^{171}Yb(^{19}F,4nγ) 1992Ja01

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. C. Batchelder and A. M. Hurst, M. S. Basunia	NDS 183, 1 (2022)	1-Mar-2022

No change compared to previous evaluation (2003Ba44).

E=92-97 MeV; enriched Yb targets backed with Pb; five coaxial Ge detectors (no Compton suppression) with NaI and BGO detector multiplicity filter; measured Eγ, Iγ, $\gamma\gamma$, $\gamma(\theta)$ (at 5 angles), $\gamma\gamma$-t, excit; searched for isomers in the 10 ns to 200 ns range.

^{186}Au Levels

E(level)[†]	J$^\pi$[‡]	T$_{1/2}$	Comments
0.0+x[&]	7$^-$		Additional information 1.
106.7+x[a]	8$^-$		
228.6+x[&]	9$^-$		
398.1+x[a]	10$^-$		
455.1+x[b]	11$^-$	39 ns *4*	Additional information 2. J$^\pi$: by analogy with structure in higher mass odd-odd Au nuclei.
559.6+x?[#]	(9$^+$)		
561.4+x[&]	11$^-$		
612.9+x?	10$^{(+)}$		E(level): Order of 162.6γ and 384.3γ (based on Iγ) is not certain, so alternative value of 391.2 is possible. Further, 1996Ib01 indicate that a later, unpublished study by M. G. Porquet failed to confirm either γ. In (^{19}F,5nγ) 2012Li08,2006Zh38 also do not report 384.3γ or 162.6γ. Evaluators mark this level and these two γ as questionable and not adopted.
658.6+x[@]	(10$^+$)		Considerable Iγ imbalance at this level suggests the existence of unobserved low-energy transition(s) deexciting it.
770.4+x[c]	12$^-$		
775.5+x[#]	11$^{(+)}$		
791.1+x[a]	12$^-$		
924.8+x[@]	12$^{(+)}$		
926.9+x[b]	13$^-$		
994.7+x[&]	13$^-$		
1093.0+x[#]	13$^{(+)}$		
1276.3+x[a]	14$^-$		
1292.3+x[@]	14$^+$		
1293.0+x[c]	14$^-$		
1496.9+x[#]	15$^{(+)}$		
1518.0+x[&]	15$^-$		
1632.7+x[b]	15$^-$		
1738.0+x[@]	16$^{(+)}$		
1844.7+x[a]	16$^-$		
1964.9+x[#]	17$^{(+)}$		
1991.0+x[c]	16$^-$		
2124.0+x[&]	17$^-$		
2211.0+x[d]	15$^+$		
2226.2+x[@]	18$^{(+)}$		
2343.2+x[b]	17$^-$		
2399.1+x[d]	17$^+$		

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$^{171}Yb(^{19}F,4n\gamma)$ 1992Ja01 (continued)

^{186}Au Levels (continued)

E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]	E(level)[†]	Jπ[‡]
2462.1+x[#]	$19^{(+)}$	2725.6+x[@]	$20^{(+)}$	3197.0+x[a]	20^-	3619.0+x[d]	(21^+)
2488.5+x[a]	18^-	2808.5+x[&]	19^-	3266.2+x[@]	$22^{(+)}$	3868.8+x[d]	(22^+)
2603.5+x[d]	(18^+)	2986.6+x[#]	$21^{(+)}$	3549.5+x?[&]	(21^-)	3954+x?[a]	(22^-)
2665.4+x[c]	18^-	3114.4+x[d]	(20^+)	3573.2+x[#]	$23^{(+)}$		

[†] From least-squares adjustment of Eγ, assuming equal weight for all Eγ values and fixed level energies at 0.0+x, 455.1+x. Energies of band structures relative to the 3^- g.s. have not been determined; if the g.s. and the 7^- 0.0+x level were members of same band, x≈300 would be expected, so E<100 for the intervening ΔJ=1 intraband transitions (making them difficult to detect).

[‡] Authors′ values, based on mult of deexciting gammas and/or on similarities of band structures in heavier odd-odd Au isotopes.

[#] Band(A): π=(+), α=1 prolate band. Possible Configuration=(ν 9/2[624])(π 1/2[541]). Yrast for J>13. Energies may not be reliably established; see comment on x+612.9 level.

[@] Band(B): π=(+), α=0 prolate band. Possible Configuration=(ν 9/2[624])(π 1/2[541]). Yrast for J>14. Energies may not be reliably established; see comment on x+612.9 level.

[&] Band(C): π=−, α=1 prolate band. Possible Configuration=(ν 9/2[624])(π 1/2[660]). Yrast for J≤9.

[a] Band(D): π=−, α=0 prolate band. Possible Configuration=(ν 9/2[624])(π 1/2[660]). Yrast for J≤10.

[b] Band(E): $K^\pi=(11^-)$, α=1 oblate band. See comment on signature partner of this band.

[c] Band(F): $K^\pi=(11^-)$, α=0 oblate band. Probable Configuration=$(\nu\ i_{13/2}{}^{-1})(\pi\ h_{11/2}{}^{-1})$. Same characteristic energy spacing as 11^- isomer bands in A=188-194 odd-odd Au isotopes.

[d] Band(G): π=+ 4-quasiparticle oblate band. Structure analogous to band in heavier odd-odd Au isotopes.

$\gamma(^{186}Au)$

Transitions with E<100 may not have been observed due to presence of strong x-ray peaks, low detector efficiency and/or large internal conversion (1992Ja01).

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.	α[@]	Comments
57[&]	49 *10*	455.1+x	11^-	398.1+x	10^-	[M1]	6.97	I_γ: Based on I(γ+ce)=373 *20* feeding 39 ns isomer (1992Ja01), assuming mult=M1 for 57γ and 315.4γ. Mult.: D from RUL; Δπ=no favored by isomer systematics in heavier odd-odd Au isotopes.
99[&]	<8[#]	658.6+x	(10^+)	559.6+x?	(9^+)			
106.8	121[#] *7*	106.7+x	8^-	0.0+x	7^-	D+Q		A_2=−0.43 *7*; A_4=−0.09 *7*
117.3	44 *10*	775.5+x	$11^{(+)}$	658.6+x	(10^+)			
122.1	101[#] *5*	228.6+x	9^-	106.7+x	8^-	D+Q		A_2=−0.44 *6*; A_4=+0.06 *6*
[x]131.5	15 *3*							
149.5	73 *4*	924.8+x	$12^{(+)}$	775.5+x	$11^{(+)}$	D+Q		A_2=−0.42 *5*; A_4=+0.11 *5*
156.5	34[#] *3*	926.9+x	13^-	770.4+x	12^-	D+Q		A_2=−0.23 *9*; A_4=+0.09 *10*
162.6[&]	75 *8*	775.5+x	$11^{(+)}$	612.9+x?	$10^{(+)}$	(D+Q)		A_2=−0.28 *2*; A_4=+0.04 *3* for 162.6γ+163.4γ doublet. If A_2=−0.55 *10* (as expected) for 163.4γ, A_2(162.6γ)=−0.12 *9*, characteristic of a D+Q, ΔJ=1 transition (though pure D is also possible) (1992Ja01). Placement from 1992Ja01; however, see comment on 612.9 level. γ not adopted.
163.4	45 *5*	561.4+x	11^-	398.1+x	10^-			A_2=−0.28 *2*; A_4=+0.04 *3* for 162.6γ+163.4γ doublet.
168.1	82 *5*	1093.0+x	$13^{(+)}$	924.8+x	$12^{(+)}$	D+Q		A_2=−0.14 *9*; A_4=+0.06 *6*

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$^{171}Yb(^{19}F,4n\gamma)$ 1992Ja01 (continued)

$\gamma(^{186}Au)$ (continued)

E_γ †	I_γ ‡	E_i(level)	J_i^π	E_f	J_f^π	Mult.	Comments
169.4	189# 7	398.1+x	10⁻	228.6+x	9⁻	D+Q	A_2=−0.64 3; A_4=+0.17 3
x184.0	34 3						A_2=+0.02 8; A_4=−0.10 10
188.1	60 3	2399.1+x	17⁺	2211.0+x	15⁺	(Q)	A_2=+0.52 4; A_4=−0.06 5
199.3	55# 4	1292.3+x	14⁺	1093.0+x	13(+)	D+Q	A_2=−0.43 8; A_4=−0.06 15
203.5	48# 7	994.7+x	13⁻	791.1+x	12⁻	D+Q	A_2=−0.53 6; A_4=+0.15 9
204.4	56 5	2603.5+x	(18⁺)	2399.1+x	17⁺		A_2=−0.26 3; A_4=−0.06 4 for 203.5γ+204.4γ doublet.
204.7	51 4	1496.9+x	15(+)	1292.3+x	14⁺		A_2=−0.26 3; A_4=−0.06 4 for 203.5γ+204.4γ doublet.
226.9	31# 2	1964.9+x	17(+)	1738.0+x	16(+)	D+Q	A_2=−0.59 6; A_4=+0.04 8
228.5	50 5	228.6+x	9⁻	0.0+x	7⁻		
229.8	80# 3	791.1+x	12⁻	561.4+x	11⁻	D+Q	A_2=−0.55 2; A_4=+0.01 3
235.9	26 4	2462.1+x	19(+)	2226.2+x	18(+)		
241.1	33 3	1738.0+x	16(+)	1496.9+x	15(+)		A_2=−0.54 3; A_4=+0.10 4 for 241.1γ+241.6γ doublet.
241.6	36 3	1518.0+x	15⁻	1276.3+x	14⁻		A_2=−0.54 3; A_4=+0.10 4 for 241.1γ+241.6γ doublet.
250&	<8#	3868.8+x	(22⁺)	3619.0+x	(21⁺)		
261.1	20 3	2986.6+x	21(+)	2725.6+x	20(+)		
261.5	29 4	2226.2+x	18(+)	1964.9+x	17(+)		
263.5	24 3	2725.6+x	20(+)	2462.1+x	19(+)		
265.9	35 7	924.8+x	12(+)	658.6+x	(10⁺)		
x272.1	15 3						
279.2	16 3	2124.0+x	17⁻	1844.7+x	16⁻		
279.6	20 3	3266.2+x	22(+)	2986.6+x	21(+)		
281.5	41# 2	1276.3+x	14⁻	994.7+x	13⁻	D+Q	A_2=−0.53 4; A_4+=0.08 6
291.5	98 4	398.1+x	10⁻	106.7+x	8⁻	(Q)	A_2=+0.40 2; A_4=+0.02 4
307.0	17 4	3573.2+x	23(+)	3266.2+x	22(+)		
315.4	179 14	770.4+x	12⁻	455.1+x	11⁻		
317.6	65 5	1093.0+x	13(+)	775.5+x	11(+)	Q	A_2=+0.47 7; A_4=−0.31 9
320.2	9 2	2808.5+x	19⁻	2488.5+x	18⁻		
322.4	16 3	2665.4+x	18⁻	2343.2+x	17⁻		
326.7	21 3	1844.7+x	16⁻	1518.0+x	15⁻		
332.8	100#	561.4+x	11⁻	228.6+x	9⁻	Q	A_2=+0.33 2; A_4=−0.04 3
339.7	32# 3	1632.7+x	15⁻	1293.0+x	14⁻	D+Q	A_2=−0.26 6; A_4=+0.05 6
352.5	21 3	2343.2+x	17⁻	1991.0+x	16⁻		
358.3	29 4	1991.0+x	16⁻	1632.7+x	15⁻		
364.4	11 2	2488.5+x	18⁻	2124.0+x	17⁻		
366.2	144 4	1293.0+x	14⁻	926.9+x	13⁻		A_2=+0.09 3; A_4=−0.02 4 for 366.2γ+367.3γ doublet.
367.3	59 7	1292.3+x	14⁺	924.8+x	12(+)		A_2=+0.09 3; A_4=−0.02 4 for 366.2γ+367.3γ doublet.
x377.1	<8#						
384.3&	91# 3	612.9+x?	10(+)	228.6+x	9⁻	D	A_2=−0.23 3; A_4=+0.02 4; compatible with pure L=1. Placement from 1992Ja01; however, see comment on 612.9 level.
388.6	8 2	3197.0+x	20⁻	2808.5+x	19⁻		
392.9	107# 4	791.1+x	12⁻	398.1+x	10⁻	Q	A_2=+0.26 3; A_4=−0.08 4
404.0	57# 3	1496.9+x	15(+)	1093.0+x	13(+)	(Q)	A_2=+0.35 10; A_4=+0.05 7
433.3	111# 4	994.7+x	13⁻	561.4+x	11⁻	(Q)	A_2=+0.27 5; A_4=+0.08 5. A_4 not consistent with ΔJ=2.
445.7	53# 3	1738.0+x	16(+)	1292.3+x	14⁺	Q	A_2=+0.31 5; A_4=−0.02 5
x455.1	23 2					D+Q	A_2=−0.28 4; A_4=−0.11 4
468.0	52# 4	1964.9+x	17(+)	1496.9+x	15(+)	(Q)	A_2=+0.28 5; A_4=+0.01 7
471.8	136 8	926.9+x	13⁻	455.1+x	11⁻		
485.2	65# 3	1276.3+x	14⁻	791.1+x	12⁻	Q	A_2=+0.32 3; A_4=−0.03 6
488.1	45 3	2226.2+x	18(+)	1738.0+x	16(+)		

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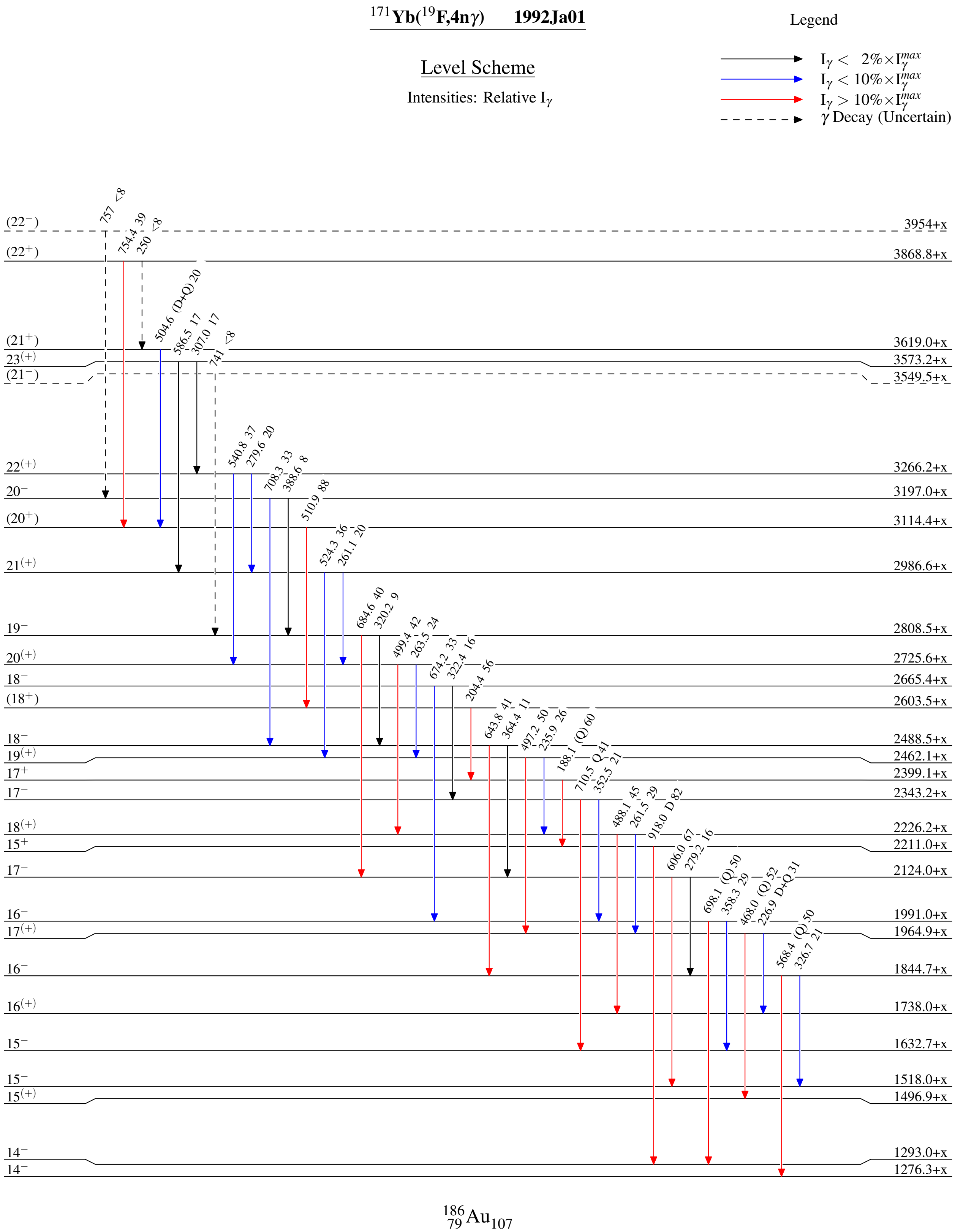
^{171}Yb(^{19}F,4nγ) 1992Ja01 (continued)

γ(^{186}Au) (continued)

E_γ †	I_γ ‡	E_i(level)	J^π_i	E_f	J^π_f	Mult.	Comments
497.2	50 *3*	2462.1+x	$19^{(+)}$	1964.9+x	$17^{(+)}$		
499.4	42 *3*	2725.6+x	$20^{(+)}$	2226.2+x	$18^{(+)}$		
504.6	20 *3*	3619.0+x	(21^+)	3114.4+x	(20^+)	(D+Q)	A_2=−0.19 *13*; A_4=+0.27 *16*
510.9	88 *30*	3114.4+x	(20^+)	2603.5+x	(18^+)		
522.6	61 *4*	1293.0+x	14^-	770.4+x	12^-		A_2=+0.42 *4*; A_4=+0.05 *6* for 522.6γ+523.4γ doublet.
523.4	90 *5*	1518.0+x	15^-	994.7+x	13^-		A_2=+0.42 *4*; A_4=+0.05 *6* for 522.6γ+523.4γ doublet.
524.3	36 *3*	2986.6+x	$21^{(+)}$	2462.1+x	$19^{(+)}$		
540.8	37 *3*	3266.2+x	$22^{(+)}$	2725.6+x	$20^{(+)}$		
568.4	50# *3*	1844.7+x	16^-	1276.3+x	14^-	(Q)	A_2=+0.34 *9*; A_4=+0.15 *10*. A_4 not consistent with ΔJ=2.
586.5	17 *2*	3573.2+x	$23^{(+)}$	2986.6+x	$21^{(+)}$		
x600.6	29 *3*						
606.0	67 *4*	2124.0+x	17^-	1518.0+x	15^-		
x610.1	23 *2*						
643.8	41 *3*	2488.5+x	18^-	1844.7+x	16^-		
674.2	33 *3*	2665.4+x	18^-	1991.0+x	16^-		
684.6	40 *3*	2808.5+x	19^-	2124.0+x	17^-		
698.1	50# *5*	1991.0+x	16^-	1293.0+x	14^-	(Q)	A_2=+0.33 *19*; A_4=+0.07 *17*
705.6	79# *3*	1632.7+x	15^-	926.9+x	13^-	Q	A_2=+0.32 *6*; A_4=−0.11 *7*
708.3	33 *3*	3197.0+x	20^-	2488.5+x	18^-		
710.5	41 *3*	2343.2+x	17^-	1632.7+x	15^-	Q	A_2=+0.51 *21*; A_4=−0.29 *23*
741&	<8#	3549.5+x?	(21^-)	2808.5+x	19^-		
754.4	39 *3*	3868.8+x	(22^+)	3114.4+x	(20^+)		
757&	<8#	3954+x?	(22^-)	3197.0+x	20^-		
x808.9	31 *3*						
918.0	82# *4*	2211.0+x	15^+	1293.0+x	14^-	D	A_2=−0.31 *5*; A_4=+0.04 *8*

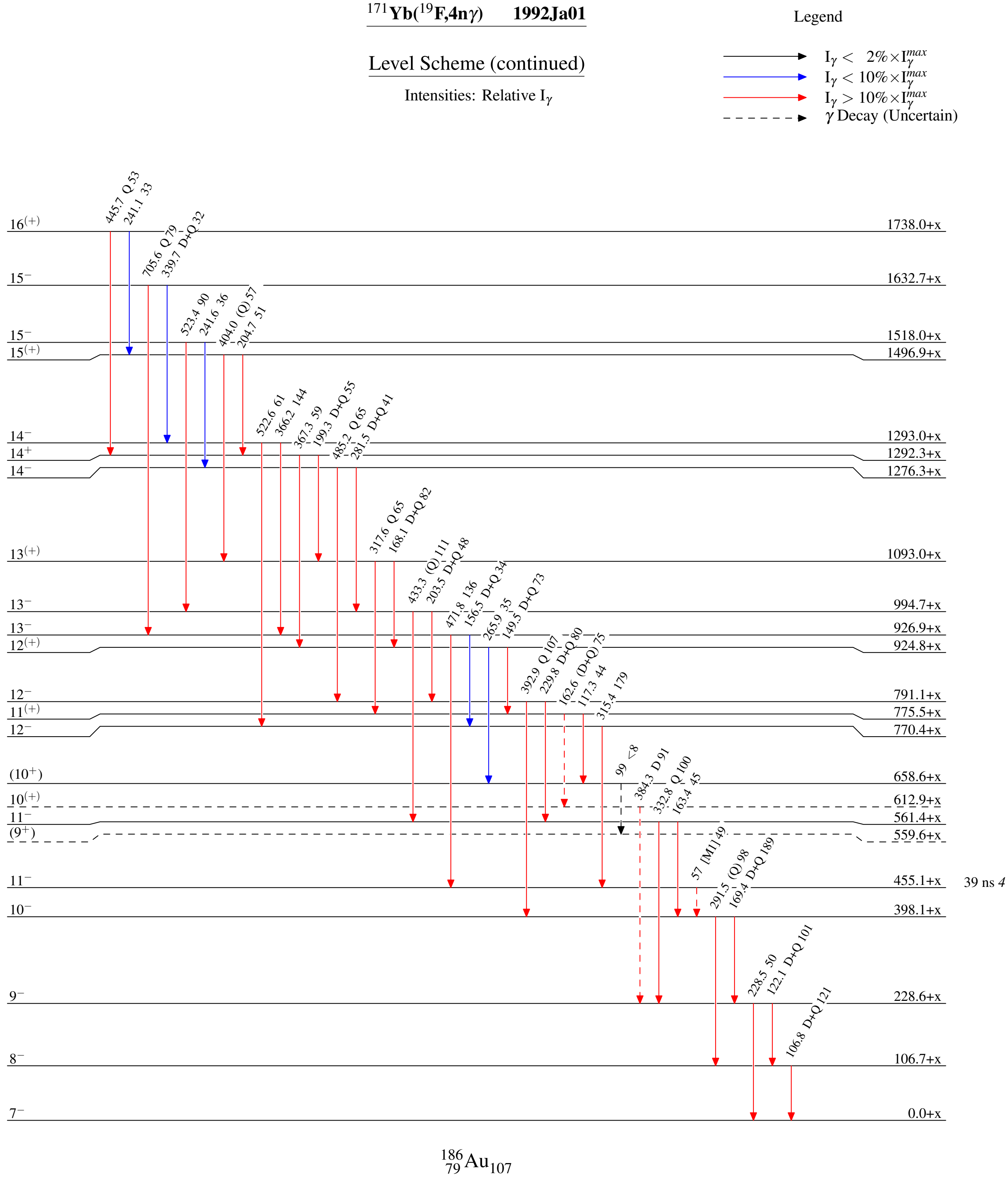
† ΔE=0.2 to 0.5 keV (1992Ja01), depending on Iγ.
‡ Photon intensity relative to I(332.8γ)=100 for E(^{19}F)=93-94 MeV; from $\gamma\gamma$ coin analysis, unless noted otherwise.
# Not from $\gamma\gamma$ coin.
@ Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) 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.
x γ ray not placed in level scheme.


^{171}Yb(^{19}F,4nγ) 1992Ja01
Level Scheme
Intensities: Relative I_γ
Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
γ Decay (Uncertain)
(22−) 3954+x
(22+) 3868.8+x
(21+) 3619.0+x
23(+) 3573.2+x
(21−) 3549.5+x
22(+) 3266.2+x
20− 3197.0+x
(20+) 3114.4+x
21(+) 2986.6+x
19− 2808.5+x
20(+) 2725.6+x
18− 2665.4+x
(18+) 2603.5+x
18− 2488.5+x
19(+) 2462.1+x
17+ 2399.1+x
17− 2343.2+x
18(+) 2226.2+x
15+ 2211.0+x
17− 2124.0+x
16− 1991.0+x
17(+) 1964.9+x
16− 1844.7+x
16(+) 1738.0+x
15− 1632.7+x
15− 1518.0+x
15(+) 1496.9+x
14− 1293.0+x
14− 1276.3+x
$^{186}_{79}Au_{107}$

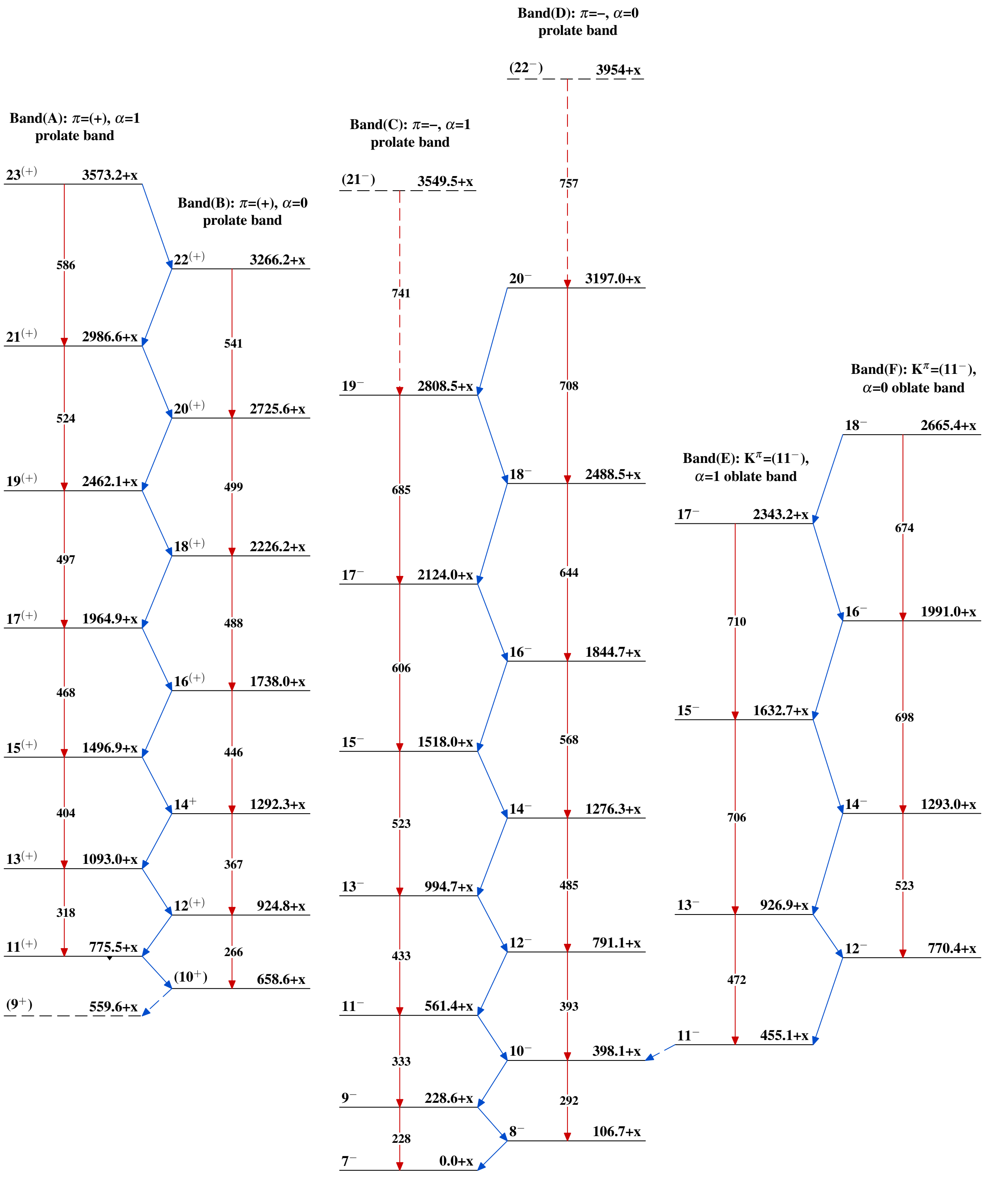
^{171}Yb(^{19}F,4nγ) 1992Ja01

Level Scheme (continued)

Intensities: Relative I_γ

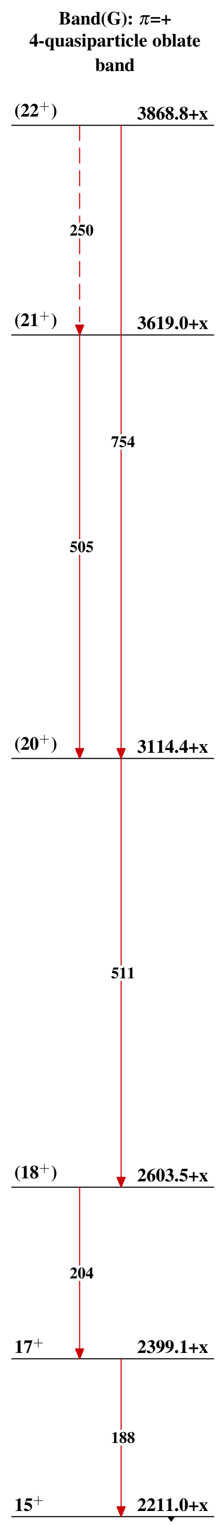


$^{171}Yb(^{19}F,4n\gamma)$ 1992Ja01



$^{186}_{79}Au_{107}$

$^{171}Yb(^{19}F,4n\gamma)$ 1992Ja01 (continued)



$^{186}_{79}Au_{107}$