129.52 [#] 16	(7/2+)	A		
229.03& 19	(3/2-)	A		
251.15 § 16	(9/2+)	A		
379.94@ 24	(5/2-)	A		
641.5& 3	(7/2-)	A		
710.0 [#] 3	(11/2+)	A		
873.7 § 3	(13/2+)	A		
941.5@ 4	(9/2-)	A		
1325.2& 5	(11/2-)	A		
1441.4 [#] 6	(15/2+)	A		
1720.9 § 5	(17/2+)	A		
1721.1@ 7	(13/2-)	A		
2236.2?& 11	(15/2-)	A		
2484.4 [#] 21	(19/2+)	A		
2689.1?@ 12	(17/2-)	A		
2777.3 § 7	(21/2+)	A		
4009.3 § 21	(25/2+)	A		
5241 § 3	(29/2+)	A		
6664 § 4	(33/2+)	A		

[†] From a least-squares fit to E_γ by evaluator.

[‡] Spin, parity, and single-particle configuration assignments are based on decay patterns, multipolarity assignments, comparison with projected shell model calculations and on the analogy with rotational band structures in ⁷⁷Kr and ⁷⁹Sr.

§ (A): Kπ=5/2+, α=+1/2. Configuration=π5/2[422].

(B): Kπ=5/2+, α=-1/2. Configuration=π5/2[422].

@ (C): Kπ=3/2-, α=+1/2. Configuration=π3/2[301].

& (D): Kπ=3/2-, α=-1/2. Configuration=π3/2[301].

γ(⁸³Nb)

E(level)	E _γ [†]	I _γ [†]	Mult. [‡]	δ [‡]	α
129.52	129.5 2	100	(M1+E2)	+0.20 7	0.124 11
229.03	229.0 2	100	(E1) §		0.01093
251.15	121.6 2	100 4	(M1+E2)	+0.15 6	0.141 10
	251.2 2	39 6	(E2)		0.0422
379.94	150.9 2	100 7	(M1+E2)	+0.14 9	0.077 6
	250.6 [#] 5	<22			
641.5	261.5 3	100 19	(M1+E2)	+0.19 17	0.0180 16
	412.4 4	100 30			
710.0	458.8 3	87 23			
	580 1	100 50			
873.7	163.4 4	6 4			
	622.7 3	100 13	(E2)		0.00238
941.5	299.8 4	59 17			
	561.9 5	100 30			
1325.2	384 1	<32			
	683.6 5	100 40			

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $\gamma(^{83}\text{Nb})$ (continued)

E(level)	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{\dagger}$
1441.4	731.3 5	100
1720.9	847.2 4	100
1721.1	779.6 6	100
2236.2?	911# 1	100
2484.4	1043 2	100
2689.1?	968# 1	100
2777.3	1056.4 5	100
4009.3	1232@ 2	100
5241	1232@ 2	100
6664	1423 2	100

 $\dagger$ From $^{28}\text{Si}(^{58}\text{Ni}, \text{p}2\text{n}\gamma)$. $\ddagger$ From $\gamma(0)$ in $^{28}\text{Si}(^{58}\text{Ni}, \text{p}2\text{n}\gamma)$. Except where noted, Q and D+Q transitions are assumed E2 and M1+E2, respectively, based on the transitions being assigned to a rotational band and for the D+Q transitions, non-zero values for the mixing ratios. $\S$ Based on analogy with negative parity levels in ^{77}Kr and ^{79}Sr , the 229-keV level is assumed to have $\pi=-$ and thus, the D 229-keV transition is assumed (E1).

Placement of transition in the level scheme is uncertain.

@ Multiply placed.

²⁸Si(⁵⁸Ni,p2n γ) **2007Fi07,1991Gr01**

2007Fi07: E(⁵⁸Ni)=204,215 MeV. Measured E γ , I γ , $\gamma(\theta)$, $\gamma\gamma$ and recoil- γ coincidences using Gammasphere array consisting of 95 Compton-suppressed HPGe detectors. Reaction products separated according to their mass to charge ratio using the Fragment Mass Analyzer (FMA); two position-sensitive channel plate detectors and an ionization chamber at the focal plane of the FMA allowed for Z identification.

1991Gr01: E(⁵⁸Ni)=195 MeV. Measured E γ , I γ , $\gamma\gamma$ and recoil- γ coincidences using 20 Compton-suppressed Ge detectors. Reaction products separated according to their mass to charge ratio using the Daresbury Recoil Separator (RS); an ionization chamber at the focal plane of the RS allowed for Z identification.

The level scheme of 1991Gr01 is confirmed by 2007Fi07, the latter of which is more extensive and adopted here.

⁸³Nb Levels

E(level) [†]	J $\pi^{\ddagger}$	E(level) [†]	J $\pi^{\ddagger}$	E(level) [†]	J $\pi^{\ddagger}$
0.0 §	5/2+	873.7 § 3	13/2+	2484.4 # 21	(19/2+)
129.52 # 16	7/2+	941.5 @ 4	(9/2-)	2689.1 ? @ 12	(17/2-)
229.03 & 19	3/2-	1325.2 & 5	(11/2-)	2777.3 § 7	(21/2+)
251.15 § 16	9/2+	1441.4 # 6	(15/2+)	4009.3 § 21	(25/2+)
379.94 @ 24	5/2-	1720.9 § 5	(17/2+)	5241 § 3	(29/2+)
641.5 & 3	7/2-	1721.1 @ 7	(13/2-)	6664 § 4	(33/2+)
710.0 # 3	11/2+	2236.2 ? & 11	(15/2-)		

[†] From a least-squares fit to E γ , by evaluator.

[‡] As proposed by 2007Fi07 based on decay patterns, multipolarity assignments and comparison with projected shell model calculations.

§ (A): K π =5/2+, α =+1/2. Configuration= π 5/2[422].

(B): K π =5/2+, α =-1/2. Configuration= π 5/2[422].

@ (C): K π =3/2-, α =+1/2. Configuration= π 3/2[301].

& (D): K π =3/2-, α =-1/2. Configuration= π 3/2[301].

 $\gamma(^{83}\text{Nb})$

E $\gamma^{\dagger}$	E(level)	I $\gamma^{\dagger}$	Mult. [‡]	$\delta^{\ddagger}$	Comments
121.6 2	251.15	71 3	D+Q	+0.15 6	
129.5 2	129.52	100 5	D+Q	+0.20 7	
150.9 2	379.94	45 3	D+Q	+0.14 9	
163.4 4	873.7	5 3			
229.0 2	229.03	114 6	D		I γ : includes a contribution from a contaminant γ ray in ⁸⁴ Nb.
250.6 § 5	379.94	<10			
251.2 2	251.15	28 4	Q		
261.5 3	641.5	27 5	D+Q	+0.19 17	
299.8 4	941.5	17 5			
384 1	1325.2	<8			
412.4 4	641.5	26 7			
458.8 3	710.0	26 7			
561.9 5	941.5	29 9			
580 1	710.0	30 16			
622.7 3	873.7	78 10	Q		
683.6 5	1325.2	25 10			
731.3 5	1441.4	25 10			
779.6 6	1721.1	28 11			
847.2 4	1720.9	72 14			
911 § 1	2236.2 ?	18 9			
968 § 1	2689.1 ?	21 11			
1043 2	2484.4	16 9			
1056.4 5	2777.3	32 8			
1232 # 2	4009.3	53 #			
	5241	53 #			
1423 2	6664	8			

[†] From 2007Fi07. The data at E(⁵⁸Ni)=204 MeV and 215 MeV were combined.

[‡] From $\gamma(\theta)$ measurements in 2007Fi07. No details on A₂ or A₄ coefficients were given by the authors.

§ Placement of transition in the level scheme is uncertain.

Multiply placed; undivided intensity given.

Adopted Levels

S(p)=1775 SY; Q(α)=−2052 SY 2012Wa38.
ΔS(p)=499; ΔQ(α)=566 (2012Wa38).
S(2p)=2868 syst 433, Q(ep)=9968 syst 448 (2012Wa38).
1997Re12, 1999Ja02: ⁸³Mo isotope produced in fragmentation of a ⁹²Mo beam at 60 MeV / nucleon on natural Ni targets.
Reaction products separated with the LISE3 spectrometer and identified by TOF-ΔE-E measurements using a four element Si detector telescope.
2002StZZ, 2001Ki13, 2000StZU: ⁸³Mo isotope produced in fragmentation of a ¹¹²Sn beam at 1 GeV / nucleon on a ⁹Be target. Reaction products separated by the fragment separator (FRS) and identified using TOF, ΔE, and fragment trajectories. Isotopes implanted into four double sided Si strip detectors sandwiched between two stacks of ten Si detectors each. Measured T_{1/2}.

⁸³Mo Levels

E(level)	T _{1/2}	Comments
0 . 0	6 ms +30−3	%ε+%β ⁺ =100. T _{1/2} : from implant-β(t) correlations (2001Ki13). Data analyzed with the maximum likelihood method taking into account three decay generations and applying background subtraction. Only one decay event of ⁸³ Mo was observed.

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