^{194}Po IT decay (12.9 μs) 2016An10

History

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

Parent: ^{194}Po: E=2313.6 *3*; J^π=(10$^-$); $T_{1/2}$=12.9 μs *5*; %IT decay=100.0

^{194}Po-E: From Adopted Levels.

^{194}Po-%IT decay: Assumed 100% decay by isomeric transitions.

This dataset adapted from a dataset in the XUNDL database compiled from 2016An10 by C. Smith and C.D. Nesaraja (ORNL), Oct 7, 2016.

2016An10: 259-MeV beam of ^{56}Fe with an intensity of 450 pnA was incident on a 372 μg/cm^2 thick $^{141}PrF_3$ target. The ^{194}Po produced by the fusion-evaporation reaction was separated from the primary beam and other products by the SHIP velocity filter. After separation, the evaporation residues (ER) were implanted into a position-sensitive silicon detector (PSSD). Time-position correlation was used to search for the nuclei of interest and reduce background. Two time intervals were used to measure particle-γ correlations; $\leq 5\mu$ and ≥ 26 μs. Detector system consisted of 300 μm thick PSSD with 16 strips, six silicon detectors divided into 28 segments, placed upstream of the PSSD to form an open box (BOX) to detect escaping particles. Three TOF detectors were used in coincidence or anti-coincidence mode to distinguish implantations of incoming ion or decays in the detector. A four-crystal germanium clover detector was placed behind the PSSD to detect γ-rays and x-rays. Measured: Eγ, Iγ, ER-γ-coin, $\gamma\gamma$ coin with correlation chain: ER-γ-α, ER-(γ-ce)-α, and (ER-γ-γ)-α correlations.

^{194}Po Levels

E(level)[†]	J^π[‡]	$T_{1/2}$	Comments
0.0[#]	0$^+$		
319.28[#] *10*	2$^+$		
685.38[#] *14*	4$^+$		
757.67[@] *12*	2$^+$		
1146.98[#] *25*	6$^+$		E(level): level energy is given as 1174 keV in Fig. 2 (2016An10).
1210.27[@] *17*	4$^+$		
1644.31[@] *24*	6$^+$		
1692.0[#] *3*	8$^+$		Non-physical negative transition intensity imbalance of 16 *4* units at this level.
1984.4 *4*	7$^-$		
2065.4 *3*	(8$^+$)		Non-physical negative transition intensity imbalance of 12 *6* units at this level.
2281.2 *5*	9$^-$		Non-physical negative transition intensity imbalance of 61 *4* units at this level, with the assumption of I(γ+ce)=33 *5* for the 32.2-keV transition from 2313 level.
2313.4 *3*	(10$^-$)	12.9 μs *5*	Possible configuration: $\pi h_{9/2}\otimes i_{3/2}$ (2016An10). J^π: from (M2) 248γ to (8$^+$) 2066 keV level. $T_{1/2}$: from ER-γ-α correlations by gating with "OR" condition on 319, 366, 373 and 545 keV γ transitions.

[†] From a least-squares fit to Eγ data.

[‡] As given in 2016An10.

[#] Band(A): g.s. band.

[@] Band(B): Band based on 2$^+$.

γ(^{194}Po)

Iγ normalization: Summed I(γ+ce)(319γ and 758γ)=100, assuming that none of the unplaced γ rays feeds the ground state.

Note that there is non-physical negative transition intensity balance at the 1692, 2065, and 2281 levels, implying an incomplete decay scheme for the isomer, especially for the decays of the two highest levels at 2281 and 2313 keV, due to apparent large negative transition intensity imbalance at the 2281 level. It is possible that the decay of the 2313 level is poorly known.

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^{194}Po IT decay (12.9 μs) 2016An10 (continued)

γ(^{194}Po) (continued)

E_γ[†]	I_γ[†#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[‡]	α[@]	$I_{(\gamma+ce)}$[#]	Comments
(32.2)		2313.4	(10$^-$)	2281.2	9$^-$			33 *5*	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. Energy is from level-energy difference. 2016An10 give ≈33 keV. $I_{(\gamma+ce)}$: deduced by evaluators, assuming absolute I(γ+ce)=100 for the three transitions (33, 248 and 622 keV) from the 2313-keV isomer.
[x]209.4 *2*	14 *1*								%Iγ=12.1 *9* Relative I(γ+ce)≥14 (2016An10).
248.0 *1*	18 *1*	2313.4	(10$^-$)	2065.4	(8$^+$)	(M2)	3.50		%Iγ=15.6 *9* Relative I(γ+ce)=71 *4* (2016An10). 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. γ in coin with Po K x-rays, 319, 366, 373, 459, 462, 545 γ rays.
296.8 *2*	7 *1*	2281.2	9$^-$	1984.4	7$^-$	(E2)	0.1301		%Iγ=6.1 *9* Relative I(γ+ce)=7 *1* (2016An10).
319.3 *1*	100	319.28	2$^+$	0.0	0$^+$	E2	0.1048		%Iγ=86.5 *8* Relative I(γ+ce)=100 (2016An10).
340.1 *3*	12 *1*	1984.4	7$^-$	1644.31	6$^+$	(E1)	0.0236		%Iγ=10.4 *9* Relative I(γ+ce)=11 *1* (2016An10).
[x]358.8 *1*	14 *1*								%Iγ=12.1 *9* Relative I(γ+ce)≥13 (2016An10).
[x]362.2 *2*	12 *1*								%Iγ=10.4 *9* Relative I(γ+ce)≥11 (2016An10).
366.1 *1*	80 *3*	685.38	4$^+$	319.28	2$^+$	E2	0.0712		%Iγ=69 *3* Relative I(γ+ce)=78 *3* (2016An10).
373.3 *1*	41 *2*	2065.4	(8$^+$)	1692.0	8$^+$	[M1]	0.279		%Iγ=35.5 *18* Relative I(γ+ce)=48 *2* (2016An10).
(421)	≤2.4	2065.4	(8$^+$)	1644.31	6$^+$	[E2]	0.0492		%Iγ<2.08 I_γ: deduced by 2016An10 based on the background counts.
434.1 *2*	8 *1*	1644.31	6$^+$	1210.27	4$^+$	[E2]	0.0455		%Iγ=6.9 *9* Relative I(γ+ce)=8 *1* (2016An10).
438.4 *1*	7 *1*	757.67	2$^+$	319.28	2$^+$	[M1]	0.181		%Iγ=6.1 *9* Relative I(γ+ce)=8 *1* (2016An10).
(453)	7 *2*	1210.27	4$^+$	757.67	2$^+$	(E2)	0.0408		%Iγ=6.1 *17* Relative I(γ+ce)=7 *2* (2016An10). $I_{(\gamma+ce)}$: from (ER-γ-ce)-α correlations.

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^{194}Po IT decay (12.9 μs) 2016An10 (continued)

γ(^{194}Po) (continued)

E_γ †	I_γ †#	E_i(level)	J_i^π	E_f	J_f^π	Mult.‡	α@	Comments
x458.8 *2*	26 *2*							%Iγ=22.5 *18* Relative I(γ+ce)≥24 (2016An10). γ in coin with Po K x-rays, 248, 319, 366, 373 γ rays.
461.6 *2*	74 *3*	1146.98	6^+	685.38	4^+	(E2)	0.0390	%Iγ=64 *3* Relative I(γ+ce)=70 *3* (2016An10).
x493.6 *2*	6 *1*							%Iγ=5.2 *9* Relative I(γ+ce)≥6 (2016An10).
524.9 *1*	6 *1*	1210.27	4^+	685.38	4^+	[M1]	0.1120	%Iγ=5.2 *9* Relative I(γ+ce)=6 *1* (2016An10).
545.0 *1*	35 *2*	1692.0	8^+	1146.98	6^+	(E2)	0.0262	%Iγ=30.3 *18* Relative I(γ+ce)=33 *2* (2016An10).
(622)	≤2.2	2313.4	(10^-)	1692.0	8^+	[M2]	0.191	%Iγ<1.9 I_γ: deduced by 2016An10 based on the background counts.
757.6 *2*	5 *1*	757.67	2^+	0.0	0^+	(E2)	0.01280	%Iγ=4.3 *8* Relative I(γ+ce)=5 *1* (2016An10).
x802.0 *2*	7 *1*							%Iγ=6.1 *9* Relative I(γ+ce)≥6 (2016An10).
918.5 *2*	16 *1*	2065.4	(8^+)	1146.98	6^+	[E2]	0.00868	%Iγ=13.8 *9* Relative I(γ+ce)=14 *1* (2016An10).
958.7 *4*	3.1 *5*	1644.31	6^+	685.38	4^+	[E2]	0.00798	%Iγ=2.7 *4* Relative I(γ+ce)=2.9 *4* (2016An10).

† From ER-γ-α correlations (2016An10). Authors also give relative I(γ+ce) values by assuming multipolarities. These values are listed under comments.
‡ From Adopted Gammas, except as noted.
# For absolute intensity per 100 decays, multiply by 0.87 *1*.
@ 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.
x γ ray not placed in level scheme.

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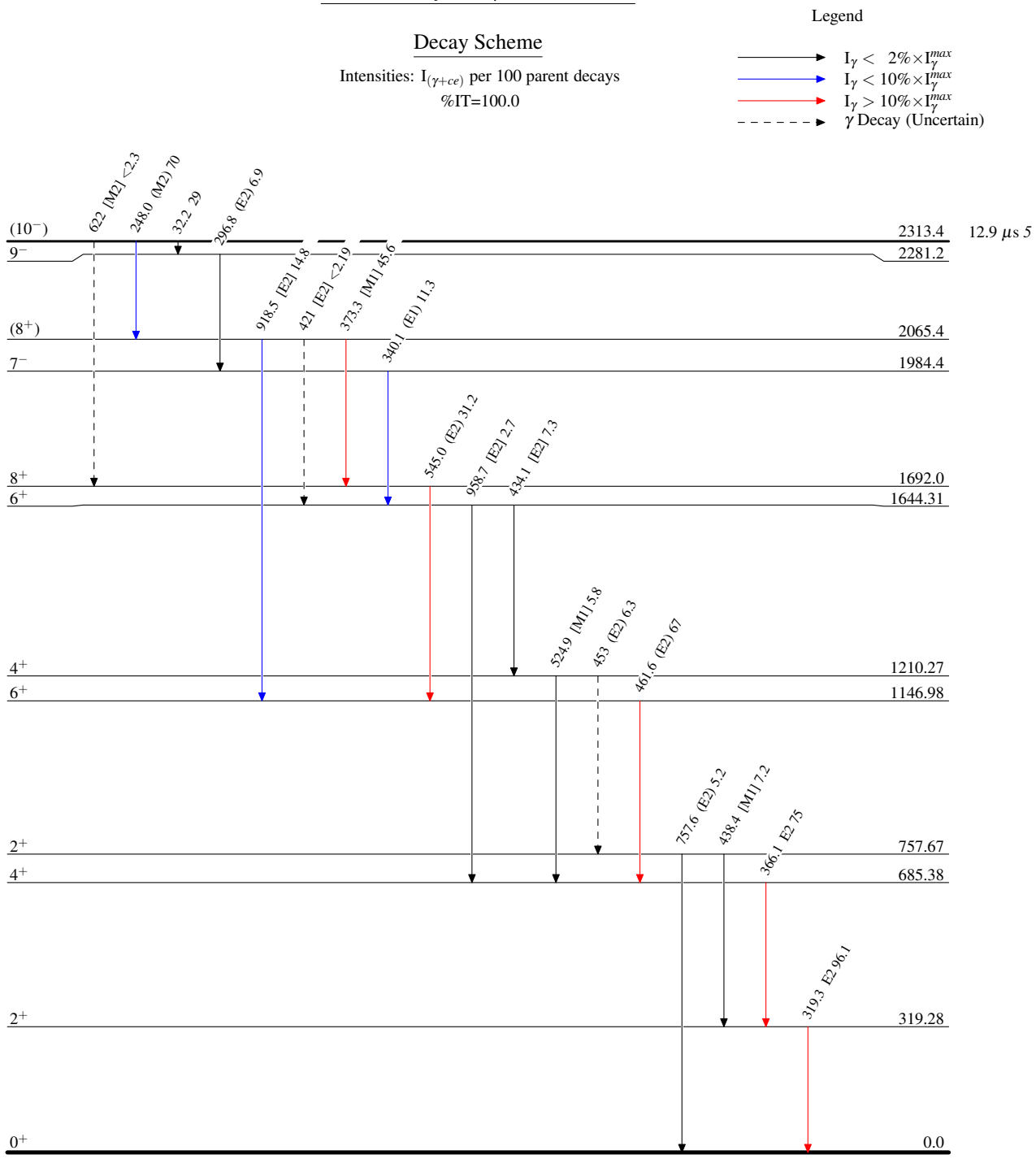
Decay Scheme

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

%IT=100.0



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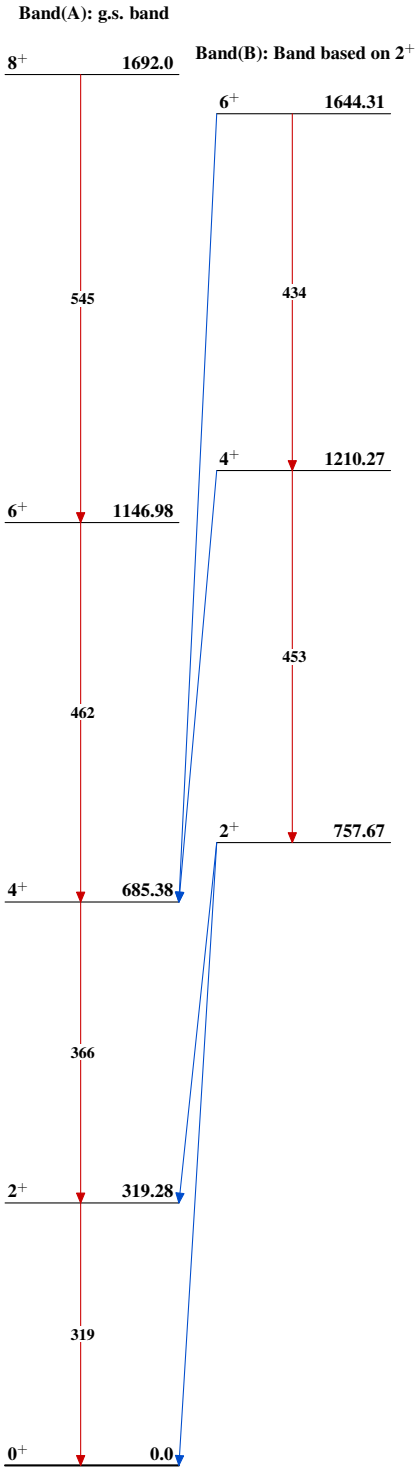

$^{194}_{84}Po_{110}$