Adopted Levels, Gammas

History			
Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	31-Mar-2022

Q(β^-)=3010 *60*; S(n)=6360 *80*; S(p)=7760 *80*; Q(α)=40×10[1] *10* 2021Wa16
S(2n)=11640 *60*, S(2p)=17510 *310* (syst) (2021Wa16).

1999Be63: ^{187}Ta produced and identified in ^{9}Be(^{197}Au,X), E(^{197}Au)=950 MeV/nucleon pulsed beam at the SIS synchrotron of GSI. Fragments of interest separated by Bπ-TOF-ΔE method using FRS fragment separator, two position-sensitive scintillation detectors, time-of-flight, and multi-sampling ionization chambers (MUSICs). Measured production cross section.

2010Re07, 2012Re19 (also 2012ReZZ thesis, 2011St21, 2000PoZY): Schottky mass spectrometry technique used to measure masses and identify high-spin isomers. ^{187}Ta g.s. and isomers were produced in ^{9}Be(^{197}Au,X),E(^{197}Au=478-492 MeV/nucleon and ^{9}Be(^{208}Pb,X),E=1 GeV/nucleon reactions at the UNILAC-SIS facility of GSI. Target=^{9}Be 1035 mg/cm^2 with a 221 mg/cm^2 niobium backing. Mostly bare atoms of highly-charged reaction products were separated with FRS and injected into the storage ring ESR. The ions were stochastically and electron cooled. Deduced masses from Schottky spectra; and identified high-spin isomers, with ^{187}Ta in 73$^+$ charge state, i.e. bare ion.

2013Sh30: measured masses by Schottky mass spectrometry (SMS) technique using FRS-ESR facility at GSI.

^{187}Ta Levels

Cross Reference (XREF) Flags

A ^{187}Ta IT decay (7.3 s)

E(level)	J$^\pi$[†]	T$_{1/2}$	XREF	Comments
0.0	(7/2$^+$)	283 s *10*	A	%β^-=100 Number of ions detected=102 (2010Re07,2012Re19). T$_{1/2}$: from growth and decay curve of γ rays from ^{187}Ta β^- decay, in coincidence with β^- radiation, including the contribution from the β^- decay of 7.3-s ^{187}Ta (2022Mu10). Other: 2.3 min *6* (2010Re07, 2012Re19 for bare ^{187}Ta ion). Large difference by almost a factor of 2.05 is not expected between the half-lives of neutral atom and bare ion of ^{187}Ta. 2022Mu10 discuss possible reasons of lower half-life measured (2010Re07,2012Re09) in Experimental Storage Ring (ESR) setting at GSI. J$^\pi$: K^π=7/2$^+$ with configuration=π7/2[404] (from model considerations) (2020Wa29,2022Mu10), possible bandhead based on the proposed configuration.
154.8 *4*	(9/2$^+$)		A	J$^\pi$: possible member of band based on π7/2[404] configuration, as for example in ^{185}Ta structure.
245.2[‡] *4*	(9/2$^-$)		A	
403.8[#] *5*	(11/2$^-$)		A	
595.5[‡] *7*	(13/2$^-$)		A	
802.1[#] *7*	(15/2$^-$)		A	
1053.8[‡] *7*	(17/2$^-$)		A	
1287.0[#] *8*	(19/2$^-$)		A	
1586.4[‡] *8*	(21/2$^-$)		A	
1778.1 *10*	(25/2$^-$)	7.3 s *9*	A	%IT>60; %β^-<40 (2020Wa29) Number of ions detected=17 (2010Re07,2012Re19). E(level): from 2020Wa29. Other: 1793 *10* (2012Re19, 1789 *13* in 2010Re07, from measured mass difference between the isomer and g.s.). J$^\pi$: from 2020Wa29 with proposed configuration=π7/2[404]$\otimes\nu$11/2[615]$\otimes\nu$7/2[503] or π9/2[514]$\otimes\nu$9/2[505]$\otimes\nu$7/2[503], K$^\pi$=25/2$^-$ (2020Wa29). Other: 2010Re07 and 2012Re19 proposed configuration=π9/2[514]$\otimes\nu^2$(7/2[503],11/2[615], K^π=27/2$^-$, from model considerations, and observation of γ rays from the isomer to the g.s.).

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued)

^{187}Ta Levels (continued)

E(level)	J^{π}[†]	$T_{1/2}$	XREF	Comments
				$T_{1/2}$: from sum of $\beta\gamma$(t) of transitions following the IT decay (2020Wa29). Other: $T_{1/2}$=22 s *9* for bare ^{187}Ta ion (2010Re07,2012Re19).
2933 *14*	(41/2$^+$)	>5 min		%β^-=?; %IT=? E(level): from measured mass difference between the isomer and g.s. (2010Re07,2012Re19). In 2010Re07, E=2935 keV *14*. $T_{1/2}$: measured in 2010Re07 and 2012Re19 for bare ^{187}Ta ion. Number of ions detected=9 (2010Re07,2012Re19). J^{π}: K^{π}=41/2$^+$ (2010Re07, 2012Re19, from model considerations).

[†] Levels above 155 keV are assigned members of band based on π9/2[514] configuration, consistent with model calculations (2020Wa29).
[‡] Band(A): π9/2[514],α=+1/2. Band assignment from ^{187}Ta IT decay (2020Wa29).
[#] Band(a): π9/2[514],α=−1/2. Band assignment from ^{187}Ta IT decay (2020Wa29).

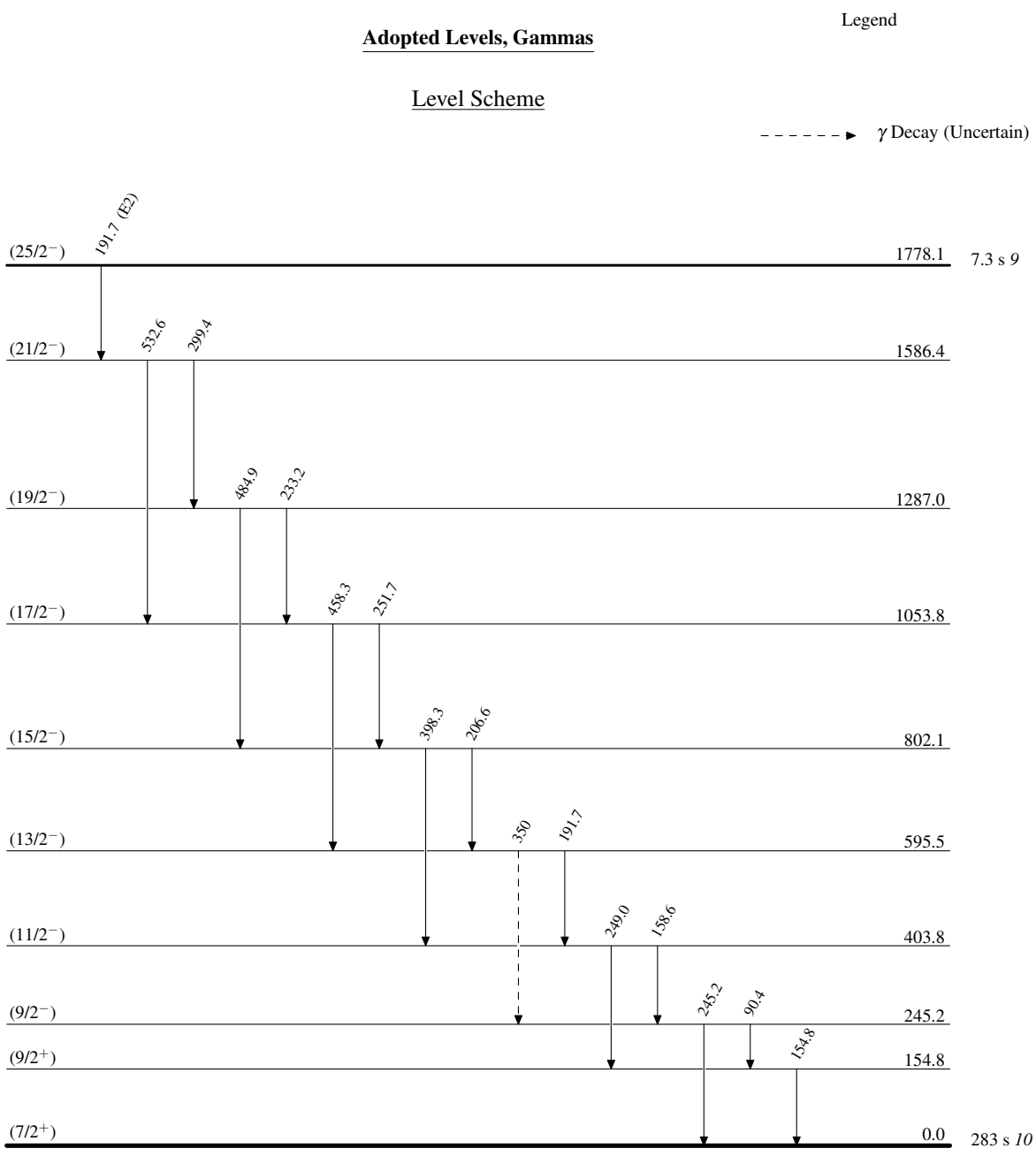
$\gamma(^{187}Ta)$

E_i(level)	J_i^{π}	E_{γ}[†]	E_f	J_f^{π}	Mult.	Comments
154.8	(9/2$^+$)	154.8 *5*	0.0	(7/2$^+$)		
245.2	(9/2$^-$)	90.4 *5*	154.8	(9/2$^+$)		
		245.2 *5*	0.0	(7/2$^+$)		
403.8	(11/2$^-$)	158.6 *5*	245.2	(9/2$^-$)		
		249.0 *5*	154.8	(9/2$^+$)		
595.5	(13/2$^-$)	191.7[#‡] *5*	403.8	(11/2$^-$)		
		350[@]	245.2	(9/2$^-$)		
802.1	(15/2$^-$)	206.6 *5*	595.5	(13/2$^-$)		
		398.3 *5*	403.8	(11/2$^-$)		
1053.8	(17/2$^-$)	251.7 *5*	802.1	(15/2$^-$)		
		458.3 *5*	595.5	(13/2$^-$)		
1287.0	(19/2$^-$)	233.2 *5*	1053.8	(17/2$^-$)		
		484.9 *5*	802.1	(15/2$^-$)		
1586.4	(21/2$^-$)	299.4 *5*	1287.0	(19/2$^-$)		
		532.6 *5*	1053.8	(17/2$^-$)		
1778.1	(25/2$^-$)	191.7[#‡] *5*	1586.4	(21/2$^-$)	(E2)	Mult.: tentatively assigned by 2020Wa29 in ^{187}Ta IT decay from α(K)exp.

[†] From ^{187}Ta IT decay (7.3 s) (2020Wa29).
[‡] Doublet with intensities separately determined (2020Wa29), but intensity values are not given by authors.
[#] Multiply placed.
[@] Placement of transition in the level scheme is uncertain.

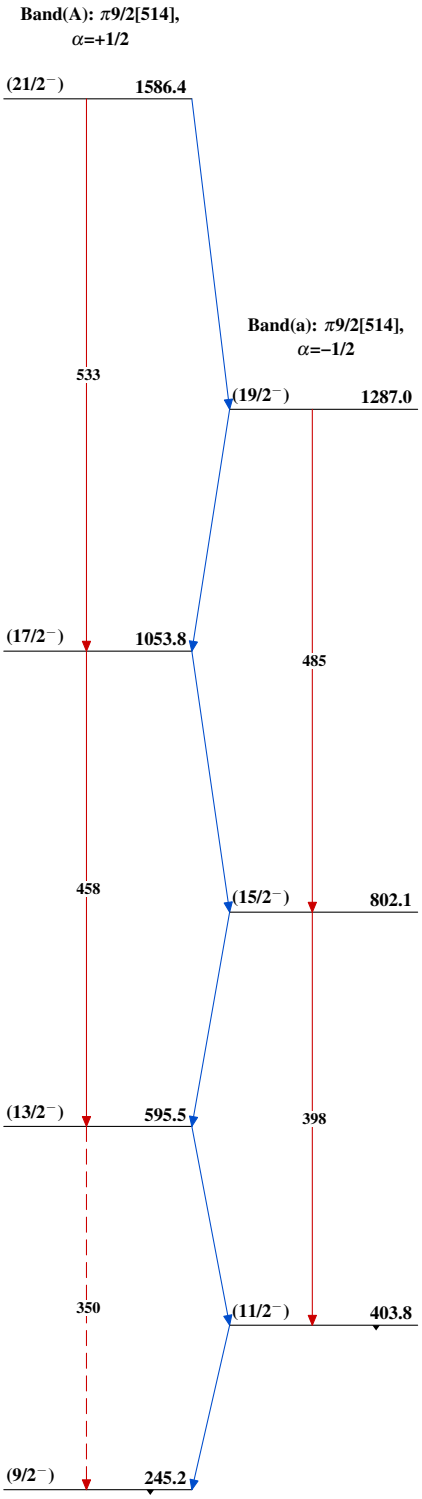
Adopted Levels, Gammas

Level Scheme



$^{187}_{73}Ta_{114}$

Adopted Levels, Gammas



$^{187}_{73}Ta_{114}$