^{190}Re IT decay (3.1 h) 1974Ya02,2012Re19

History

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

Parent: ^{190}Re: E=204 *10*; $J^\pi=(6^-)$; $T_{1/2}$=3.1 h *2*; %IT decay=45.6 *20*

^{190}Re-%IT decay: 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 ^{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.

1974Ya02 (also 1974YaZU): ^{190}Re ions were produced by the (d,α) reaction with natural osmium bombarded with a 18 MeV deuteron beam from the ANL 152-cm cyclotron. γ rays were detected with Ge(Li) detectors. Measured Eγ, Iγ, $\gamma\gamma$-coin, γ(t). Deduced $T_{1/2}$ of g.s. and isomer. See more data for ^{190}Os in ^{190}Re β^- decay.

2012Re19: direct measurement of the masses of ground state and isomer of ^{190}Re by Schottky mass spectrometry technique. ^{190}Re produced in ^{9}Be(^{197}Au,X),E=478-492 MeV/nucleon reaction using UNILAC-SIS facility at GSI. Target was ^{9}Be 1035 mg/cm^2 with a 221 mg/cm^2 niobium backing. Mostly bare atoms of the highly-charged reaction products were separated with FRS and injected into storage ring ESR. The ions were stochastically and electron cooled. Deduced masses from Schottky spectra; identified high-spin isomer.

Others: 1973DeWI, 1972Ru06, 1972KaYS, 1966BaZY, 1964Fl02, 1962Ba60.

^{190}Re Levels

E(level)	J^π [†]	$T_{1/2}$ [†]	Comments
0.0	$(2)^-$	3.0 min *2*	Number of ions detected>40 (2012Re19). Configuration=π5/2[402]⊗ν9/2[505], $K^\pi=2^-$ (1974Ya02).
119.12 *5*	$(3)^-$		
204 *10*	(6^-)	3.1 h *2*	%β^-=54.4 *20*; %IT=45.6 *20* E(level): from measured mass difference between the isomer and the g.s. (2012Re19), with number of ions detected>60. $T_{1/2}$: the adopted value is from weighted average of 3.3 h *2* (1974Ya02), 3.0 h *5* (1972Ru06), and 2.96 h *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. Other: 2.8 h (1962Ba60). Configuration=π5/2[402]⊗ν7/2[503], $K^\pi=6^-$ (1974Ya02). Also possible configuration=ν9/2[505]⊗π5/2[402], same as for the g.s., but with $K^\pi=7^-$, according to GM rule.

[†] From the Adopted Levels.

γ(^{190}Re)

Iγ normalization: From I(γ+ce)(119γ)=100.

E_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α [@]	Comments
85[&]	204	(6^-)	119.12	$(3)^-$	[M3]	8.0×10^2 *4*	α(K)=154.7 *22*; α(L)=443 *7*; α(M)=126.5 *18* α(N)=31.2 *5*; α(O)=4.73 *7*; α(P)=0.1604 *23* B(M3)(W.u.)=1.02×10^{-4} *+12−11* 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.)=$1.02\times10_4$ *+12−11*. E4 transition to the g.s., $(2)^-$ is also possible.

Continued on next page (footnotes at end of table)

^{190}Re IT decay (3.1 h) 1974Ya02,2012Re19 (continued)

$\gamma(^{190}Re)$ (continued)

E_γ [†]	I_γ [‡#]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	δ	α [@]	Comments
119.12 *5*	56 *5*	119.12	(3)$^-$	0.0	(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* Mult.,δ: from α=3.0 *4* deduced by the evaluators from γ+ce balance of 119γ at 119 level, which is fed by the IT decay of the 3.1-h isomer and de-excites via the 119γ to the 3.0-min g.s. assuming I(γ+ce)(absolute)(119γ)=100, with β^- decays of the 3.0-min g.s. and the 3.1-h isomer in equilibrium. The feedings to 119 level from the 3.1-h isomer are obtained from and equal to the sum of net γ+ce intensities from 2352, 1996 and 1387 levels in ^{190}Os, which are the only levels fed directly by the β^- decay of the 3.0-min g.s. but not directly fed by the β^- decay of the 3.1-h isomer, as claimed by 1974Ya02. See ^{190}Re β^- decay (3.1 h) for more details on the feedings.

[†] From 1974Ya02.
[‡] Relative to Iγ=100 for 371γ from the combination of β^- decays of the ^{190}Re 3.1-h isomer and 3.0-min g.s. in equilibrium (1974Ya02).
[#] For absolute intensity per 100 decays, multiply by 0.21 *3*.
[@] 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.

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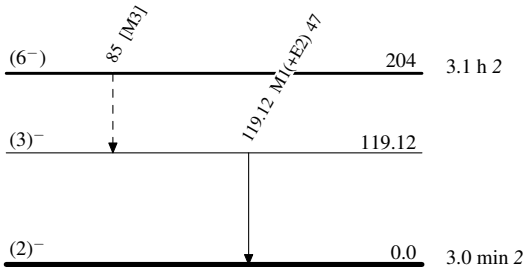
Legend

Decay Scheme

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

%IT=45.6 *20*

γ Decay (Uncertain)



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