

**Adopted Levels, Gammas**

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich	NDS 113, 2537 (2012)	1-Mar-2012

Q( $\beta^-$ )=-11956 (syst) 334; S(n)=11718 (syst) 334; S(p)=2.56×10<sup>3</sup> 15; Q( $\alpha$ )=6029 4 2017Wa10  
 Q( $\epsilon$ )=5.88×10<sup>3</sup> 14; S(2n)=21289 (syst) 334; S(2p)=2.46×10<sup>3</sup> 15; Q( $\epsilon p$ )=5.40×10<sup>3</sup> 15 2017Wa10  
 Additional information 1.

<sup>156</sup>Hf Levels

Cross Reference (XREF) Flags

- A <sup>102</sup>Pd(<sup>58</sup>Ni,2p2n $\gamma$ )
- B <sup>156</sup>Ta  $\epsilon$  decay (0.36 s)
- C <sup>156</sup>Ta  $\epsilon$  decay (106 ms)
- D <sup>160</sup>W  $\alpha$  decay

E(level) <sup>†</sup>	J <sup>π</sup> <sup>‡</sup>	T <sub>1/2</sub>	XREF	Comments
0 <sup>‡</sup>	0 <sup>+</sup>	23 ms 1	ABCD	% $\alpha$ ≈100 XREF: C(?). % $\alpha$ : 1996Pa01 report % $\alpha$ =100 6. 1979Ho10 report % $\alpha$ =100 19. T <sub>1/2</sub> : From 1996Pa01. Other: 25 ms 4 (1979Ho10).
857.2 <sup>‡</sup>	2 <sup>+</sup>		A	
1454.2 <sup>#</sup>	(2 <sup>+</sup> )		A	
1585.2 <sup>‡</sup>	4 <sup>+</sup>		A	
1959 <sup>@</sup> 6	8 <sup>+</sup>	0.52 ms 1	AB	% $\alpha$ =100 1981HoZM report a level having T <sub>1/2</sub> =0.444 ms 17, for which an excitation energy of 1977 18 is deduced. The evaluator has assumed that this is the same as the 1959, 8 <sup>+</sup> level adopted here. T <sub>1/2</sub> : From 1996Pa01, $\alpha$ decay. Others: 0.57 ms 3, <sup>156</sup> Ta $\epsilon$ decay (1989Ho12); 0.52 ms 16, $\alpha$ decay (1979Ho10). J <sup>π</sup> : From the systematic trend of the Gamow-Teller 9 <sup>+</sup> →8 <sup>+</sup> $\beta$ transitions in the neighboring nuclides (1984HaZD,1989Ho12). J <sup>π</sup> : Authors suggest the configuration (( $\nu$ h <sub>9/2</sub> )( $\nu$ f <sub>7/2</sub> )) <sub>8+</sub> , fed in the $\epsilon$ decay of <sup>156</sup> Ta, with the configuration (( $\pi$ h <sub>11/2</sub> )( $\nu$ f <sub>7/2</sub> )) <sub>9+</sub> .
2000.2 <sup>‡</sup>	6 <sup>+</sup>		A	
2221.6 <sup>#</sup>	(4 <sup>+</sup> )		A	
2547.8 <sup>#</sup>	(6 <sup>+</sup> )		A	
2878.2 <sup>@</sup>	10 <sup>+</sup>		A	
3189.6	11 <sup>-</sup>		A	J <sup>π</sup> : Level interpreted as (( $\nu$ h <sub>9/2</sub> )( $\nu$ f <sub>7/2</sub> )) <sub>8+</sub> coupled to a 3 <sup>-</sup> phonon.
3336.7 <sup>a</sup>	(10 <sup>+</sup> )		A	J <sup>π</sup> : Member of the (( $\nu$ h <sub>9/2</sub> )( $\nu$ f <sub>7/2</sub> )) $\otimes$ (6 <sup>+</sup> ) multiplet.
3678.3 <sup>&amp;</sup>	12 <sup>+</sup>		A	
3816.5 <sup>a</sup>	(12 <sup>+</sup> )		A	J <sup>π</sup> : Stretched conf: ( $\nu$ f <sub>7/2</sub> ) <sup>2</sup> $\otimes$ (6 <sup>+</sup> ).
3996.9 <sup>a</sup>	(14 <sup>+</sup> )		A	J <sup>π</sup> : Proposed conf is (( $\nu$ h <sub>9/2</sub> )( $\nu$ f <sub>7/2</sub> )) <sub>8+</sub> coupled to two octupole phonons (J <sup>π</sup> =6 <sup>+</sup> ).
4264.5 <sup>&amp;</sup>	14 <sup>+</sup>		A	
4384.0 <sup>a</sup>	(14 <sup>+</sup> )		A	J <sup>π</sup> : possible conf is (( $\nu$ h <sub>9/2</sub> )( $\nu$ f <sub>7/2</sub> )) $\otimes$ (6 <sup>+</sup> ).
4482.5	(16 <sup>+</sup> )		A	Suggested (2005Se11) as the 16 <sup>+</sup> member of the ((( $\nu$ h <sub>9/2</sub> )( $\nu$ f <sub>7/2</sub> )) <sub>8+</sub> ) $\otimes$ ( $\pi$ h <sub>11/2</sub> ) <sub>10+</sub> multiplet.
4590.6			A	
4592.5			A	
4812.6 <sup>&amp;</sup>	(16 <sup>+</sup> )		A	J <sup>π</sup> : Possible 16 <sup>+</sup> member of the indicated multiplet.
5019.3			A	

Continued on next page (footnotes at end of table)

Adopted Levels, Gammas (continued) $^{156}\text{Hf}$  Levels (continued)

† From  $^{102}\text{Pd}(^{58}\text{Ni},2\text{p}2\text{n}\gamma)$ , unless noted otherwise.

‡ Band(A):  $(\nu f_{7/2})^2$  multiplet.

# Band(B): possible  $(\nu h_{9/2})^2$  multiplet.

@ Band(C):  $8^+$  isomer, conf= $((\nu h_{9/2})(\nu f_{7/2}))_{8^+}$ .

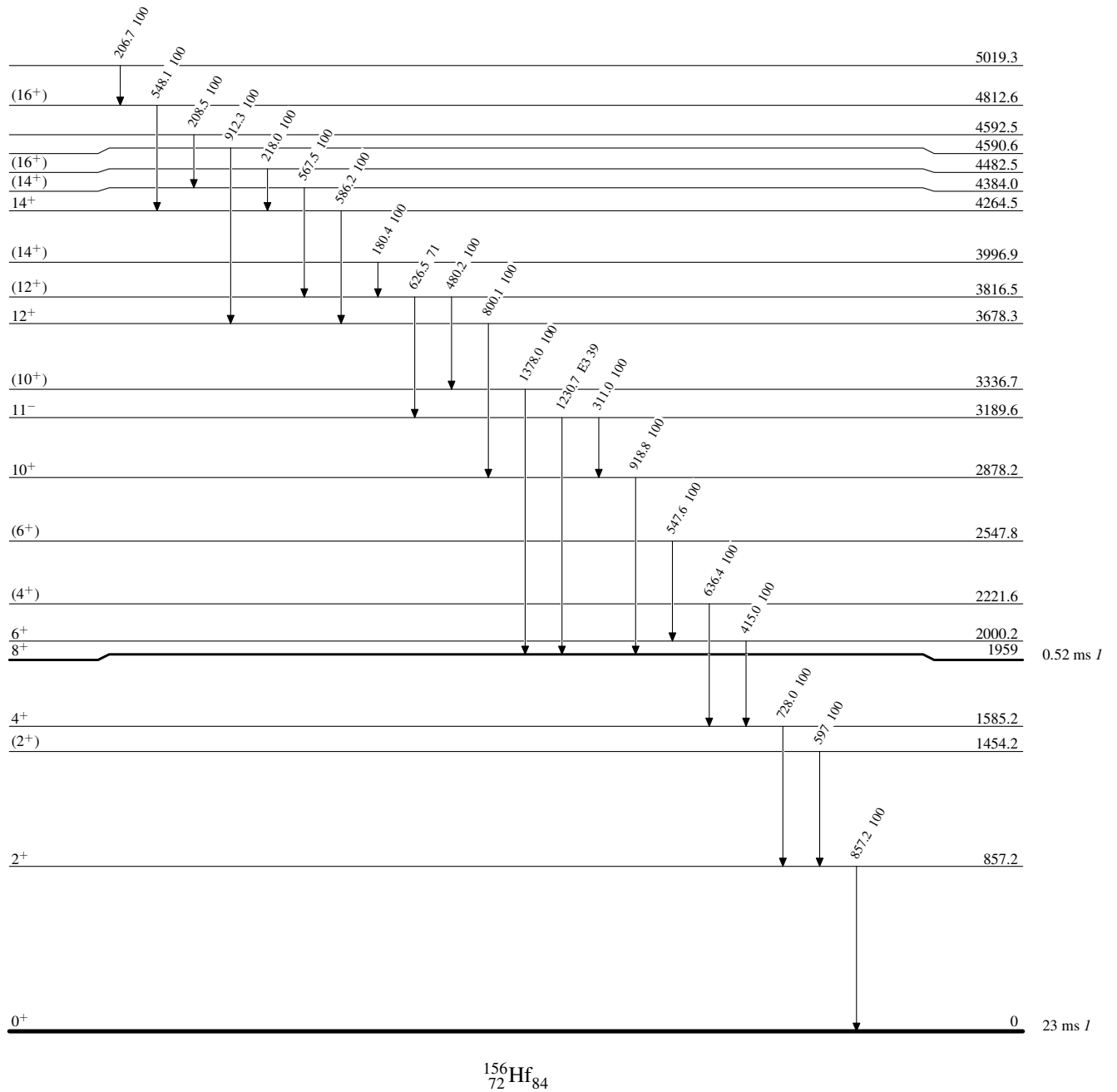
& Band(D):  $(\nu f_{7/2})^2 \otimes (\pi h_{11/2})^2_{10^+}$  multiplet.

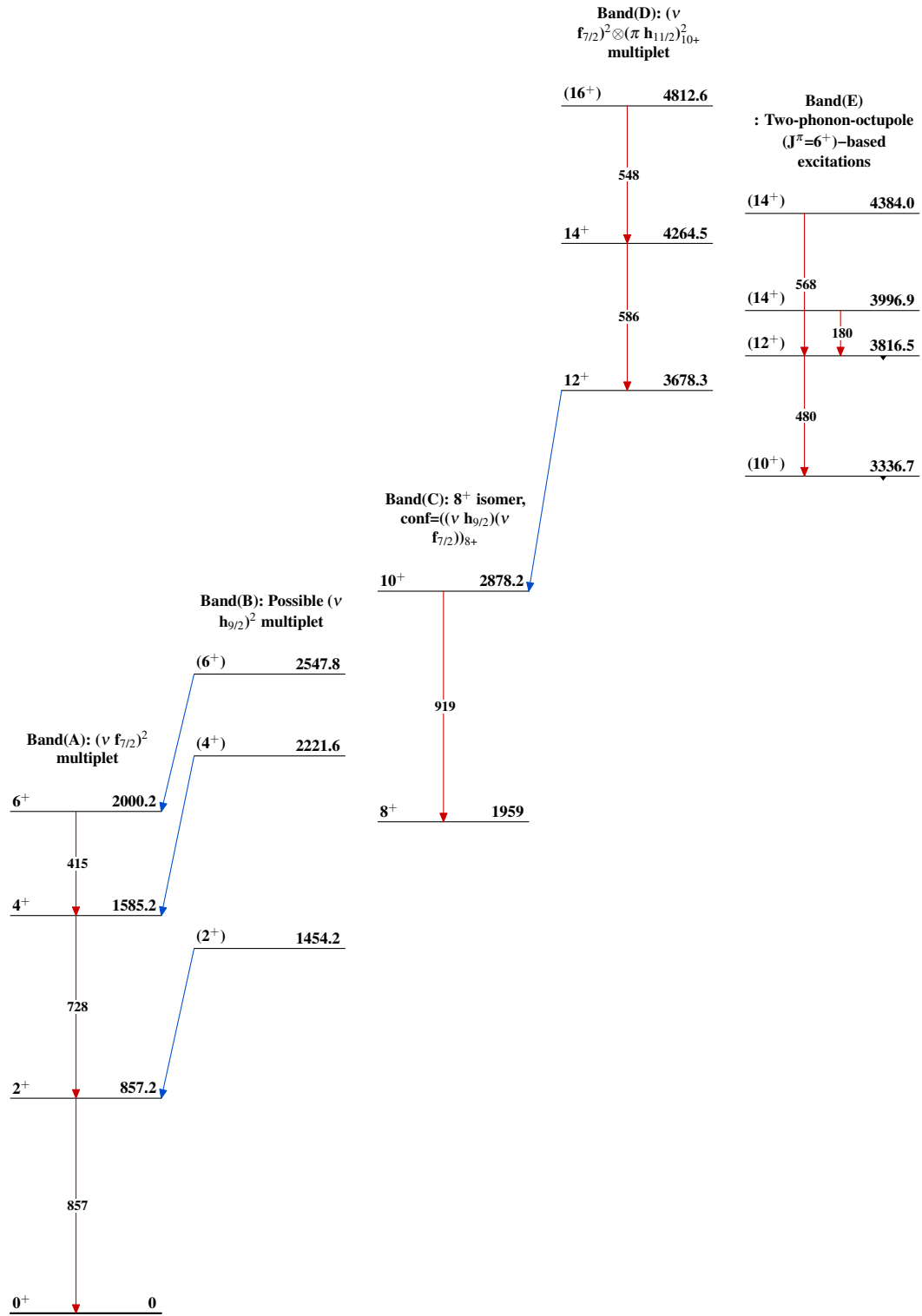
<sup>a</sup> Band(E): Two-phonon-octupole ( $J^\pi=6^+$ )-based excitations.

$E_i(\text{level})$	$J_i^\pi$	$E_\gamma$	$I_\gamma$	$E_f$	$J_f^\pi$	Mult.	$\gamma(^{156}\text{Hf})$	Comments
857.2	2 <sup>+</sup>	857.2	100	0	0 <sup>+</sup>			
1454.2	(2 <sup>+</sup> )	597	100	857.2	2 <sup>+</sup>			
1585.2	4 <sup>+</sup>	728.0	100	857.2	2 <sup>+</sup>			
2000.2	6 <sup>+</sup>	415.0	100	1585.2	4 <sup>+</sup>			
2221.6	(4 <sup>+</sup> )	636.4	100	1585.2	4 <sup>+</sup>			
2547.8	(6 <sup>+</sup> )	547.6	100	2000.2	6 <sup>+</sup>			
2878.2	10 <sup>+</sup>	918.8	100	1959	8 <sup>+</sup>			
3189.6	11 <sup>-</sup>	311.0	100 8	2878.2	10 <sup>+</sup>			
		1230.7	39 8	1959	8 <sup>+</sup>	E3	Mult.: Assigned as E3 by <a href="#">2005Se11</a> .	
3336.7	(10 <sup>+</sup> )	1378.0	100	1959	8 <sup>+</sup>			
3678.3	12 <sup>+</sup>	800.1	100	2878.2	10 <sup>+</sup>			
3816.5	(12 <sup>+</sup> )	480.2	100 12	3336.7	(10 <sup>+</sup> )			
		626.5	71 12	3189.6	11 <sup>-</sup>			
3996.9	(14 <sup>+</sup> )	180.4	100	3816.5	(12 <sup>+</sup> )			
4264.5	14 <sup>+</sup>	586.2	100	3678.3	12 <sup>+</sup>			
4384.0	(14 <sup>+</sup> )	567.5	100	3816.5	(12 <sup>+</sup> )			
4482.5	(16 <sup>+</sup> )	218.0	100	4264.5	14 <sup>+</sup>			
4590.6		912.3	100	3678.3	12 <sup>+</sup>			
4592.5		208.5	100	4384.0	(14 <sup>+</sup> )			
4812.6	(16 <sup>+</sup> )	548.1	100	4264.5	14 <sup>+</sup>			
5019.3		206.7	100	4812.6	(16 <sup>+</sup> )			

**Adopted Levels, Gammas****Level Scheme**

Intensities: Relative photon branching from each level



**Adopted Levels, Gammas** $^{156}_{72}\text{Hf}_{84}$