Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Jun Chen and Balraj Singh	NDS 177, 1 (2021)	3-Sep-2021

Q(β^-)=−10288 *27*; S(n)=10751 *19*; S(p)=2409 *15*; Q(α)=6987 *3* 2021Wa16
S(2n)=19081 *17*, S(2p)=3031 *14*, Q(ε)=5018 *14*, Q(εp)=3936 *17* (2021Wa16).
Isotope produced in heavy-ion reactions and identified by mass separation: 1967Si09, 1977De32, 1981Le23, 1984YaZY, 1985Va03, 1993Wa04.
Mass measurement by Schottky spectrometry: 2002No01, 1998GeZY.
2011Co01 (also 2012Co24): ^{194}Po produced in spallation reaction using UC_x target and 1.4 GeV proton beam at CERN-ISOLDE facility. Resonant ionization laser spectroscopy. Measured isotope shifts and deduced rms nuclear charge radius relative to that of ^{210}Po.
Additional information 1.
Theoretical references: consult the NSR database (www.nndc.bnl.gov/nsr/) for 91 primary references dealing with nuclear structure, and half-lives in different decay modes.

^{194}Po Levels

Cross Reference (XREF) Flags

A ^{194}Po IT decay (12.9 μs)
B ^{198}Rn α decay (65 ms)
C ^{170}Yb(^{28}Si,4nγ)

E(level)†	Jπ‡	$T_{1/2}$	XREF	Comments
0.0@	0^+	0.392 s *4*	ABC	%α=93 *7*; %ε+%β^+=7 *7* $T_{1/2}$: from 1993Wa04. Other values: 0.34 s *+11−7* (2014Ka23), 0.20 s *+96−9* (2005Uu02), 0.37 s *4* (1999He32,2001Ju09), 0.42 s *+8−6* (1996En02), 0.41 s *3* (1981Le23), 0.70 s *10* (1977De32), 0.6 s *2* (1967Si09). %α=93 *7* for ^{194}Po decay was obtained by M. Leino, Ph.D. Thesis (1983), as quoted in reference 19 of 1993Wa04. Other: %α>88%, estimated by 2014Ka23 from their α data. Theoretical $T_{1/2}$(β decay)=11.4 s and $T_{1/2}$(α)=0.69 ms (2019Mo01) suggests negligible β decay. $<r^2>^{1/2}$=5.517 fm *18* (2013An02 evaluation). $\Delta<r^2>$(^{194}Po,^{208}Po)=−0.462 fm^2 *16* (2013An02 evaluation). Other: $\Delta<r^2>$(^{194}Po,^{210}Po)=−0.596 fm^2 *10*(stat)*20*(syst) (2011Co01, collinear laser spectroscopy). Measured $\delta\nu$(^{194}Po,^{210}Po)=+7.36 GHz *16* (2011Co01). 2013An03 estimated upper limits for the total kinetic energy release in the fission of ^{194}Po, being the β+ε daughter product of ^{194}At.
319.31@ *10*	2^+	26# ps *5*	ABC	Jπ: 319.3γ E2, ΔJ=2 to 0^+. Q_t=5.5 *6*, β_2^t=0.18 *2* from (^{28}Si,4nγ) (2008Gr04).
685.46@ *14*	4^+	9.7# ps *28*	A C	Jπ: 366.1γ ΔJ=2, E2 to 2^+; member of g.s. band. Q_t=5.4 *8*, β_2^t=0.17 *3* from (^{28}Si,4nγ) (2008Gr04).
757.67& *12*	(2^+)		A C	Jπ: 757.7γ ΔJ=(2), (E2) to 0^+.
1147.19@ *24*	6^+		A C	Jπ: 461.7γ ΔJ=2, (E2) to 4^+; member of g.s. band.
1210.38& *17*	(4^+)		A C	Jπ: 453.9γ ΔJ=2, (E2) to (2^+); band assignment.
1644.39& *23*	(6^+)		A C	Jπ: 434.1γ to (4^+); band assignment.
1692.2@ *3*	8^+		A C	Jπ: 545.0γ ΔJ=2 to 6^+; member of g.s. band.
1984.7a *5*	(7^-)		A C	Jπ: proposed by 1999He32 in (^{28}Si,4nγ); 340.5γ ΔJ=(1) to (6^+).
2065.6 *3*	(8^+)		A C	Jπ: proposed by 1999He32 in (^{28}Si,4nγ); 373.1γ to 8^+, 918.5γ to 6^+.
2281.7a *6*	(9^-)		A C	Jπ: 297.3γ ΔJ=2, (E2) to (7^-).

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Adopted Levels, Gammas (continued)

^{194}Po Levels (continued)

E(level)[†]	Jπ[‡]	$T_{1/2}$	XREF	Comments
2294.0[@] *4*	10^+		C	Jπ: 601.8γ ΔJ=2, (E2) to 8^+; member of g.s. band.
2313.6 *3*	(10^-)	12.9 μs *5*	A	%IT=100 Possible configuration: $\pi h_{9/2}\otimes i_{13/2}$ (2016An10). Jπ: 248.0γ (M2) to (8^+). $T_{1/2}$: from ER-γ-α correlations by gating with "OR" condition on 319, 366, 373 and 545 keV γ transitions (2016An10). Other: 15 μs *2* (1999He32,2001Ju09, (recoil)(458.6)γ(t), but 458γ is not placed by 2016An10).
2623.2[@] *5*	12^+		C	Jπ: 392.3γ ΔJ=2, (E2) to 10^+; member of g.s. band.
2653.8?[a] *8*	(10)		C	Jπ: 371.9γ ΔJ=(1) to (9^-).
2915.3[@] *6*	(14^+)		C	Jπ: 292.1γ to 12^+; member of g.s. band.
3325.3?[@] *8*	(16^+)		C	Jπ: 409.9γ to (14^+); possible member of g.s. band.

[†] From a least-squares fit to Eγ values.
[‡] As proposed by 1999He32 based on γ(θ) data and systematics of heavier Po nuclides.
[#] From recoil-decay tagging technique in recoil-distance Doppler-shift (RDDS) measurements in ^{170}Yb(^{28}Si,4nγ) dataset, with analysis by differential-decay curve method (DDCM) using ^{114}Cd(^{83}Kr,3nγ) reaction (2006Gr16,2008Gr04) .
[@] Band(A): g.s. band.
[&] Band(B): Band based on (2^+).
[a] Seq.(C): Sequence based on (7^-).

γ(^{194}Po)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	α[@]	Comments
319.31	2^+	319.3 *1*	100	0.0	0^+	E2	0.1048	B(E2)(W.u.)=89 *+21−14* E_γ: other: 319.7 *3* from (^{28}Si,4nγ).
685.46	4^+	366.1 *1*	100	319.31	2^+	E2	0.0712	B(E2)(W.u.)=124 *+50−28* E_γ: other: 366.5 *3* from (^{28}Si,4nγ).
757.67	(2^+)	438.4 *1*	100 *14*	319.31	2^+	[M1+E2]	0.11 *7*	E_γ,I_γ: other: 438.1 *5* with Iγ=100 *34* from (^{28}Si,4nγ).
		757.7 *2*	71 *14*	0.0	0^+	(E2)		E_γ: weighted average of 757.6 *2* from ^{194}Po IT decay and 758.1 *5* from (^{28}Si,4nγ). I_γ: other: 116 *84* from (^{28}Si,4nγ).
1147.19	6^+	461.7 *2*	100	685.46	4^+	(E2)	0.0390	E_γ: weighted average of 461.6 *2* from ^{194}Po IT decay and 461.8 *3* from (^{28}Si,4nγ).
1210.38	(4^+)	453.9[‡] *5*	88 *22*	757.67	(2^+)	(E2)	0.0408	I_γ: weighted average of 116 *34* from ^{194}Po IT decay and 76 *22* from (^{28}Si,4nγ).
		524.9 *1*	100 *17*	685.46	4^+	[M1+E2]	0.07 *5*	E_γ,I_γ: other: 524.4 *5* with Iγ=100 *24* from (^{28}Si,4nγ).
1644.39	(6^+)	434.1 *2*	100 *13*	1210.38	(4^+)	[E2]	0.0455	E_γ,I_γ: other: 433.9 *5* with Iγ=100 *25* from (^{28}Si,4nγ).
		958.7 *4*	39 *6*	685.46	4^+			E_γ: other: 958.7 *5* from (^{28}Si,4nγ). I_γ: weighted average of 38.8 *63* from ^{194}Po IT decay and 37 *14* from (^{28}Si,4nγ).
1692.2	8^+	545.0 *1*	100	1147.19	6^+	(E2)	0.0262	E_γ: other: 545.2 *3* from (^{28}Si,4nγ).
1984.7	(7^-)	340.5 *4*	100	1644.39	(6^+)	(E1)	0.0235	E_γ: weighted average of 340.1 *3* from ^{194}Po IT decay and 340.8 *3* from (^{28}Si,4nγ). Mult.: ΔJ=(1), dipole from γ(θ) in (^{28}Si,4nγ); (E1) from level scheme.
2065.6	(8^+)	373.3 *1*	100 *5*	1692.2	8^+	[M1+E2]	0.17 *11*	E_γ: other: 373.1 *5* from (^{28}Si,4nγ).

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Adopted Levels, Gammas (continued)

γ(^{194}Po) (continued)

E_i(level)	J_i^π	E_γ[†]	I_γ[†]	E_f	J_f^π	Mult.[#]	α[@]	$I_{(\gamma+ce)}$	Comments
2065.6	(8$^+$)	(421)	≤5.9	1644.39	(6$^+$)				
		918.5 *2*	39.0 *25*	1147.19	6$^+$				E_γ: other: 918.3 *5* from (^{28}Si,4nγ).
2281.7	(9$^-$)	297.3 *5*	100	1984.7	(7$^-$)	(E2)	0.1301		E_γ: unweighted average of 296.8 *2* in IT decay and 297.3 *3* in (^{28}Si,4nγ).
2294.0	10$^+$	601.8[‡] *3*	100	1692.2	8$^+$	(E2)	0.0210		
2313.6	(10$^-$)	(33)		2281.7	(9$^-$)			180	E_γ: unobserved γ-ray but 2016An10 indicate that the 33γ could populate the 2281 level as the weak 296.8 γ decay of the 2281 level was observed in the delayed γ ray spectroscopic data indicating population of the 2281 by an isomeric state.
		248.0 *1*	100 *6*	2065.6	(8$^+$)	(M2)	3.50		B(M2)(W.u.)=0.0120 *+5–6* Mult.: From α(K)exp≤2.3 *4*. Value was considered as an upper limit as additional sources of Po K x-rays from significant E0 components as well as unobserved highly converted transitions cannot be ruled out. However, 2016An10 have strongly suggested M2 transition based on their observation of the Po K x-rays intensities in coincidence with other transitions as well as the intensity balance from γγ coincidence at the 8$^+$ level, with intensity of the 248γ calculated for several other possible multipolarities.
		(622)	≤12	1692.2	8$^+$	[M2]	0.191		B(M2)(W.u.)<1.6×10^{-5}
2623.2	12$^+$	329.2[‡] *3*	100	2294.0	10$^+$	(E2)	0.0960		
2653.8?	(10)	371.9[‡&] *5*	100	2281.7	(9$^-$)	(D)	0.15 *13*		
2915.3	(14$^+$)	292.1[‡] *3*	100	2623.2	12$^+$	[E2]	0.1365		
3325.3?	(16$^+$)	409.9[‡&] *5*	100	2915.3	(14$^+$)	[E2]	0.0528		

[†] From ^{194}Po IT decay (2016An10), unless otherwise noted.
[‡] From ^{170}Yb(^{28}Si,4nγ) (1999He32).
[#] Assigned by evaluators based on γ(θ) data in (^{28}Si,4nγ) (1999He32), and RUL (for E2 and M2 transitions) for gamma rays from levels of known half-lives, and assuming half-lives of no longer than 20 or so nanoseconds for other levels (for in-band transitions). Exceptions are noted.
[@] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[&] Placement of transition in the level scheme is uncertain.

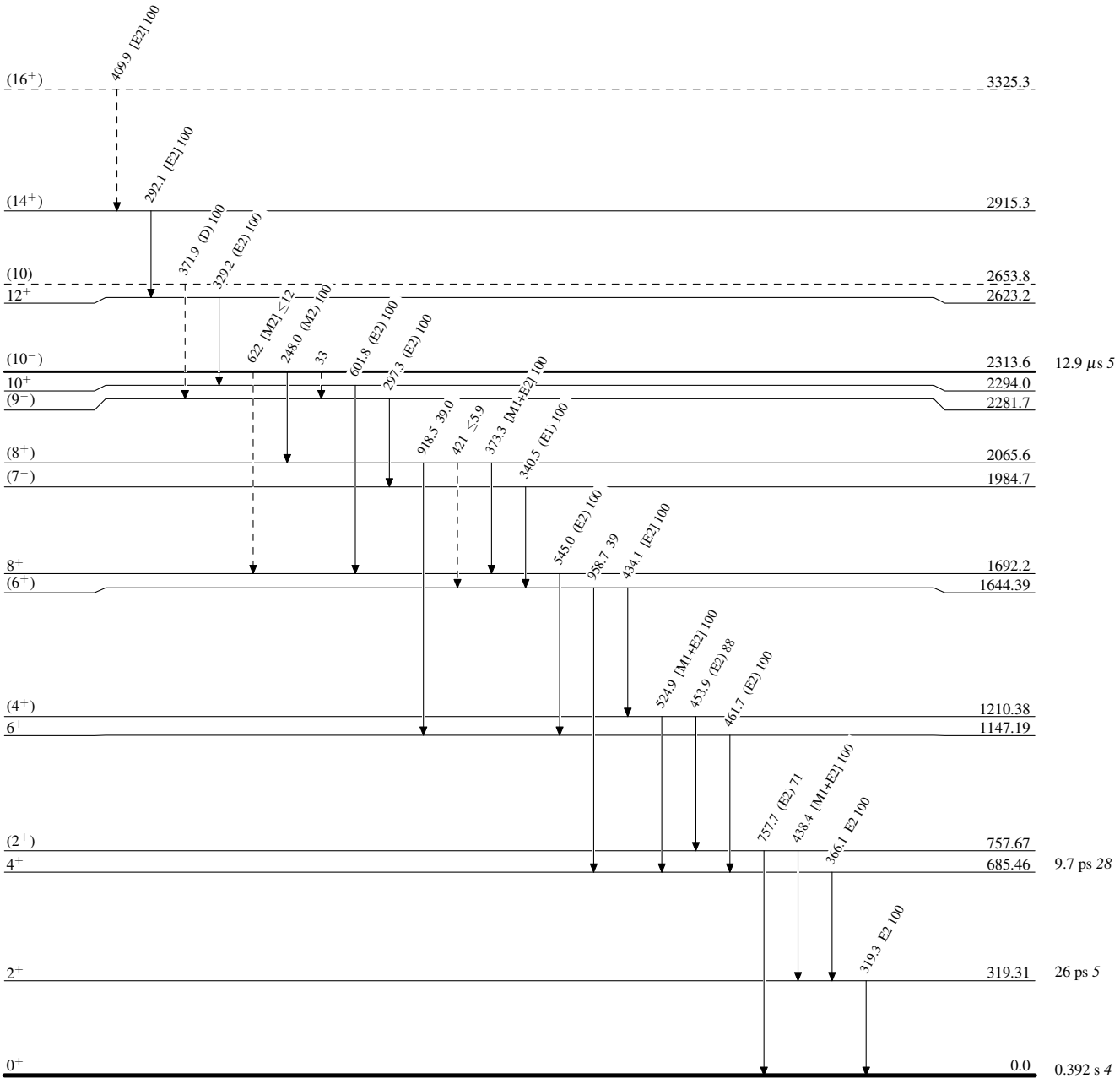
Adopted Levels, Gammas

Legend

Level Scheme

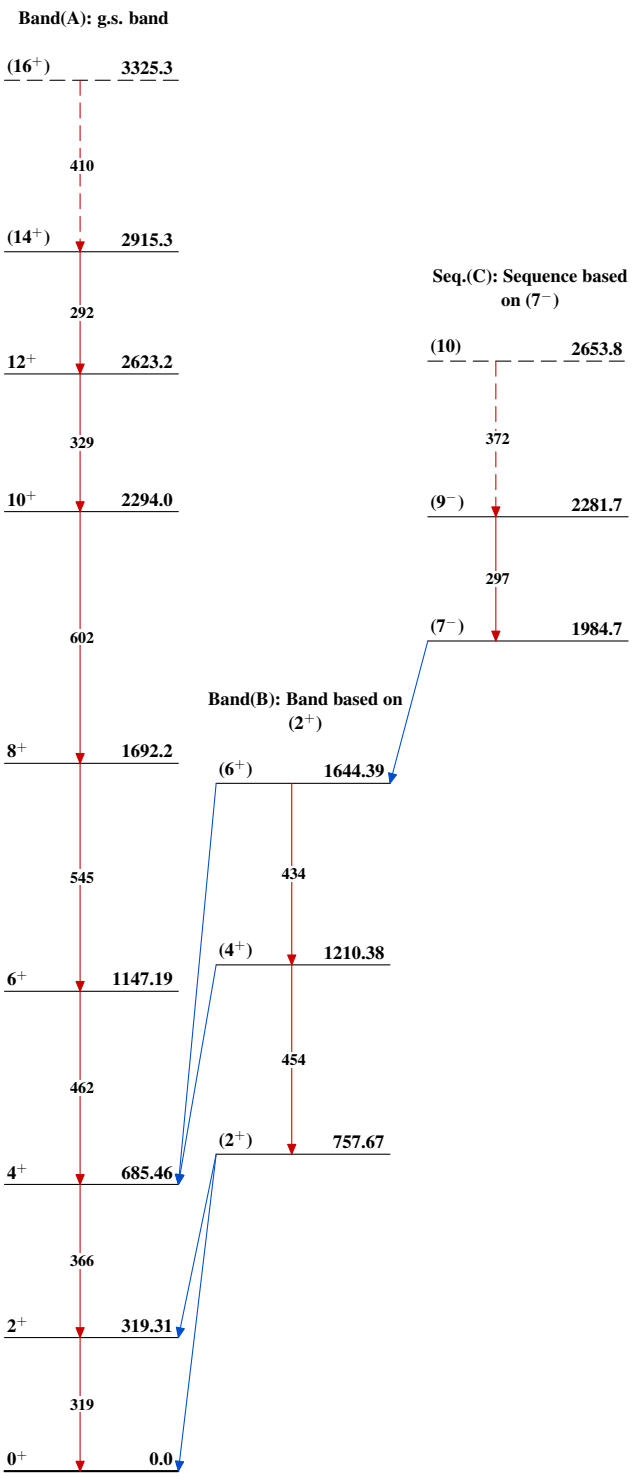
Intensities: Relative photon branching from each level

γ Decay (Uncertain)



$^{194}_{84}Po_{110}$

Adopted Levels, Gammas



$^{194}_{84}Po_{110}$