^{215}Pb β^- decay (147 s) 2013De20

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation		NDS 114, 2023 (2013)	23-Sep-2013

Parent: ^{215}Pb: E=0; $J^\pi=(9/2^+)$; $T_{1/2}$=147 s *12*; Q(β^-)=277×10[1] *10*; %β^- decay=100.0

^{215}Pb-J^π,$T_{1/2}$: From ^{215}Pb Adopted Levels.

^{215}Pb-Q(β^-): 2770 *100* (syst,2012Wa38). Other: 2013De20 used 3.2 MeV in deducing log *ft* values.

^{215}Pb-%β^- decay: %β^-=100.

2013De20 (also 2004DeZV thesis): ^{215}Pb produced via the reaction ^{238}U(p,X) with E(p)=1.4 GeV, ionized by the Resonance Ionization Laser Ion Source (RILIS) and separated using the ISOLDE on-line mass separator. Detector system included an Si-detector for α-particles, one low-energy Ge and two HPGe detectors for x-rays and γ-rays, as well as a plastic scintillator ΔE detector for β-particles. Measured Eγ, Iγ, Iβ, $\beta\gamma$, $\gamma\gamma$ coincidence. Deduced levels, $T_{1/2}$. Data listed from 2013De20 also contain adjusted β feedings communicated to the evaluators by H. De Witte by an email reply of June 19, 2013.

The decay scheme is considered as incomplete by the evaluators.

^{215}Bi Levels

E(level)[†]	J^π[‡]	$T_{1/2}$[‡]
0	(9/2$^-$)	7.6 min *2*
183.5 *3*	(7/2$^-$)	
854.5 *10*		
1022.5 *10*		
1168.5 *10*		
1199.8 *7*		
1959.8 *12*		

[†] From Eγ data.
[‡] From Adopted Levels.

β^- radiations

E(decay)	E(level)	Iβ^-[†#]	Log *ft*[‡]	Comments
(8.1×10^2 *10*)	1959.8	1.0 *5*	>6.0	av Eβ=257 *37* Iβ^-: 1.4 *7* (2013De20, adjusted value).
(1.57×10^3 *10*)	1199.8	1.7 *12*	>6.8	av Eβ=553 *41* Iβ^-: 2.1 *16* (2013De20, adjusted value).
(1.60×10^3 *10*)	1168.5	2.1 *7*	>6.7	av Eβ=566 *41* Iβ^-: 2.6 *13* (2013De20, adjusted value).
(1.75×10^3 *10*)	1022.5	1.8 *6*	>6.9	av Eβ=626 *42* Iβ^-: 2.4 *11* (2013De20, adjusted value).
(1.92×10^3 *10*)	854.5	1.2 *5*	>7.3	av Eβ=695 *42* Iβ^-: 1.6 *8* (2013De20, adjusted value).
(2.59×10^3 *10*)	183.5	18 *5*	>6.6	av Eβ=979 *43* Iβ^-: 16 *11* (2013De20, adjusted value).
(2.77×10^3 *10*)	0	≤74	≥6.1	av Eβ=1057 *43* Iβ^-: original value of ≤81% *4* is adjusted to ≤74% 6 in an email reply from the first author of 2013De20. Value of 81% was based on Iγ(293.5γ)(absolute)=35.2% taken from 2003Ku26, but γ intensities in 2003Ku26 were incorrectly labeled as absolute, these were relative values instead (see ^{215}Bi to ^{215}Po decay dataset). Evaluators deduce absolute Iγ of 293.5γ as 48.9% 15 in ^{215}Bi decay, based on which the first author of 2013De20 has deduced Iβ≤76% 4. The β feeding to g.s. is deduced from a comparison of the measured intensities of γ and α lines in the decay chain:

Continued on next page (footnotes at end of table)

^{215}Pb β^- decay (147 s) 2013De20 (continued)

β^- radiations (continued)

E(decay)	E(level)	Comments
		^{215}Pb –> ^{215}Bi –> ^{215}Po –> ^{211}Pb. Intensities of the following lines were measured: 183.5γ from decay of ^{215}Pb to ^{215}Bi, 293.5γ from decay of ^{215}Bi to ^{215}Po, and 7386α line from the decay of ^{215}Po to ^{211}Pb. By normalizing to the known absolute intensity of 7386α, absolute intensities of 183.5 and 293.5 gammas were deduced, both assigned mult=M1. From these values, lower limits of β feedings to excited states in ^{215}Bi and ^{215}Po were deduced, which in turn gave upper limits of β feedings to ground states with values of 74% 6 for ^{215}Pb to ^{215}Bi decay. Value in 2004DeZV was≤67% 5; and ≤12% 8 for ^{215}Bi to ^{215}Po decay.

† Only the apparent β feedings, deduced by the evaluators from intensity balances, are given, assuming β feeding of 74% 6 to the g.s., since the decay scheme is considered as incomplete in the population of higher energy levels, some of which may decay directly to the g.s.. Adjusted values of β feedings communicated by the first author of 2013De20 are listed under comments.

‡ Values are treated as lower limits due to incomplete level level scheme. Note that log *ft* values listed in figure 3 of 2013De20 are high by 0.3-0.6 due to higher Q(β^-) value of 3.2 MeV used by the authors.

Absolute intensity per 100 decays.

$\gamma(^{215}Bi)$

Iγ normalization: I(γ+ce) of 183.5γ and 1200γ≈19, for g.s. β feeding of ≤74% 6 (adjusted value communicated by an email reply of June 19, 2013 from the first author of 2013De20).

Additional information 1.

E_γ	I_γ†	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α‡	Comments
183.5 *3*	100 *19*	183.5	(7/2$^-$)	0	(9/2$^-$)	M1	1.82 *3*	α(K)exp=1.2 *4* (2013De20) α(K)=1.478 *22*; α(L)=0.258 *4*; α(M)=0.0606 *9*; α(N)=0.01550 *23* Mult.: measured α(K)exp from K x ray and Iγ gives dominant M1 with δ(E2/M1)<0.7, or much less likely E1+M2 with δ(M2/E1)=0.50 *8*. Some E2 admixture is possible. Also α(K)exp=1.4 *3* from total β-gated K x ray spectrum (2013De20).
671 *1*	14 *5*	854.5		183.5	(7/2$^-$)			
760 *1*	12 *5*	1959.8		1199.8				
839 *1*	21 *7*	1022.5		183.5	(7/2$^-$)			
985 *1*	24 *8*	1168.5		183.5	(7/2$^-$)			
1016 *1*	14 *5*	1199.8		183.5	(7/2$^-$)			
1200 *1*	17 *11*	1199.8		0	(9/2$^-$)			

† For absolute intensity per 100 decays, multiply by ≈0.087.

‡ 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.

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Decay Scheme

Intensities: Relative I_γ