(HI,xnγ) 1987Bl06,1983Ag01,1977Bo14

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

See separate data set for information from ^{96}Zr(^{74}Ge,4nγ).

Other: 1990JaZR (^{142}Ce(^{29}Si,5nγ), E=160 MeV; searched for large-deformation triaxiality In ^{166}Hf).

2006Mc02: ^{122}Sn(^{48}Ti,4n) E(^{48}Ti)=200 MeV; SPEEDY detector array (8 Compton-suppressed HPGE clover detectors, θ=41.5° and 138.5°); measured $T_{1/2}$ using recoil distance Doppler shift and differential decay curve method applied In coincidence mode (gate on shifted component of a feeding γ).

1987Bl06: ^{148}Sm(^{22}Ne,4n) E(^{22}Ne)=106-117 MeV; measured Eγ, Iγ, DCO ratios (30°, 90°, Q γ In gate), γγ-coin.

1983Ag01: ^{150}Sm(^{20}Ne,4n) E(^{20}Ne)=105 MeV, measured Eγ, Iγ, γγ(θ), γγ-coin. γ-ray angular correlations were measured with twoGe(Li) detectors at 10 angles between 90° and 360° with respect to the beam direction.

1977Bo14: ^{122}Sn(^{48}Ti,4n) E(^{48}Ti)=195 MeV, measured recoil distance Doppler shift, Iγ. Other measurements: 1973Ne08, 1965St03.

^{166}Hf Levels

E(level)†	Jπ#	$T_{1/2}$‡	Comments
0&	0^+	6.77 min *30*	$T_{1/2}$: from Adopted Levels.
158.5& *3*	2^+	497 ps *23*	$T_{1/2}$: from 1977Bo14.
470.3& *5*	4^+	16.4 ps *5*	$T_{1/2}$: weighted average of 16.8 ps *10* (1977Bo14) and 16.3 ps *6* (2006Mc02).
896.9& *5*	6^+	3.24 ps *19*	$T_{1/2}$: weighted average of 3.5 ps *5* (1977Bo14) and 3.19 ps *21* (2006Mc02).
1406.4& *6*	8^+	1.05 ps *10*	$T_{1/2}$: weighted average of 1.2 ps *5* (1977Bo14) and 1.04 ps *10* (2006Mc02).
1466.3 *6*	(5^-)		
1551.8 *6*	(5^-)		Jπ: adopted value is (4^-).
1726.3[a] *6*	7^-		
1841.1 *6*	$(6^-,7^-)$		Jπ: adopted value is (6^-).
1971.9& *6*	10^+	0.7 ps *5*	$T_{1/2}$: from 1977Bo14.
2078.5[a] *6*	9^-	1.73 ps *35*	$T_{1/2}$: from 2006Mc02.
2197.3[b] *6*	8^-@		
2496.7[a] *6*	11^-		
2539.7[b] *6*	10^-@		
2565.8& *7*	12^+	0.9 ps *7*	$T_{1/2}$: from 1977Bo14.
2734.6[d] *7*	12^+		
2910.9[b] *6*	12^-@		
2962.2[a] *7*	13^-		
3009.2[d] *7*	14^+	6.9 ps *7*	$T_{1/2}$: from 2006Mc02.
3211.1[c] *7*	14^+		
3375.1[b] *7*	14^-@		
3449.0[d] *8*	16^+		
3472.6[a] *7*	15^-		
3835.2[c] *8*	16^+		
3920.3[b] *8*	16^-@		
4009.2[d] *8*	18^+		
4030.1[a] *8*	17^-		
4459.3[c] *9*	18^+		
4516.0[b] *8*	18^-@		
4625.2[a] *9*	19^-		
4671.0[d] *9*	20^+		
5089.6[b] *9*	20^-@		

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(HI,xnγ) 1987Bl06,1983Ag01,1977Bo14 (continued)

^{166}Hf Levels (continued)

E(level)†	Jπ#	E(level)†	Jπ#	E(level)†	Jπ#	E(level)†	Jπ#
5121.7[c] 9	20+	6201.2[d] 10	24+	7894.7[d] 11	28+	9753.5[d] 18	32+
5253.3[a] 9	21−	6356.4[b] 10	24−@	8017.3[b] 11	28−@	9991.2[b] 18	(32−)@
5409.9[d] 9	22+	6665.5[a] 10	25−	8375.4[a] 11	29−	10330.3?[a] 18	(33−)
5678.8[b] 9	22−@	7030.1[d] 10	26+	8800.7[d] 15	30+	10747.5[d] 21	(34+)
5851.7[c] 10	22+	7137.4[b] 10	26−@	8980.0[b] 15	(30−)@		
5926.9[a] 10	23−	7481.1[a] 11	27−	9337.8[a] 15	(31−)		

† From least-squares fit to Eγ.
‡ From recoil distance Doppler shift measurements by 1977Bo14 and/or 2006Mc02, As indicated In comment on each level.
# Authors′ values (1987Bl06). see Adopted Levels for evaluator′s assignments.
@ Transitions connecting the two side bands have positive anisotropies and are interpreted as mixed M1/E2 transitions (1987Bl06).
& Band(A): K=0+ g.s. band. The assignment is based on γ-angular distributions and supported by the intensity balance.
[a] Band(B): side band 1. The interband transition between side band 1 and the ground-state band show angular distributions of pure stretched dipole type, most likely E1.
[b] Band(C): side band 2.
[c] Band(D): π=+, α=0 band.
[d] Band(E): super band. The assignment is based on γ(θ) and supported by intensity balance.

γ(^{166}Hf)

A_2 and A_4 normalized to the 565.8γ 10+ to 8+ E2 transition.

Eγ†	Iγ‡	Ei(level)	Jiπ	Ef	Jfπ	Mult.#	α[g]	Comments
158.5 3	272 14	158.5	2+	0	0+	E2[f]	0.638 10	Additional information 1. A_2=+0.33 3; A_4=−0.12 5 (1983Ag01). DCO=0.52 1 (1987Bl06).
274.6 3	75 8	3009.2	14+	2734.6	12+	E2[f]	0.1037	Additional information 17. A_2=+0.32 7; A_4=−0.11 8 (1983Ag01). DCO=0.9060 (1987Bl06).
289.2 3	10 2	1841.1	(6−,7−)	1551.8	(5−)			DCO=0.95 25 (1987Bl06).
311.8 3	929 47	470.3	4+	158.5	2+	E2[f]	0.0706	Additional information 2. A_2=+0.32 2; A_4=−0.10 3 (1983Ag01). DCO=0.81 2 (1987Bl06).
342.5 3	67 7	2539.7	10−	2197.3	8−			Additional information 12. DCO=0.87 8 (1987Bl06).
352.2 3	57 6	2078.5	9−	1726.3	7−	E2[f]	0.0495	Additional information 7. A_2=+0.29 7; A_4=−0.15 8 (1983Ag01). DCO=1.08 14 (1987Bl06).
356.3 3	59 6	2197.3	8−	1841.1	(6−,7−)			Additional information 9. DCO=1.00 13 (1987Bl06).
371.3 3	114 11	2910.9	12−	2539.7	10−	(E2)	0.0427	A_2=+0.28 7; A_4=−0.09 8 (1983Ag01). DCO=0.98 8 (1987Bl06). Additional information 15.
374.7 3	29 3	1841.1	(6−,7−)	1466.3	(5−)			DCO=0.87 21 (1987Bl06).
396.4 3	21 4	2962.2	13−	2565.8	12+			DCO=0.56 19 (1987Bl06).
414.0 3	54 5	2910.9	12−	2496.7	11−			DCO=0.84 19 (1987Bl06).
418.1 3	193 10	2496.7	11−	2078.5	9−	(E2)	0.0308	Additional information 10.

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(HI,xnγ) 1987Bl06,1983Ag01,1977Bo14 (continued)

γ(^{166}Hf) (continued)

E_γ[†]	I_γ[‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[g]	Comments
								A_2=+0.28 *5*; A_4=−0.09 *6* (1983Ag01). DCO=1.01 *4* (1987Bl06).
426.6 *3*	1000	896.9	6^+	470.3	4^+	E2[f]	0.0292	Additional information 3. A_2=+0.34 *2*; A_4=−0.10 *3* (1983Ag01). DCO=0.98 *2* (1987Bl06).
439.8 *3*	354 *17*	3449.0	16^+	3009.2	14^+	(E2)	0.0269	Additional information 21. A_2=+0.27 *4*; A_4=−0.06 *5* (1983Ag01). DCO=1.07 *3* (1987Bl06).
443.4 *3*	336 *17*	3009.2	14^+	2565.8	12^+	E2[f]	0.0264	Additional information 18. A_2=+0.32 *4*; A_4=−0.02 *5* (1983Ag01). DCO=1.01 *2* (1987Bl06).
461.2 *3*	58 *6*	2539.7	10^-	2078.5	9^-			DCO=0.98 *18* (1987Bl06).
464.2 *3*	190 *10*	3375.1	14^-	2910.9	12^-	(E2)	0.0234	A_2=+0.30 *5*; A_4=−0.10 *6* (1983Ag01). DCO=0.97 *4* (1987Bl06).
465.4 *3*	255 *13*	2962.2	13^-	2496.7	11^-	(E2)	0.0232	Additional information 20. Additional information 16. A_2=+0.31 *4*; A_4=−0.09 *5* (1983Ag01). DCO=1.09 *4* (1987Bl06).
471.0 *3*	47 *5*	2197.3	8^-	1726.3	7^-			DCO=1.15 *25* (1987Bl06).
509.5 *3*	&	1406.4	8^+	896.9	6^+	E2[f]	0.0185	Additional information 4. A_2=+0.29 *3*; A_4=−0.09 *5* (1983Ag01). DCO=1.03 *2* (1987Bl06).
510.4 *3*	&	3472.6	15^-	2962.2	13^-	(E2)	0.0184	Additional information 22. A_2=+0.31 *4*; A_4=−0.07 *5* (1983Ag01). DCO=0.97 *3* (1987Bl06).
524.7 *3*	120 *12*	2496.7	11^-	1971.9	10^+	D[@]		Additional information 11. A_2=−0.25 *7*; A_4=−0.08 *9* (1983Ag01). DCO=0.68 *8* (1987Bl06).
545.2 *3*	167 *17*	3920.3	16^-	3375.1	14^-	(E2)	0.01561	A_2=+0.25 *6*; A_4=−0.14 *6* (1983Ag01). DCO=0.89 *8* (1987Bl06).
557.5 *3*	191 *19*	4030.1	17^-	3472.6	15^-	(E2)	0.01479	Additional information 24. Additional information 26. A_2=+0.35 *4*; A_4=−0.02 *6* (1983Ag01). DCO=1.07 *6* (1987Bl06).
560.2 *3*	340 *17*	4009.2	18^+	3449.0	16^+	(E2)	0.01462	Additional information 25. A_2=+0.29 *6*; A_4=−0.16 *8* (1983Ag01). DCO=1.11 *2* (1987Bl06).
565.5 *3*	699 *35*	1971.9	10^+	1406.4	8^+	E2[f]	0.01429	Additional information 6. A_2=+0.35; A_4=−0.07 (1983Ag01). DCO=1.04 *3* (1987Bl06).
573.6 *3*	110 *11*	5089.6	20^-	4516.0	18^-			Additional information 28. DCO=0.90 *11* (1987Bl06).
589.2 *3*	103 *10*	5678.8	22^-	5089.6	20^-			DCO=1.28 *16* (1987Bl06).
594.0 *3*	*a*	2565.8	12^+	1971.9	10^+	E2[f]	0.01271	Additional information 13. A_2=+0.35 *3*; A_4=−0.09 *4* (1983Ag01). DCO=1.02 *4* (1987Bl06).
595.1 *3*	*a*	4625.2	19^-	4030.1	17^-			DCO=1.06 *5* (1987Bl06).
595.7 *3*	*a*	4516.0	18^-	3920.3	16^-			DCO=1.13 *9* (1987Bl06).
624.1[h] *3*	176[h] *18*	3835.2	16^+	3211.1	14^+			Additional information 23. DCO=0.96 *11* (1987Bl06) for doublet.
624.1[h] *3*	176[h] *18*	4459.3	18^+	3835.2	16^+			DCO=0.96 *11* (1987Bl06).
628.1 *3*	168 *17*	5253.3	21^-	4625.2	19^-	(E2)	0.01115	Additional information 29. A_2=+0.27 *8*; A_4=0.00 *9* (1983Ag01). DCO=1.03 *5* (1987Bl06).

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(HI,xnγ) 1987Bl06,1983Ag01,1977Bo14 (continued)

γ(^{166}Hf) (continued)

E_γ [†]	I_γ [‡]	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	α[g]	Comments
645.3 *3*	123 *12*	3211.1	14^+	2565.8	12^+	(E2)	0.01048	A_2=+0.25 *6*; A_4=−0.03 *7* (1983Ag01). DCO=0.90 *13* (1987Bl06). Additional information 19.
661.8 *3*	310 *16*	4671.0	20^+	4009.2	18^+			Additional information 27. DCO=0.98 *3* (1987Bl06).
662.3 *3*	70 *7*	5121.7	20^+	4459.3	18^+			DCO=1.1 *3* (1987Bl06).
672.2 *3*	204 *10*	2078.5	9^-	1406.4	8^+	D[@]		Additional information 8. A_2=−0.25 *5*; A_4=+0.03 *6* (1983Ag01). DCO=0.80 *10* (1987Bl06).
673.6 *3*	122 *12*	5926.9	23^-	5253.3	21^-			DCO=1.03 *7* (1987Bl06).
677.6 *3*	72 *7*	6356.4	24^-	5678.8	22^-			DCO=1.38 *16* (1987Bl06).
730.0 *3*	42 *4*	5851.7	22^+	5121.7	20^+			DCO=1.1 *3* (1987Bl06).
738.6 *3*	*b*	6665.5	25^-	5926.9	23^-			DCO=1.12 *9* (1987Bl06).
738.9 *3*	*b*	5409.9	22^+	4671.0	20^+			Additional information 30. A_2=+0.16 *10*; A_4=−0.06 *13* (1983Ag01). DCO=1.12 *5* (1987Bl06).
762.7 *3*	90 *9*	2734.6	12^+	1971.9	10^+	(E2)	0.00721	Additional information 14. A_2=+0.45 *10*; A_4=−0.06 *12* (1983Ag01). DCO=1.06 *15* (1987Bl06).
781.0 *3*	61 *6*	7137.4	26^-	6356.4	24^-			DCO=1.04 *23* (1987Bl06).
791.3 *3*	170 *17*	6201.2	24^+	5409.9	22^+			Additional information 31. DCO=1.19 *8* (1987Bl06).
815.6 *3*	70 *7*	7481.1	27^-	6665.5	25^-			DCO=0.92 *18* (1987Bl06).
828.9 *3*	*c*	7030.1	26^+	6201.2	24^+			DCO=1.15 *10* (1987Bl06).
829.3 *3*	*c*	1726.3	7^-	896.9	6^+	D[@]		Additional information 5. A_2=−0.29 *8*; A_4=−0.07 *9* (1983Ag01). DCO=0.65 *19* (1987Bl06).
864.6 *3*	69 *7*	7894.7	28^+	7030.1	26^+			DCO=0.84 *14* (1987Bl06).
879.9 *3*	28 *6*	8017.3	28^-	7137.4	26^-			DCO=1.4 *7* (1987Bl06).
894.3 *3*	51 *5*	8375.4	29^-	7481.1	27^-			DCO=1.3 *4* (1987Bl06).
906.0 *10*	42 *8*	8800.7	30^+	7894.7	28^+			DCO=0.91 *22* (1987Bl06).
944.3 *3*	26 *3*	1841.1	$(6^-,7^-)$	896.9	6^+	D		DCO=0.45 *31* (1987Bl06).
952.7 *10*	44 *8*	9753.5	32^+	8800.7	30^+			DCO=1.4 *4* (1987Bl06).
962.4 *10*	38[d]	9337.8	(31^-)	8375.4	29^-			DCO=0.7 *4* (1987Bl06).
962.7 *10*	*d*	8980.0	(30^-)	8017.3	28^-			DCO=0.5 *4* (1987Bl06).
992.5[i] *10*	21 *4*	10330.3?	(33^-)	9337.8	(31^-)			
994.0 *10*	*e*	10747.5	(34^+)	9753.5	32^+			DCO=1.9 *9* (1987Bl06).
995.8 *10*	*e*	1466.3	(5^-)	470.3	4^+	D		DCO<0.3 (1987Bl06).
1011.2 *10*	19 *4*	9991.2	(32^-)	8980.0	(30^-)			DCO<0.5 (1987Bl06).
[x]1057	<13							
1081.4 *10*	16 *3*	1551.8	(5^-)	470.3	4^+	D		DCO<0.5 (1987Bl06).

[†] From 1987Bl06. Others: 1965St03, 1983Ag01.

[‡] From 1987Bl06 determined from spectra coincident with 158.5γ and 311.8γ and normalized so Iγ(426.6γ)=1000.

[#] Q from γ(θ) (1983Ag01), except As noted. not M2 from RUL if value is shown without parentheses; Δπ=(No) assigned for all other intraband stretched Q transitions.

[@] From DCO ratio (1987Bl06).

[&] Iγ=1132 *57* for 509.5γ+510.4γ.

[a] Iγ=836 *42* for 594.0γ+595.1γ+595.7γ.

[b] Iγ=265 *13* for 738.6γ+738.9γ.

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(HI,xnγ) 1987Bl06,1983Ag01,1977Bo14 (continued)

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

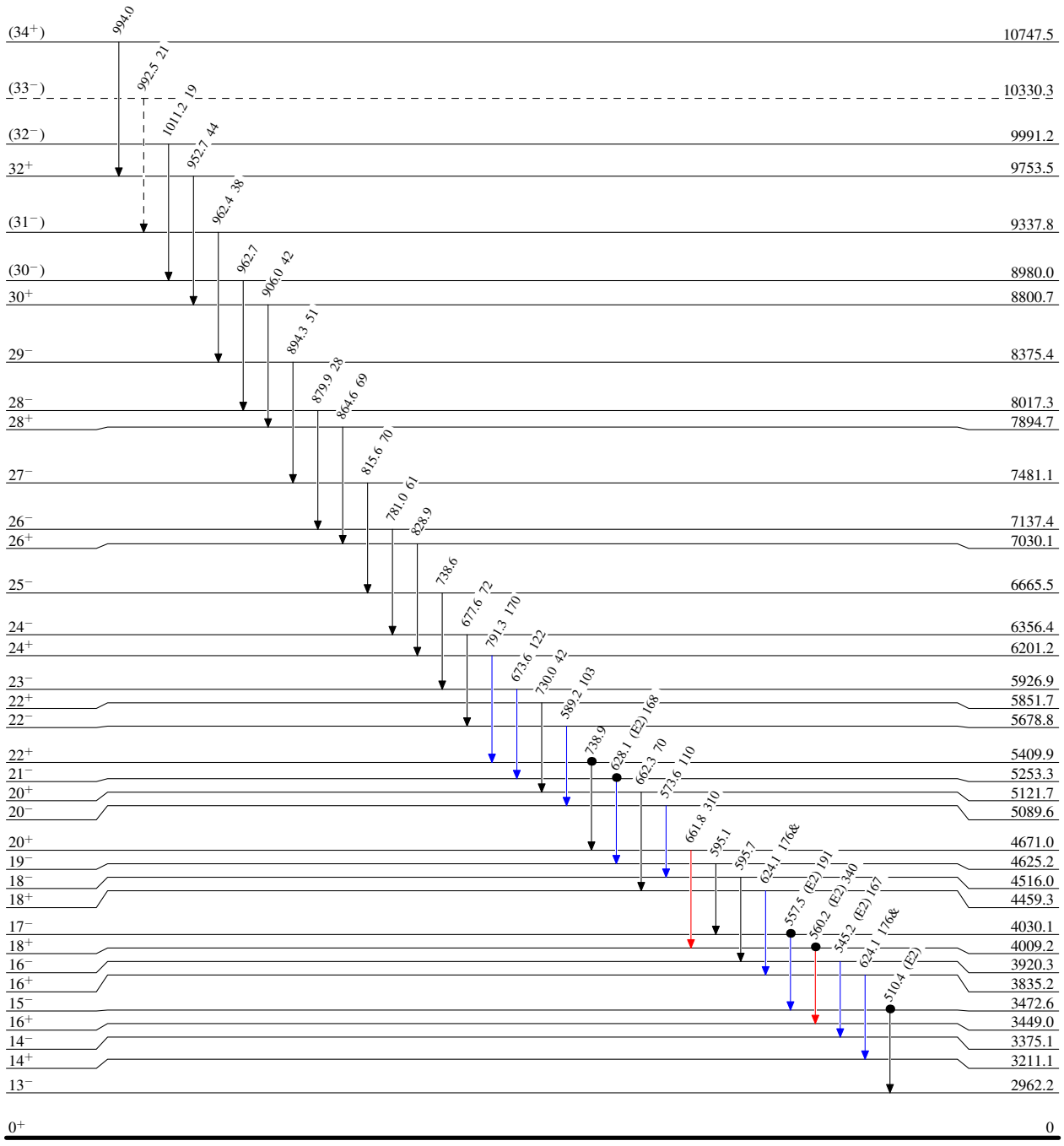
[c] Iγ=203 *10* for 828.9γ+829.3γ.
[d] Iγ=38 *4* for 962.4γ+962.7γ.
[e] Iγ=45 *5* for 994.0γ+995.8γ.
[f] Stretched Q from $\gamma(\theta)$; not M2 from RUL.
[g] Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on γ-ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.
[h] Multiply placed with undivided intensity.
[i] Placement of transition in the level scheme is uncertain.
[x] γ ray not placed in level scheme.

(HI,xnγ) 1987Bl06,1983Ag01,1977Bo14

Level Scheme

Intensities: Relative I_γ
& Multiply placed: undivided intensity given

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)
- Coincidence



6.77 min *30*

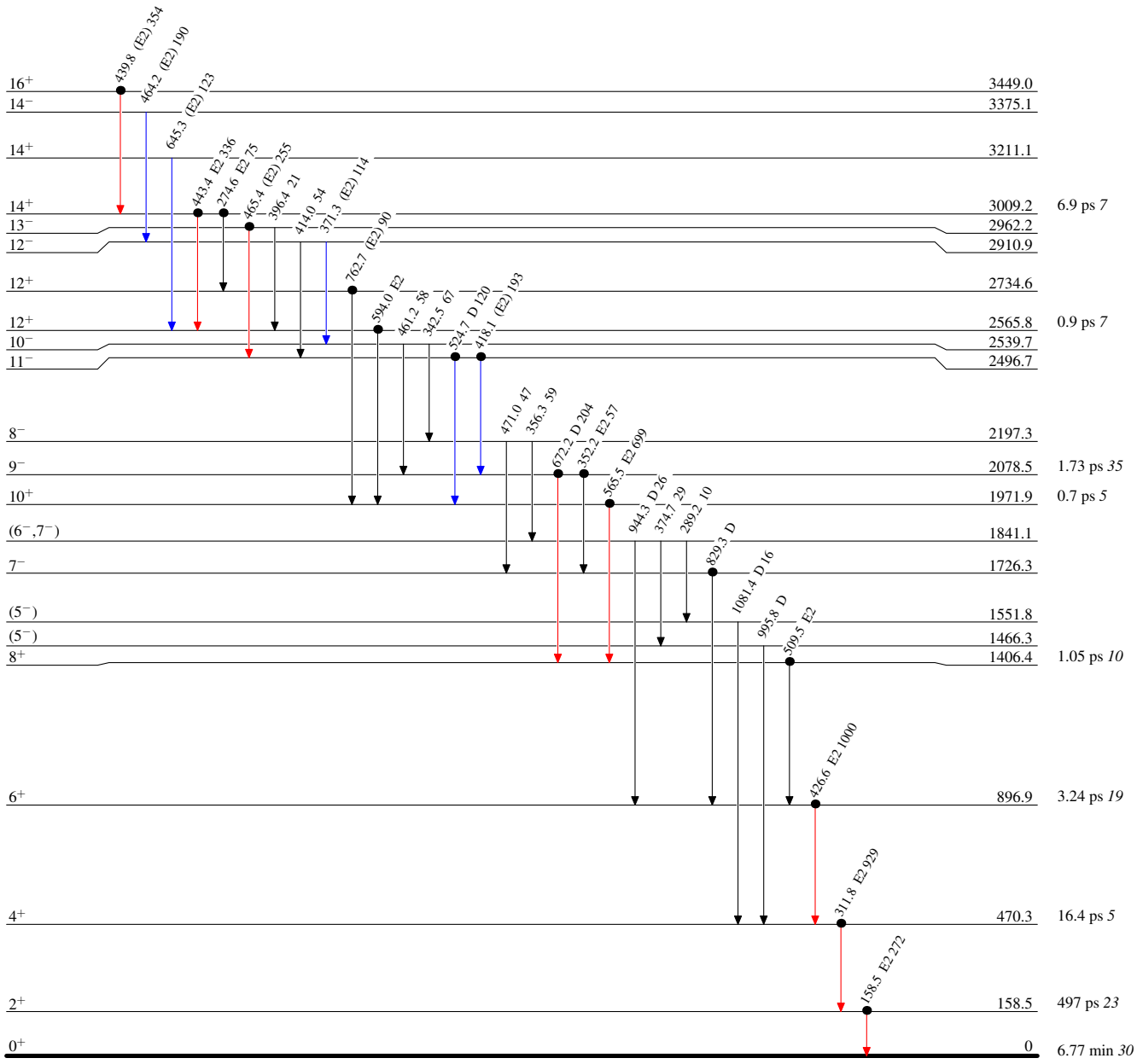
$^{166}_{72}Hf_{94}$

(HI,xnγ) 1987Bl06,1983Ag01,1977Bo14

Level Scheme (continued)

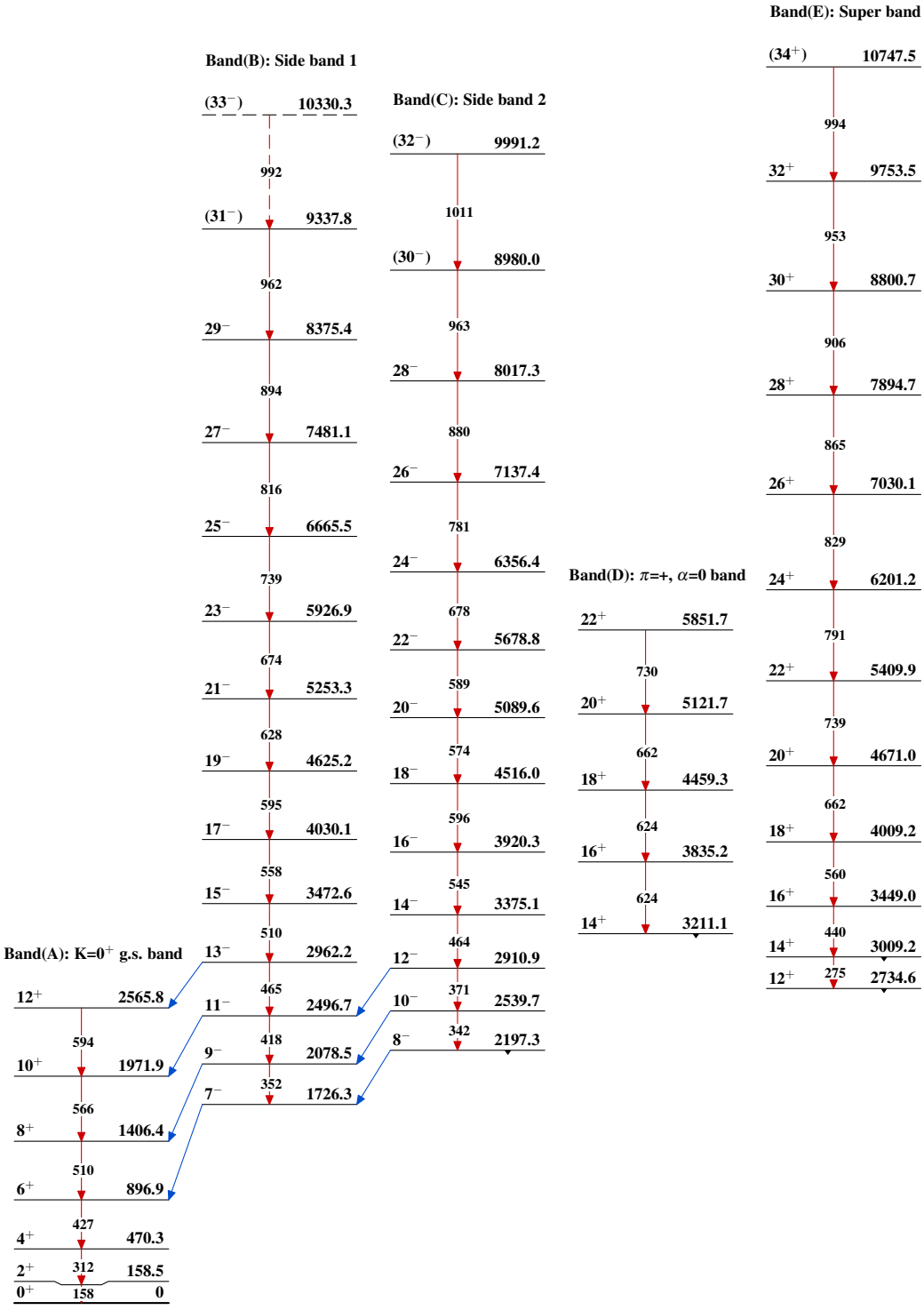
Intensities: Relative I_γ
& Multiply placed: undivided intensity given

Legend
$I_\gamma < 2\% \times I_\gamma^{max}$
$I_\gamma < 10\% \times I_\gamma^{max}$
$I_\gamma > 10\% \times I_\gamma^{max}$
Coincidence



$^{166}_{72}Hf_{94}$

(HI,xnγ) 1987Bl06,1983Ag01,1977Bo14



$^{166}_{72}Hf_{94}$