Adopted Levels, Gammas

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh, [1] and Jun Chen[2]	NDS 169, 1 (2020)	15-Oct-2020

Q(β^-)=3125 *5*; S(n)=5675 *10*; S(p)=7252 *40*; Q(α)=600 *60* 2020Gr08,2017Wa10

Q(β^-),S(n),S(p),Q(α): Deduced by evaluators from mass excess=−35583 *5* for ^{190}Re measured by 2020Gr08, and known masses of ^{190}Os, ^{189}Re, ^{189}W and ^{186}Ta in 2017Wa10. Values from 2017Wa10: Q(β^-)=3070 *70*, S(n)=5730 *70*, S(p)=7310 *80*, Q(α)=550 *90*.

S(2n)=12760 *70*, S(2p)=16600 *90* (2017Wa10).

Mass measurements: 2020Gr08 (reference to ^{192}Ir mass using (d,α) reaction with Q3D magnetic spectrograph at MLL, measured mass excess=−35583 keV *5*), 2012Re19 (Schottky mass spectrometry technique at GSI, measured isomer-to-g.s. mass difference=204 keV *10*).

Additional information 1.

Theory references: consult the NSR database (www.nndc.bnl.gov/nsr/) for two primary references dealing with nuclear structure calculations.

2006Wa31 calculated total Routhian surfaces (TRS), which predicted oblate shapes induced by rotation-alignment of $\pi h_{11/2}\otimes\nu i_{13/2}$ pair of nucleons, with the oblate shape remaining yrast over a large range of angular momentum. Near-prolate high-K energy minima at $\hbar\omega\approx0$ and near-oblate energy minima at $\hbar\omega\approx0.1$ MeV are predicted from total Routhian surface (TRS) calculations in this work.

^{190}Re Levels

Cross Reference (XREF) Flags

A ^{190}W β^- decay (30.0 min)
B ^{190}Re IT decay (3.1 h)

E(level)†	J$^\pi$	T$_{1/2}$	XREF	Comments
0	(2)$^-$	3.0 min *2*	AB	%β^-=100 J$^\pi$: allowed β feeding (log*ft*=5.1) to 3$^-$; absence of β^- feeding to 4$^-$. Configuration=ν9/2[505]⊗π5/2[402], K^π=2$^-$ (1976Ha39, 1974Ya02). T$_{1/2}$: weighted average of 3.1 m *3* (1969Ha44), 2.8 m *5* (1955At21), and 2.92 m *20* (1973DeWI). The original uncertainty of 0.10 in 1973DeWI seems too small (probably statistical only) and has been increased by a factor of 2 in the average by the evaluators.
119.12 *5*	(3)$^-$		B	J$^\pi$: 119.1γ M1(+E2) to (2)$^-$; probable band member. 3$^-$ member of configuration=ν9/2[505]⊗π5/2[402], K^π=2$^-$ (1976Ha39, 1974Ya02).
162.10 *10*	(0$^+$)		A	J$^\pi$: 157.6γ (M1) from 1$^+$; 162.1γ (M2) to (2)$^-$. Configuration=ν9/2[505]⊗π9/2[514], K^π=0$^+$ (1976Ha39, 1974Ya02). T$_{1/2}$: >0.94 μs (from RUL(M2)<1).
204 *10*	(6$^-$)	3.1 h *2*	B	%β^-=54.4 *20*; %IT=45.6 *20* E(level): from measured mass difference between the isomer and the g.s. (2012Re19). Other: 227 *40* from an earlier ESR measurement at the same lab as 2012Re19. J$^\pi$: log*ft*=7.9 to 5$^-$; weak β^- feeding of (8)$^+$; a (6)$^-$ isomer is known in ^{188}Re at 169 keV. Also proposed configuration=ν7/2[503]⊗π5/2[402], K^π=6$^-$ (1976Ha39, 1974Ya02). J^π can also be 7$^-$ from configuration=ν9/2[505]⊗π5/2[402], same as for the g.s., but with K^π=7$^-$, according to GM rule. T$_{1/2}$: weighted average of 3.3 h *2* (1974Ya02), 3.0 h *5* (1972Ru06), and 2.96 h *20* (1973DeWI)in ^{190}Re IT decay. The original uncertainty of 0.10 in 1973DeWI seems too small (probably statistical only) and has been increased by a factor of 2 in the average by the evaluators. Other: 2.8 h (1962Ba60). %IT: deduced by the evaluators from γ+ce intensity balances of γ transitions in ^{190}Os from β^- decays of the 3.0-min g.s. and the 3.1-h isomer of ^{190}Re in equilibrium (which means the total number of ^{190}Re g.s. decays is equal to the total number of ^{190}Re IT decays that feeds the g.s.) measured by 1974Ya02. Note that the relative γ intensities given as for ^{190}Re isomer β^- decay in 1974Ya02 are actually for the combination of

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{190}Re Levels (continued)

E(level)[†]	Jπ	XREF	Comments
			^{190}Re isomer and g.s. β^- decays, with the latter fed by the IT decays of ^{190}Re isomer in equilibrium. See those decay datasets of ^{190}Os for more details.
319.70 *15*	1^+	A	Jπ: strong β feeding (log*ft*≈5.0) from 0^+ parent (^{190}W), likely a Gamow-Teller transition.

[†] From a least-squares fit to γ-ray energies.

$\gamma(^{190}Re)$

E_i(level)	J_i^π	E_γ	I_γ	E_f	J_f^π	Mult.	δ	α[‡]	Comments
119.12	$(3)^-$	119.12 *5*	100	0	$(2)^-$	M1(+E2)	0.4 *+7−4*	3.0 *5*	α(K)=2.3 *9*; α(L)=0.5 *3*; α(M)=0.12 *8* α(N)=0.029 *18*; α(O)=0.0047 *24*; α(P)=0.00025 *10* E_γ: from ^{190}Re IT decay. Mult.,δ: from α(exp)=3.0 *4* deduced from intensity balance in ^{190}Re IT decay.
162.10	(0^+)	162.1 *1*	100	0	$(2)^-$	(M2)[†]		7.85	α(K)=5.81 *9*; α(L)=1.558 *23*; α(M)=0.380 *6* α(N)=0.0928 *14*; α(O)=0.01527 *22*; α(P)=0.000984 *14* E_γ: from ^{190}W β^- decay.
204	(6^-)	85[#]		119.12	$(3)^-$	[M3]		8.0×10^2 *4*	E_γ: no isomeric transitions from the decay of this isomer have been reported in the literature. Transition to the 119, $(3)^-$ level is suggested by evaluators. If this transition has 100% I(γ+ce) branching, then B(M3)(W.u.)=0.000102 *+12−11*. E4 transition to the g.s., $(2)^-$ is also possible.
319.70	1^+	157.6 *1*	100	162.10	(0^+)	(M1)[†]		1.414	α(K)=1.172 *17*; α(L)=0.187 *3*; α(M)=0.0428 *6* α(N)=0.01039 *15*; α(O)=0.001746 *25*; α(P)=0.0001277 *18*

[†] From intensity balance arguments in ^{190}W β^- decay.
[‡] 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.

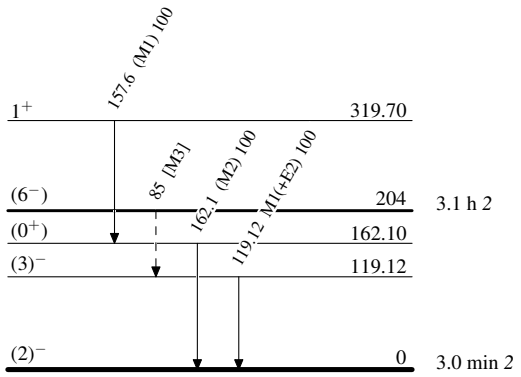
Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

- - - - - - ► γ Decay (Uncertain)



$^{190}_{75}Re_{115}$