^{176}Yb(^{136}Xe,Xγ) 2012Hu10

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Jin Wu	NDS 206,1 (2025)	29-Oct-2024

XUNDL file compiled by B. Singh and E. Thiagalingam (McMaster), Jan 5, 2013.

2012Hu10: The excited states of ^{175}Tm were produced at Argonne National Laboratory via deep-inelastic reaction using a 820-MeV ^{136}Xe beam and the targets of ^{176}Yb (97% enriched), ^{176}Lu (47% enriched), ^{174}Yb (95% enriched), and ^{175}Lu (natural 97% 175Lu, 3% ^{176}Lu). The target thickness of ≈ 6 mg/cm^2 and the operated beam energy were used to maximize the yields. The deexcited γ rays were detected with the Gammasphere spectrometer consisting of 101 Compton-suppressed Ge detectors. Measured Eγ, Iγ, γ-γ coin., $\gamma\gamma$(t). Deduced E(level), J$^\pi$, T$_{1/2}$, $|\ g_K - g_R\ |$.

^{175}Tm Levels

The magnitude of g_K-g_R values deduced by 2012Hu10 assuming Q_0=7.4 *3*.

E(level)[†]	J$^\pi$[b]	T$_{1/2}$[‡]	Comments
0.0[@]	1/2$^+$		
0.1[@] *10*	3/2$^+$		
127.0[@] *10*	5/2$^+$		
129.0[@] *10*	7/2$^+$		
352.7[@] *11*	9/2$^+$		
358.5[@] *11*	11/2$^+$		
440.0[&] *10*	7/2$^-$	319 ns *35*	
532.0[&] *10*	9/2$^-$		
646.1[&] *10*	11/2$^-$		Magnitude g_K-g_R=0.86 *+9–7*.
674.5[@] *12*	13/2$^+$		
685.2[@] *11*	15/2$^+$		
782.9[&] *10*	13/2$^-$		Magnitude g_K-g_R=0.88 *+8–6*.
941.5[&] *10*	15/2$^-$		Magnitude g_K-g_R=0.85 *+15–10*.
946.7 *10*	15/2$^-$	44.4 ns *21*	
1004.8[a] *12*	17/2$^-$		
1083.3[@] *13*	17/2$^+$		
1103.6[@] *12*	19/2$^+$		
1123.1[&] *11*	17/2$^-$		Magnitude g_K-g_R=0.88 *+12–9*.
1174.8[#] *12*	(9/2$^-$)		Configuration of 9/2[514]: from analogy with ^{173}Tm.
1196.0[a] *12*	19/2$^-$		
1323.7[&] *11*	19/2$^-$		Magnitude g_K-g_R=1.03 *+22–14*.
1409.4[a] *12*	21/2$^-$		Magnitude g_K-g_R=0.45 *+4–3*.
1433.3[#] *11*			
1517.7 *12*	23/2$^+$	21 μs *14*	
1606.0[@] *12*	23/2$^+$		
1644.5[a] *12*	23/2$^-$		Magnitude g_K-g_R=0.46 *+17–8*.
1900.0[a] *12*	25/2$^-$		Magnitude g_K-g_R=0.48 *+43–15*.
2123.9[#] *11*			
2176.3[a] *14*	27/2$^-$		Magnitude g_K-g_R=0.67 *+24–12*.

[†] From least-squares fit to Eγ's.

[‡] From $\gamma\gamma$(t) (2012Hu10).

Continued on next page (footnotes at end of table)

^{176}Yb(^{136}Xe,Xγ) 2012Hu10 (continued)

^{175}Tm Levels (continued)

[#] Low-spin level populated from decay of ^{175}Er formed in reactions.
[@] Band(A): π1/2[411] band.
[&] Band(B): π7/2[523] band.
[a] Band(C): ΔJ=1 Band based on 17/2$^-$.
[b] From 2012Hu10.

^{176}Yb(^{136}Xe,Xγ) 2012Hu10 (continued)

$\gamma(^{175}Tm)$

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[†]	α[@]	Comments
(5.2)	<0.013	946.7	15/2$^-$	941.5	15/2$^-$	(M1)		701 *10*	α(M)=552 *8*; α(N)=129.3 *18*; α(O)=18.49 *26*; α(P)=0.993 *14* I_γ: from intensity balance.
58.2 *6*	22 *8*	1004.8	17/2$^-$	946.7	15/2$^-$	(M1+E2)	0.37 *+16−22*	5.3 *24*	α(exp)=5.3 *23* α(L)=4.1 *18*; α(M)=1.0 *4*; α(N)=0.22 *10*; α(O)=0.028 *11*; α(P)=0.00069 *7* Mult.: 2012Hu10 assigned M1 based on the comparison between calculated and measured ICC. δ: calculated by evaluator using α(exp).
87.4 *4*	1.3 *9*	440.0	7/2$^-$	352.7	9/2$^+$	E1		0.475 *9*	α(K)=0.392 *7*; α(L)=0.0651 *12*; α(M)=0.01452 *28*; α(N)=0.00332 *6*; α(O)=0.000436 *8* α(P)=1.715×10^{-5} *31*
91.9 *2*	26 *4*	532.0	9/2$^-$	440.0	7/2$^-$				
108.3 *1*	100 *6*	1517.7	23/2$^+$	1409.4	21/2$^-$	E1		0.270 *4*	α(exp)=0.26 *4* α(K)=0.2243 *32*; α(L)=0.0359 *5*; α(M)=0.00800 *11*; α(N)=0.001836 *26*; α(O)=0.0002446 *35* α(P)=1.011×10^{-5} *14*
114.1 *1*	38 *5*	646.1	11/2$^-$	532.0	9/2$^-$	[M1+E2]	0.17 *3*	2.118 *30*	α(K)=1.752 *27*; α(L)=0.285 *7*; α(M)=0.0641 *18*; α(N)=0.0150 *4*; α(O)=0.00212 *5* α(P)=0.0001070 *17*
126.9[‡] *3*	22.1[‡] *24*	127.0	5/2$^+$	0.1	3/2$^+$				
127[‡] *1*	[‡]	127.0	5/2$^+$	0.0	1/2$^+$				
128.8 *2*	30 *3*	129.0	7/2$^+$	0.1	3/2$^+$				
136.8 *1*	42 *5*	782.9	13/2$^-$	646.1	11/2$^-$	[M1+E2]	0.16 *2*	1.261 *18*	α(K)=1.048 *15*; α(L)=0.1657 *27*; α(M)=0.0371 *6*; α(N)=0.00867 *15*; α(O)=0.001233 *19* α(P)=6.40×10^{-5} *10*
158.6 *2*	3.8 *6*	941.5	15/2$^-$	782.9	13/2$^-$	[M1+E2]	0.17 *5*	0.828 *13*	α(K)=0.690 *12*; α(L)=0.1080 *23*; α(M)=0.0242 *6*; α(N)=0.00565 *13*; α(O)=0.000805 *15* α(P)=4.21×10^{-5} *8*
163.8 *1*	57 *4*	946.7	15/2$^-$	782.9	13/2$^-$	M1		0.763 *11*	α(exp)=0.70 *8* α(K)=0.640 *9*; α(L)=0.0963 *14*; α(M)=0.02145 *30*; α(N)=0.00502 *7*; α(O)=0.000722 *10* α(P)=3.92×10^{-5} *6* δ: 0.6 *6* (M1+E2) calculated by evaluator using α(exp).
181.6 *3*		1123.1	17/2$^-$	941.5	15/2$^-$	[M1+E2]	0.17 *4*	0.566 *9*	α(K)=0.472 *8*; α(L)=0.0731 *12*; α(M)=0.01635 *28*; α(N)=0.00382 *7*; α(O)=0.000546 *9* α(P)=2.88×10^{-5} *5*
191.2 *1*	82 *7*	1196.0	19/2$^-$	1004.8	17/2$^-$				
200.5 *5*		1323.7	19/2$^-$	1123.1	17/2$^-$	[M1+E2]	0.14 *4*	0.431 *7*	α(K)=0.361 *6*; α(L)=0.0550 *9*; α(M)=0.01228 *20*; α(N)=0.00287 *5*; α(O)=0.000411 *7* α(P)=2.20×10^{-5} *4*

$^{175}_{69}Tm_{106}$-3

^{176}Yb(^{136}Xe,Xγ) 2012Hu10 (continued)

γ(^{175}Tm) (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Mult.[#]	δ[†]	α[@]	Comments
206.2 *2*	4.2 *8*	646.1	11/2$^-$	440.0	7/2$^-$				
213.4 *1*	84 *7*	1409.4	21/2$^-$	1196.0	19/2$^-$	[M1+E2]	0.31 *4*	0.352 *6*	α(K)=0.292 *6*; α(L)=0.0469 *7*; α(M)=0.01053 *16*; α(N)=0.00246 *4*; α(O)=0.000348 *5* α(P)=1.77×10^{-5} *4*
224 *1*	0.7 *5*	352.7	9/2$^+$	129.0	7/2$^+$				
226 *1*	0.7 *5*	352.7	9/2$^+$	127.0	5/2$^+$				
229.5 *2*		358.5	11/2$^+$	129.0	7/2$^+$				
235.1 *3*		1644.5	23/2$^-$	1409.4	21/2$^-$	[M1+E2]	0.30 *13*	0.270 *10*	α(K)=0.224 *10*; α(L)=0.0354 *6*; α(M)=0.00794 *15*; α(N)=0.001855 *34*; α(O)=0.000263 *4* α(P)=1.36×10^{-5} *7*
249 *1*	0.9 *5*	1196.0	19/2$^-$	946.7	15/2$^-$				
250.9 *2*	10.5 *15*	782.9	13/2$^-$	532.0	9/2$^-$				
255.5 *4*		1900.0	25/2$^-$	1644.5	23/2$^-$	[M1+E2]	0.29 *26*	0.215 *17*	α(K)=0.179 *17*; α(L)=0.0280 *4*; α(M)=0.00626 *11*; α(N)=0.001462 *24*; α(O)=0.000208 *4* α(P)=1.09×10^{-5} *12*
259 *1*		1433.3		1174.8	(9/2$^-$)				
276 *1*		2176.3	27/2$^-$	1900.0	25/2$^-$	[M1+E2]	0.21 *10*	0.178 *5*	α(K)=0.149 *5*; α(L)=0.0226 *4*; α(M)=0.00504 *9*; α(N)=0.001178 *20*; α(O)=0.0001687 *32* α(P)=9.01×10^{-6} *31*
295.4 *2*	1.8 *4*	941.5	15/2$^-$	646.1	11/2$^-$				
300.6 *1*	25.5 *18*	946.7	15/2$^-$	646.1	11/2$^-$	E2		0.0710 *10*	α(K)=0.0514 *7*; α(L)=0.01515 *21*; α(M)=0.00357 *5*; α(N)=0.000820 *12*; α(O)=0.0001042 *15* α(P)=2.63×10^{-6} *4*
311.0 *2*	74 *8*	440.0	7/2$^-$	129.0	7/2$^+$	E1		0.01759 *25*	α(K)=0.01483 *21*; α(L)=0.002158 *30*; α(M)=0.000478 *7*; α(N)=0.0001109 *16* α(O)=1.549×10^{-5} *22*; α(P)=7.61×10^{-7} *11*
313.0 *2*	55 *6*	440.0	7/2$^-$	127.0	5/2$^+$	E1		0.01732 *24*	α(K)=0.01460 *21*; α(L)=0.002123 *30*; α(M)=0.000470 *7*; α(N)=0.0001092 *15* α(O)=1.525×10^{-5} *21*; α(P)=7.50×10^{-7} *11*
316 *1*		674.5	13/2$^+$	358.5	11/2$^+$				
321.7 *2*	5.3 *10*	1517.7	23/2$^+$	1196.0	19/2$^-$				
322 *1*		674.5	13/2$^+$	352.7	9/2$^+$				
326.7 *3*		685.2	15/2$^+$	358.5	11/2$^+$				
340.2 *3*		1123.1	17/2$^-$	782.9	13/2$^-$				Iγ(340.2)/Iγ(181.6)=0.66 *15* from in-beam data.
382.2 *4*		1323.7	19/2$^-$	941.5	15/2$^-$				Iγ(382.2)/Iγ(200.5)=0.69 *22* from in-beam data.
398 *1*		1083.3	17/2$^+$	685.2	15/2$^+$				
404.6 *2*	12.6 *16*	1409.4	21/2$^-$	1004.8	17/2$^-$				
409 *1*		1083.3	17/2$^+$	674.5	13/2$^+$				
418.4 *4*		1103.6	19/2$^+$	685.2	15/2$^+$				
440 *1*	1.3 *8*	440.0	7/2$^-$	0.1	3/2$^+$	M2		0.1758 *28*	α(K)=0.1431 *22*; α(L)=0.0253 *4*; α(M)=0.00576 *9*; α(N)=0.001352

$^{175}_{69}Tm_{106}$-4

^{176}Yb(^{136}Xe,Xγ) 2012Hu10 (continued)

$\gamma(^{175}Tm)$ (continued)

E_γ	I_γ	E_i(level)	J_i^π	E_f	J_f^π	Comments
						21; α(O)=0.0001927 *31* α(P)=1.002×10^{-5} *16*
448.5 *3*		1644.5	23/2$^-$	1196.0	19/2$^-$	Iγ(448.5)/Iγ(235.1)=0.32 *14* from in-beam data.
490.6 *4*		1900.0	25/2$^-$	1409.4	21/2$^-$	Iγ(490.6)/Iγ(255.5)=0.47 *43* from in-beam data.
502.4 *4*		1606.0	23/2$^+$	1103.6	19/2$^+$	
513 *1*	1.2 *7*	1517.7	23/2$^+$	1004.8	17/2$^-$	
532 *1*		2176.3	27/2$^-$	1644.5	23/2$^-$	Iγ(532)/Iγ(276)=0.36 *16* from in-beam data.
643 *1*		1174.8	(9/2$^-$)	532.0	9/2$^-$	
690.6 *3*		2123.9		1433.3		
735 *1*		1174.8	(9/2$^-$)	440.0	7/2$^-$	
993.3 *3*		1433.3		440.0	7/2$^-$	

† Deduced by 2012Hu10 from in-band gamma-ray energy and intensity data using rotational band formulas.
‡ Unseparated Doublet, total intensity of doublet is 22.1 *24*.
# From 2012Hu10.
@ Additional information 1.

$^{175}_{69}Tm_{106}$-5

^{176}Yb(^{136}Xe,Xγ) 2012Hu10

Level Scheme

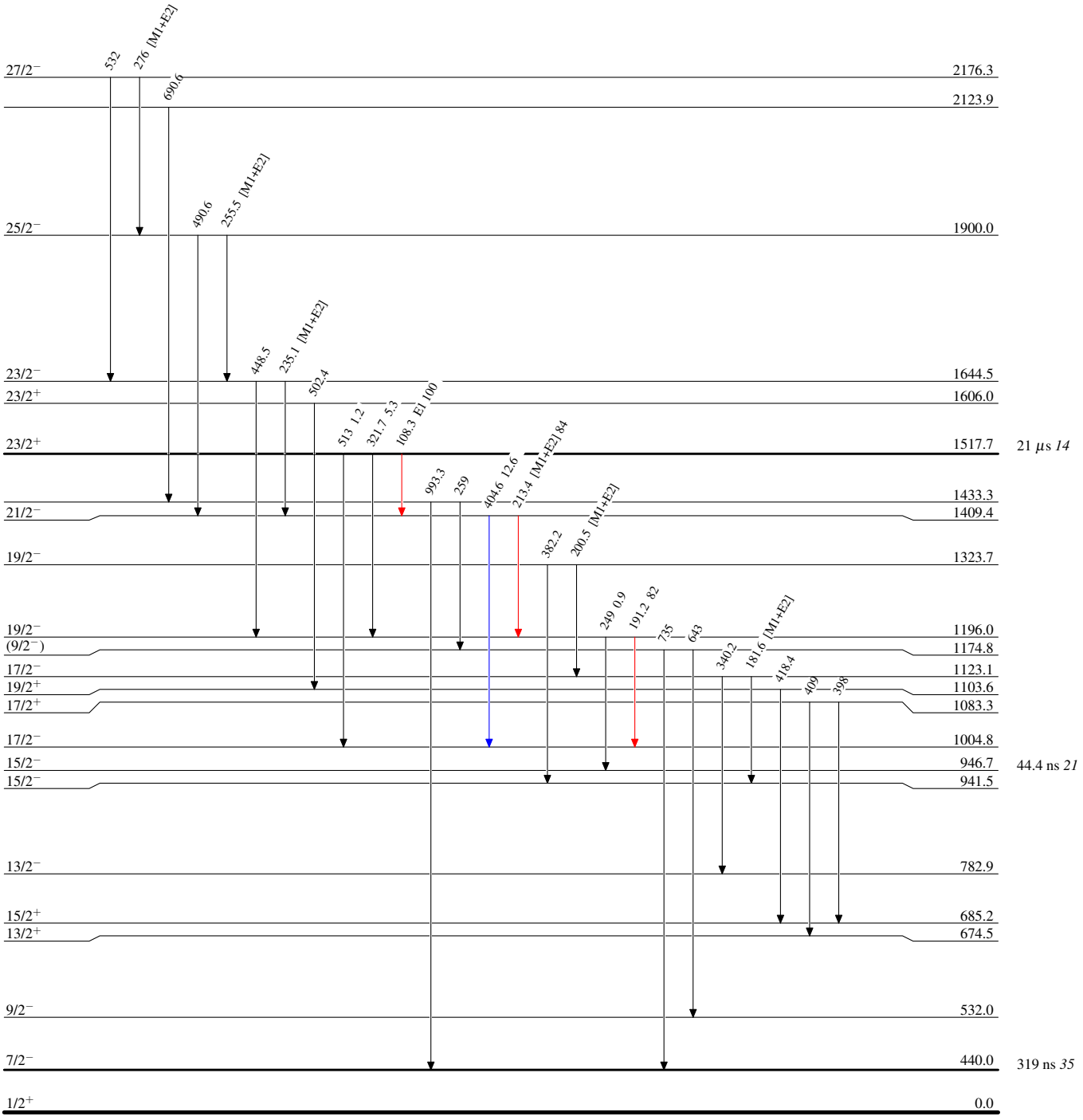
Intensities: Relative I_γ

Legend

$I_\gamma < 2\% \times I_\gamma^{max}$

$I_\gamma < 10\% \times I_\gamma^{max}$

$I_\gamma > 10\% \times I_\gamma^{max}$

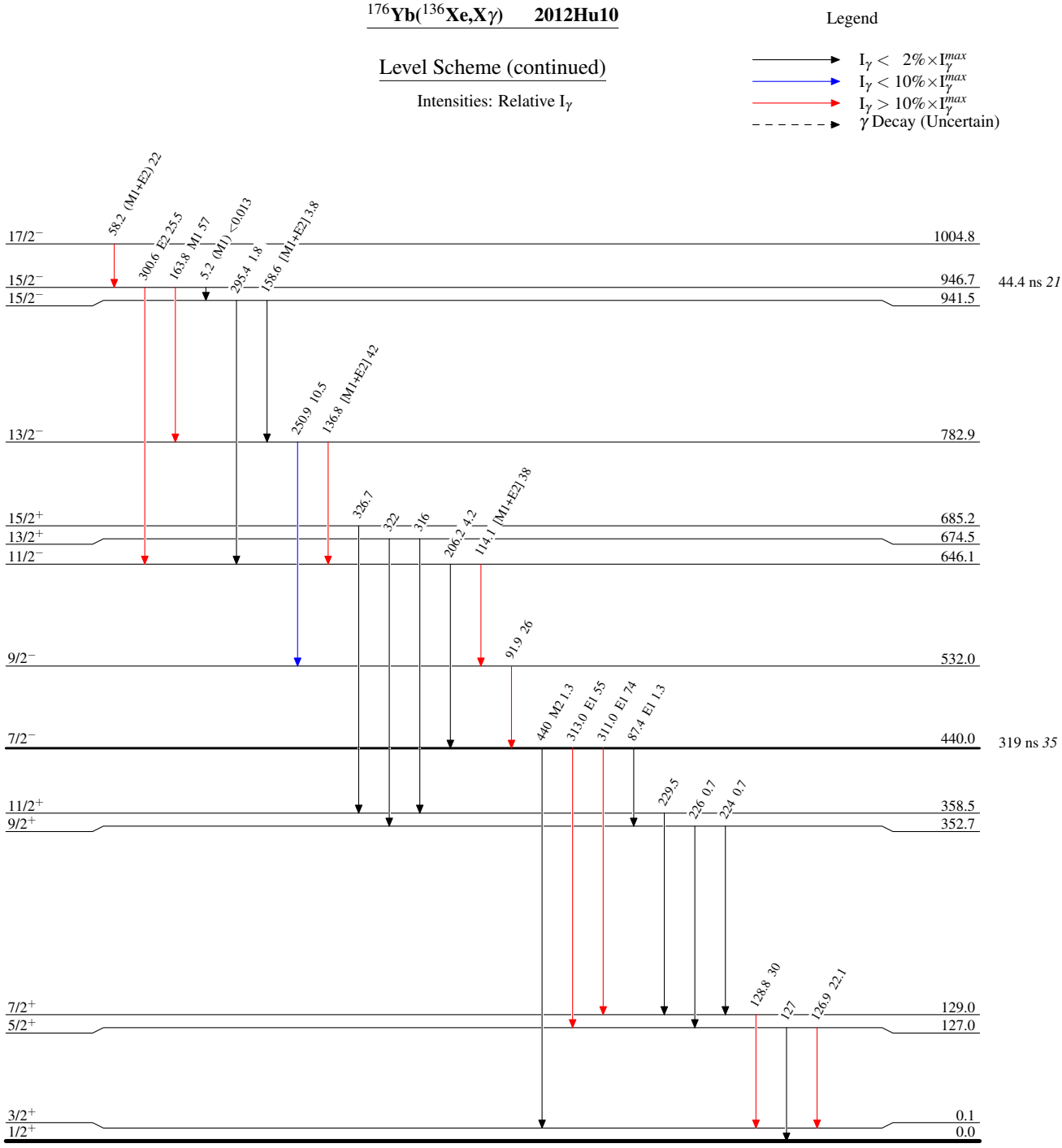


$^{175}_{69}Tm_{106}$

^{176}Yb(^{136}Xe,Xγ) 2012Hu10

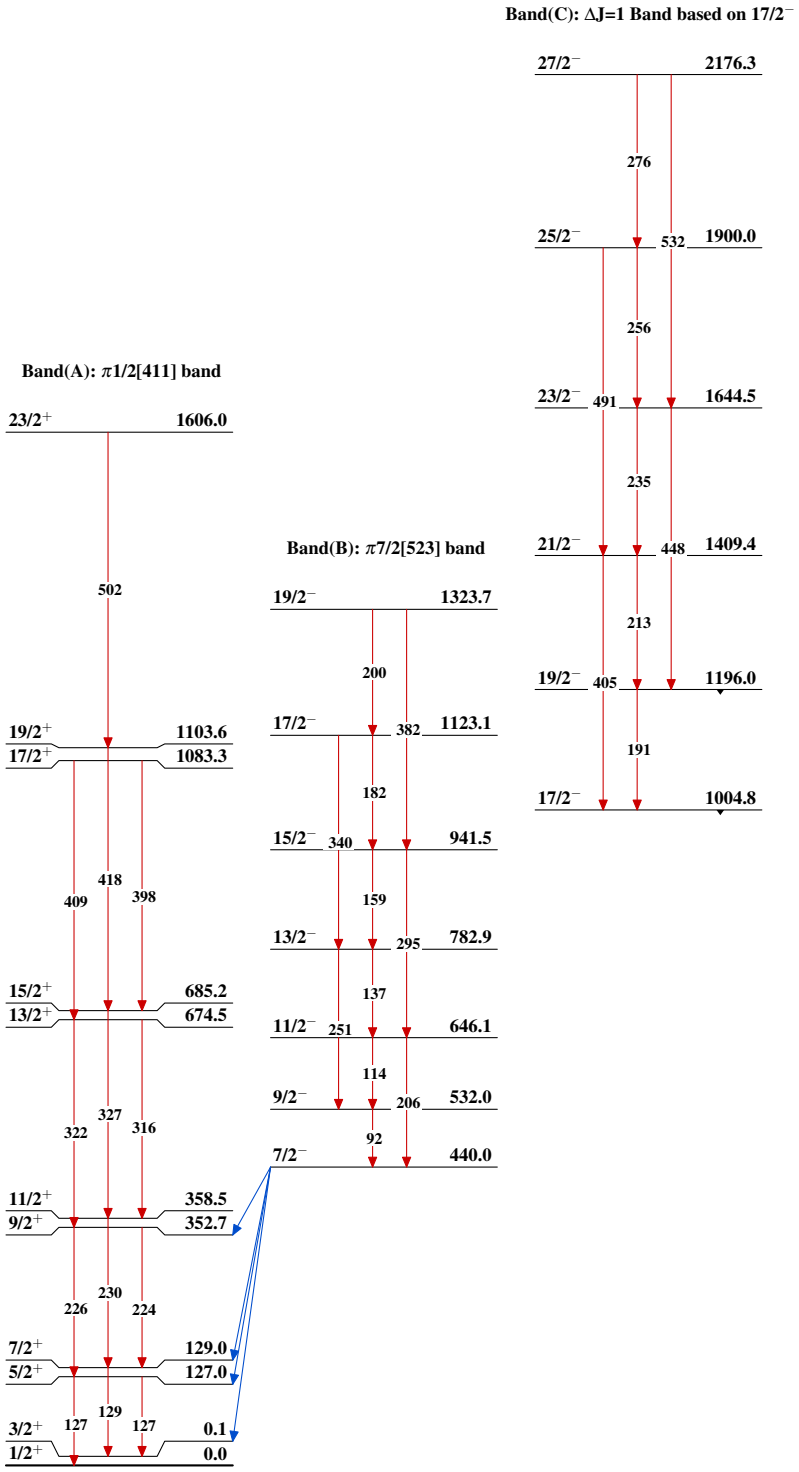
Level Scheme (continued)

Intensities: Relative I_γ



$^{175}_{69}Tm_{106}$

^{176}Yb(^{136}Xe,Xγ) 2012Hu10



$^{175}_{69}Tm_{106}$