^{170}Ir α decay (811 ms) 2007Ha45,2004GoZZ,1996Pa01

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 109, 1103 (2008)	1-Mar-2008

Parent: ^{170}Ir: E=0.0+x; $J^{\pi}=(8^+)$; $T_{1/2}$=811 ms *18*; Q(α)=6110 *SY*; %α decay=38 *5*

^{170}Ir-%α decay: From weighted average of %α=36 *10* (1996Pa01) and %α=39 *6* (2004GoZZ). note, however, that Eα values reported by 1996Pa01 and 2004GoZZ for one strong α differ from values from 2007Ha45.

Others: 1977Ca23, 1978Ca11, 1978Sc26, 1982De11, 2002Ro17.

1996Pa01: ^{170}Ir produced in 354 MeV ^{70}Ge bombardment of ^{106}Cd; measured Eα, parent-daughter α correlations.

2002Ro17: ^{170}Ir produced by α decay of ^{174}Au; Si strip detector; measured Eα, parent-daughter α correlations, $T_{1/2}$ for ^{170}Ir.

2004GoZZ: ^{170}Ir from α decay of ^{174}Au produced by ^{92}Mo(^{84}Sr,pn) At E=390, 395 MeV; fragment mass analyzer and double-sided Si strip detector (for recoils and decay α particles) surrounded by 4 Ge detectors and a low-energy photon spectrometer; recoil decay tagging technique; measured Eα, Iα, recoil-α-γ coin, α(t), parent-daughter α correlations.

2007Ha45: ^{170}Ir source from ^{112}Sn(^{60}Ni,pn), E(^{60}Ni)=266 MeV; 93% enriched, self-supporting target; JUROGAM spectrometer (43 EUROGAM type Compton-suppressed HPGE detectors) for prompt-γ detection; fusion-evaporation products selected using RITU gas-filled recoil separator and GREAT spectrometer (2 double-sided Si strip detectors, a multiwire proportional avalanche counter and an array of 28 Si PIN diode detectors); Ge detector near RITU focal plane to detect isomeric γ decay; measured Eγ, Eα, α-γ coin, $\gamma\gamma$ coin, α-recoil correlated $\gamma\gamma$ coin; Iγ and Iα not enumerated.

Parent $T_{1/2}$: 811 ms *18* is the authors' recommended value from 2007Ha45, based on the following α(t) data: 802 ms *+30−28* (6007α), 826 ms *+30−28* (6053α), 830 ms *+58−53* (5951α), 801 ms *+63−57* (6121α). others: 0.43 s *5* (2002Ro17, 6082α), 0.83 s *30* (1996Pa01, 6083α), 0.82 s *3* from 6088α(t) (2004GoZZ; from table 5.1, but note that fig. 6.7 shows 0.82 s *2*). the result from 2002Ro17 is inconsistent and the reason for this is not understood. 0.8 s *2* (1977ScYH, 6045α), 1.05 s *15* (1978Sc26, 6030α) and 1.1 s *2* (1977Ca23 and 1978Ca11, 6010α) are reported for lines whose parentage the evaluator considers to Be unclear.

Summary of ^{170}Ir α decay data (for both isomers):

Eα	%α(Ir)	Half-life		Reference(s)	Correlation(s)
5815 10	5.2 17	0.87 S +18-12	L	2002Ro17	^{174}Au(6538α)
5815 5	-	-	L	2004GoZZ	^{174}Au(6547α)
5951 10	-	0.83 S +6-5	H	2007Ha45	-
6045 10	-	0.8 S 2	?	1977ScYH	-
6030 10	-	1.05 S 15	?	1978Sc26	-
6027 5	-	-	?	1982De11	-
6010 10	-	1.1 S 2	H?	1977Ca23,1978Ca11	-
6003 10	-	-	H	1996Pa01	^{166}Re(5515α)
6007 10	-	0.802 S +30-28	H	2007Ha45	-
6053 10	-	0.826 S +30-28	H	2007Ha45	-
6083 11	36 10	0.83 S 30	H?	1996Pa01	-
6082	-	0.43 S 5	?	2002Ro17	^{174}Au(6544α#)
6088 5	39 6	0.82 S 3	H?	2004GoZZ	^{174}Au(6433α, 6471α, 6618α)
6121? 10	-	0.80 S 6	H	2007Ha45	-

\# Consistent With 2004GoZZ If This Is Assumed To Be The Sum Peak From 6471α(^{174}Au)-153ce(^{170}Ir) Coin.

L - Associated With Low-spin ^{170}Ir Decay.

H - Associated With High-spin ^{170}Ir Decay.

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^{166}Re Levels

E(level)†	Comments
0.0+x	
53+x	E(level): an alternative value of 69+x is possible because the order of the 53γ and the 69γ could not Be established (2007Ha45).
65+x	
75+x	other E: 70+x 14 from energy difference between α group feeding this level and the possible 6121α feeding the 0+x level.
122+x	other E: 119+x 12 from energy difference between α group feeding this level and the possible 6121α feeding the 0+x level.
175+x	other E: 174+x 14 from energy difference between α group feeding this level and the possible 6121α feeding the 0+x level.

† From least-squares fit to Eγ.

α radiations

Eα	E(level)	Comments
5951 *10*	175+x	Eα: reported by 2007Ha45 only. coincident with 110γ and 175γ As well As 53γ, 75γ and 122γ.
6005 *7*	122+x	Eα: weighted average of 6003 *10* (1996Pa01) and 6007 *10* (2007Ha45). other: 6010 *10* (1977Ca23, 1978Ca11); however, this α has $T_{1/2}$=1.1 s *2*, somewhat longer than value adopted for ^{170}Ir high spin isomer. 6003α correlated with 5533α from ^{166}Re (1996Pa01). Strong coincidence with 122γ As well As 53γ, 69γ, 75γ (2007Ha45). Additional information 1.
6053 *10*	75+x	Eα: from 2007Ha45. other Eα: 6088 *5* (2004GoZZ), 6083 *11* (1996Pa01), 6082 (2002Ro17); the inconsistency between these data and the adopted Eα=6053 *10* is troubling and unexplained. correlated with 6544α from ^{174}Au (1996Pa01); correlated with 6433α, 6471α and 6618α from high-spin ^{174}Au (2004GoZZ). No correlation with α decay from ^{166}Re was observed (1996Pa01). Coincident with 75γ and Re K x ray. Additional information 2.
6121† *10*	0.0+x	Eα: from 2007Ha45 only; shown As tentative because authors cannot rule out the possibility that this is a sum peak arising from 6053α+ce(L)(75γ) and/or 6007α+ce(L)(122γ). No coincidence with γ or Re(K x ray) observed by 2007Ha45.

† Existence of this branch is questionable.

γ(^{166}Re)

Eγ†	E$_i$(level)	E$_f$	Mult.	α‡	Comments
(47)	122+x	75+x			Eγ,Mult.: highly tentative γ; however, observation of 6005α-75γ coin (2007Ha45) suggests the existence of a transition connecting the 122+x and 75+x levels and such a transition May Be too highly converted to Be seen In the α-γ coincidence spectrum. however, level scheme suggests $\Delta\pi$=(yes) so multipolarity of M2 or higher May Be implied.
53#	53+x	0.0+x	(E1)	0.410	α(L)=0.317 *5*; α(M)=0.0732 *11*; α(N+..)=0.0199 *3* α(N)=0.01723 *25*; α(O)=0.00258 *4*; α(P)=0.0001057 *15* see comments on 53γ from 175+x level.
53#@	175+x	122+x	[M1,E2]	4.×10^1 *4*	α(L)=28 *24*; α(M)=7 *6*; α(N+..)=1.9 *17* Mult.: assumed, based on level scheme; however, I(53γ)/I(122γ) is

Continued on next page (footnotes at end of table)

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$\gamma(^{166}Re)$ (continued)

E_γ [†]	E_i(level)	E_f	Mult.	α [‡]	Comments
					approximately the same In the spectra gated by the 5951α and by the 6007α (2007Ha45). authors favor M1 multipolarity for this component and E1 for the other. this second placement of 53γ is suggested by energy difference between 175γ and 122γ (2007Ha45).
(65)	65+x	0.0+x	[M1]	3.12	α(L)=2.41 *4*; α(M)=0.551 *8*; α(N+..)=0.1578 *22* α(N)=0.1337 *19*; α(O)=0.0225 *4*; α(P)=0.001638 *23* Mult.: expected by 2007Ha45 to form a cascade with 110γ to 0+x level. γ is absent In 5951α-γ spectrum; this May indicate significant conversion, and authors suggest M1 multipolarity, consistent with level scheme.
69	122+x	53+x	[M1]	2.62	α(L)=2.02 *3*; α(M)=0.463 *7*; α(N+..)=0.1325 *19* α(N)=0.1123 *16*; α(O)=0.0189 *3*; α(P)=0.001376 *20* E_γ,Mult.: Eγ coincides with energy of Kβ x ray(Re) but peak is too strong relative to Kα x ray In 6007α-γ coin spectrum to Be attributed entirely to Re Kβ x ray. authors tentatively suggest M1 multipolarity based on the level scheme.
75	75+x	0.0+x	(M1)	11.75	α(K)=9.70 *14*; α(L)=1.588 *23*; α(M)=0.363 *5*; α(N+..)=0.1039 *15* α(N)=0.0880 *13*; α(O)=0.01479 *21*; α(P)=0.001079 *16* Mult.: suggested by 2007Ha45 based on 6053α-γ coin spectrum which includes significant I(K x ray) attributed to internal conversion of the 75γ; analogous to authors′ observations for known M1 92γ from ^{171}Re α decay.
110	175+x	65+x	(E1)	0.300	α(K)=0.245 *4*; α(L)=0.0427 *6*; α(M)=0.00978 *14*; α(N+..)=0.00271 *4* α(N)=0.00233 *4*; α(O)=0.000366 *6*; α(P)=1.90×10^{-5} *3* Mult.: based on an argument similar to that used by 2007Ha45 to assign multipolarity to 122γ.
122	122+x	0.0+x	(E1)	0.229	α(K)=0.188 *3*; α(L)=0.0322 *5*; α(M)=0.00738 *11*; α(N+..)=0.00205 *3* α(N)=0.001758 *25*; α(O)=0.000278 *4*; α(P)=1.479×10^{-5} *21* Mult.: since I(75γ)/I(Kα x ray) is approximately the same In spectra gated by the 6053α and by the 6007α, 2007Ha45 conclude that the 122γ is probably E1 since it provides No significant contribution to K x ray peak′s intensity via internal conversion.
175	175+x	0.0+x	(E1)	0.0906	α(K)=0.0748 *11*; α(L)=0.01223 *18*; α(M)=0.00279 *4*; α(N+..)=0.000782 *11* α(N)=0.000668 *10*; α(O)=0.0001073 *15*; α(P)=6.19×10^{-6} *9* Mult.: based on an argument similar to that used by 2007Ha45 to assign multipolarity to 122γ.

[†] From 2007Ha45; uncertainty unstated by authors.
[‡] 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.
[#] Multiply placed.
[@] Placement of transition in the level scheme is uncertain.

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Legend

γ Decay (Uncertain)

Decay Scheme