Adopted Levels, Gammas

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	Coral M. Baglin	NDS 134, 149 (2016)	15-Apr-2015

Q(β^-)=−9016 *30*; S(n)=11.35×10^3 *6*; S(p)=300 *14*; Q(α)=5976 *9* 2012Wa38
Q(εp)=4425 *22* (2012Wa38).
Production: ^{187}Bi α decay (1999Ba45); ^{108}Pd(^{78}Kr,p2nγ), E=340 MeV (2000Re04); ^{144}Sm(^{42}Ca,p2nγ), E=209 MeV (2001Mu26) and E=195, 200 MeV (2004Ra28).
For calculation of $T_{1/2}$ using generalized liquid drop model, see 2013Ni01.

^{183}Tl Levels

Δ<r^2>,μ: from In-source LASER spectroscopic measurements by 2013Ba41. ^{183}Tl from 1 GeV proton bombardment of 91 gm/cm^2 uranium monocarbide target; two-step resonant ionization using a narrow-band scanning dye LASER tuned to a 276.9 nm transition followed by copper vapor LASER to ionize the Tl atom into the continuum; 554 nm fundamental LASER wavelength produced with Rhodamine 110 dye solution; frequency doubled using nonlinear β-barium borate crystal.

Cross Reference (XREF) Flags

A	^{187}Bi α decay (38 ms)	D	^{144}Sm(^{42}Ca,p2nγ):E=195,200 MeV
B	^{187}Bi α decay (0.370 ms)	E	^{144}Sm(^{42}Ca,p2nγ):E=209 MeV
C	^{108}Pd(^{78}Kr,p2nγ)		

E(level)[†]	J$^\pi$[‡]	$T_{1/2}$	XREF	Comments
0.0	(1/2$^+$)	6.9 s *7*	AB	%ε+%β^+>0; %α=? μ=1.62 *4* (2013Ba41) μ: HFA correction included. Δ<r^2>=−1.056 *74* (2013Ba41). systematic uncertainty (due to scaling uncertainties of electronic factor and specific mass shift) is shown here; the statistical uncertainty (arising from isotope shift uncertainties) is 28 (2013Ba41). for isotope shift for 276.9 nm transition and magnetic hfs constants, see 2013Ba41. %ε+%β^+: ε decay observed (1992BoZO,1992BlZW,1999Ba45). J$^\pi$: from systematics of heavier odd-A Tl isotopes. $T_{1/2}$: from K x ray(Hg)(t) (1992BoZO,1992BlZW). Other: 6.9 s *14* from accumulation of α line from ^{183}Hg α decay following ^{183}Tl ε decay (1992BoZO).
273? *1*	(3/2$^+$)		A	E(level): from Eγ in ^{187}Bi α decay (38 ms). J$^\pi$: E is consistent with energy systematics for (π d$_{3/2}$)$^{-1}$ levels in ^{185}Tl through ^{201}Tl (E=285 to 385) (2001Mu26); population in ^{187}Bi α decay (38 ms) is consistent with observations for h$_{9/2}$ to d$_{3/2}$ transitions from heavier odd-A Bi isotopes (1999Ba45).
628.7	(9/2$^-$)	53.3 ms *3*	A DE	%α=1.5 *3*; %ε+%β^+=?; %IT=? %α: from 2006An11. other:≈1.5, tentative value based on one correlated 7000α(^{187}Bi)−6380α(^{183}Tl) event (1999Ba45). Decays by 6333?α, 6384α and 6456α (2006An11). %IT: from systematics, this level would be expected to deexcite via an E3 transition to the d$_{3/2}$ state, but such a transition has yet to be identified. E(level): from private communication from A.N. Andreyev to 2011Ve01, uncertainty unstated by 2011Ve01 In ^{187}Bi α decay (38 ms). E=625 *7* from energy difference between α group feeding this state and that feeding the g.s.. $T_{1/2}$: from ^{144}Sm(^{42}Ca,p2nγ):E=195 MeV (2004Ra28; α-recoil(t)). Other: 60 ms *15* from ^{183}Tl α decay (1980Sc09). J$^\pi$: allowed α decay from (9/2$^-$) ^{187}Bi; supported by systematics of heavier odd-A Tl isotopes (see 2001Mu26). Probable configuration=(π h$_{9/2}$); oblate state.
905.69 *23*	(11/2$^-$)		DE	J$^\pi$: Possible (π h$_{11/2}$)$^{-1}$ bandhead (2001Mu26), based on energy systematics for

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Adopted Levels, Gammas (continued)

^{183}Tl Levels (continued)

E(level)[†]	J^{π}[‡]	$T_{1/2}$	XREF	Comments
				heavier odd-A Tl isotopes.
927.70[@] 25	(9/2$^-$)		D	
975.01[#] 23	(13/2$^+$)	1.48 μs 10	CDE	%IT=100 $T_{1/2}$: from spectrum of time difference between detection of recoil and 347γ in (^{42}Ca,p2nγ):E=209 MeV. Other: 1.3 μs 4 from (^{42}Ca,p2nγ):E=209 MeV.
1027.70[@] 25	(13/2$^-$)		D	
1095.7[a] 5	(11/2$^-$)		DE	
1134.8[#] 4	(17/2$^+$)		CDE	
1160.0[&] 4	(13/2$^-$)		D	
1332.7[@] 4	(17/2$^-$)		D	
1394.8[#] 5	(21/2$^+$)		CDE	
1442.4[a] 6	(15/2$^-$)		D	
1467.5[&] 5	(15/2$^-$)		D	
1597.0 6			D	
1669.3 7			D	
1713.7[@] 5	(21/2$^-$)		D	
1749.6[#] 6	(25/2$^+$)		C E	
1855.3[a] 8	(19/2$^-$)		D	
2168.8[@] 7	(25/2$^-$)		D	
2188.5[#] 8	(29/2$^+$)		CDE	
2268.0 8			D	
2337.1[a] 10	(23/2$^-$)		D	
2344.6 8			D	
2688.7[@] 9	(29/2$^-$)		D	
2703.0[#] 9	(33/2$^+$)		CDE	
2882.8[a] 11	(27/2$^-$)		D	
3284.3[#] 11	(37/2$^+$)		CD	
3315.8[@] 10	(33/2$^-$)		CD	
3925.1[#] 12	(41/2$^+$)		CD	
0+x[b]			D	Additional information 1. Possible γ to 902 level.
257.2+x[b] 3			D	
406.5+x[b] 5			D	Possible γ to 1156 level.
579.1+x[b] 6			D	
807.5+x[b] 6			D	
1035.9+x[b] 7			D	

† Based on measured Eγ, except as noted. For E(level)>630, energies are expressed relative to E=628.7 for the (9/2$^-$) level; note that the uncertainty in that level energy is unknown.

‡ Values given without comment are from (^{78}Kr,p2nγ) and/or (^{42}Ca,p2nγ) and are based on deduced band structure in comparison with that known for heavier Tl isotopes.

\# Band(A): (π $i_{13/2}$) α=+1/2 yrast band (2000Re04). 2001Mu26 suggest that this is the prolate $i_{13/2}$ band, but energy systematics for heavier Tl isotopes predict almost the same energy for the expected oblate and prolate $i_{13/2}$ states.

@ Band(B): π$h_{9/2}$ α=+1/2 prolate band (?). Band assignment based on systematics, for example, in ^{185,187}Tl. Band parameters: E_0=867, α=7.4 (J=13/2,15/2,17/2) for poor fit.

& Band(C): π$h_{9/2}$ oblate band. Band parameters: E_0=576, α=20.5 (J=13/2,15/2).

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Adopted Levels, Gammas (continued)

^{183}Tl Levels (continued)

[a] Band(D): $\pi f_{7/2}$ α=−1/2 prolate band (?). Band assignment based on systematics, e.g., ^{185,187}Tl. Band parameters: E_0=798, α=12.9, B_0=−9.3 (J=11/2,15/2,19/2,23/2).
[b] Band(E): Tentative γ sequence.

γ(^{183}Tl)

E_i(level)	J^π_i	E_γ[‡]	I_γ[‡]	E_f	J^π_f	Mult.[#]	α[†]	Comments
273?	(3/2+)	273 *1*	100	0.0	(1/2+)	(M1)	0.508 *9*	E_γ: from α decay (38 ms). Mult.: from α(K)exp=0.55 *15* in ^{187}Bi α decay (38 ms).
905.69	(11/2−)	276.7 *3*	100	628.7	(9/2−)	[M1]	0.489	other Eγ: 277.4 *5* from ^{144}Sm(^{42}Ca,p2nγ):E=209 MeV. Mult.: intensity balance at the 906 level is achieved if the 69γ and 277γ are assumed to have E1 and M1 multipolarity, respectively, in (^{42}Ca,p2nγ).
927.70	(9/2−)	299.0 *3*	100	628.7	(9/2−)	[E2+M1]	0.25 *15*	
975.01	(13/2+)	69.2 *2*	26[@] *10*	905.69	(11/2−)	[E1]	0.239	B(E1)(W.u.)=4.9×10^{-8} *20* Mult.: see comment on 277γ.
		346.6 *3*	100[@] *11*	628.7	(9/2−)	[M2]	0.923	B(M2)(W.u.)=0.057 *10* Mult.: if M2, hindrance would be comparable to that for 13/2+ to 9/2− transitions in ^{195}Bi and ^{197}At (2001Mu26).
1027.70	(13/2−)	100.0 *3*	10 *5*	927.70	(9/2−)	[E2]	5.92 *12*	
		399.0 *3*	100 *50*	628.7	(9/2−)			
1095.7	(11/2−)	467.0 *5*	100	628.7	(9/2−)			
1134.8	(17/2+)	159.8 *3*	100	975.01	(13/2+)	(E2)	0.914 *15*	
1160.0	(13/2−)	254.3 *3*	100	905.69	(11/2−)	[M1]	0.617	
1332.7	(17/2−)	305.0 *3*	100	1027.70	(13/2−)			
1394.8	(21/2+)	260.0 *3*	100	1134.8	(17/2+)			other Eγ: 259.7 from (^{78}Kr,p2nγ).
1442.4	(15/2−)	346.7 *3*	100	1095.7	(11/2−)			
1467.5	(15/2−)	307.5 *3*	100	1160.0	(13/2−)			
1597.0		622.0[&] *5*	<100	975.01	(13/2+)			
1669.3		534.5 *5*	100	1134.8	(17/2+)			E_γ: from table III of 2004Ra28; 534.6 in authors′ figure 6.
1713.7	(21/2−)	381.0 *3*	100	1332.7	(17/2−)			
1749.6	(25/2+)	354.8 *3*	100	1394.8	(21/2+)			
1855.3	(19/2−)	412.9 *5*	100	1442.4	(15/2−)			
2168.8	(25/2−)	455.1 *5*	100	1713.7	(21/2−)			
2188.5	(29/2+)	438.9 *5*	100	1749.6	(25/2+)	(E2)	0.0388	other Eγ: 439.4 *5* from (^{42}Ca,p2nγ):E=209 MeV.
2268.0		518.4 *5*	100	1749.6	(25/2+)			
2337.1	(23/2−)	481.8 *5*	100	1855.3	(19/2−)			
2344.6		595.0 *5*	100	1749.6	(25/2+)			
2688.7	(29/2−)	519.9 *5*	100	2168.8	(25/2−)			
2703.0	(33/2+)	514.5 *5*		2188.5	(29/2+)			
2882.8	(27/2−)	545.7 *5*		2337.1	(23/2−)			
3284.3	(37/2+)	581.3 *5*	100	2703.0	(33/2+)			other Eγ: 582.4 from (^{78}Kr,p2nγ).
3315.8	(33/2−)	627.1 *5*		2688.7	(29/2−)			
3925.1	(41/2+)	640.8 *5*	100	3284.3	(37/2+)			
257.2+x		257.2 *3*	100	0+x				
406.5+x		149.3 *3*	100	257.2+x				
579.1+x		172.6 *3*	100	406.5+x				

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Adopted Levels, Gammas (continued)

γ(^{183}Tl) (continued)

E_i(level)	E_γ‡	I_γ‡	E_f
807.5+x	228.4 *3*	100	579.1+x
1035.9+x	228.4 *3*	100	807.5+x

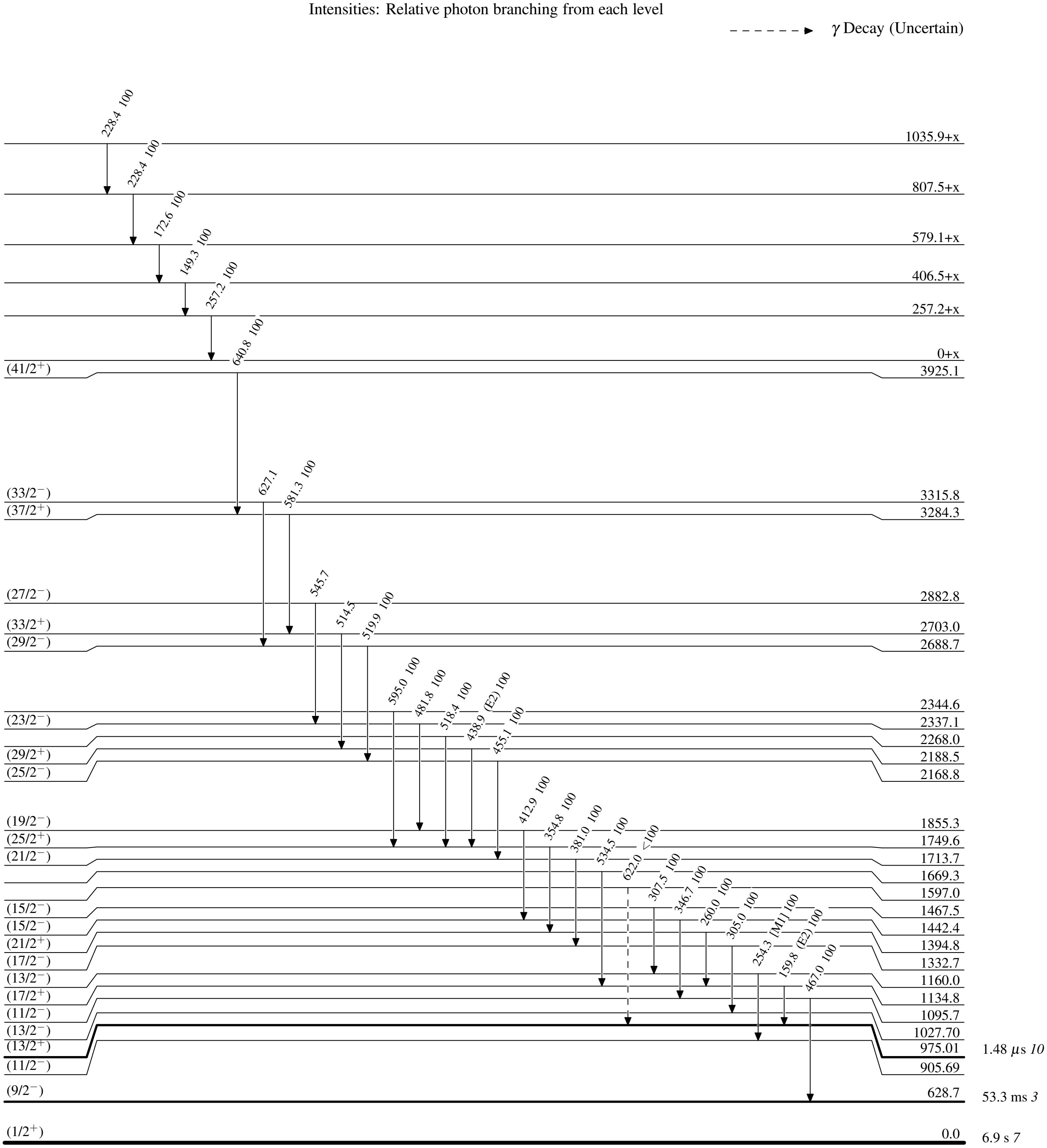
† Additional information 2.
‡ From ^{144}Sm(^{42}Ca,p2nγ):E=195,200 MeV, except as noted.
# From ^{144}Sm(^{42}Ca,p2nγ):E=209 MeV, assigning $\Delta\pi$=(No) for intraband transitions, except As noted.
@ From ^{144}Sm(^{42}Ca,p2nγ):E=209 MeV.
& Placement of transition in the level scheme is uncertain.

Adopted Levels, Gammas

Legend

Level Scheme

Intensities: Relative photon branching from each level

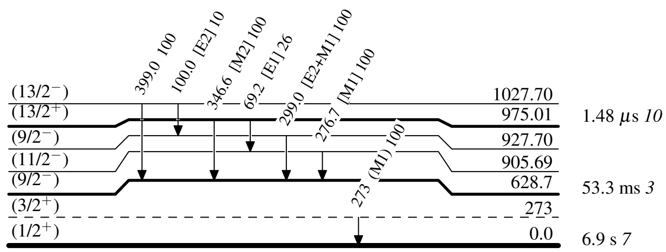


$^{183}_{81}Tl_{102}$

Adopted Levels, Gammas

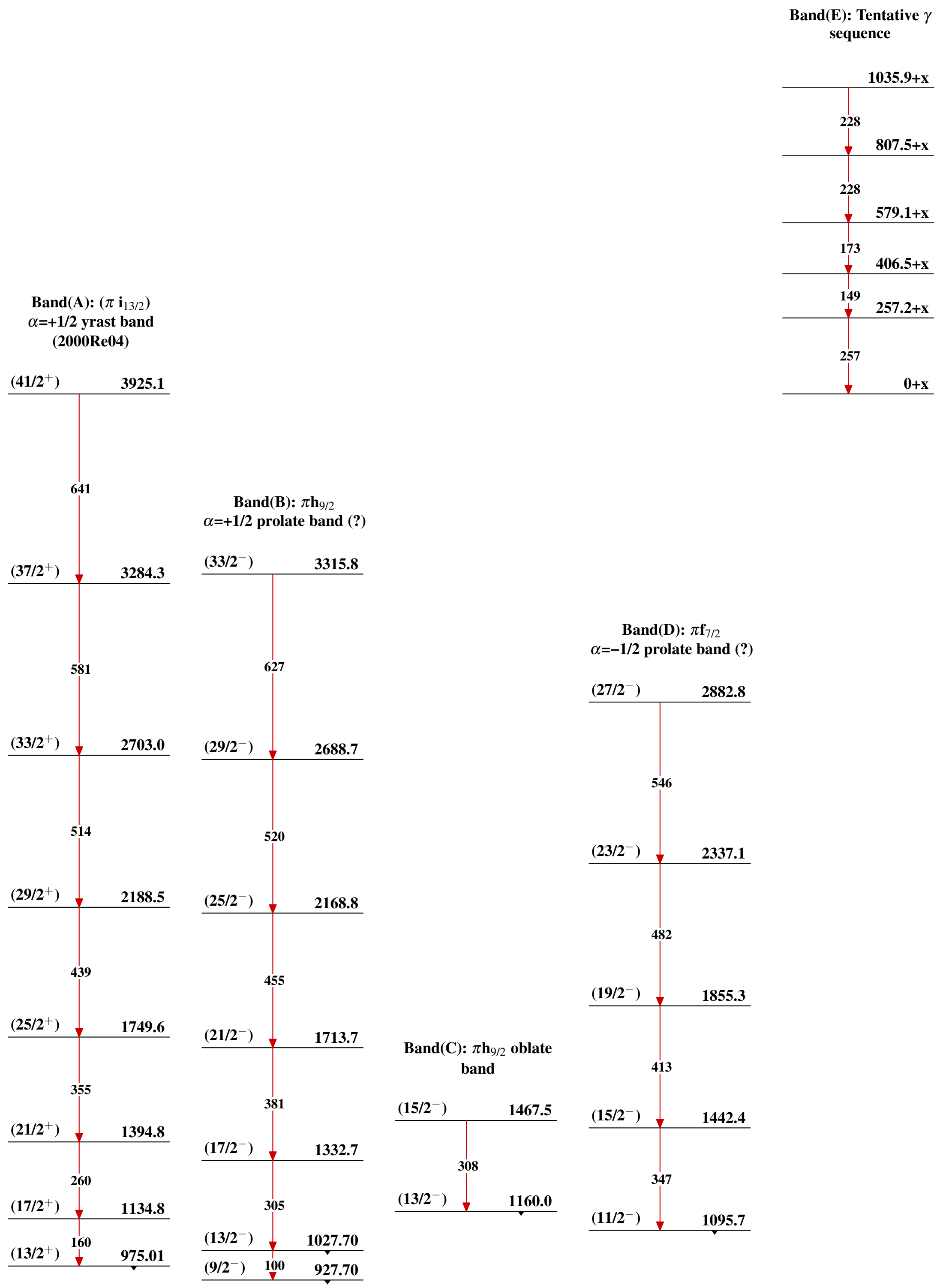
Level Scheme (continued)

Intensities: Relative photon branching from each level



$^{183}_{81}Tl_{102}$

Adopted Levels, Gammas



$^{183}_{81}Tl_{102}$