Adopted Levels, Gammas

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	20-Jul-2015

$Q(\beta^-)$=9941 *10*; S(n)=4359 *6*; S(p)=12018 *13*; $Q(\alpha)$=−7451 *6* 2012Wa38

$Q(\beta^-n)$=3072 *10*, S(2n)=10517 *5*, S(2p)=26710 *400* (syst) (2012Wa38).

1969WiZX: ^{106}Nb produced in ^{252}Cf SF decay, measured $T_{1/2}$.

1976Ah06: ^{106}Nb produced in ^{239}Pu fission fragments and charge determined from on-line niobium chemistry, measured half-life from 172γ decay curve.

2009Pe06: ^{106}Nb formed by fragmentation of ^{136}Xe beam at 120 MeV/nucleon at NSCL facility using Coupled Cyclotrons and A1900 fragment separator. The time-of-flight and transversal positions of each particle was measured using two plastic scintillators. The ΔE energy loss in a Si PIN detector was measured which, when combined with time-of-flight (tof) and transversal position measurements, allowed for an event-by-event identification of the transmitted nuclei. Transmitted nuclei and their β decays were measured using the β counting system consisting of four Si PIN detectors and a double-sided Si strip detector. β-delayed neutrons were measured in coincidence with β-decay precursor using neutron emission ratio observer (NERO) detector consisting of 60 proportional gas counter tubes embedded in polyethylene moderator matrix. The γ rays were measured with SeGA Ge detectors. Measured isotopic half-lives and delayed neutron emission probabilities Isotopic half-life was measured by 2009Pe06 from least-squares fit and maximum likelihood method of time differences of implantations and correlated β decay events.

No information is available for levels populated in ^{106}Nb from the β^- decay of 180-ms ^{106}Zr.

Additional information 1.

^{106}Nb Levels

Cross Reference (XREF) Flags

A	^{106}Zr β^- decay (180 ms)
B	^{106}Nb IT decay (0.82 μs)
C	^{252}Cf SF decay

E(level)†	Jπ‡	$T_{1/2}$	XREF	Comments
0.0#	(1⁻)	1.02 s *5*	ABC	%β^-=100; %β^-n=4.5 *3* %β^-n: from weighted average of 5 *1* (2009Pe06) and 4.5 *3* (1996Me09). Jπ: proposed configuration=π3/2[301]⊗ν5/2[413] (2014Lu07). Other: 2⁺ from syst (2012Au07). $T_{1/2}$: from 1983Sh06, from decay curves for 171.6 and 350.7 γ rays emitted by ^{106}Nb. Others: 1.240 s *21* and 1.030 s *72* (2009Pe06, from ion-β correlated events, first value from least-squares fit analysis with 0.015 s systematic and 0.015 s statistical uncertainties; second value from maximum likelihood method (MLH) analysis with 0.065 s systematic and 0.030 s statistical uncertainties); 0.90 s *2* (1996Me09, β-gated and neutron singles multiscaling curves by fitting the total growth-in and decay periods of the time spectra); ≈1 s (1976Ah06, from decay curve for 172γ), 1.08 s *7* (1969WiZX, from decay curve for 172γ). The value from 1983Sh06 is preferred by the evaluator since the selectivity by characteristic γ rays is better than in other methods where presence of impurities can affect the value. The result in 1996Me09 is the most precisely quoted, but it is in disagreement with values from 2009Pe06. The values obtained by 2009Pe06 by two different analyses are in mutual disagreement, but their value from MLH analysis agrees well with that from 1983Sh06. Weighted average of all the values (using 1.030 s *72* from 2009Pe06, and increasing the uncertainty to 0.05 s in 1996Me09) is 0.99 s *4*. If 1.240 s *21* is used from 2009Pe06,
107.9 *2*	(1⁺)		BC	Jπ: $proposed configuration=π3/2[301]⊗ν5/2[532] (2014Lu07).
202.2 *1*	(2⁺)		BC	Jπ: $proposed configuration=π1/2[431]⊗ν5/2[413] (2014Lu07).
204.8 *1*	(3⁺)	0.82 μs *6*	BC	%IT=100 Decay mode: only the isomeric transitions have been seen. $T_{1/2}$: from γ(t) method. Weighted average of 0.66 μs $^{11-10}$ (2012Ka36) and 0.84 μs *4*

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Adopted Levels, Gammas (continued)

^{106}Nb Levels (continued)

E(level)[†]	J^{π}[‡]	XREF	Comments
			(1999Ge01). J^{π}: proposed configuration=π1/2[431]⊗ν5/2[413] (2014Lu07). But note B(M2)(W.u.) or B(E3)(W.u.) values are much higher than RUL for M2 and E3 transitions.
337.6 *2*	(2$^-$)	C	J^{π}: proposed configuration=π3/2[301]⊗ν1/2[411] (2014Lu07).
470.6[#] *2*	(2$^-$)	C	
627.3[@] *2*	(3$^-$)	C	
815.2[#] *2*	(4$^-$)	C	
995.0 *4*		C	
1039.9[@] *3*	(5$^-$)	C	
1274.4[#] *3*	(6$^-$)	C	
1589.2[@] *4*	(7$^-$)	C	
1838.8[#] *4*	(8$^-$)	C	

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

[‡] The assignments are proposed by 2014Lu07, based on possible 2-qp states from potential-energy surface (PES) and projected shell model (PSM) calculations.

[#] Band(A): π1/2[431]⊗ν5/2[532],K^{π}=2$^-$,α=0. Configuration proposed by 2014Lu07.

[@] Band(a): π1/2[431]⊗ν5/2[532],K^{π}=2$^-$,α=1.

γ(^{106}Nb)

E_i(level)	J^{π}_i	E_{γ}[†]	I_{γ}[†]	E_f	J^{π}_f	Mult.	α[#]	Comments
107.9	(1$^+$)	108.1 *3*	100[‡]	0.0	(1$^-$)	[E1]	0.0954 *16*	
202.2	(2$^+$)	94.5 *3*	100[‡] *28*	107.9	(1$^+$)	[M1+E2]	0.8 *6*	I_{γ}: no intensity given in ^{252}Cf SF decay. α: for δ(E2,M1)=1.0.
		202.2 *1*	99[‡] *28*	0.0	(1$^-$)	[E1]	0.0155	
204.8	(3$^+$)	204.8 *1*	100	0.0	(1$^-$)	[M2]	0.189	B(M2)(W.u.)=3.9 *3* Note that B(M2)(W.u.) exceeds RUL(M2)=1 by almost a factor of 4. Allowing for δ(E3/M2)=1 does not remove this inconsistency, since B(E3)(W.u.) is also much larger than RUL(E3)=100. It is possible that the problem lies in an incomplete decay scheme of the isomer since two γ rays of 63.5 and 147.5 are still unplaced.
337.6	(2$^-$)	132.8 *1*	100	204.8	(3$^+$)			
470.6	(2$^-$)	133.0 *1*	100	337.6	(2$^-$)			
627.3	(3$^-$)	156.7 *1*	100 *3*	470.6	(2$^-$)			
		289.7 *3*	21.1 *23*	337.6	(2$^-$)			
815.2	(4$^-$)	188.0 *2*	100 *5*	627.3	(3$^-$)			
		344.6 *2*	76 *4*	470.6	(2$^-$)			
995.0		524.4 *3*	100	470.6	(2$^-$)			
1039.9	(5$^-$)	224.7 *2*	100 *5*	815.2	(4$^-$)			
		412.6 *2*	82 *4*	627.3	(3$^-$)			
1274.4	(6$^-$)	234.5 *3*	38 *4*	1039.9	(5$^-$)			
		459.2 *2*	100 *5*	815.2	(4$^-$)			
1589.2	(7$^-$)	314.7 *3*	43 *4*	1274.4	(6$^-$)			
		549.3 *3*	100 *9*	1039.9	(5$^-$)			

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Adopted Levels, Gammas (continued)

$\gamma(^{106}Nb)$ (continued)

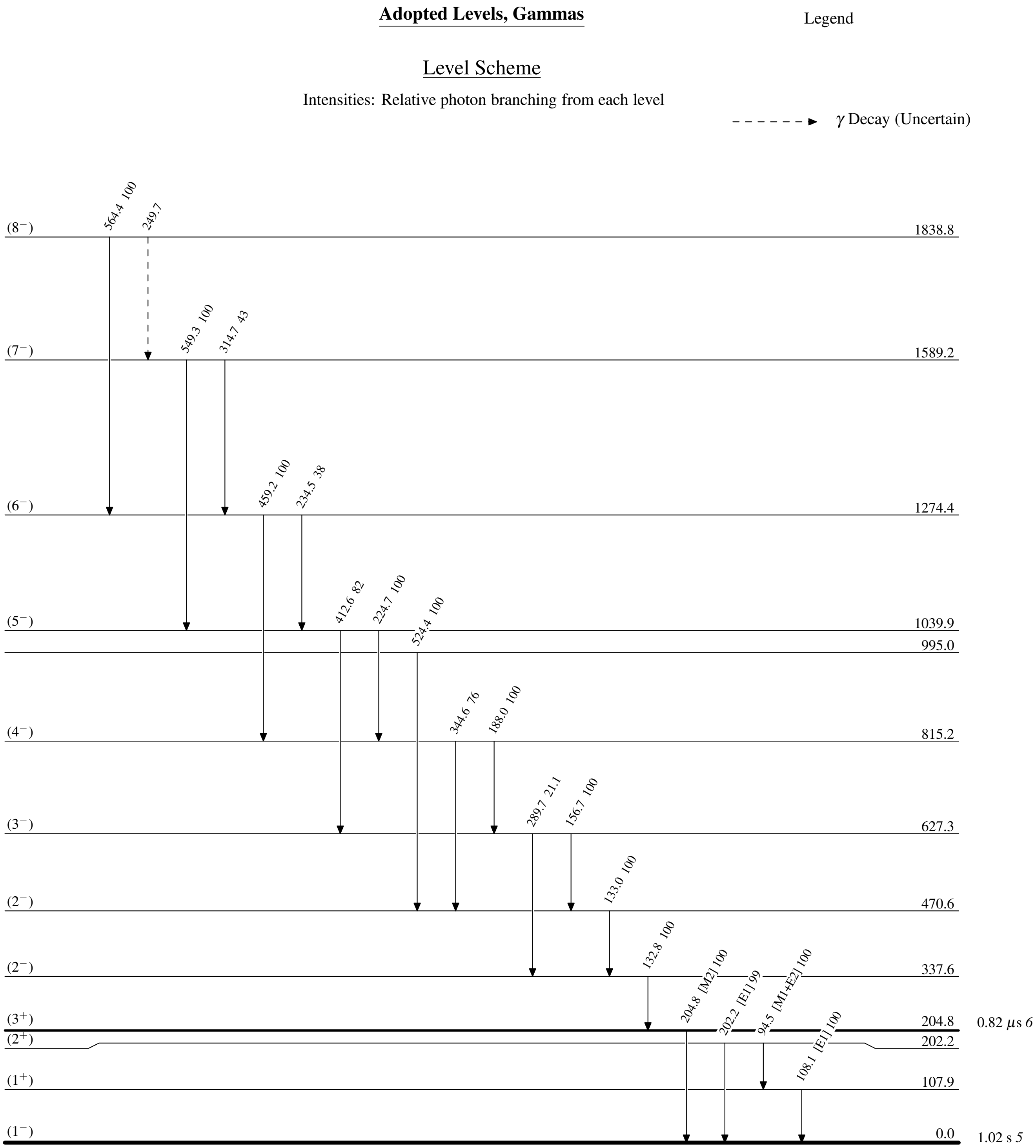
E_i(level)	J^π_i	E_γ†	I_γ†	E_f	J^π_f
1838.8	(8$^-$)	249.7@ *3*		1589.2	(7$^-$)
		564.4 *3*	100 *11*	1274.4	(6$^-$)

† From ^{252}Cf SF decay, unless otherwise stated.
‡ From ^{106}Nb IT decay.
# From BrIcc code (2008Ki07) with "Frozen-orbit" approximation.
@ Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

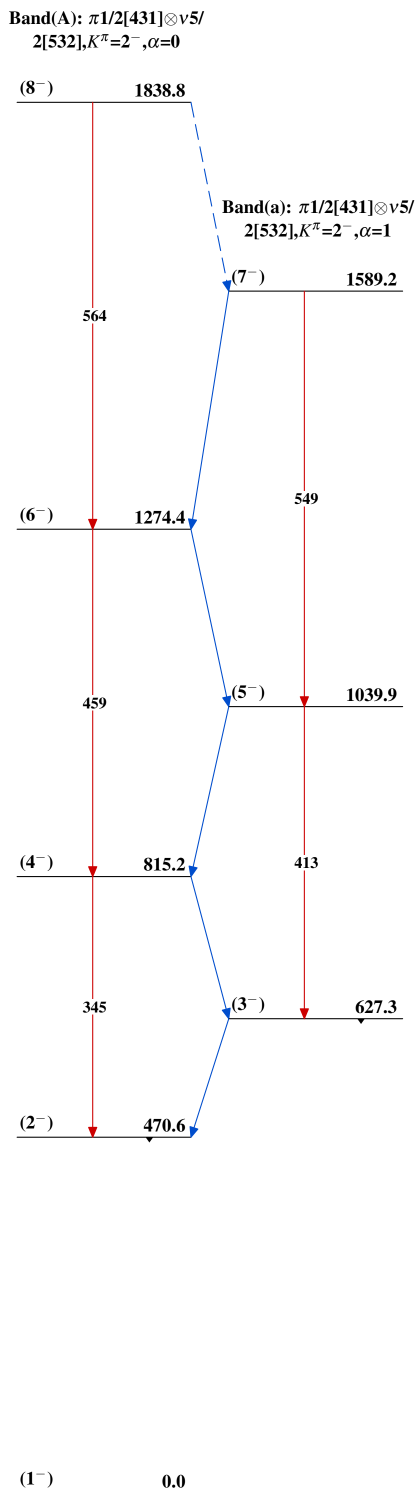
Level Scheme

Intensities: Relative photon branching from each level



$^{106}_{41}Nb_{65}$

Adopted Levels, Gammas



$^{106}_{41}Nb_{65}$