Adopted Levels, Gammas

	Type	Author	History Citation	Literature Cutoff Date
	Full Evaluation	N. Nica	NDS 154, 1 (2018)	20-Nov-2018

Q(β^-)=12640 *SY*; S(n)=2220 *SY*; S(p)=12790 *SY*; Q(α)=−5850 *SY*   2017Wa10

Uncertainties based on syst are: ΔQ(β^-)=600, ΔS(n)=720, ΔS(p)=780, ΔQ(α)=720.

S(2n)=5860 *1220* (2017Wa10,syst), $\hat{Q}$(B-N)=8200 600 (2017Wa10,SY).

2010Oh02: ^{140}Sb nuclide identified in Be(^{238}U,F) and Pb(^{238}U,F) reactions with a ^{238}U^{86+} beam energy of 345 MeV/nucleon produced by the cascade operation of the RBIF accelerator complex of the linear accelerator RILAC and four cyclotrons RRC, fRC, IRC and SRC. Identification of ^{140}Sb nuclei was made on the basis of magnetic rigidity, time-of-flight and energy loss of the fragments using BigRIPS fragment separator. Experiments performed at RIKEN facility.

Based on A/Q spectrum and Z versus A/Q plot, 124 counts were assigned to ^{140}Sb isotope. (Q=charge state).

2007Ot03: calculated proton single-particle level energies.

2017Mo12 (compiled for XUNDL compilation by B. Singh (McMaster)): ^{140}Sb produced in ^{9}Be(^{238}U,F), E(^{238}U)=345 MeV per nucleon using BigRIPS spectrometer at RIBF-RIKEN facility. Measured reaction products using WAS3ABi system of Si detectors, Eγ, Iγ, $\gamma\gamma$-coin, β, %β^-n and %β^-2n and half-life of ^{140}Sb decay using EURICA HPGe cluster array.

2017Mo12 report the first measurement of half-life of ^{140}Sb decay.

^{140}Sb Levels

Cross Reference (XREF) Flags

A ^{140}Sb IT decay (41 μs)

E(level)	J$^\pi$	T$_{1/2}$	XREF	Comments
0.0	(3$^-$,4$^-$)	173 ms *12*	A	%β^-=100; %β^-n=23 *4* (2017Mo12); %β^-2n=7.6 *25* (2017Mo12)
				%β^-n and %β^-2n are lower limits deduced by the authors from only the γ-ray data without accounting for any direct feedings to the ground states of ^{139}Te and ^{138}Te. Value of %β^-2n is deduced more precisely (by B. Singh) from summed intensities of 442.8 and 460.8 gamma rays (Table I). 2017Mo12 quote ≈8%. The normalization procedure is not clearly stated in 2017Mo12.
				For comparison, see the following calculated values: %β^-n=42.5, %β^-2n=16.4 (1997Mo25); %β^-n=58.6 or 100 (2002Pf04); %β^-n=62 (2011Ar18, deformed), 78 (2011Ar18, spherical).
				J$^\pi$: assigned by 2017Mo12 based on possible β feedings to the (2$^+$) and (4$^+$) states in ^{140}Te, but (4$^-$) is not ruled out.
				T$_{1/2}$: measured by 2017Mo12 from decay curve for combined 271-, 423-, and 425-keV gamma rays, fitted by a single exponential decay with a constant background level, and using maximum likelihood method. Other value: > 407 ns (2010Oh02, from time-of-flight − from T. Kubo e-mail reply of July 14, 2010). Actual half-life is much longer as suggested previously by the calculated values of 37.8 ms (1997Mo25); 38 ms or 645 ms (2002Pf04); 37 ms (2011Ar18, deformed), 364 ms (2011Ar18, spherical).
				Measured σ=4.30 nb (2010Oh02), systematic uncertainty≈30% (probability of misidentification of ^{140}Sb isotope<0.001% (2010Oh02).
70.9 *8*	(4$^-$,5$^-$)		A	J$^\pi$: (M1) γ to (3$^-$,4$^-$).
298.2 *10*	(5$^-$,6$^-$)†		A	
298.2+x	(6$^-$,7$^-$)†	41 μs *8*	A	%IT=100
				Possible configuration=$\pi g^1_{7/2} \otimes \nu f^{-1}_{7/2}$ (2016Lo01).
				E(level): x<30 keV (2016Lo01).
				T$_{1/2}$: from 70.9γ(t) and 227.3γ(t) (2016Lo01).

† Assigned by 2016Lo01 based on ΔJ=1,2, $\Delta\pi$=no expected type of transition.

Adopted Levels, Gammas (continued)

$\gamma(^{140}\text{Sb})$

E_i(level)	J^π_i	E_γ	I_γ	E_f	J^π_f	Mult.[†]	α[‡]	Comments
70.9	$(4^-,5^-)$	70.9 *8*	100	0.0	$(3^-,4^-)$	(M1)	1.66 *6*	α(K)=1.43 *6*; α(L)=0.185 *7*; α(M)=0.0366 *14* α(N)=0.0070 *3*; α(O)=0.00069 *3* Mult.: pure E2 is ruled out by 2016Lo01 since with a total conversion coefficient of 5.61, its Iγ would be about five times smaller than that of the 227.3 transition. Note that even with M1 multipolarity of the 70.9 transition, its total intensity (I(γ+ce)) is about 2.7 times larger than that of the 227 transition whereas one would expect equal intensity if the decay scheme of the isomer is complete.
298.2	$(5^-,6^-)$	227.3 *5*	100	70.9	$(4^-,5^-)$	[M1,E2]	0.079 *15*	α(K)=0.066 *11*; α(L)=0.0103 *33*; α(M)=0.00206 *67* α(N)=3.9×10^{-4} *12*; α(O)=3.5×10^{-5} *9* E$_\gamma$: this transition is unlikely to be the isomeric transition since the implied B(M1) or B(E2) would be too small to be consistent with expected transition rates from Weisskopf estimates.
298.2+x	$(6^-,7^-)$	x		298.2	$(5^-,6^-)$			E$_\gamma$: x<30 keV if E2, <1-2 keV if M1 (2016Lo01), based on consideration of transition rates in this mass region, and γ-energy detection threshold in this experiment.

[†] Estimated by 2016Lo01 from intensity balance and theoretical arguments based on which E1, E3 and M2 type of transitions between levels of opposite parities are not considered likely based on expected active spherical orbitals involved in the low-lying structure of ^{140}Sb. Particular arguments are given in the table when avaible.

[‡] Additional information 1.

Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

●   Coincidence

$^{140}_{51}Sb_{89}$