		History	
Туре	Author	Citation	Literature Cutoff Date
Full Evaluation	C. W. Reich	NDS 112,2497 (2011)	1-Jun-2011

 $Q(\beta^{-}) = -1996 \ 9$ ;  $S(n) = 8886 \ 16$ ;  $S(p) = 4814.1 \ 22$ ;  $Q(\alpha) = 1141.3 \ 25$ 2012Wa38

Note: Current evaluation has used the following Q record \$ -1994 9 8886 15 4813.8 22 1142.8 25 2003Au03,2009AuZZ.

Additional information 1. These data are from <sup>161</sup>Er  $\varepsilon$  decay, in-beam  $\gamma$  studies, and several charged-particle reaction studies.

Several studies of the <sup>161</sup>Er decay scheme reported after 2000 have appeared in which modifications to the level scheme presented here have been reported. Because many of the details regarding these modications have not been given and because they remain as yet unpublished, the evaluator has not included them here. For a discussion of these matters, see the <sup>161</sup>Er decay data set.

In  ${}^{160}$ Gd( ${}^{7}$ Li, $6n\gamma$ ), 2004Es01 propose the existence of a band structure consisting of both signature partners and tentatively assign it to <sup>161</sup>Ho. Because almost nothing is known about this band, the evaluator has not adopted it. For additional information about it, see the  $(^{7}\text{Li}, 6n\gamma)$  data set.

## <sup>161</sup>Ho Levels

Model calculations can be found in the following: wavefunctions of various levels - 1972So12 (or 1971SoZW), 1972WiZG, 1972FuZH, 1992Bo45, and 1995Dz02; B(E1) values between members of the 7/2[404] and 7/2[523] bands up to 17/2 - 1973Ba86; and other theory discussions - 1984Ja10 and 1992Ba42.

Additional information 2.

#### Cross Reference (XREF) Flags

			A 16 B 16 C 15 D 16	<sup>60</sup> Gd( <sup>7</sup> Li,6nγ) <sup>61</sup> Er ε decay <sup>59</sup> Tb( $\alpha$ ,2nγ), <sup>161</sup> Dy(d,2nγ) <sup>60</sup> Dy( <sup>3</sup> He,d), <sup>160</sup> Dy( $\alpha$ ,t)	E F G	<sup>162</sup> Er(pol t, $\alpha$ ) <sup>164</sup> Er(p, $\alpha$ ) <sup>161</sup> Ho IT decay (6.76 s)
E(level) <sup>†</sup>	J <sup>π<b>#@</b></sup>	T <sub>1/2</sub>	XREF			Comments
0.0&	7/2-	2.48 h 5	ABCDEFG	%ε=100 $\mu$ =+4.25 3; Q=+3.22 11 J <sup>π</sup> : J measured by atomic laser spectroscopy (198 allowed-unhindered ε tr $\pi7/2[523] \rightarrow v5/2[523]$ . <sup>161</sup> Ho g.s. T <sub>1/2</sub> : weighted average of (1961Bj02), and 3.0 h. (1954Ha01). $\mu$ : from the compilation of $\delta < r^2 > (161-162)=0.033$ fm values computed by eva computed by error prop by same authors. From an evaluation of dat $< r^2 > 1/2 = 5$ 179 fm 31	beam $7A1Z_{1}$ ansiti This t This t $2.488$ $5(196)$ f 200 f 200 $1^{2}$ 7 a uluato a an f	magnetic resonance (1964Bu09 and 1969Ek01) and $D_11988NeZZ$ ). Log $ft$ =4.88 to $5/2^-$ level indicates an on, which in this mass region is hus establishes 7/2[523] as the configuration of the h 5 (1965Ab04), 2.5 h 2 (1963Ra15), 1.9 h 5 61Ba32). Others: 4.6 h 1 (1950Wi13) and 2.5 h 55t24 and based on a measurement of 1989Al27. 55t24 and based on a measurement of 1989Al27. 108 $\delta$ <r<sup>2&gt;(160-161)=0.123 fm<sup>2</sup> 3, from 1989Al27; r by subtraction of table entries. Uncertainties are on and may be overestimates. Other: plot in 1987AlZU nuclear rms charge radii, 2004An14 report</r<sup>
99.63 <sup>a</sup> 3	9/2-		ABCDEF	$J^{\pi}$ : from M1 component i	nγto	$7/2^{-}$ level and analysis of (pol t, $\alpha$ ) data.
211.15 <sup>b</sup> 3	1/2+	6.76 s 7	BCDEFG	%IT=100 J <sup><math>\pi</math></sup> : from E3 $\gamma$ to 7/2 <sup>-</sup> and region.	I expe	ected occurrence of this Nilsson orbital in this energy

# <sup>161</sup>Ho Levels (continued)

E(level) <sup>†</sup>	J <sup>π#@</sup>	T <sub>1/2</sub>	XREF	Comments
				$T_{1/2}$ : weighted average of 6.80 s <i>10</i> (1965St08) and 6.73 s <i>10</i> (1971Ge01). Others: 6.1 s <i>3</i> (1966Bo02) and 6.78 s <i>15</i> (1967Ge09 by the same authors as 1971Ge01) (all from <sup>161</sup> Ho IT decay).
221.95 <sup>&amp;</sup> 6	11/2-		ABCDEF	$J^{\pi}$ : from Q component in $\gamma$ to $7/2^{-}$ level, (M1) $\gamma$ to $9/2^{-}$ , and
222.43 <sup>c</sup> 3	3/2+		BCDEF	$J^{\pi}$ : from M1 $\gamma$ to $1/2^+$ level and band structure.
252.68 <sup>d</sup> 3	7/2+	$\leq 0.2$ ns	ABCDEF	J <sup><math>\pi</math></sup> : from L=4 in ( <sup>3</sup> He,d), analysis of (pol t, $\alpha$ ) data, and E1 $\gamma$ 's to $7/2^{-}$ and $9/2^{-}$ .
282			D	$T_{1/2}$ : from $\gamma\gamma(t)$ in (p,n $\gamma$ ) study (1976Sc19).
298.68 <sup>f</sup> 3	3/2+		BCDEF	$J^{\pi}$ : from L=2 in ( <sup>3</sup> He,d) and M1 $\gamma$ to 1/2 <sup>+</sup> level.
316.56 <sup>b</sup> 4	5/2+		ABCDEF	$J^{\pi}$ : from E2 $\gamma$ to 1/2 <sup>+</sup> level, L=2 in ( <sup>3</sup> He,d), and analysis of (pol t, $\alpha$ ) data
353.28 <sup>°</sup> 4	7/2+	0.52 ns 15	ABCD	$J^{\pi}$ : from E2 $\gamma$ to 3/2 <sup>+</sup> level and band structure.
368.10 <sup>a</sup> 7	$13/2^{-}$		AC	$J^{\pi}$ : from Q $\gamma$ to 9/2 <sup>-</sup> level and expected band structure.
370.77 <sup>e</sup> 7	9/2+		ABC	$J^{\pi}$ : from D component in $\gamma$ to $7/2^{-}$ level, $\gamma$ to $11/2^{-}$ , and expected band structure.
373.24 <mark>8</mark> 4	5/2+		BCDEF	J <sup><math>\pi</math></sup> : from L=2 in ( <sup>3</sup> He,d) and M1 $\gamma$ to 7/2 <sup>+</sup> level.
423.91 <sup><i>h</i></sup> 4	1/2-		BCD	$J^{\pi}$ : from E1 $\gamma$ to 1/2 <sup>+</sup> level, L=1 in ( <sup>3</sup> He,d) and band structure. J <sup><math>\pi</math></sup> : from model calcuations of 1992Bo45, this state is 30% 1/2[541], 18% 1/2[550], 25% quadrupole vibration, and 14% octupole vibration.
446.83 <sup>j</sup> 4	5/2+		B D	$J^{\pi}$ : from L=(2) in ( <sup>3</sup> He,d), E1 $\gamma$ to 7/2 <sup>-</sup> level, and band structure. J <sup><math>\pi</math></sup> : from model calcuations of 1992Bo45, this state is 82% 5/2[402], 5% quadrupole vibration, and 5% octupole vibration.
458.87 <sup>h</sup> 4	5/2-		B de	XREF: d(459)e(458). J <sup><math>\pi</math></sup> : from E1 $\gamma$ 's to 3/2 <sup>+</sup> and 7/2 <sup>+</sup> levels.
463.23 <sup><i>f</i></sup> 7	7/2+		BCdeF	XREF: d(459)e(458). $J^{\pi}$ : from M1 $\gamma$ 's to 5/2 <sup>+</sup> and 7/2 <sup>+</sup> levels and band structure.
511.78 <sup>d</sup> 7	$11/2^{+}$		AC	$J^{\pi}$ : from D $\gamma$ to 9/2 <sup>-</sup> level, $\gamma$ to 7/2 <sup>+</sup> , and expected band structure.
519.57 <mark>b</mark> 19	9/2+		AC F	J <sup><math>\pi</math></sup> : from expected band structure and $\gamma$ to 5/2 <sup>+</sup> level.
525.92 <sup>i</sup> 4	3/2-		BCD	$J^{\pi}$ : from E1 $\gamma$ 's to $1/2^+$ and $5/2^+$ levels and L=1 in ( <sup>3</sup> He,d).
534.45 <sup>&amp;</sup> 8	15/2-		A C EF	$J^{\pi}$ : from D $\gamma$ to 13/2 <sup>-</sup> and Q $\gamma$ to 11/2 <sup>-</sup> level, and expected band structure.
554.12 9	$(5/2^-, 7/2, 9/2^+)$		В	J <sup><math>\pi</math></sup> : from $\gamma$ 's to 5/2 <sup>+</sup> and 9/2 <sup>-</sup> levels.
579.50 <sup>h</sup> 10	9/2-	≤0.2 ns	A CDE	XREF: E(585).
				$J^{\pi}$ : from L=(5) in ( <sup>3</sup> He,d), analysis of (pol t, $\alpha$ ) data, and D $\gamma$ to 7/2 <sup>+</sup> level.
583.85 <sup>C</sup> 10	11/2+		A C	$I_{1/2}$ : From (p,n $\gamma$ ) study (19/6Sc19). $I^{\pi}$ : from (Q $\chi$ to $7/2^+$ level and expected hand structure
$592.66^{k} 4$	$3/2^{-}$		R	$I^{\pi}$ : from E2 $\gamma$ to $7/2^{-1}$ level and E1 $\gamma$ to $3/2^{+1}$
572.00	5/2		2	$J^{\pi}$ : from model calcuations of 1992Bo45, this state is 36% 3/2[541], 49% quadrupole vibration, and 9% octupole vibration.
598.80 <sup>g</sup> 12	9/2+		C F	J <sup><math>\pi</math></sup> : from $\gamma$ 's to $5/2^+$ and $7/2^+$ levels and expected band structure.
649.02 <sup>k</sup> 10	5/2-		B D	XREF: D(646).
674 50 <mark>6</mark> 0	13/2+		A C	J <sup>*</sup> : from E1 $\gamma$ to $3/2^{+}$ level and E2 $\gamma$ to $9/2^{-}$ .
$694^{i}$ 2	7/2-		л С D	$I^{\pi}$ : from $I = (3.4)$ in $({}^{3}He d)$ and hand structure
$710.69^{\ddagger} 4$	1/2		B	$J$ . Hom $\Sigma^{-}(J,T)$ in ( $\Pi^{-}(J,T)$ and band structure.
726.42 <sup><i>a</i></sup> 9	17/2-		A CD	$J^{\pi}$ : from Q $\gamma$ to 13/2 <sup>-</sup> level, D $\gamma$ to 15/2 <sup>-</sup> , and expected band structure.

Continued on next page (footnotes at end of table)

# <sup>161</sup>Ho Levels (continued)

732.94 f       11       11/2*       C       F       from D y to 9/2* level and expected band structure.         780.44 /13       5/2*       B       EF       F: from D y to 9/2* level and D to 1/2*.         821.06 /11       13/2*       A       C       F: from A IV 9/2* level, and D to 1/2*.         821.66 /19       5/2*       B       F       F: from F IV 03/2* level and C y to 1/2*.         826.67 /19       5/2*       A       C       F: from A IV 02* level and C y to 1/2*.         826.67 /19       5/2*       A       C       F: from A IV 01/2*. level and expected band structure.         860 /4       7/2*       DF       F: from A IV 01/2*. level and expected band structure.       90.0000         906 /14       7/2*       DF       F: from A IV 01/2* level and expected band structure.       90.0000         906 /14       13/2*       C       F: from A IV 01/2* level and expected band structure.       90.0000         916 /16       D       P:       F: from I=(2) in ( <sup>3</sup> He.d).       90.00000000000000000000000000000000000	E(level) <sup>†</sup>	J <sup>π#@</sup>	XREF	Comments
760.44 $iJ$ $5/2^+$ B       EF $jF$ : from $Q$ to $9/2^-$ level, and $Q$ to $1/2^+$ .         788.12 $iJ$ $iJ/2^+$ A       C $F^+$ : $Q > (0 > 0/2^+$ level, $Y = 1/1/2^+$ , and expected band structure.         82.66.27 $gJ/2^+$ A       C $F^+$ : $Q > (0 > 0/2^+$ level, $Y = 1/1/2^+$ , and expected band structure.         82.66.27 $gJ/2^+$ A       C $F^+$ : from $JJ/2^+$ level and $D > 0/2^-$ .         86.47 $IJ/2^-$ A       C $F^+$ : from analysis of (pol t.a) data.         906.44 $IJ/2^-$ C $F^+$ : from analysis of (pol t.a) data.         906.84 $IJ$ $IJ/2^-$ C $F^+$ : from analysis of (pol t.a) data.         906.84 $IJ$ $IJ/2^-$ C $F^+$ : from analysis of (pol t.a) data.         930       D       F $F^-$ : from analysis of (pol t.a) data.         935'' $JJ/2^-$ A       C $F^+$ : from analysis of (pol t.a) data.         1095.95'' $JJ/2^-$ A $JJ/2^ P^-$ : from $JY$ is to $JJ/2^-$ : and expected band structure.         1096.01/ $IJ/2^-$ A $JJ/2^ P^-$ : from $JY$ is to $JJ/2^-$ invel, $Q$ to $JJ/2^-$ ; and expected band structure.	732.94 <sup><i>f</i></sup> 11	11/2+	C F	$J^{\pi}$ : from D $\gamma$ to 9/2 <sup>+</sup> level and expected band structure.
788.12h       11       13/2*       A C       JF: from Q y to 9/2* level and D y to 11/2*.         821.08h       21       13/2*       A C       JF: Q y to 9/2* level and D y to 11/2*.         821.08h       21       13/2*       A C       JF: from D y to 13/2* level and D y to 11/2*.         857.30f       9       15/2*       A C       JF: from D y to 13/2* level and D y to 11/2*.         906*//4       7/2*       DEF       FF: from D y to 13/2* level and expected band structure.         906*//4       7/2*       DEF       XREF: Fr0909.         916.48f       12       15/2*       C       JF: from Q y to 11/2* level and expected band structure.         920.688       14       (13/2*)       C       JF: from analysis of (pol t.o.) data.         930       D       F       JF: from analysis of (pol t.o.) data.         1030*//       (9/2*)       F       JF: from J by to 15/2* level, Q y to 13/2*, and expected band structure.         1036*//       11/2*       A C       JF: from J by to 15/2* level, Q y to 13/2*, and expected band structure.         1036*//       11/2*       A C       JF: from J by to 15/2* level and y to 72*.         1030*//       11/2*       A C       JF: from Y is to 11/2* and (13/2*) and expected band structure.         1040*//2*       11	760.44 <sup>1</sup> 13	5/2+	B EF	$J^{\pi}$ : from M1 $\gamma$ to 7/2 <sup>+</sup> level, analysis of (pol t. $\alpha$ ) data, and expected band structure.
821.08 <sup>20</sup> 9       5/2*       B       D       P <sup>2</sup> : Q y to 9/2* level, y to 11/2*, and expected band structure.         826.62 <sup>20</sup> 9       5/2*       B       D       P <sup>2</sup> : from D y to 13/2* level and Q y to 11/2*.         866.47       9       5/2*       B       D       P <sup>2</sup> : from D y to 13/2* level and Q y to 11/2*.         860       4       7/2*       DEF       XRTF: F(900)       Q y to 13/2* level and Q y to 11/2*.         906.84       12       15/2*       C       P <sup>2</sup> : from analysis of (p1 t.c.) data.         906.84       13/2*       C       P <sup>2</sup> : from Q y to 15/2* level, D y to 17/2*, and expected band structure.         91.644       10       19/2*       A       C       P <sup>2</sup> : from Q y to 15/2* level, D y to 17/2*, and expected band structure.         93       940       D       F       P <sup>2</sup> : from D y to 15/2* level, Q y to 13/2*, and expected band structure.         10390 <sup>10</sup> (9/2*)       EF       P <sup>2</sup> : from D y to 15/2* level, Q y to 13/2*, and expected band structure.         10391 <sup>10</sup> 17/2*       A       C       P <sup>2</sup> : from D y to 15/2* level, Q y to 13/2*, and expected band structure.         1084.41 <sup>11</sup> 13       17/2*       A       C       P <sup>2</sup> : from D y to 15/2* level, Q y to 13/2*, and expected band structure.         1108 <sup>2</sup>	788.12 <sup>h</sup> 11	13/2-	AC	$J^{\pi}$ : from O $\gamma$ to 9/2 <sup>-</sup> level and D $\gamma$ to 11/2 <sup>+</sup> .
826.62 <sup>m</sup> 0 $5/2^-$ B D F       J <sup>2</sup> ; from El y to $3/2^+$ level and E2 y to $9/2^-$ .         887.30 <sup>4</sup> 9 $15/2^+$ A C       J <sup>2</sup> ; from D y to $13/2^-$ level and Q y to $11/2^+$ .         886 <sup>0</sup> 4 $7/2^+$ DEF       XREF; F(909).       J <sup>2</sup> ; from analysis of (pol t.o.) data.         906 <sup>m</sup> 4 $7/2^-$ DEF       XREF; F(909).       J <sup>2</sup> ; from analysis of (pol t.o.) data.         906.84 <sup>f</sup> 12 $15/2^+$ C       J <sup>2</sup> ; from Q y to $11/2^+$ level and expected band structure.         931.64 <sup>k</sup> 10       19/2 <sup>-</sup> A C       J <sup>2</sup> ; from analysis of (pol t.o.) data.         934       D       F       Fr from analysis of (pol t.o.) data.         935 <sup>f</sup> 2       3/2 <sup>t</sup> D       J <sup>2</sup> ; from analysis of (pol t.o.) data.         936 <sup>m</sup> 10/2 <sup>-</sup> F       J <sup>2</sup> ; from D y to $15/2^-$ level, Q y to $13/2^-$ , and expected band structure.         1036 <sup>m</sup> (9/2 <sup>+</sup> )       F       J <sup>2</sup> ; from D y to $15/2^-$ level, Q y to $13/2^-$ , and expected band structure.         1037 <sup>m</sup> (9/2 <sup>+</sup> )       C       J <sup>2</sup> ; from L=0 in ( <sup>3</sup> He.d.)         1128 <sup>m</sup> 3       11/2 <sup>+</sup> A C       J <sup>2</sup> ; from L=0 in ( <sup>3</sup> He.d.)         1128 <sup>m</sup> 4       (5/2 <sup>+/2</sup> )       C       J <sup>2</sup> ; from 1/2 in 0/3/2 <sup>+</sup> and (x) 7/2 <sup>+</sup> .         1177 <sup>3</sup> D	821.08 <sup>b</sup> 21	$13/2^+$	AC	$I^{\pi}$ : O $\gamma$ to 9/2 <sup>+</sup> level $\gamma$ to 11/2 <sup>+</sup> and expected band structure
857.30 <sup>d</sup> 9       15/2*       A C       F: from D y to 13/2* level and Q y to 11/2*.         860 <sup>d</sup> 4       7/2*       EF       F: from analysis of (pol t.o) data.         906.84 <sup>d</sup> 12       15/2*       DF       KKEF: F(909).         906.84 <sup>d</sup> 12       15/2*       C       F: from analysis of (pol t.o) data.         920.68 <sup>d</sup> 10       19/2*       A C       F: from expected band structure and y's to 9/2* and 11/2* levels.         931.64 <sup>d</sup> 10       19/2*       A C       F: from analysis of (pol t.o) data.         930       D F       F: from analysis of (pol t.o) data.       17/2*.         940       D F: from analysis of (pol t.o) data.       17/2*.       A C         933 <sup>d</sup> 17/2*       A C       F: from analysis of (pol t.o) data.         1059.35 <sup>d</sup> 17/2*       A C       F: from D y to 15/2* level, Q y to 13/2*, and expected band structure.         1060.0 <sup>f</sup> I6       (5/2.7)       B       F: from S to 11/2* and (13/2*) and expected band structure.         1107.9       1/2*       D F       F: from B Y to 5/2* level, Q y to 15/2*, and expected band structure.         1108.9       2       1/2*       D F       F: from D Y to 15/2* level, Q y to 15/2*, and expected band structure. <td< td=""><td><math>826.62^m 9</math></td><td>5/2-</td><td>BDF</td><td><math>J^{\pi}</math>: from E1 <math>\gamma</math> to 3/2<sup>+</sup> level and E2 <math>\gamma</math> to 9/2<sup>-</sup>.</td></td<>	$826.62^m 9$	5/2-	BDF	$J^{\pi}$ : from E1 $\gamma$ to 3/2 <sup>+</sup> level and E2 $\gamma$ to 9/2 <sup>-</sup> .
860 <sup>1</sup> 4       7/2 <sup>+</sup> <b>EF</b> J <sup>2</sup> : from analysis of (pol 1, a <sup>2</sup> ) data.         906 <sup>11</sup> 4       7/2 <sup>-</sup> <b>DE XEE</b> :: F(009).         906.84 <sup>1</sup> 12       15/2 <sup>+</sup> <b>C</b> J <sup>2</sup> : from analysis of (pol 1, a <sup>2</sup> ) data.         906.84 <sup>4</sup> 12       15/2 <sup>+</sup> <b>C</b> J <sup>2</sup> : from Q y to 11/2 <sup>+</sup> level and expected band structure.         931.64 <sup>8</sup> 10       19/2 <sup>-</sup> <b>A C</b> J <sup>2</sup> : from <b>L</b> =(2) in ( <sup>3</sup> He,d).         933 <b>D F</b> : from analysis of (pol 1, a) data.         934 <b>D F</b> : from analysis of (pol 1, a) data.         1030 <sup>m</sup> (9/2 <sup>+</sup> ) <b>EF</b> J <sup>2</sup> : from D y to 15/2 <sup>-1</sup> level, Q y to 13/2 <sup>-</sup> , and expected band structure.         10359.53 <sup>6</sup> 10       17/2 <sup>+</sup> <b>A C</b> J <sup>2</sup> : from J to 15/2 <sup>-1</sup> level, Q y to 13/2 <sup>-</sup> , and expected band structure.         1036 <sup>0</sup> 11/2 <sup>1</sup> 11/2 <sup>+</sup> <b>A C</b> J <sup>2</sup> : from J to 15/2 <sup>-1</sup> level, Q y to 13/2 <sup>-</sup> , and expected band structure.         1036 <sup>0</sup> 11/2 <sup>1</sup> 11/2 <sup>+</sup> <b>C</b> J <sup>2</sup> : from Q y to 15/2 <sup>+1</sup> level, Q y to 13/2 <sup>-</sup> , and expected band structure.         1046 <sup>0</sup> 21       12 <sup>+</sup> <b>C</b> J <sup>2</sup> : from Q y to 15/2 <sup>+1</sup> level, A y to 19/2 <sup>+</sup> , and expected band structure.         112 <sup>0</sup> 21 <b>D J F</b> : from M i y's to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 7/2 <sup>+</sup> levels, but and y's are multiply placed.	857.30 <sup>d</sup> 9	$15/2^+$	AC	$J^{\pi}$ : from D $\gamma$ to $13/2^{-}$ level and O $\gamma$ to $11/2^{+}$ .
906 <sup>m</sup> 172 <sup>m</sup> DFF       KREF: F(909),       C product (add)         906.84 <sup>6</sup> 12       15/2*       C $F^{+}$ from analysis of (pol L <sub>0</sub> ) data.         906.84 <sup>6</sup> 10       19/2 <sup>-</sup> C $F^{+}$ from expected band structure and $\gamma$ 's to 9/2* and 11/2* levels.         931.64 <sup>8</sup> 10       19/2 <sup>-</sup> A       C $F^{+}$ from approximation (add)         930       D       D       F       from Q $\gamma$ to 15/2 <sup>-</sup> level, D $\gamma$ to 17/2 <sup>+</sup> , and expected band structure.         934       0       D       F       From analysis of (pol t <sub>4</sub> c) data.         930       0       17/2 <sup>+</sup> A       C       F <sup>+</sup> from analysis of (pol t <sub>4</sub> c) data.         1089.93 <sup>8</sup> 0       17/2 <sup>+</sup> A       C       F <sup>+</sup> from 10 $\gamma$ to 15/2 <sup>+</sup> level, Q to 13/2 <sup>+</sup> , and expected band structure.         1096.01 <sup>1</sup> 18       (15/2 <sup>+</sup> )       C       F <sup>+</sup> from 10 $\gamma$ to 15/2 <sup>+</sup> level, Q to 13/2 <sup>+</sup> , and expected band structure.         1109 <sup>0</sup> 1/2 <sup>+</sup> D       F <sup>+</sup> from 10 $\gamma$ to 17/2 <sup>+</sup> level and (13/2 <sup>+</sup> ) and (13/2 <sup>+</sup> ), and expected band structure.         1109 <sup>0</sup> 1/2 <sup>+</sup> D       F <sup>+</sup> from 10 $\gamma$ to 17/2 <sup>+</sup> level and (13/2 <sup>+</sup> ), and 7/2 <sup>+</sup> , and expected band structure.         1109 <sup>0</sup> 1/2 <sup>+</sup> D       F <sup>+</sup> from 10 $\gamma$ to 17	860 <sup><i>l</i></sup> 4	7/2+	FF	$I^{\pi}$ : from analysis of (nol t $\alpha$ ) data
$P_{1}^{r}$ from analysis of (pol L2) data.         900.84% 14       (13/2*)       C $P_{1}^{r}$ from Q $\gamma$ to 11/2* level and expected band structure.         931.64% 10       19/2*       A       C $P_{1}^{r}$ from Q $\gamma$ to 15/2* level, D $\gamma$ to 17/2*, and expected band structure.         933       D       P       F       from Q $\gamma$ to 15/2* level, D $\gamma$ to 17/2*, and expected band structure.         940       D       F       F       from analysis of (pol La) data.         1030 <sup>m</sup> (9/2*)       F       F       from analysis of (pol La) data.         1030 <sup>m</sup> (9/2*)       F $P_{1}^{r}$ from D $\gamma$ to 15/2* level, Q $\gamma$ to 13/2*, and expected band structure.         1084.1 <sup>H</sup> 13       17/2*       A       C $P_{1}^{r}$ from D $\gamma$ to 15/2* level, Q $\gamma$ to 13/2*, and expected band structure.         1086.01 <sup>J</sup> 18       (15/2*)       C $P_{1}^{r}$ from analysis of (pol La) data.         1123.1 <sup>m</sup> 4       (5/2.7/2)*       B $P_{1}^{r}$ from Q $\gamma$ to 15/2* level, Q $\gamma$ to 13/2*.         1128       11/2*       E $P_{1}^{r}$ from Q $\gamma$ to 13/2* level and $\gamma$ to 7/2*.         1128.5       14       (3/2)*       B $P_{1}^{r}$ from Q $\gamma$ to 15/2* level, D $\gamma$ to 15/2*.         1128.8       (3/2)*       B $P_{1$	$906^{m} 4$	$7/2^{-}$	DEF	XREF: F(909).
906.84 $l^2$ 15/2 <sup>+</sup> C       J <sup>2</sup> : from Q $\gamma$ to 11/2 <sup>+</sup> level and expected band structure.         920.68 $l^2$ (13/2 <sup>+</sup> )       C       J <sup>2</sup> : from Q $\gamma$ to 15/2 <sup>-</sup> level, D $\gamma$ to 0/2 <sup>+</sup> and 11/2 <sup>+</sup> levels.         933       D         940       D F         955 <sup>1</sup> 3/2 <sup>+</sup> D       J <sup>2</sup> : from L=(2) in ( <sup>3</sup> He,d).         992 <sup>1</sup> (9/2 <sup>+</sup> )       E       F <sup>2</sup> : from analysis of (pol L <sub>a</sub> ) data.         1059.55 <sup>2</sup> 10       17/2 <sup>-</sup> A C       F <sup>2</sup> : from D $\gamma$ to 15/2 <sup>-</sup> level, Q $\gamma$ to 13/2 <sup>-</sup> , and expected band structure.         1089.55 <sup>2</sup> 10       17/2 <sup>-</sup> A C       F <sup>2</sup> : from D $\gamma$ to 15/2 <sup>+</sup> level, Q $\gamma$ to 13/2 <sup>-</sup> , and expected band structure.         1096.01 <sup>f</sup> 8       (52 <sup>+</sup> )       C       J <sup>2</sup> : from D $\gamma$ to 15/2 <sup>+</sup> level, Q $\gamma$ to 13/2 <sup>-</sup> , and expected band structure.         1100 <sup>f</sup> 2       1/2 <sup>-</sup> D       F <sup>2</sup> : from analysis of (pol L <sub>a</sub> ) data.         112 <sup>f</sup> T       D       F <sup>3</sup> : from C $\gamma$ to 15/2 <sup>+</sup> level, Q $\gamma$ to 13/2 <sup>-</sup> , and expected band structure.         1100 <sup>f</sup> 2       1/2 <sup>-</sup> D       F <sup>3</sup> : from C $\gamma$ to 17/2 <sup>-</sup> level, b and a structure.         112 <sup>f</sup> D       F <sup>3</sup> : from M $\gamma$ to 1/2 <sup>-</sup> level, $\gamma$ to 17/2 <sup>+</sup> .       If for M $\gamma$ to 1/2 <sup>-</sup> level, $\gamma$ to 17/2 <sup>+</sup> .         1210.89 <sup>f</sup>		,		J <sup><math>\pi</math></sup> : from analysis of (pol t, $\alpha$ ) data.
920.68 <sup>k</sup> 14       (13/2 <sup>+</sup> )       C       J <sup>2</sup> : from Q y to 15/2 <sup>-</sup> level, D y to 17/2 <sup>-</sup> , and expected band structure.         931.64 <sup>k</sup> 10       19/2 <sup>-</sup> A       C       J <sup>2</sup> : from Q y to 15/2 <sup>-</sup> level, D y to 17/2 <sup>-</sup> , and expected band structure.         930       D       F       F       from analysis of (plot Lo) data.         1030 <sup>m</sup> (9/2 <sup>-</sup> )       F       F       from D y to 15/2 <sup>-</sup> level, Q y to 13/2 <sup>+</sup> , and expected band structure.         1059.53 <sup>k</sup> 10       17/2 <sup>+</sup> A       C       J <sup>2</sup> : from J's to 11/2 <sup>+</sup> and (13/2 <sup>+</sup> ) and expected band structure.         1066.01 <i>I</i> 18       (15/2 <sup>+</sup> )       C       J <sup>2</sup> : from J's to 11/2 <sup>+</sup> and (13/2 <sup>+</sup> ) and expected band structure.         11069.21       1/2 <sup>+</sup> D       F       From manalysis of (pol La) data.         1128 <sup>m</sup> 11/2 <sup>-</sup> E       F <sup>2</sup> : from B + to 5/2 <sup>+</sup> level and y to 7/2 <sup>+</sup> .         1167.29 <sup>d</sup> 11       21/2 <sup>-</sup> A       C         1177       3       D       F <sup>2</sup> : from G'y to 17/2 <sup>-</sup> level, D y to 15/2 <sup>+</sup> , and expected band structure.         1121.89 <sup>d</sup> 0       21/2 <sup>+</sup> A       C       J <sup>4</sup> : from G'y to 17/2 <sup>-</sup> level, y to 15/2 <sup>+</sup> , and expected band structure.         1210.89 <sup>d</sup> 0       21       17/2 <sup>+</sup> A       C       J <sup>4</sup> : from M'	906.84 <sup>°</sup> 12	15/2+	С	$J^{\pi}$ : from Q $\gamma$ to $11/2^+$ level and expected band structure.
931.64 <sup>45</sup> 10 19/2 <sup>-</sup> A C J <sup>2</sup> : from Q $\gamma$ to 15/2 <sup>-</sup> level, D $\gamma$ to 17/2 <sup>-</sup> , and expected band structure. 940 D F 955 <sup>17</sup> 2 3/2 <sup>+</sup> D J <sup>2</sup> : from L=(2) in ( <sup>3</sup> He,d). 955 <sup>17</sup> 2 (9/2 <sup>+</sup> ) EF J <sup>2</sup> : from analysis of (pol t.c) data. 1030 <sup>17</sup> (9/2 <sup>-</sup> ) F J <sup>2</sup> : from analysis of (pol t.c) data. 1059.53 <sup>17</sup> 10 17/2 <sup>+</sup> A C J <sup>2</sup> : from D $\gamma$ to 15/2 <sup>+</sup> level, Q $\gamma$ to 13/2 <sup>+</sup> , and expected band structure. 1059.53 <sup>17</sup> 10 17/2 <sup>+</sup> A C J <sup>2</sup> : from D $\gamma$ to 15/2 <sup>+</sup> level, Q $\gamma$ to 13/2 <sup>+</sup> , and expected band structure. 1059.53 <sup>17</sup> 10 17/2 <sup>+</sup> A C J <sup>2</sup> : from D $\gamma$ to 15/2 <sup>+</sup> level, Q $\gamma$ to 13/2 <sup>+</sup> , and expected band structure. 1059.53 <sup>17</sup> 10 17/2 <sup>+</sup> A C J <sup>2</sup> : from D $\gamma$ to 15/2 <sup>+</sup> level, Q $\gamma$ to 13/2 <sup>+</sup> , and expected band structure. 1050.01 <sup>1</sup> 18 (15/2 <sup>+</sup> ) C J <sup>2</sup> : from D $\gamma$ to 15/2 <sup>+</sup> level and $\gamma$ to 7/2 <sup>+</sup> . 1167.29 <sup>6</sup> 11 21/2 <sup>-</sup> A C J <sup>2</sup> : from Q $\gamma$ to 17/2 <sup>+</sup> level, D $\gamma$ to 19/2 <sup>-</sup> , and expected band structure. 1177.3 D 1210.89 <sup>6</sup> 23 17/2 <sup>+</sup> A C J <sup>2</sup> : from Q $\gamma$ to 13/2 <sup>+</sup> level, $\gamma$ to 15/2 <sup>+</sup> , and expected band structure. 124.2 D 1232.85 14 (3/2) <sup>+</sup> B J <sup>2</sup> : from L $\gamma$ to 17/2 <sup>-</sup> level, $\gamma$ to 15/2 <sup>+</sup> , and expected band structure. 124.4 D 124.4 D 1232.407 22 (11/2 <sup>-</sup> ) D J <sup>2</sup> : from M $\gamma$ to 17/2 <sup>-</sup> level, $\gamma$ to 15/2 <sup>+</sup> and 17/2 <sup>+</sup> , and expected band structure. 1278.33 <sup>4</sup> 11 19/2 <sup>+</sup> A C J <sup>2</sup> : from M $\gamma$ to 15/2 <sup>+</sup> levels. but all $\gamma$ 's are multiply placed. 1278.33 <sup>4</sup> 11 19/2 <sup>+</sup> A C J <sup>2</sup> : from M $\gamma$ to 15/2 <sup>+</sup> and 7/2 <sup>+</sup> levels, but most $\gamma$ 's are multiply placed. 128.60 <sup>2</sup> 1 (3/2,5/2) <sup>+</sup> B J <sup>2</sup> : from M $\gamma$ to 15/2 <sup>-</sup> and 5/2 <sup>-</sup> levels. 1355.4 I <sup>2</sup> (3/2,5/2) <sup>+</sup> B J <sup>2</sup> : from S to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>-</sup> levels. 1404.22 <sup>k</sup> 1/2 23/2 <sup>-</sup> A C J <sup>2</sup> : from M $\gamma$ to 17/2 <sup>-</sup> and 5/2 <sup>-</sup> levels. 1404.22 <sup>k</sup> 1/2 23/2 <sup>-</sup> B d XREF: d(1392). J <sup>2</sup> : from M $\gamma$ to 1/2 <sup>-</sup> and 5/2 <sup>-</sup> levels. 1404.35 15 1/2,3/2 B J <sup>2</sup> : from S to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 3/2 <sup>-</sup> levels. 1404.35 13 3/2 <sup>-</sup> B D J <sup>2</sup> : from Y to 19/2 <sup>-</sup> level and Y to 1/2 <sup>-</sup> . 1405.56 <sup>3</sup> 16 21/2 <sup>-</sup> A C J <sup>2</sup> : from Y to 17/2 <sup>-</sup> and 5/2 <sup>+</sup> levels. 1405.56 <sup>3</sup> 1/6 21/2 <sup>-</sup>	920.68 <sup>8</sup> 14	$(13/2^{+})$	C	$J^{\pi}$ : from expected band structure and $\gamma'$ s to $9/2^+$ and $11/2^+$ levels.
933       D       D         940       D       F       from L=(2) in ( <sup>3</sup> / <sub>2</sub> He,d).         955 <sup>11</sup> 3/2 <sup>+</sup> D       J <sup>4</sup> : from analysis of (pol La) data.         1030 <sup>77</sup> (9/2 <sup>+</sup> )       EF       J <sup>4</sup> : from analysis of (pol La) data.         1030 <sup>78</sup> (9/2 <sup>-</sup> )       F       If <sup>2</sup> : from analysis of (pol La) data.         1030 <sup>78</sup> (9/2 <sup>-</sup> )       C       J <sup>4</sup> : from D y to 15/2 <sup>-</sup> level, Q y to 13/2 <sup>+</sup> , and expected band structure.         1006.01 <sup>7</sup> I8       (15/2 <sup>+</sup> )       C       J <sup>4</sup> : from L=0 in ( <sup>3</sup> / <sub>1</sub> He,d).         1128 <sup>78</sup> 11/2 <sup>-</sup> D       F       J <sup>4</sup> : from analysis of (pol t,a) data.         1130.17 <sup>3</sup> 4       (5/2,7/2) <sup>-</sup> B       J <sup>4</sup> : from L=0 in ( <sup>3</sup> / <sub>1</sub> He,d).         1128 <sup>78</sup> 11/2 <sup>-</sup> F       F       Torm analysis of (pol t,a) data.         1137.17 <sup>3</sup> 4       C       J <sup>4</sup> : from B1 y to 5/2 <sup>1</sup> level, y to 13/2 <sup>-</sup> , and expected band structure.         1137.17 <sup>3</sup> 4       C       J <sup>4</sup> : from M1 y's to 1/2 <sup>-</sup> , and 7/2 <sup>+</sup> , and expected band structure.         1210.89 <sup>b</sup> 23       17/2 <sup>+</sup> A C       J <sup>4</sup> : from M1 y's to 1/2 <sup>-</sup> , and 7/2 <sup>+</sup> levels, but and y's are multiply placed.         1240.49 <sup>2</sup> 19/2 <sup>+</sup> A C       J <sup>4</sup> : from M1 y's to 1/2 <sup>-</sup> , and 5/2 <sup>+</sup> l	931.64 <sup><b>x</b></sup> 10	19/2-	AC	$J^{\pi}$ : from Q $\gamma$ to 15/2 <sup>-</sup> level, D $\gamma$ to 17/2 <sup>-</sup> , and expected band structure.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	933		DE	
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	940 $955^{n}$ 2	3/2+	דע ח	$I^{\pi}$ : from $I - (2)$ in $({}^{3}He d)$
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	$002^{l}$	$(0/2^+)$	FF	$I^{\pi}$ : from analysis of (pol t $\alpha$ ) data
1059.53 <sup>e</sup> 10       17/2 <sup>+</sup> A C       J <sup>a</sup> : from D y to 15/2 <sup>+</sup> level, Q y to 13/2 <sup>+</sup> , and expected band structure.         1084.41 <sup>h</sup> 13       17/2 <sup>-</sup> A C       J <sup>a</sup> : from D y to 15/2 <sup>+</sup> level, Q y to 13/2 <sup>-</sup> , and expected band structure.         1096.01 <sup>f</sup> 18       (15/2 <sup>+</sup> )       C       J <sup>a</sup> : from D y to 15/2 <sup>+</sup> level, Q y to 13/2 <sup>-</sup> , and expected band structure.         1100 <sup>o</sup> 2       1/2 <sup>+</sup> D F       J <sup>a</sup> : from L=0 in ( <sup>3</sup> He,d).         1128 <sup>m</sup> 3       11/2 <sup>-</sup> EF       J <sup>a</sup> : from El y to 5/2 <sup>+</sup> level and y to 7/2 <sup>+</sup> .         1167.29 <sup>d</sup> 11       21/2 <sup>-</sup> A C       J <sup>a</sup> : from Q y to 13/2 <sup>+</sup> level, y to 15/2 <sup>+</sup> , and expected band structure.         1177 3       D       D       J <sup>a</sup> : from V s' to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 7/2 <sup>+</sup> levels, but all y's are multiply placed.         1210.89 <sup>b</sup> 23       17/2 <sup>+</sup> A C       J <sup>a</sup> : from D y to 15/2 <sup>+</sup> level, y to 15/2 <sup>+</sup> , and expected band structure.         1214.2       D       J <sup>a</sup> : from V s' to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 7/2 <sup>+</sup> levels, but all y's are multiply placed.         1240.07 22       (11/2 <sup>-</sup> )       D       J <sup>a</sup> : from L=(s) in ( <sup>3</sup> He,d).         1218.49       I       19/2 <sup>+</sup> A C       J <sup>a</sup> : from El y to 3/2 <sup>-</sup> and s's to 5/2 <sup>-</sup> and 5/2 <sup>+</sup> .         1280.4       I       I       EF       I       if if from Y s to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>+</sup> levels, but most y's are multiply placed.	$1030^{m}$	$(9/2^{-})$	F	$J^{\pi}$ : from analysis of (pol t, $\alpha$ ) data.
1084.41 <sup>h</sup> 13       17/2 <sup>-</sup> A C       J <sup>π</sup> : from D y to 15/2 <sup>+</sup> level, Q y to 13/2 <sup>-</sup> , and expected band structure.         1096.01 <sup>f</sup> 18       (15/2 <sup>+</sup> )       C       J <sup>π</sup> : from J y to 11/2 <sup>+</sup> and (13/2 <sup>+</sup> ) and expected band structure.         1100 <sup>o</sup> 2       1/2 <sup>+</sup> D F       J <sup>π</sup> : from analysis of (pol t, a) data.         1128 <sup>m</sup> 3       11/2 <sup>-</sup> EF       J <sup>π</sup> : from C y to 17/2 <sup>-</sup> level, D data.         1137.17 <sup>±</sup> 4       (5/2,7/2) <sup>-</sup> B       J <sup>π</sup> : from C y to 17/2 <sup>-</sup> level, D y to 19/2 <sup>-</sup> , and expected band structure.         1177.3       D       J <sup>π</sup> : from Q y to 13/2 <sup>+</sup> level, Q to 15/2 <sup>+</sup> , and expected band structure.       J <sup>m</sup> : from Q y to 13/2 <sup>+</sup> level, y to 15/2 <sup>+</sup> , and expected band structure.         1210.89 <sup>b</sup> 23       17/2 <sup>+</sup> A C       J <sup>π</sup> : from Q y to 13/2 <sup>+</sup> level, y to 15/2 <sup>+</sup> , and expected band structure.         1240.07       (1/2,3/2,5/2) <sup>+</sup> B       J <sup>π</sup> : from L=(5) in ( <sup>3</sup> He,d).         1280P       2       (1/2 <sup>-</sup> )       D       J <sup>π</sup> : from L=(5) in ( <sup>3</sup> He,d).         1232.507 <sup>‡</sup> 9       J <sup>π</sup> : from Y to 17/2 <sup>-</sup> level, y's to 5/2 <sup>-</sup> and 5/2 <sup>+</sup> .         1235       19/2 <sup>±</sup> A C       J <sup>π</sup> : from EI y to 3/2 <sup>-</sup> and y's to 5/2 <sup>-</sup> and 5/2 <sup>+</sup> .         1311.78 <sup>c</sup> 19/2 <sup>±</sup> A C       J <sup>π</sup> : from H y to 12/2 <sup>-</sup> and 5/2 <sup>+</sup> levels,	1059.53 <sup>e</sup> 10	$17/2^+$	AC	$J^{\pi}$ : from D $\gamma$ to $15/2^{-}$ level, Q $\gamma$ to $13/2^{+}$ , and expected band structure.
1096.01 <sup>f</sup> 18 $(15/2^+)$ C       J <sup>±</sup> : from Y's to 11/2 <sup>+</sup> and (13/2 <sup>+</sup> ) and expected band structure.         1100 <sup>o</sup> 2       1/2 <sup>+</sup> D       F       J <sup>±</sup> : from L = 0 in ( <sup>3</sup> He, d).         1128 <sup>m</sup> 3       11/2 <sup>-</sup> EF       J <sup>±</sup> : from El y to 5/2 <sup>+</sup> level and y to 7/2 <sup>+</sup> .         1167.29 <sup>4</sup> 11       21/2 <sup>-</sup> A       C       J <sup>±</sup> : from Q y to 13/2 <sup>+</sup> level, D y to 19/2 <sup>-</sup> , and expected band structure.         1177 3       D       J <sup>±</sup> : from Q y to 13/2 <sup>+</sup> level, y to 15/2 <sup>+</sup> , and expected band structure.       D         1210.89 <sup>b</sup> 23       17/2 <sup>+</sup> A       C       J <sup>±</sup> : from M y 's to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 7/2 <sup>+</sup> levels, but all y's are multiply placed.         1240.07 22       (1/2,3/2,5/2) <sup>+</sup> B       J <sup>±</sup> : from M y 's to 13/2 <sup>+</sup> levels.       If 's from L = (5) in ( <sup>3</sup> He, d).         1294.07       (11/2 <sup>-</sup> )       D       J <sup>±</sup> : from L = (5) in ( <sup>3</sup> He, d).       If 's from 2 y to 15/2 <sup>+</sup> level and expected band structure.         1280.9 <sup>2</sup> (11/2 <sup>-</sup> )       D       J <sup>±</sup> : from S y to 1/2 <sup>-</sup> level, y's to 5/2 <sup>-</sup> and 17/2 <sup>+</sup> , and cype to 13/2 <sup>+</sup> .       If 's from Y 's to 1/2 <sup>-</sup> , int's to 1/2 <sup>-</sup> , and 5/2 <sup>+</sup> .         1391.46       (1/2 <sup>+</sup> )       J       J <sup>±</sup> : from Y 's to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>+</sup> levels, but most y's are multiply placed.         1392.209 <sup>‡</sup> J       J       J <sup>±</sup> : from Y 's to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>-</sup> levels	1084.41 <sup>h</sup> 13	$17/2^{-}$	AC	$J^{\pi}$ : from D $\gamma$ to 15/2 <sup>+</sup> level, Q $\gamma$ to 13/2 <sup>-</sup> , and expected band structure.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1096.01 <sup><i>f</i></sup> 18	$(15/2^+)$	С	$J^{\pi}$ : from $\gamma'$ s to $11/2^+$ and $(13/2^+)$ and expected band structure.
1128 <sup>m</sup> 3       11/2 <sup>-</sup> EF $J^{7}$ : from analysis of (pol t, $\alpha$ ) data.         1137.17 <sup>4</sup> 4       (5/2,7/2) <sup>-</sup> B $J^{7}$ : from E1 $\gamma$ to 5/2 <sup>+</sup> level and $\gamma$ to 7/2 <sup>+</sup> .         1167.29 <sup>a</sup> 11       21/2 <sup>-</sup> A C $J^{7}$ : from Q $\gamma$ to 17/2 <sup>-</sup> level, D $\gamma$ to 19/2 <sup>-</sup> , and expected band structure.         1210.89 <sup>b</sup> 23       17/2 <sup>+</sup> A C $J^{7}$ : from Q $\gamma$ to 13/2 <sup>+</sup> level, $\gamma$ to 15/2 <sup>+</sup> , and expected band structure.         1214 2       D       J <sup>7</sup> : from $\gamma'$ s to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 7/2 <sup>+</sup> levels, but all $\gamma'$ s are multiply placed.         1240.07 22       (1/2,3/2,5/2) <sup>+</sup> B       J <sup>7</sup> : from Y's to 3/2 <sup>+</sup> levels.         1278.33 <sup>d</sup> 11       19/2 <sup>+</sup> A C       J <sup>7</sup> : from D $\gamma$ to 17/2 <sup>-</sup> level, $\gamma'$ to 15/2 <sup>+</sup> and 17/2 <sup>+</sup> , and expected band structure.         1280P 2       (1/2 <sup>-</sup> )       D       J <sup>7</sup> : from L=(5) in ( <sup>3</sup> He, d).         1291 4       E         1311.78 <sup>C</sup> 15       19/2 <sup>+</sup> A C       J <sup>7</sup> : from Q $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1325.20 <sup>+</sup> 19       (2,5/2) <sup>+</sup> B       J <sup>7</sup> : from C $\gamma'$ to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>+</sup> levels, but most $\gamma'$ s are multiply placed.         1396.95 12       3/2 <sup>-</sup> B d       XREF: d(1392).       J <sup>7</sup> : from M1 $\gamma'$ s to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>+</sup> levels, but most $\gamma'$ s are multiply placed.         1404.22 <sup>k</sup> 12 <td>1100°2</td> <td>1/2+</td> <td>DF</td> <td><math>J^{\pi}</math>: from L=0 in (<sup>3</sup>He,d).</td>	1100°2	1/2+	DF	$J^{\pi}$ : from L=0 in ( <sup>3</sup> He,d).
1137.17 <sup>2</sup> 4 $(5/2,7/2)^{-}$ B $J^{\pi}$ ; from El $\gamma$ to $5/2^{+}$ level and $\gamma$ to $7/2^{+}$ .         1167.29 <sup>a</sup> 11       21/2 <sup>-</sup> A C $J^{\pi}$ ; from Q $\gamma$ to $17/2^{-}$ level, D $\gamma$ to $19/2^{-}$ , and expected band structure.         1210.89 <sup>b</sup> 23       17/2 <sup>+</sup> A C $J^{\pi}$ ; from Q $\gamma$ to $13/2^{+}$ levels, $\gamma$ to $15/2^{+}$ , and expected band structure.         1214 2       D       D         1232.85 14 $(3/2)^{+}$ B $J^{\pi}$ ; from M1 $\gamma$ 's to $3/2^{+}$ levels.         1278.33 <sup>d</sup> 11       19/2 <sup>+</sup> A C $J^{\pi}$ ; from D $\gamma$ to $17/2^{-}$ level, $\gamma$ 's to $15/2^{+}$ and $17/2^{+}$ , and expected band structure.         1280 P       2 $(11/2^{-})$ D $J^{\pi}$ ; from Cl $\gamma$ to $15/2^{+}$ levels and expected band structure.         1280 P       2 $(11/2^{-})$ D $J^{\pi}$ ; from Cl $\gamma$ to $15/2^{+}$ level and expected band structure.         1280 P       2 $(12/2^{-})^{-}$ D $J^{\pi}$ ; from Cl $\gamma$ to $15/2^{+}$ level and expected band structure.         1385 4       EF       E $J^{\pi}$ ; from M1 $\gamma$ 's to $1/2^{-}$ , $1/2^{+}$ , and $5/2^{-}$ levels, but most $\gamma$ 's are multiply placed.         1396.95 12 $3/2^{-}$ B       XEEF: d(1392). $J^{\pi}$ ; from M1 $\gamma$ 's to $1/2^{-}$ and $5/2^{-}$ levels.         1404.22 <sup>k</sup> 12       23/2^{-}	1128 <sup>m</sup> 3	$11/2^{-}$	EF	$J^{\pi}$ : from analysis of (pol t, $\alpha$ ) data.
1167.294 11       21/2 <sup>-</sup> A C       J <sup>7</sup> : from Q $\gamma$ to 17/2 <sup>-</sup> level, D $\gamma$ to 19/2 <sup>-</sup> , and expected band structure.         1177 3       D       J <sup>7</sup> : from Q $\gamma$ to 13/2 <sup>+</sup> level, $\gamma$ to 15/2 <sup>+</sup> , and expected band structure.         1210.89 <sup>b</sup> 23       17/2 <sup>+</sup> A C       J <sup>7</sup> : from Q $\gamma$ to 13/2 <sup>+</sup> level, $\gamma$ to 15/2 <sup>+</sup> , and expected band structure.         1232.85 14       (3/2) <sup>+</sup> B       J <sup>7</sup> : from Y s to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 7/2 <sup>+</sup> levels, but all $\gamma$ 's are multiply placed.         1240.07 22       (1/2,3/2,5/2) <sup>+</sup> B       J <sup>7</sup> : from D $\gamma$ to 17/2 <sup>-</sup> level, $\gamma$ 's to 15/2 <sup>+</sup> and 17/2 <sup>+</sup> , and expected band structure.         1280 <sup>P</sup> 2       (11/2 <sup>-</sup> )       D       J <sup>7</sup> : from D $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1281.78 <sup>C</sup> 15       19/2 <sup>+</sup> A C       J <sup>7</sup> : from Q $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1285.207 <sup>‡</sup> 19       (3/2,5/2) <sup>+</sup> B       J <sup>7</sup> : from Q $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1355 4       EF       Iff       iff mold 1 $\gamma$ 's to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>-</sup> levels, but most $\gamma$ 's are multiply placed.         1399.45 12       3/2 <sup>-</sup> B       d       XREF: d(1392).         1 <sup>7</sup> : from M 's to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>-</sup> levels, but most $\gamma$ 's are multiply placed.       XREF: d(1392).         1404.22 <sup>k</sup> 12       23/2 <sup>-</sup> A C       J <sup>r</sup> : from Q $\gamma$ to 19/2 <sup>-</sup> level and expected band st	1137.1? <sup>‡</sup> 4	$(5/2,7/2)^{-}$	В	$J^{\pi}$ : from E1 $\gamma$ to 5/2 <sup>+</sup> level and $\gamma$ to 7/2 <sup>+</sup> .
11/7 3       D         1210.89 <sup>b</sup> 23       17/2 <sup>+</sup> A C       J <sup>π</sup> : from Q $\gamma$ to 13/2 <sup>+</sup> level, $\gamma$ to 15/2 <sup>+</sup> , and expected band structure.         1214 2       D         1232.85 14       (3/2) <sup>+</sup> B       J <sup>π</sup> : from M1 $\gamma$ 's to 3/2 <sup>+</sup> levels, but all $\gamma$ 's are multiply placed.         1240.07 22       (1/2,3/2,5/2) <sup>+</sup> B       J <sup>π</sup> : from D $\gamma$ to 17/2 <sup>-</sup> level, $\gamma$ 's to 15/2 <sup>+</sup> and 17/2 <sup>+</sup> , and expected band structure.         1280 <sup>P</sup> 2       (11/2 <sup>-</sup> )       D       J <sup>π</sup> : from D $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1291 4       E         1311.78 <sup>c</sup> 15       19/2 <sup>+</sup> A C       J <sup>π</sup> : from C $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1325.20? <sup>±</sup> 19       (3/2,5/2) <sup>+</sup> B       J <sup>π</sup> : from C $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1394.46 16       (1/2 <sup>+</sup> , 3/2)       B d       XREF: d(1392).         J <sup>π</sup> : from $\gamma$ 's to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>+</sup> levels, but most $\gamma$ 's are multiply placed.         1396.95 12       3/2 <sup>-</sup> B d         1404.22 <sup>&amp; k</sup> 12       23/2 <sup>-</sup> A C       J <sup>π</sup> : from M1 $\gamma$ 's to 1/2 <sup>-</sup> and 5/2 <sup>-</sup> levels.         1404.35 15       1/2.3/2       B       J <sup>π</sup> : from analysis of (pol t <sub>A</sub> ) data         14366 4       (1/2 <sup>+1</sup> )       DEF       J <sup>π</sup> : from En $\gamma$ to 1/2 <sup>+</sup> and 3/2 <sup>-</sup> levels.         <	1167.29 <sup><i>a</i></sup> 11	21/2-	AC	J <sup><math>\pi</math></sup> : from Q $\gamma$ to 17/2 <sup>-</sup> level, D $\gamma$ to 19/2 <sup>-</sup> , and expected band structure.
1210.89 <sup>0</sup> 23       17/2*       A C       J <sup>n</sup> : from Q $\gamma$ to 13/2* level, $\gamma$ to 15/2*, and expected band structure.         1214 2       D       J <sup>n</sup> : from Y's to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 7/2 <sup>+</sup> levels, but all $\gamma'$ s are multiply placed.         1232.85 14       (3/2) <sup>+</sup> B       J <sup>n</sup> : from M1 $\gamma'$ s to 3/2 <sup>+</sup> levels.         1240.07 22       (1/2,3/2,5/2) <sup>+</sup> B       J <sup>n</sup> : from D $\gamma$ to 17/2 <sup>-</sup> level, $\gamma'$ s to 15/2 <sup>+</sup> and 17/2 <sup>+</sup> , and expected band structure.         1280 <sup>P</sup> 2       (11/2 <sup>-</sup> )       D       J <sup>n</sup> : from D $\gamma$ to 17/2 <sup>-</sup> level, $\gamma'$ s to 15/2 <sup>+</sup> and 17/2 <sup>+</sup> , and expected band structure.         1291 4       E         1311.78 <sup>c</sup> 15       19/2 <sup>+</sup> A C       J <sup>n</sup> : from Q $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1325.20? <sup>±</sup> 19       (3/2,5/2) <sup>+</sup> B       J <sup>n</sup> : from Cl $\gamma$ to 3/2 <sup>-</sup> and $\gamma'$ s to 5/2 <sup>-</sup> and 5/2 <sup>+</sup> .         1396.46 16       (1/2 <sup>+</sup> ,3/2)       B d       XREF: d(1392).       J <sup>n</sup> : from M1 $\gamma'$ s to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>+</sup> levels, but most $\gamma'$ s are multiply placed.         1396.95 12       3/2 <sup>-</sup> B d       XREF: d(1392).       J <sup>n</sup> : from M 1 $\gamma'$ s to 1/2 <sup>-</sup> and 5/2 <sup>-</sup> levels.         1404.22 <sup>&amp; k</sup> 12       23/2 <sup>-</sup> A C       J <sup>n</sup> : from M 1 $\gamma'$ s to 1/2 <sup>-</sup> and 5/2 <sup>-</sup> levels.       J <sup>n</sup> : from 1/2 <sup>-</sup> and 3/2 <sup>-</sup> levels.         1404.23 <sup>k</sup> 15       1/2,3/2       B       J <sup>n</sup> : from M 1 $\gamma'$ s to 1/2 <sup>-</sup> and 3/2 <sup>-</sup> levels. <td>1177 3</td> <td></td> <td>D</td> <td></td>	1177 3		D	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	1210.89° 23	17/2*	AC	J <sup><i>n</i></sup> : from Q $\gamma$ to 13/2 <sup>+</sup> level, $\gamma$ to 15/2 <sup>+</sup> , and expected band structure.
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1214 2	$(3/2)^+$	B	$I^{\pi}$ : from $\gamma'$ s to $1/2^{-}$ $1/2^{+}$ and $7/2^{+}$ levels but all $\gamma'$ s are multiply placed
1278.33 <sup>d</sup> 11       19/2 <sup>+</sup> A C $J^{\pi}$ : from D $\gamma$ to 17/2 <sup>-</sup> level, $\gamma'$ s to 15/2 <sup>+</sup> and 17/2 <sup>+</sup> , and expected band structure.         1280P 2       (11/2 <sup>-</sup> )       D $J^{\pi}$ : from D $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1291 4       E         1311.78 <sup>c</sup> 15       19/2 <sup>+</sup> A C $J^{\pi}$ : from Q $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1325.207 <sup>±</sup> 19       (3/2,5/2) <sup>+</sup> B $J^{\pi}$ : from E1 $\gamma$ to 3/2 <sup>-</sup> and $\gamma'$ s to 5/2 <sup>-</sup> and 5/2 <sup>+</sup> .         1355 4       EF         1394.46 16       (1/2 <sup>+</sup> , 3/2)       B d       XREF: d(1392). $J^{\pi}$ : from M's to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>+</sup> levels, but most $\gamma'$ s are multiply placed.         1396.95 12       3/2 <sup>-</sup> B d       XREF: d(1392). $J^{\pi}$ : from M $\gamma'$ s to 1/2 <sup>-</sup> , and 5/2 <sup>-</sup> levels, but most $\gamma'$ s are multiply placed.       J <sup>*</sup> : from M 1 $\gamma'$ s to 1/2 <sup>-</sup> and 5/2 <sup>-</sup> levels.         1404.32 <sup>&amp; d</sup> 12       23/2 <sup>-</sup> A C       J <sup>*</sup> : from M $\gamma'$ s to 1/2 <sup>-</sup> , and 3/2 <sup>-</sup> levels.         1404.35 15       1/2,3/2       B       J <sup>*</sup> : from 2 $\gamma$ to 19/2 <sup>-</sup> level and $\gamma'$ s to 1/2 <sup>-</sup> .         1436 <sup>d</sup> 4       (1/2 <sup>+</sup> )       DEF       J <sup>*</sup> : from E1 $\gamma'$ to 1/2 <sup>+</sup> and 3/2 <sup>+</sup> levels, and $\gamma$ to 7/2 <sup>-</sup> .         1455.62 <sup>ln</sup> 16       21/2 <sup>-</sup> B       J <sup>*</sup> : from C1 $\gamma$ to 5/2 <sup></sup>	1240.07 22	$(1/2,3/2,5/2)^+$	B	$J^{\pi}$ : from M1 $\gamma$ 's to $3/2^+$ levels.
1280P 2 $(11/2^-)$ D       J <sup>#</sup> : from L=(5) in ( <sup>3</sup> He,d).         1291 4       E         1311.78 <sup>c</sup> 15       19/2 <sup>+</sup> A C       J <sup>#</sup> : from Q $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1325.20? <sup>±</sup> 19 $(3/2,5/2)^+$ B       J <sup>#</sup> : from E1 $\gamma$ to 3/2 <sup>-</sup> and $\gamma'$ s to 5/2 <sup>-</sup> and 5/2 <sup>+</sup> .         1355 4       EF         1394.46 16 $(1/2^+, 3/2)$ B d       XREF: d(1392).         J <sup>#</sup> : from $\gamma'$ s to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>+</sup> levels, but most $\gamma'$ s are multiply placed.         1396.95 12       3/2 <sup>-</sup> B d       XREF: d(1392).         J <sup>#</sup> : from $\gamma'$ s to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 5/2 <sup>+</sup> levels, but most $\gamma'$ s are multiply placed.         1404.32 <sup>&amp;</sup> I2       23/2 <sup>-</sup> A C         J <sup>#</sup> : from Q $\gamma$ to 19/2 <sup>-</sup> level and expected band structure.       J <sup>#</sup> : from Q $\gamma$ to 19/2 <sup>-</sup> levels.         1404.35 15       1/2.3/2       B       J <sup>#</sup> : from Q $\gamma$ to 19/2 <sup>-</sup> levels, and $\gamma$ to 7/2 <sup>-</sup> .         1436 <sup>4</sup> 4       (1/2 <sup>+</sup> )       DEF       J <sup>#</sup> : from E1 $\gamma'$ to 5/2 <sup>+</sup> level and $\gamma'$ to 1/2 <sup>-</sup> and $\gamma'$ to 1/2 <sup>-</sup> .         1465.62 <sup>th</sup> 16       21/2 <sup>-</sup> B       J <sup>#</sup> : from Q $\gamma$ to 1/2 <sup>+</sup> and $\gamma'$ to 1/2 <sup>-</sup> .         1465.62 <sup>th</sup> 16       21/2 <sup>-</sup> A C       J <sup>#</sup> : from M1 $\gamma$ to 3/2 <sup>-</sup> level and $\gamma'$ s to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 7/2 <sup>-</sup> .         1491.17 13	1278.33 <sup>d</sup> 11	19/2+	AC	$J^{\pi}$ : from D $\gamma$ to $17/2^{-}$ level, $\gamma$ 's to $15/2^{+}$ and $17/2^{+}$ , and expected band structure.
1291 4       E         1311.78 <sup>c</sup> 15       19/2 <sup>+</sup> A C       J <sup><math>\pi</math></sup> : from Q $\gamma$ to 15/2 <sup>+</sup> level and expected band structure.         1325.207 <sup>‡</sup> 19       (3/2,5/2) <sup>+</sup> B       J <sup><math>\pi</math></sup> : from E1 $\gamma$ to 3/2 <sup>-</sup> and $\gamma$ 's to 5/2 <sup>-</sup> and 5/2 <sup>+</sup> .         1355 4       EF         1394.46 16       (1/2 <sup>+</sup> ,3/2)       B d       XREF: d(1392).         J <sup><math>\pi</math></sup> : from $\gamma$ 's to $1/2^-$ , $1/2^+$ , and $5/2^-$ levels, but most $\gamma$ 's are multiply placed.         1396.95 12       3/2 <sup>-</sup> B d       XREF: d(1392).         J <sup><math>\pi</math></sup> : from M1 $\gamma$ 's to $1/2^-$ and $5/2^-$ levels.       J       J         1404.22 <sup>&amp;</sup> 12       23/2 <sup>-</sup> A C       J <sup><math>\pi</math></sup> : from Q $\gamma$ to 19/2 <sup>-</sup> level and expected band structure.         1404.35 15       1/2,3/2       B       J <sup><math>\pi</math></sup> : from Y's to $1/2^-$ and $3/2^-$ levels.         1436 <sup>4</sup> 4       (1/2 <sup>+</sup> )       DEF       J <sup><math>\pi</math></sup> : from E1 $\gamma$ 's to $1/2^+$ , and $3/2^-$ levels.         1457.67 10       3/2 <sup>-</sup> B       J <sup><math>\pi</math></sup> : from E1 $\gamma$ to $5/2^+$ level and $\gamma$ 's to $1/2^-$ .         1465.62 <sup>h</sup> 16       21/2 <sup>-</sup> A C       J <sup><math>\pi</math></sup> : from Q $\gamma$ to 17/2 <sup>-</sup> and 3/2 <sup>+</sup> levels, and $\gamma$ to $7/2-$ .         1488.33 12       3/2 <sup>-</sup> B D       J <sup><math>\pi</math></sup> : from M1 $\gamma$ to $3/2- level and \gamma's to 1/2-, 1/2+, and 7/2-.         1491.17 13       (3/2)-       B D       KREF: $	1280 <b>P</b> 2	$(11/2^{-})$	D	$J^{\pi}$ : from L=(5) in ( <sup>3</sup> He,d).
1311.78°       15       19/2*       A C       J <sup>*</sup> : from Q $\gamma$ to 15/2* level and expected band structure.         1325.20? <sup>‡</sup> 19       (3/2,5/2)*       B       J <sup>#</sup> : from El $\gamma$ to 3/2 <sup>-</sup> and $\gamma$ 's to 5/2 <sup>-</sup> and 5/2*.         1355 4       EF         1394.46 16       (1/2*,3/2)       B d       XREF: d(1392).         J <sup>#</sup> : from $\gamma$ 's to 1/2 <sup>-</sup> , 1/2*, and 5/2 <sup>+</sup> levels, but most $\gamma$ 's are multiply placed.         1396.95 12       3/2 <sup>-</sup> B d       XREF: d(1392).         J <sup>#</sup> : from M1 $\gamma$ 's to 1/2 <sup>-</sup> and 5/2 <sup>-</sup> levels.       J <sup>#</sup> : from M1 $\gamma$ 's to 1/2 <sup>-</sup> and 3/2 <sup>-</sup> levels.         1404.22 <sup>&amp;</sup> 12       23/2 <sup>-</sup> A C       J <sup>#</sup> : from Q $\gamma$ to 19/2 <sup>-</sup> level and expected band structure.         1404.35 15       1/2,3/2       B       J <sup>#</sup> : from $\gamma$ 's to 1/2 <sup>+</sup> , 1/2 <sup>-</sup> , and 3/2 <sup>-</sup> levels.         1436 <sup>4</sup> 4       (1/2 <sup>+</sup> )       DEF       J <sup>#</sup> : from El $\gamma$ to 5/2 <sup>+</sup> level and $\gamma$ 's to 1/2 <sup>+</sup> .         1457.67 10       3/2 <sup>-</sup> B       J <sup>#</sup> : from El $\gamma$ to 5/2 <sup>+</sup> level and $\gamma$ to 1/2 <sup>+</sup> .         1461.55 13       3/2 <sup>-</sup> B       J <sup>#</sup> : from El $\gamma$ to 5/2 <sup>+</sup> level and $\gamma$ 's to 1/2 <sup>+</sup> .         1465.62 <sup>h</sup> 16       21/2 <sup>-</sup> A C       J <sup>#</sup> : from M1 $\gamma$ to 3/2 <sup>-</sup> level and $\gamma$ 's to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 7/2 <sup>-</sup> .         1491.17 13       (3/2) <sup>-</sup> B ef       XREF: e(1490).       J <sup>#</sup> : from M1 $\gamma$ to 3/2 <sup>-</sup> level and (El	1291 4		E	
1325.20?*19 $(3/2,5/2)^+$ B $J^{\pi}$ : from El $\gamma$ to $3/2^-$ and $\gamma'$ s to $5/2^-$ and $5/2^+$ .1355 4EF1394.46 16 $(1/2^+,3/2)$ B dXREF: $d(1392)$ . $J^{\pi}$ : from $\gamma'$ s to $1/2^-$ , $1/2^+$ , and $5/2^+$ levels, but most $\gamma'$ s are multiply placed.1396.95 12 $3/2^-$ B dXREF: $d(1392)$ . $J^{\pi}$ : from M1 $\gamma'$ s to $1/2^-$ , $1/2^+$ , and $5/2^-$ levels.1404.22 & 12 $23/2^-$ A C $J^{\pi}$ : from Q $\gamma$ to $19/2^-$ level and expected band structure.1404.35 15 $1/2,3/2$ B $J^{\pi}$ : from $\gamma'$ s to $1/2^+$ , $1/2^-$ , and $3/2^-$ levels.14369 4 $(1/2^+)$ DEF $J^{\pi}$ : from El $\gamma'$ s to $1/2^+$ and $3/2^+$ levels, and $\gamma$ to $7/2^-$ .1461.55 13 $3/2^-$ B $J^{\pi}$ : from El $\gamma$ to $5/2^+$ level and expected band structure.1455.62 h 16 $21/2^-$ A C $J^{\pi}$ : from Q $\gamma$ to $17/2^-$ and expected band structure.1488.33 12 $3/2^-$ B D $J^{\pi}$ : from Q $\gamma$ to $1/2^-$ and expected band structure.1491.17 13 $(3/2)^-$ B eFXREF: $e(1490)$ . $J^{\pi}$ : from M1 $\gamma$ to $3/2^-$ level and $(E1) \gamma$ to $1/2^+$ , and $7/2^-$ .1514.03 e 13 $21/2^+$ A C $J^{\pi}$ : from D $\gamma$ to $19/2^-$ level, $\gamma'$ s to $17/2^+$ and $19/2^+$ , and expected band structure.1524.64 11 $(5/2,7/2)^-$ B DXREF: D(1519).	1311.78° <i>15</i>	19/2+	AC	$J^{n}$ : from Q $\gamma$ to $15/2^{+}$ level and expected band structure.
1333 4IF1394.46 16 $(1/2^+, 3/2)$ B dXREF: d(1392). J <sup><math>\pi</math></sup> : from $\gamma'$ s to $1/2^-$ , $1/2^+$ , and $5/2^+$ levels, but most $\gamma'$ s are multiply placed.1396.95 12 $3/2^-$ B dXREF: d(1392). J <sup><math>\pi</math></sup> : from M1 $\gamma'$ s to $1/2^-$ and $5/2^-$ levels.1404.22 (12) $23/2^-$ A CJ <sup><math>\pi</math></sup> : from Q $\gamma$ to $19/2^-$ level and expected band structure.1404.35 15 $1/2, 3/2$ BJ <sup><math>\pi</math></sup> : from Q $\gamma$ to $19/2^-$ level and expected band structure.1436 4 $(1/2^+)$ DEFJ <sup><math>\pi</math></sup> : from analysis of (pol t, $\alpha$ ) data.1457.67 10 $3/2^-$ BJ <sup><math>\pi</math></sup> : from E1 $\gamma'$ s to $1/2^+$ and $3/2^+$ levels, and $\gamma$ to $7/2^-$ .1461.55 13 $3/2^-$ BJ <sup><math>\pi</math></sup> : from Q $\gamma$ to $17/2^-$ and expected band structure.1488.33 12 $3/2^-$ BD1491.17 13 $(3/2)^-$ BeFXREF: e(1490). J <sup><math>\pi</math></sup> : from M1 $\gamma$ to $3/2^-$ level and (E1) $\gamma$ to $1/2^+$ .1514.03 e 13 $21/2^+$ A CJ <sup><math>\pi</math></sup> : from D $\gamma$ to $19/2^-$ level, $\gamma'$ s to $17/2^+$ and $19/2^+$ , and expected band structure.1524.64 11 $(5/2,7/2)^-$ BDXREF: e(1519).	1325.20?* 19	$(3/2,5/2)^+$	В	$J^{\pi}$ : from E1 $\gamma$ to $3/2^{-}$ and $\gamma'$ s to $5/2^{-}$ and $5/2^{+}$ .
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	1333 4	$(1/2^+ 3/2)$	Er Rd	XREF: d(1392)
1396.95 12 $3/2^-$ B d       XREF: $d(1392)$ . $J^{\pi}$ : from M1 $\gamma'$ s to $1/2^-$ and $5/2^-$ levels.         1404.22& 12 $23/2^-$ A C $J^{\pi}$ : from Q $\gamma$ to $19/2^-$ level and expected band structure.         1404.35 15 $1/2, 3/2$ B $J^{\pi}$ : from Q $\gamma$ to $19/2^-$ level and expected band structure.         1404.35 15 $1/2, 3/2$ B $J^{\pi}$ : from $\gamma$ 's to $1/2^+$ , $1/2^-$ , and $3/2^-$ levels.         1436 <sup>q</sup> 4 $(1/2^+)$ DEF $J^{\pi}$ : from analysis of (pol t, $\alpha$ ) data.         1457.67 10 $3/2^-$ B       J^{\pi}: from E1 $\gamma$ 's to $1/2^+$ and $3/2^+$ levels, and $\gamma$ to $7/2^-$ .         1461.55 13 $3/2^-$ B       J^{\pi}: from E1 $\gamma$ to $5/2^+$ level and $\gamma$ 's to $1/2^+$ and $7/2^-$ .         1465.62 <sup>h</sup> 16 $21/2^-$ A C       J^{\pi}: from Q $\gamma$ to $17/2^-$ and expected band structure.         1488.33 12 $3/2^-$ B De       XREF: e(1490).         J^{\pi}: from M1 $\gamma$ to $3/2^-$ level and $\gamma$ 's to $1/2^-$ , $1/2^+$ , and $7/2^-$ .         1491.17 13 $(3/2)^-$ B eF       XREF: e(1490).         J^{\pi}: from E1 $\gamma$ to $5/2^+$ level and (E1) $\gamma$ to $1/2^+$ .       1514.03 <sup>e</sup> 13 $21/2^+$ A C         1524.64 11 $(5/2,7/2)^-$ B D       XREF: D(1519).       XREF: D(1519).	1574.40 10	(1/2, 3/2)	bu	$J^{\pi}$ : from $\gamma'$ s to $1/2^-$ , $1/2^+$ , and $5/2^+$ levels, but most $\gamma'$ s are multiply placed.
$J^{\pi}: \text{ from M1 } \gamma' \text{ s to } 1/2^{-} \text{ and } 5/2^{-} \text{ levels.}$ $1404.22^{\&} 12  23/2^{-} \qquad \text{A C} \qquad J^{\pi}: \text{ from Q } \gamma \text{ to } 19/2^{-} \text{ level and expected band structure.}$ $1404.35 \ 15  1/2,3/2 \qquad \text{B} \qquad J^{\pi}: \text{ from } \gamma' \text{ s to } 1/2^{+}, 1/2^{-}, \text{ and } 3/2^{-} \text{ levels.}$ $1436^{q} \ 4  (1/2^{+}) \qquad \text{DEF} \qquad J^{\pi}: \text{ from analysis of (pol t, \alpha) data.}$ $1457.67 \ 10  3/2^{-} \qquad \text{B} \qquad J^{\pi}: \text{ from E1 } \gamma' \text{ s to } 1/2^{+} \text{ and } 3/2^{+} \text{ levels, and } \gamma \text{ to } 7/2^{-}.$ $1461.55 \ 13  3/2^{-} \qquad \text{B D} \qquad J^{\pi}: \text{ from E1 } \gamma \text{ to } 5/2^{+} \text{ level and } \gamma' \text{ s to } 1/2^{+} \text{ and } 7/2^{-}.$ $1465.62^{h} \ 16  21/2^{-} \qquad \text{A C} \qquad J^{\pi}: \text{ from Q } \gamma \text{ to } 17/2^{-} \text{ and expected band structure.}$ $1488.33 \ 12 \qquad 3/2^{-} \qquad \text{B De} \qquad \text{XREF: e(1490).}$ $J^{\pi}: \text{ from M1 } \gamma \text{ to } 3/2^{-} \text{ level and } \gamma' \text{ s to } 1/2^{-}, 1/2^{+}, \text{ and } 7/2^{-}.$ $1491.17 \ 13 \qquad (3/2)^{-} \qquad \text{B eF} \qquad \text{XREF: e(1490).}$ $J^{\pi}: \text{ from E1 } \gamma \text{ to } 5/2^{+} \text{ level and (E1) } \gamma \text{ to } 1/2^{-}.$ $1514.03^{e} \ 13 \qquad 21/2^{+} \qquad \text{A C} \qquad J^{\pi}: \text{ from D } \gamma \text{ to } 19/2^{-} \text{ level and } 19/2^{+}, \text{ and expected band structure.}$ $XREF: D(1519).$	1396.95 12	3/2-	Βd	XREF: d(1392).
1404.22 <sup>&amp;</sup> 12       23/2 <sup>-</sup> A C $J^{\pi}$ : from Q $\gamma$ to 19/2 <sup>-</sup> level and expected band structure.         1404.35 15       1/2,3/2       B $J^{\pi}$ : from $\gamma'$ s to 1/2 <sup>+</sup> , 1/2 <sup>-</sup> , and 3/2 <sup>-</sup> levels.         1436 <sup>q</sup> 4       (1/2 <sup>+</sup> )       DEF $J^{\pi}$ : from analysis of (pol t, $\alpha$ ) data.         1457.67 10       3/2 <sup>-</sup> B $J^{\pi}$ : from E1 $\gamma'$ s to 1/2 <sup>+</sup> and 3/2 <sup>+</sup> levels, and $\gamma$ to 7/2 <sup>-</sup> .         1461.55 13       3/2 <sup>-</sup> B D $J^{\pi}$ : from E1 $\gamma$ to 5/2 <sup>+</sup> level and $\gamma'$ s to 1/2 <sup>+</sup> and 7/2 <sup>-</sup> .         1465.62 <sup>h</sup> 16       21/2 <sup>-</sup> A C $J^{\pi}$ : from M1 $\gamma$ to 3/2 <sup>-</sup> level and $\gamma'$ s to 1/2 <sup>-</sup> , and 7/2 <sup>-</sup> .         1488.33 12       3/2 <sup>-</sup> B De       XREF: e(1490).         J <sup>\pi</sup> : from M1 $\gamma$ to 3/2 <sup>-</sup> level and $\gamma'$ s to 1/2 <sup>-</sup> , and 7/2 <sup>-</sup> .         1491.17 13       (3/2) <sup>-</sup> B eF         SREF: e(1490).       J <sup>\pi</sup> : from E1 $\gamma$ to 5/2 <sup>+</sup> level and (E1) $\gamma$ to 1/2 <sup>+</sup> .         1514.03 <sup>e</sup> 13       21/2 <sup>+</sup> A C       J <sup>\pi</sup> : from D $\gamma$ to 19/2 <sup>-</sup> level, $\gamma'$ s to 17/2 <sup>+</sup> and 19/2 <sup>+</sup> , and expected band structure.         1524.64 11       (5/2,7/2) <sup>-</sup> B D       XREF: D(1519).	0			$J^{\pi}$ : from M1 $\gamma$ 's to $1/2^{-}$ and $5/2^{-}$ levels.
1404.35 15       1/2,3/2       B $J^{\pi}$ : from $\gamma'$ s to $1/2^+$ , $1/2^-$ , and $3/2^-$ levels.         1436 <sup>4</sup> 4       (1/2 <sup>+</sup> )       DEF $J^{\pi}$ : from analysis of (pol t, $\alpha$ ) data.         1457.67 10 $3/2^-$ B $J^{\pi}$ : from El $\gamma'$ s to $1/2^+$ and $3/2^+$ levels, and $\gamma$ to $7/2^-$ .         1461.55 13 $3/2^-$ B $J^{\pi}$ : from El $\gamma$ to $5/2^+$ level and $\gamma'$ s to $1/2^+$ and $7/2^-$ .         1465.62 <sup>h</sup> 16 $21/2^-$ A       C $J^{\pi}$ : from M $\gamma$ to $3/2^-$ level and $\gamma'$ s to $1/2^-$ , and $7/2^-$ .         1488.33 12 $3/2^-$ B       De       XREF: e(1490). $J^{\pi}$ : from M1 $\gamma$ to $3/2^-$ level and $\gamma'$ s to $1/2^-$ , $1/2^+$ , and $7/2^-$ .       Image: from El $\gamma$ to $5/2^+$ level and (El) $\gamma$ to $1/2^+$ .         1491.17 13 $(3/2)^-$ B       eF       XREF: e(1490). $J^{\pi}$ : from El $\gamma$ to $5/2^+$ level and (El) $\gamma$ to $1/2^+$ .       Image: from El $\gamma$ to $5/2^+$ level and (El) $\gamma$ to $1/2^+$ .         1514.03 <sup>e</sup> 13 $21/2^+$ A       C $J^{\pi}$ : from D $\gamma$ to $19/2^-$ level, $\gamma'$ s to $17/2^+$ and $19/2^+$ , and expected band structure.         1524.64 11 $(5/2, 7/2)^-$ B       D       XREF: D(1519).	1404.22 <sup>&amp;</sup> 12	23/2-	A C	$J^{\pi}$ : from Q $\gamma$ to 19/2 <sup>-</sup> level and expected band structure.
1436 <sup>4</sup> 4 $(1/2^{-1})$ DEF $J^{-1}$ : from analysis of (pol $t, \alpha$ ) data.         1457.67 10 $3/2^{-}$ B $J^{\pi}$ : from E1 $\gamma$ 's to $1/2^{+}$ and $3/2^{+}$ levels, and $\gamma$ to $7/2^{-}$ .         1461.55 13 $3/2^{-}$ B       D $J^{\pi}$ : from E1 $\gamma$ to $5/2^{+}$ level and $\gamma$ 's to $1/2^{+}$ and $7/2^{-}$ .         1465.62 <sup>h</sup> 16 $21/2^{-}$ A       C       J <sup><math>\pi</math></sup> : from Q $\gamma$ to $17/2^{-}$ and expected band structure.         1488.33 12 $3/2^{-}$ B       De       XREF: e(1490).         J <sup><math>\pi</math></sup> : from M1 $\gamma$ to $3/2^{-}$ level and $\gamma$ 's to $1/2^{-}$ , $1/2^{+}$ , and $7/2^{-}$ .       I491.17 13 $(3/2)^{-}$ B       eF       XREF: e(1490).       J <sup><math>\pi</math></sup> : from E1 $\gamma$ to $5/2^{+}$ level and (E1) $\gamma$ to $1/2^{+}$ .         1514.03 <sup>e</sup> 13 $21/2^{+}$ A       C       J <sup><math>\pi</math></sup> : from D $\gamma$ to $19/2^{-}$ level, $\gamma$ 's to $17/2^{+}$ and $19/2^{+}$ , and expected band structure.         1524.64 11 $(5/2, 7/2)^{-}$ B       D       XREF: D(1519).	1404.35 15	1/2,3/2	В	$J^{\pi}$ : from $\gamma$ 's to $1/2^+$ , $1/2^-$ , and $3/2^-$ levels.
1457.07 10 $3/2^-$ B       J <sup>T</sup> : from E1 $\gamma$ to $7/2^-$ and $3/2^-$ fevers, and $\gamma$ to $7/2^-$ .         1461.55 13 $3/2^-$ B       D       J <sup>T</sup> : from E1 $\gamma$ to $5/2^+$ level and $\gamma'$ s to $1/2^+$ and $7/2^-$ .         1465.62 <sup>h</sup> 16 $21/2^-$ A       C       J <sup>T</sup> : from Q $\gamma$ to $17/2^-$ and expected band structure.         1488.33 12 $3/2^-$ B       De       XREF: e(1490).         J <sup>T</sup> : from M1 $\gamma$ to $3/2^-$ level and $\gamma'$ s to $1/2^-$ , $1/2^+$ , and $7/2^-$ .         1491.17 13 $(3/2)^-$ B       eF         XREF: e(1490).       J <sup>T</sup> : from E1 $\gamma$ to $5/2^+$ level and (E1) $\gamma$ to $1/2^+$ .         1514.03 <sup>e</sup> 13 $21/2^+$ A       C         J <sup>T</sup> : from D $\gamma$ to $19/2^-$ level, $\gamma'$ s to $17/2^+$ and $19/2^+$ , and expected band structure.         1524.64 11 $(5/2, 7/2)^-$ B       D         XREF: D(1519).       XREF: D(1519).	14364 4	$(1/2^{+})$ $3/2^{-}$	DEF	J <sup>*</sup> : from analysis of (pol t, $\alpha$ ) data. $I^{\pi}$ : from E1 $\alpha$ 's to $1/2^+$ and $3/2^+$ levels, and $\alpha$ to $7/2^-$
1465.62 <sup>h</sup> 16 $21/2^-$ A C $J^{\pi}$ : from Q $\gamma$ to $17/2^-$ and expected band structure.         1488.33 $12$ $3/2^-$ B De       XREF: e(1490). $J^{\pi}$ : from M1 $\gamma$ to $3/2^-$ level and $\gamma'$ s to $1/2^-$ , $1/2^+$ , and $7/2^-$ .         1491.17 $13$ $(3/2)^-$ B eF         XREF: e(1490). $J^{\pi}$ : from E1 $\gamma$ to $5/2^+$ level and (E1) $\gamma$ to $1/2^+$ .         1514.03 <sup>e</sup> $13$ $21/2^+$ A C $J^{\pi}$ : from D $\gamma$ to $19/2^-$ level, $\gamma'$ s to $17/2^+$ and $19/2^+$ , and expected band structure.         1524.64 $11$ $(5/2, 7/2)^-$ B D         XREF: D(1519).       XREF: D(1519).	1461.55 13	$3/2^{-}$	BD	$J^{\pi}$ : from E1 $\gamma$ to $5/2^+$ level and $\gamma'$ s to $1/2^+$ and $7/2^-$ .
1488.33 $12$ $3/2^-$ B       De       XREF: e(1490). $1491.17$ $13$ $(3/2)^-$ B       eF       XREF: e(1490). $1491.17$ $13$ $(3/2)^-$ B       eF       XREF: e(1490). $1491.17$ $13$ $(3/2)^-$ B       eF       XREF: e(1490). $17$ : from E1 $\gamma$ to $5/2^+$ level and (E1) $\gamma$ to $1/2^+$ . $1514.03^e$ $13$ $21/2^+$ A       C $J^{\pi}$ : from D $\gamma$ to $19/2^-$ level, $\gamma'$ s to $17/2^+$ and $19/2^+$ , and expected band structure. $1524.64$ $11$ $(5/2, 7/2)^-$ B       D       XREF: D(1519).	$1465.62^{h}$ 16	$21/2^{-}$	AC	$J^{\pi}$ : from $\Omega \neq to 17/2^{-}$ and expected band structure.
1491.17 13 $(3/2)^-$ B       eF $J^{\pi}$ : from M1 $\gamma$ to $3/2^-$ level and $\gamma'$ s to $1/2^-$ , $1/2^+$ , and $7/2^-$ .         1491.17 13 $(3/2)^-$ B       eF       XREF: e(1490). $J^{\pi}$ : from E1 $\gamma$ to $5/2^+$ level and (E1) $\gamma$ to $1/2^+$ .       J^{\pi}: from D $\gamma$ to $19/2^-$ level, $\gamma'$ s to $17/2^+$ and $19/2^+$ , and expected band structure.         1524.64 11 $(5/2, 7/2)^-$ B       D       XREF: D(1519).	1488.33 12	3/2-	B De	XREF: e(1490).
1491.17 13 $(3/2)^-$ B eF       XREF: e(1490).         J <sup><math>\pi</math></sup> : from E1 $\gamma$ to $5/2^+$ level and (E1) $\gamma$ to $1/2^+$ .         1514.03 <sup>e</sup> 13 $21/2^+$ A C         J <sup><math>\pi</math></sup> : from D $\gamma$ to $1/2^-$ level, $\gamma$ 's to $17/2^+$ and $19/2^+$ , and expected band structure.         1524.64 11 $(5/2,7/2)^-$ B D         XREF: D(1519).		-		J <sup><math>\pi</math></sup> : from M1 $\gamma$ to 3/2 <sup>-</sup> level and $\gamma$ 's to 1/2 <sup>-</sup> , 1/2 <sup>+</sup> , and 7/2 <sup>-</sup> .
J <sup><i>n</i></sup> : from E1 $\gamma$ to 5/2 <sup><i>T</i></sup> level and (E1) $\gamma$ to 1/2 <sup><i>T</i></sup> . 1514.03 <sup><i>e</i></sup> 13 21/2 <sup>+</sup> A C J <sup><i>π</i></sup> : from D $\gamma$ to 19/2 <sup>-</sup> level, $\gamma$ 's to 17/2 <sup>+</sup> and 19/2 <sup>+</sup> , and expected band structure. 1524.64 11 (5/2,7/2) <sup>-</sup> B D XREF: D(1519).	1491.17 <i>13</i>	$(3/2)^{-}$	B eF	XREF: e(1490).
$1514.05 \ 15 \ 21/2$ A C $3 \ 1000 \ D \ \gamma \ 100 \ 19/2 \ 1evel, \ \gamma \ s \ 100 \ 19/2 \ and \ 19/2 \ and \ expected band structure. 1524.64 11 (5/2,7/2)^- B D XREF: D(1519).$	1514 028 12	21/2+		J <sup>*</sup> : from E1 $\gamma$ to 5/2 <sup>+</sup> level and (E1) $\gamma$ to 1/2 <sup>+</sup> .
	1524.64 11	$(5/2,7/2)^{-}$	B D	XREF: D(1519).

Continued on next page (footnotes at end of table)

# <sup>161</sup>Ho Levels (continued)

E(level) <sup>†</sup>	J <sup>π#@</sup>	XREF	Comments
			J <sup><math>\pi</math></sup> : from M1 $\gamma$ to 5/2 <sup>-</sup> level, $\gamma$ to 9/2 <sup>-</sup> , and multiply placed M1 $\gamma$ to 3/2 <sup>-</sup> .
1529 <b>9</b> 4	(5/2+)	eF	XREF: $e(1530)$ . J <sup><math>\pi</math></sup> : from analysis of (pol t. $\alpha$ ) data for doublet.
1545 <del>9</del>	$(3/2^+)$	eF	XREF: $e(1530)$ . J <sup><math>\pi</math></sup> : from analysis of (pol t. $\alpha$ ) data for doublet.
1592 2		D	
1640.45 14	(5/2 <sup>+</sup> )	ΒD	XREF: D(1635). $J^{\pi}$ : from $\gamma$ 's to $1/2^+$ , $7/2^+$ , and $7/2^-$ levels.
1644		D	
1656.64 <i>10</i> 1665 <i>4</i>	5/2-	B D	$J^{\pi}$ : from E1 $\gamma$ 's to $3/2^+$ and $7/2^+$ levels.
1674.40 <sup>b</sup> 25 1675.31 <i>18</i>	21/2+	AC BD	$J^{\pi}$ : from Q $\gamma$ to 17/2 <sup>+</sup> level, $\gamma$ to 16/2 <sup>+</sup> , and expected band structure. XREF: D(1674).
1678.38 <sup>a</sup> 13	$25/2^{-}$	A C	J <sup><math>\pi</math></sup> : from D $\gamma$ to 23/2 <sup>-</sup> , $\gamma$ to 21/2 <sup>-</sup> , and expected band structure.
1691.39 <i>13</i>	5/2+	В	$J^{\pi}$ : from $\gamma$ 's to $1/2^+$ , $7/2^+$ , and $7/2^-$ levels.
1714.80 <i>17</i> 1725 <i>2</i>	5/2-	B D	$J^{\pi}$ : from E1 $\gamma$ to 3/2 <sup>+</sup> level and $\gamma$ 's to 7/2 <sup>+</sup> and 7/2 <sup>-</sup> .
1740.42 14	$5/2^{-}$	В	$J^{\pi}$ : from M1 $\gamma$ to 7/2 <sup>-</sup> level and $\gamma$ 's to 3/2 <sup>-</sup> and 3/2 <sup>+</sup> .
1745.90 17	(3/2+,5/2+)	В	J': from $\gamma$ 's to $1/2'$ and $1/2'$ levels.
1762.30 <sup>a</sup> 22 1767 4	23/2+	A C E	J <sup><i>n</i></sup> : from (Q) $\gamma$ to 19/2 <sup>+</sup> level, $\gamma$ 's to 21/2 <sup>-</sup> and 21/2 <sup>+</sup> , and expected band structure.
1776.43 16	$(3/2,5/2)^+$	В	$J^{\pi}$ : from E2,M1 $\gamma$ to 3/2 <sup>+</sup> level, $\gamma$ 's to 1/2 <sup>+</sup> and 5/2 <sup>-</sup> . The placement of the 1352 $\gamma$ to 1/2 <sup>-</sup> is only by 1972Wo08; if this is correct, $J^{\pi}$ is not 5/2 <sup>+</sup> .
1786.37 <sup>°</sup> 18	23/2+	A C	J <sup><math>\pi</math></sup> : from Q $\gamma$ to 19/2 <sup>+</sup> level, $\gamma$ to 21/2 <sup>-</sup> , and expected band structure.
1817.96 22	5/2+,7/2,9/2	В	$J^{\pi}$ : from $\gamma$ 's to $7/2^-$ , $7/2^+$ , and $9/2^+$ levels.
1829.97 23	3/2 <sup>-</sup> ,5/2	В	J <sup><math>\pi</math></sup> : from $\gamma$ 's to $3/2^-$ , $3/2^+$ , and $7/2^-$ levels.
1848.0 3	3/2- 5/2 7/2-	B	$I^{\pi}$ , from $\alpha's$ to $3/2^{-}$ and $7/2^{-}$ levels
1006.75	5/2, $5/2$ , $7/2$		J. from $y = 500 \frac{3}{2}$ and $\frac{1}{2}$ revers.
1920.95 19	23/2	AC	J. from expected band structure and y to $21/2^{-1}$ rever.
1938.67 <i>15</i> 1980 <i>4</i>	21/2	A C E	J <sup>*</sup> : from Q $\gamma$ to 23/2 level, $\gamma$ to 25/2 , and expected band structure.
2023.0 <sup>e</sup>	25/2+	A	J <sup><math>\pi</math></sup> : from $\gamma$ 's to 23/2 <sup>-</sup> , 21/2 <sup>+</sup> and 23/2 <sup>+</sup> levels, and expected band structure.
2192.90	$25/2^+$	Α	$J^{\pi}$ : $\gamma$ 's to $21/2^+$ and $23/2^+$ levels, and expected band structure.
2239.94	29/2-	A	$J^{n}$ : from $\gamma$ 's to $25/2^{-1}$ and $27/2^{-1}$ levels and expected band structure.
2292.6 <sup><i>a</i></sup>	27/2+	Α	$J^{\pi}$ : from $\gamma$ 's to 25/2 <sup>-</sup> , 23/2 <sup>+</sup> and 25/2 <sup>+</sup> levels and expected band structure.
2310.70	27/2+	AC	XREF: $C(2316.7)$ .
arcah	20/2-		J <sup>*</sup> : from $\gamma$ s to 25/2 <sup>+</sup> and 21/2 <sup>-</sup> levels, and expected band structure.
2462"	29/2	A	$J^{*}$ : $\gamma$ to 25/2 and expected band structure.
2510.9 <sup>cc</sup>	31/2	AC	XREF: C(2512.0). J <sup><math>\pi</math></sup> : from Q $\gamma$ to 27/2 <sup>-</sup> , $\gamma$ to 29/2 <sup>-</sup> , and expected band structure.
2569.0 <sup>e</sup>	29/2+	A	J <sup><i>n</i></sup> : from $\gamma$ to 25/2 <sup>+</sup> level, possible $\gamma$ to 27/2 <sup>+</sup> , and expected band structure.
2738	29/2+	Α	$J^{\pi}$ : $\gamma$ to 25/2 <sup>+</sup> and expected band structure.
2813.84	33/2-	A	J <sup><i>n</i></sup> : from $\gamma$ 's to $29/2^{-1}$ and $31/2^{-1}$ levels and expected band structure.
2845.6 <sup><i>a</i></sup>	$31/2^+$	Α	$J^{\pi}$ : from $\gamma$ to 27/2 <sup>+</sup> , possible $\gamma$ to 25/2 <sup>+</sup> , and expected band structure.
2863 <sup>c</sup>	31/2+	A	$J^{n}$ : $\gamma$ to $2^{1/2^{+}}$ and expected band structure.
3065"	33/2-	A	$J^{\pi}$ : $\gamma$ to $29/2^{-}$ and expected band structure.
3079.9 <sup><b>&amp;</b></sup> 10	35/2-	A C	XREF: C(3080.9). $J^{\pi}$ : from (O) $\gamma$ to 31/2 <sup>-</sup> , $\gamma$ to 33/2 <sup>-</sup> , and expected band structure.
3125? <sup>e</sup>	$(33/2^+)$	Α	J <sup><math>\pi</math></sup> : possible $\gamma$ to 29/2 <sup>+</sup> and expected band structure.
3277 <sup>b</sup>	33/2+	Α	$J^{\pi}$ : $\gamma$ to 29/2 <sup>+</sup> and expected band structure.
3361.6 <sup><i>a</i></sup>	37/2-	Α	J <sup><math>\pi</math></sup> : from $\gamma$ 's to $33/2^{-1}$ and $35/2^{-1}$ levels and expected band structure.
3392 <sup>d</sup>	35/2+	Α	$J^{\pi}$ : from $\gamma$ to $31/2^+$ and expected band structure.

Continued on next page (footnotes at end of table)

#### <sup>161</sup>Ho Levels (continued)

E(level) <sup>†</sup>	J <sup>π#@</sup>	XREF	Comments
3418 <sup>C</sup>	35/2+	A	$J^{\pi}$ : $\gamma$ to $31/2^+$ and expected band structure.
3630.3 <sup>&amp;</sup>	39/2-	A C	XREF: C(3625.7). $J^{\pi}$ : from $\gamma$ 's to $35/2^{-}$ and $37/2^{-}$ levels and expected band structure.
3727 <mark>h</mark>	37/2-	Α	$J^{\pi}$ : $\gamma$ to $33/2^{-}$ and expected band structure.
3824 <sup>b</sup>	$37/2^{+}$	Α	$J^{\pi}$ : $\gamma$ to $33/2^+$ and expected band structure.
3920.4 <sup>a</sup>	$41/2^{-}$	Α	$J^{\pi}$ : from $\gamma$ 's to $37/2^{-}$ and $39/2^{-}$ levels and expected band structure.
3981 <sup>°</sup>	39/2+	Α	$J^{\pi}$ : $\gamma$ to $35/2^+$ and expected band structure.
4211.5 <mark>&amp;</mark>	$43/2^{-}$	Α	$J^{\pi}$ : from $\gamma$ 's to $39/2^{-}$ and $41/2^{-}$ levels and expected band structure.
4402 <sup>b</sup>	$41/2^{+}$	Α	$J^{\pi}$ : $\gamma$ to $37/2^+$ and expected band structure.
4419 <mark>h</mark>	$41/2^{-}$	Α	$J^{\pi}$ : $\gamma$ to $37/2^{-}$ and expected band structure.
4536.0 <sup>a</sup>	$45/2^{-}$	Α	$J^{\pi}$ : from $\gamma'$ s to $41/2^{-}$ and $43/2^{-}$ levels and expected band structure.
4583 <sup>°</sup>	$43/2^{+}$	Α	$J^{\pi}$ : $\gamma$ to $39/2^+$ and expected band structure.
4853.4 <mark>&amp;</mark>	$47/2^{-}$	Α	$J^{\pi}$ : from $\gamma'$ s to $43/2^{-}$ and $45/2^{-}$ levels and expected band structure.
5223.7 <sup>a</sup>	49/2-	Α	$J^{\pi}$ : from $\gamma$ 's to $45/2^{-}$ and $47/2^{-}$ levels and expected band structure.
5239 <sup>c</sup>	$47/2^{+}$	Α	$J^{\pi}$ : $\gamma$ to $43/2^+$ and expected band structure.
5562 <mark>&amp;</mark>	$51/2^{-}$	Α	$J^{\pi}$ : from $\gamma$ to $47/2^{-}$ level and expected band structure.
5949 <sup>c</sup>	$51/2^+$	Α	$J^{\pi}$ : $\gamma$ to $47/2^+$ and expected band structure.

<sup>†</sup> From least-squares fit to  $\gamma$  energies where  $\gamma$  transitions occur; otherwise from average of results of reaction studies. For  $\gamma$ 's whose energies are quoted to only the nearest keV, the  $\Delta E$  values are assumed to be 1 keV. For levels all of whose deexciting  $\gamma$ 's are known to only the nearest keV no uncertainties are given for the level energies.

- <sup>‡</sup> See the comment on this level in the <sup>161</sup>Er  $\varepsilon$  Decay data set.
- <sup>#</sup>  $J^{\pi}$  and band assignments are based on the following: ce data from <sup>161</sup>Er  $\varepsilon$  decay studies;  $\gamma(\theta)$  from in-beam studies, especially as they imply stretched E2 character of the  $\gamma$ 's; the agreement of measured and calculated cross sections for the charged-particle reactions; and the expected structure of the rotational bands.
- <sup>(a)</sup> Wave functions from model calculations of 1992Bo45 show >88% of the state corresponds to the Nilsson state listed here for bandheads at 0, 211, 252, 298, 760, and 826 keV. The model results for the bandheads at 423, 446, and 592 keV are listed for those levels.
- & Band(A): 7/2[523] g.s. band,  $\alpha = -1/2$  branch. A=10.97 keV, B=2.5 eV, from energies of 7/2, 9/2, and 11/2 levels (i.e., both signatures).
- <sup>*a*</sup> Band(a): 7/2[523] g.s. band,  $\alpha = +1/2$  branch.
- <sup>b</sup> Band(B): 1/2[411] band,  $\alpha = +1/2$  branch. A=10.70 keV, B=74 eV, a=-0.676, from 1/2, 3/2, 5/2, and 7/2 levels.
- <sup>*c*</sup> Band(b): 1/2[411] band,  $\alpha = -1/2$  branch.
- <sup>d</sup> Band(C): 7/2[404] band,  $\alpha = -1/2$  branch. A=13.36 keV, B=-15.1 eV, from 7/2, 9/2, and 11/2 levels.
- <sup>e</sup> Band(c): 7/2[404] band,  $\alpha = +1/2$  branch.
- <sup>*f*</sup> Band(D): 3/2[411] band,  $\alpha = -1/2$  branch. A=14.88 keV, B=-39 eV, A<sub>3</sub>=+89 eV, from 3/2, 5/2, 7/2, and 9/2 levels.
- <sup>g</sup> Band(d): 3/2[411] band,  $\alpha = +1/2$  branch.
- <sup>h</sup> Band(E): 1/2[541] band,  $\alpha = +1/2$  branch. A=10.30 keV, B=-21 eV, a=2.30, from 1/2, 3/2, 5/2, and 7/2 levels.
- <sup>*i*</sup> Band(e): 1/2[541] band,  $\alpha = -1/2$  branch.
- $^{j}$  Band(F): 5/2[402] bandhead.
- <sup>k</sup> Band(G): K-2  $\gamma$  vibr based on g.s. band. Contains a mixture of 3/2[541]. A=11.27 keV, from 3/2 and 5/2 levels.
- <sup>1</sup> Band(H): 5/2[413] band. A=14.2 keV, from 5/2 and 7/2 levels.
- <sup>m</sup> Band(I): 5/2[532] band. A=11.3 keV.
- <sup>*n*</sup> Band(J): K-2  $\gamma$  vibr based on 7/2[404]. Contains an admixture of 3/2[402].
- <sup>o</sup> Band(K): K-2  $\gamma$  vibr based on 5/2[402]. Contains an admixture of 1/2[400].
- <sup>*p*</sup> Band(L): 9/2[514] bandhead.
- <sup>q</sup> Band(M): 1/2[420] band. A=16.6 kev, a=1.19. Levels are 1/2(1436), 3/2(1545), and 5/2(1529).

## $\gamma(^{161}{\rm Ho})$

E <sub>i</sub> (level)	$\mathbf{J}_i^{\pi}$	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{@}$	$\mathbf{E}_f = \mathbf{J}_f^{\pi}$	Mult. <sup>&amp;</sup>	δ	α <sup><i>a</i></sup>	Comments
99.63 211.15 221.95	9/2 <sup>-</sup> 1/2 <sup>+</sup> 11/2 <sup>-</sup>	99.63 <i>3</i> 211.15 <i>3</i> 122.3 <i>1</i>	100 100 100	$\begin{array}{c c} 0.0 & 7/2^{-} \\ 0.0 & 7/2^{-} \\ 99.63 & 9/2^{-} \end{array}$	M1+E2 E3 (M1)	0.16	2.64 1.218	B(E3)(W.u.)=0.00281 4
222 43	3/2+	221.9 <i>I</i> 11.282 5	17 100	$0.0  7/2^{-}$	(E2) M1		258	
252.68	$7/2^+$	153.0 <i>I</i>	10.5 20	99.63 9/2 <sup>-</sup>	(E1)		0.1020	$B(E1)(W.u.)>2.9\times10^{-5}$
200 (0	2/2+	252.68 3	100 5	$0.0 7/2^{-}$	E1		0.0275	$B(E1)(W.u.) > 6.2 \times 10^{-5}$
298.68	3/2	76.246 9 87.53 <i>3</i>	46 6	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	M1 M1			I <sub><math>\gamma</math></sub> : reported I $\gamma$ are discrepant: 79 (1972Ka37) and 32 (1972Wo08) from <sup>161</sup> Er $\varepsilon$ decay. I $\gamma$ =128 (1971Fu08) from <sup>159</sup> Tb( $\alpha$ ,2n $\gamma$ ) reaction, but there the 87 $\gamma$ is a doublet.
316.56	$5/2^{+}$	94.13 <i>3</i>	100 8	222.43 3/2+	M1+E2	0.15		
353 28	$7/2^{+}$	105.4 <i>1</i> 36.7	7.3 13	$211.15 \ 1/2^+$ $316.56 \ 5/2^+$	E2 M1+E2	0.08	9.12	
555.20	172	130.85 3	100	222.43 3/2+	E2	0.00	1.055	B(E2)(W.u.)= $2.7 \times 10^2 8$ The B(E2)(W.u.) value was calculated assuming that I $\gamma(36.7\gamma)=0$ and thus represents an upper limit. of the 36.7 $\gamma$ .
368.10	13/2-	146.1 <i>1</i> 268.5 <i>1</i>	100 34	221.95 11/2 <sup>-</sup> 99.63 9/2 <sup>-</sup>	D Q			
370.77	9/2+	118.5 <sup>b</sup> 5 148.6 2 271.2 <i>I</i>	≤28 <sup>b</sup> 37 90	252.68 7/2 <sup>+</sup> 221.95 11/2 <sup>-</sup> 99.63 9/2 <sup>-</sup>	-			
373 24	5/2+	370.8 1	100	$0.0 7/2^{-}$	D M1⊥F2	0.10		
575.24	5/2	150.9 3	50	$298.08 \ 3/2$ $222.43 \ 3/2^+$	M1+L2 M1	0.10		
423.91	1/2-	162.1 <i>1</i> 125.4 2 201.47 <i>3</i>	41 1.1 3 100 4 74 4	$\begin{array}{cccc} 211.15 & 1/2^+ \\ 298.68 & 3/2^+ \\ 222.43 & 3/2^+ \\ 211.15 & 1/2^+ \\ \end{array}$	E2 E1			
446.83	5/2+	148.15 <i>3</i>	74 4 58 18 100 9	$\begin{array}{c} 211.15 & 1/2^{+} \\ 298.68 & 3/2^{+} \\ 0.0 & 7/2^{-} \end{array}$	E1 M1+E2 E1		0.77 9	Mult.: 2008Eg01, in $\varepsilon$ decay, report that the dominant mult is M1.
458.87	5/2-	105.7 1	6.0 <i>19</i>	$353.28 7/2^+$ $222 43 3/2^+$	E1 F1		0.00090	
463.23	7/2+	90.0 <i>I</i> 109.9 <i>I</i> 164.7 2	64 20 100 20 35 12	$\begin{array}{c} 222.43 & 3/2 \\ 373.24 & 5/2^+ \\ 353.28 & 7/2^+ \\ 298.68 & 3/2^+ \\ 222.42 & 2/2^+ \end{array}$	M1+E2 M1	≈0.15	3.63 2.03 0.476	
511.78	11/2+	141.1 2	∠ <i>1</i> ≤14	$370.77 \ 9/2^+$				$I_{\boldsymbol{\gamma}}:$ doublet, but other component is unplaced in in-beam study.
		258.7 2 289.8 2	13 37	$\begin{array}{cccc} 252.68 & 7/2^+ \\ 221.95 & 11/2^- \end{array}$				Mult.: $\gamma(\theta)$ indicates Q, but placement suggests E1.
		412.2 <i>I</i>	100	99.63 9/2-	D			

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## $\gamma$ (<sup>161</sup>Ho) (continued)

E <sub>i</sub> (level)	$\mathbf{J}_i^\pi$	$E_{\gamma}^{\dagger}$	Ι <sub>γ</sub> @	$\mathbf{E}_f = \mathbf{J}_f^{\pi}$	Mult.&	α <sup><i>a</i></sup>	Comments
519.57	9/2+	166 <sup>#</sup>		353.28 7/2+			
		203.0 2	100	316.56 5/2+			
525.92	3/2-	102.0 1	1.0 5	423.91 1/2-	M1		
		152.6 1	4.9 10	373.24 5/2+	El		
		209.36 3	38 8	316.56 5/2	EI		
		303.50 4	13.7 15	222.43 3/2	EI		
524 45	15/0-	314.// 4	100 4	211.15 1/2	EI		
534.45	15/2	166.3 1	100	368.10 13/2	D		
554 10	(5/2 - 7/2 + 0/2 +)	312.5 1	55	221.95 11/2 446.92 5/2 <sup>±</sup>	Q		
554.12	$(5/2^{-}, 1/2, 9/2^{+})$	107.3 1	100 25	$440.83 \ 5/2^{+}$			
		160.9 5	23 0	$373.24 \ 3/2^{+}$			
		501 I 454 2 4	~30	$232.00 \ 1/2$			
		454.5 4	90 2J	99.03 9/2			
		554.20 4	≤1750	0.0 7/2-			5
579.50	9/2-	226.3 1	100	353.28 7/2+	E1	0.0365	$B(E1)(W.u.) > 9.5 \times 10^{-5}$
583.85	11/2+	230.5 1	100	353.28 7/2+	Q		
592.66	3/2	219.4 2	2.1.3	3/3.24 5/2*	<b>T</b> 1		
		276.07	2.73	$310.50 \ 5/2^+$	EI E1		
		294.00 4	12.0 /	$298.08 \ 3/2^{+}$	EI		Less is doubly placed in a decay
		570.0 5	$\leq 2.0$	$222.43 \ 3/2^{-1}$	БJ		$1_{\gamma}$ . $\gamma$ is doubly placed in $\varepsilon$ decay.
508 80	$0/2^{+}$	125 7 2	100 10	$162 22 7/2^+$	E2		
398.80	9/2	225 5 2	100	$403.23 \ 1/2$ 373.24 $5/2^+$	Q		
		225.52 245 0 <sup>C</sup> 2	36	353.24 3/2			
649 02	5/2-	350.4.2	97 14	298.68 3/2+	F1		
019.02	5/2	549.4.2	38.6	99.63 9/2-	E2		
		649.0 2	100 12	$0.0 7/2^{-}$	E2		Mult.: assigned E2 by 1972Ka37 and 1972Wo08, and M1 by 1972Ha41.
674.50	$13/2^{+}$	162.3.2	<8	$511.78 \ 11/2^+$			$I_{\rm act} \gamma$ is doubly placed in in-beam study.
		303.8 2	30	370.77 9/2+	0		-,·, ,, F
		306.5 2	16	368.10 13/2-			Mult.: $\gamma(\theta)$ indicates Q, but placement suggests E1.
		452.6 1	100	221.95 11/2-	D		
710.6?		488.8 <sup>‡c</sup> 4	100 25	221.95 11/2-	M1		
		499.1 <sup><b>b</b>‡c</sup> 5	≤40 <sup>b</sup>	211.15 1/2+			
726.42	$17/2^{-}$	191.9 <i>1</i>	100	534.45 15/2-	D		
		358.3 1	73	368.10 13/2-	Q		
732.94	11/2+	134.1 2	60	598.80 9/2+	D		
		269.7 1	100	463.23 7/2+			Mult.: $\gamma(\theta)$ indicates D, but placement suggests E2.
760.44	5/2+	507.6 2	100	252.68 7/2+	M1		
788.12	13/2-	204.2 1	100	583.85 11/2+	D		
		208.7 1	35	579.50 9/2-	Q		

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From ENSDF

## $\gamma(^{161}\text{Ho})$ (continued)

E <sub>i</sub> (level)	$J^{\pi}_{i}$	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{@}$	$E_f$	$\mathbf{J}_{f}^{\pi}$	Mult.&	Comments
821.08	13/2+	237 <sup>#</sup> 301.5 <i>1</i>	100	583.85 519.57	11/2 <sup>+</sup> 9/2 <sup>+</sup>	0	
826.62	5/2-	363.6 4	0.088 15	463.23	7/2+		
		528.0 2	0.61 4	298.68	3/2+	E1	
		573.8 10	≈0.06	252.68	7/2+	E1	
		726.8 4	1.31 19	99.63	$9/2^{-}$	E2	
	1 <b>7</b> 10 ±	826.6 <i>I</i>	100 5	0.0	1/2	MII	
857.30	15/2+	183"	4.5	674.50	$13/2^+$	0	
		345.6 1	45	511.78	11/21	Q	
006.04	15/0+	489.2 I	100	308.10	13/2	D	
906.84	15/2+	118.5 5	<u>≤9</u> 0	788.12	$\frac{13}{2^{+}}$	0	
020 68	$(12/2^{+})$	323.0 I	100	583.85 722.04	$\frac{11}{2^+}$	Q	
920.08	(15/2)	321.0.1	28	752.94 508.80	$\frac{11/2}{0/2^+}$		
931 64	$19/2^{-}$	205.2.1	100	726.42	$\frac{y_1 z}{17/2^{-1}}$	D	
251.01	1)/2	397.2.1	100	534.45	$15/2^{-1}$	0	
1059 53	17/2+	202#	100	857 30	$15/2^+$	×	
1057.55	17/2	385.0 /	57	674.50	$13/2^+$	0	
		525.1 <i>I</i>	100	534.45	$15/2^{-}$	Ď	
1084.41	$17/2^{-}$	177.5 <i>1</i>	35	906.84	$15/2^{+}$	D	
		296.3 1	100	788.12	13/2-	Q	
1096.01	$(15/2^+)$	175.4 2	52	920.68	$(13/2^+)$	D	
		363.0 2	100	732.94	$11/2^{+}$		
1137.1?	$(5/2,7/2)^{-}$	376.6 <sup>‡c</sup> 2	100 21	760.44	$5/2^{+}$	E1	
		783.9 <sup>‡c</sup> 4	46 16	353.28	$7/2^{+}$		
		885.2 <sup>‡0</sup> 6	35 16	252.68	7/2+		
1167.29	$21/2^{-}$	235.5 1	76	931.64	$19/2^{-}$	D	
	,	440.9 <i>1</i>	100	726.42	$17/2^{-}$	Q	
1210.89	$17/2^{+}$	114.9 <sup>C</sup> 2	11	1096.01	$(15/2^+)$		
		304 <sup>#</sup>		906.84	$15/2^{+}$		
		389.8 1	100	821.08	$13/2^{+}$	Q	
1232.85	$(3/2)^+$	808.8 <mark>b</mark> 3	b	423.91	$1/2^{-}$		$I_{\gamma}$ : no $I_{\gamma}$ given since all 4 $\gamma$ 's from level are multiply placed.
							Mult.: assigned E2 (1972Ha41,1979DzZZ), but $\gamma$ multiply placed.
		980.2 2		252.68	7/2+		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
		1010.8 <mark>b</mark> 3	b	222.43	$3/2^{+}$		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
		1021.4 3		211.15	$1/2^{+}$		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
1240.07	$(1/2, 3/2, 5/2)^+$	923.0 7	22 11	316.56	5/2+		
		941.0 3	100 14	298.68	$3/2^+$	M1	
		1018.3 4	31 14	222.43	3/2+	M1	

From ENSDF

## $\gamma(^{161}\text{Ho})$ (continued)

E <sub>i</sub> (level)	$\mathbf{J}_i^\pi$	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{@}$	$\mathbf{E}_f \qquad \mathbf{J}_f^{\pi}$	Mult. <sup>&amp;</sup>	Comments
1240.07	$(1/2,3/2,5/2)^+$	1029.4 <sup>b</sup> 6	<35 <sup>b</sup>	211.15 1/2+		
1278.33	$19/2^+$	219 <sup>#</sup>		1059.53 17/2+		
		421.1 1	83	857.30 15/2+		
		551.8 <i>1</i>	100	726.42 17/2-	D	
1311.78	19/2+	227.2 2	15	$1084.41 \ 17/2^{-}$	0	
1225 200	(2)2 5(2)+	405.0 I	100	906.84 15/2	Q	
1325.20?	$(3/2, 5/2)^{+}$	499.10+0 5	≤28°	826.62 5/2	-	
		799.4+0 3	100 21	525.92 3/2-	EI	
		951.3 + 6	19 12	373.24 5/2+		
		$1102.6^{0+c}$ 3	≤149 <sup>0</sup>	222.43 3/2+		Mult.: assigned E1 (1972Ka37), but $\gamma$ multiply placed.
1394.46	$(1/2^+, 3/2)$	868.8 <sup>0</sup> 3	D	525.92 3/2-		$I_{\gamma}$ : no $I_{\gamma}$ given since all 6 $\gamma$ 's from level are multiply placed. Mult.: assigned M1,E2 (1972Ka37), but $\gamma$ multiply placed.
		970.4 <sup>b</sup> 4	b	423.91 1/2-		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
		1021.4 4	,	373.24 5/2+		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
		1077.8 <sup>b</sup> 4	b	316.56 5/2+		Mult.: assigned E1 (1979DzZZ), but $\gamma$ multiply placed.
		1171.8 <mark>6</mark> 3	b	222.43 3/2+		
		1183.3 <sup>b</sup> 5	b	211.15 1/2+		Mult.: assigned E1 (1979DzZZ), but $\gamma$ multiply placed.
1396.95	3/2-	747.4 6	15 5	649.02 5/2-		
		804.4 2	77 19	592.66 3/2-	E2	
		8/1.2 5	190	525.92 3/2	( <b>M</b> 1)	
		937.30	71 10	$430.07 \ 3/2$ $123 \ 01 \ 1/2^{-1}$	(IVII) M1	
		$1008 \ 2^{b} \ 3$	<71 <sup>b</sup>	-423.91 $1/2$	1411	Mult , assigned E1 (1070Dz77), but a multiply placed
		1098.2° 3	$\leq /4^{\circ}$	298.08 3/2		Mult.: assigned E1 (1979DZZZ), but $\gamma$ multiply placed.
		$11/4.0^{\circ}$ 3 1185 8 4	$\leq 100^{\circ}$ 100 12	$222.43  3/2^{+}$ 211 15 $1/2^{+}$	F1	Mult.: assigned E1 (1979DZZZ), but $\gamma$ multiply placed.
1404.22	23/2-	236.9.1	<64	$1167.29 \ 21/2^{-1}$	LI	L <sub>x</sub> : doublet, but other component is not placed.
1101122		20000 1	_0.	110/12/ 21/2		Mult.: $\gamma(\theta)$ indicates D, but $\gamma$ is doublet in in-beam study.
		472.7 1	100	931.64 19/2-	Q	
1404.35	1/2,3/2	812.1 <sup>b</sup> 3	≤133 <sup>b</sup>	592.66 3/2-		Mult.: assigned E2 by 1972Wo08 and 1979DzZZ, and M1 by 1972Ha41; but $\gamma$ multiply placed.
		878.6 5	100 17	525.92 3/2-		
		980.2 <sup>b</sup> 2	≤50 <sup>b</sup>	423.91 1/2-		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
		1193.2 <sup>b</sup> 3	≤272 <sup>b</sup>	211.15 1/2+		$E_{\gamma}$ : placements conflict; 1972Ka37 place a 1193 $\gamma$ from 1404 and 1656 levels only and 1972Wo08 place it from 1491 level only.
1457.67	3/2-	808.8 <mark>b</mark> 3	≤15 <sup>b</sup>	649.02 5/2-		Mult.: assigned E2 (1972Ka37,1979DzZZ), but $\gamma$ multiply placed.
	,	864.9 <i>3</i>	100 14	592.66 3/2-	E2(+M1)	
		931.7 <mark>b</mark> 2	≤141 <sup>b</sup>	525.92 3/2-		Mult.: assigned M1 (1972Ka37,1972Ha41,1972Wo08), but $\gamma$ multiply placed.
		998.8 <mark>b</mark> 2	2.8 <sup>b</sup>	458.87 5/2-		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.

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## $\gamma$ <sup>(161</sup>Ho) (continued)</sup>

$E_i$ (level)	$\mathbf{J}_i^{\pi}$	$E_{\gamma}^{\dagger}$	Ι <sub>γ</sub> @	$\mathbf{E}_f  \mathbf{J}_f^{\pi}$	Mult. &	Comments
1457.67	3/2-	$   \begin{array}{r}     1010.8^{b} \ 4 \\     1158.9 \ 2 \\     1247.2 \ 4 \\     1456.4^{b} \ 9   \end{array} $	$\leq 7.6^{b}$ 42 4 21 3 $< 2.0^{b}$	$\begin{array}{c cccc} & 446.83 & 5/2^+ \\ 298.68 & 3/2^+ \\ 211.15 & 1/2^+ \\ 0.0 & 7/2^- \end{array}$	E1 E1	Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
1461.55	3/2-	812.1 <sup>b</sup> 4	$20^{b}$	649.02 5/2-		Mult.: assigned E2 by 1972Wo08 and 1979DzZZ, and M1 by 1972Ha41; but $\gamma$ multiply placed.
		868.8 <sup>b</sup> 3 935.6 6 1038.1 5 1088.6 5 1145.1 3 1162.8 5 1238.8 4 1250.4 <sup>b</sup> 4	$\leq 60^{b}$ 14 4 9.2 24 7.6 20 100 20 3.8 26 17 2 62 <sup>b</sup>	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	E1	Mult.: assigned M1,E2 (1972Ka37), but $\gamma$ multiply placed.
1465.62	21/2-	1461.8 <i>4</i> 153.9 <i>6</i>	20.6 <i>24</i> 16	0.0 7/2 <sup>-</sup> 1311.78 19/2 <sup>+</sup>		<ul> <li>I<sub>γ</sub>: reported I<sub>γ</sub>=32 divided by evaluator based on I<sub>γ</sub>(153)/I<sub>γ</sub>(252)=4.2/40 from 252 level in <sup>161</sup>Er ε decay.</li> <li>Mult.: γ(θ) indicates D, but γ is doublet.</li> </ul>
1488.33	3/2-	381.2 <i>1</i> 839.4 <i>4</i>	100 66 <i>14</i>	1084.41 17/2 <sup>-</sup> 649.02 5/2 <sup>-</sup>	Q (M1)	
		895.7 <sup>b</sup> 2 962.4 4 1029.4 <sup>b</sup> 8	$\leq 417^{b}$ $100 \ 14$ $\leq 27^{b}$	592.66 3/2 <sup>-</sup> 525.92 3/2 <sup>-</sup> 458.87 5/2 <sup>-</sup>	M1	Mult.: assigned M1 (1972Ka37), but $\gamma$ multiply placed.
1491.17	(3/2)-	$1065.0^{b} 4$ $1114.8^{b} 4$ $1171.8^{b} 3$ $1189.8 5$ $1276.4^{b} 4$ $1488.4^{b} 4$ $842.2 4$ $898.2 6$ $964.5 9$ $117.9 3$ $1174.6^{b} 3$ $1193.2^{b} 3$ $1268.2^{b} 3$	$ \leq 23^{b} \\ \leq 45^{b} \\ \leq 280^{b} \\ 53 \ 11 \\ \leq 92^{b} \\ 98^{b} \\ 9 \ 4 \\ 8 \ 6 \\ 5 \ 4 \\ 33 \ 4 \\ 100^{b} \\ \leq 92^{b} \\ 17^{b} $	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	E1	<ul> <li>Mult.: assigned M1 (1979DzZZ), but γ multiply placed.</li> <li>Mult.: assigned E1 (1979DzZZ), but γ multiply placed.</li> <li>E<sub>γ</sub>: placements conflict; 1972Ka37 place a 1193 γ from 1404 and 1656 levels and 1972Wo08 place it from 1491 level only.</li> </ul>
		1280.0 3	87 6	$222.43  5/2^{+}$ $211.15  1/2^{+}$	(E1)	

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## $\gamma$ <sup>(161</sup>Ho) (continued)</sup>

E <sub>i</sub> (level)	$\mathbf{J}_i^{\pi}$	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{@}$	$E_f$	$J_f^\pi$	Mult.&	Comments
1514.03	$21/2^{+}$	235#		1278.33	19/2+		
1011100	==/=	454.5 1	≤204	1059.53	17/2+		Mult.: $\gamma(\theta)$ indicates Q, but $\gamma$ is doublet.
		582.5 2	100	931.64	19/2-	D	
1524.64	$(5/2,7/2)^{-}$	875.8 <i>3</i>	100_12	649.02	5/2-	M1	
		931.7 <mark>b</mark> 2	42 <sup>b</sup>	592.66	3/2-		Mult.: assigned M1 (1972Ka37,1972Ha41,1972Wo08), but $\gamma$ multiply placed.
		970.4 <sup>b</sup> 4	≤46 <sup>b</sup>	554.12	$(5/2^-, 7/2, 9/2^+)$		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
		998.8 <sup>b</sup> 2	35 <sup>b</sup>	525.92	3/2-		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
		1061.6 4	16 6	463.23	7/2+		
		1077.8 <sup>b</sup> 3	≤33 <sup>b</sup>	446.83	5/2+		Mult.: assigned E1 (1979DzZZ), but $\gamma$ multiply placed.
		1425.4 4	20,4	99.63	9/2-		
		1524.3 <sup>b</sup> 8	≤18 <sup>b</sup>	0.0	7/2-		
1640.45	$(5/2^+)$	503.4 5	5.8 25	1137.1?	$(5/2,7/2)^{-}$		
		880.8 6	5.0 38	760.44	5/2+		Multiple assigned as M1 (1070 $D_777$ ), but placement suggests E1
		1047.05	13.1 19	525.00	3/2		Mult assigned as M1 (1979DZZZ), but placement suggests E1.
		1114.8 0	$\leq 11^{\circ}$	353.92	$\frac{3}{2}$		
		1324.8 6	3.7 12	316.56	$5/2^+$		
		1341 4 <sup>b</sup> 6	<15 <sup>b</sup>	298.68	3/2+		
		1417.8 3	100 10	222.43	$3/2^+$		
		1429.2 <sup>b</sup> 3	≤58 <sup>b</sup>	211.15	1/2+		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
		1640.6 <sup>b</sup> 4	_<4 <sup>b</sup>	0.0	7/2-		
1656.64	5/2-	895.7 <mark>b</mark> 2	21 <sup>b</sup>	760.44	5/2+		Mult.: assigned M1 (1972Ka37), but $\gamma$ multiply placed. Placement suggests E1.
	,	1065.0 <sup>b</sup> 4	6 <mark>b</mark>	592.66	3/2-		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
		1102.6 <mark>b</mark> 3	≤35 <sup>b</sup>	554.12	$(5/2^-, 7/2, 9/2^+)$		Mult.: assigned E1 (1972Ka37), but $\gamma$ multiply placed.
		1193.2 <sup>b</sup> 3	≤94 <sup>b</sup>	463.23	7/2+		$E_{\gamma}$ : placements conflict; 1972Ka37 place a 1193 $\gamma$ from 1404 and 1656 levels and 1972Wa08 place it from 1491 level only
		1209.8 2	62 6	446.83	5/2+	E1	and 17/20000 place it from 1771 level only.
		1283.6 9	3.8 15	373.24	5/2+		
		1303.2 4	62 8	353.28	7/2+	(E1)	
		1358.2 3	100 10	298.68	$3/2^+$	E1	
		1404.4 5	2.8 10	252.68	7/2+		
		1434.3 3	55 4 90 8	222.45	3/2* 7/2-		Mult : assigned M1 by 1972Ka37, but F2 by 1972Wo08
1674 40	21/2+	363 <sup>#</sup>	20.0	1311 78	19/2+		man., assigned mi by 17/21007, but 12 by 17/20000.
1074.40	∠ 1/ ∠	463.5 1	100	1210.89	$17/2^+$	0	
1675 31		$1228 2^{b} 3$	<210 <sup>b</sup>	446.83	5/2.+	×.	Mult: assigned E1 (1979DzZZ), but $\gamma$ multiply placed
10/0.01		1377.0 5	100 28	298.68	3/2+		indian actigues 21 (1777) (2023), out / manipij pracou
		1452.7 4	68 19	222.43	3/2+		

From ENSDF

## $\gamma$ <sup>(161</sup>Ho) (continued)</sup>

E <sub>i</sub> (level)	$\mathrm{J}_i^\pi$	$E_{\gamma}^{\dagger}$	Ι <sub>γ</sub> @	$E_f \qquad J_f^{\pi}$	Mult.&	Comments
1675.31		1464.4 <sup>b</sup> 3	≤415 <sup>b</sup>	211.15 1/2+		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
1678.38	25/2-	274.2 1	46	1404.22 23/2-	D	
		511.0 <i>1</i>	100	1167.29 21/2-		
1691.39	5/2+	554.2 <sup>b</sup> 4	≤35 <sup>b</sup>	1137.1? (5/2,7/2)-		
		1098.2 <sup>b</sup> 3	≤110 <sup>b</sup>	592.66 3/2-		Mult.: assigned E1 (1979DzZZ), but $\gamma$ multiply placed.
		1228.2 <sup>b</sup> 4	≤56 <sup>b</sup>	463.23 7/2+		Mult.: assigned E1 (1979DzZZ), but $\gamma$ multiply placed.
		1318.2 <sup>b</sup> 4	≤53 <b>b</b>	373.24 5/2+		
		1338.2 3	100 15	353.28 7/2+		Mult.: assigned E1 (1972Ka37); but then decay of this $\gamma$ to 7/2 <sup>+</sup> level conflicts with placement of other $\gamma$ 's to 1/2 <sup>+</sup> .
		1374.9 5	26 9	316.56 5/2+		
		1392.8 <sup>b</sup> 3	$\leq 40^{b}$	298.68 3/2+		
		1469.0 4	39 6	222.43 3/2+		
		1480.6 4	28 6	211.15 1/2+		
1714.80	5/2-	1691.7 9	3.5 35	0.0 7/2		
1/14.00	5/2	934.70	1912	100.44 J/2		
		$1208.2^{\circ} 3$	69 <sup>r</sup>	$440.85 \ 5/2$		
		1341.4° 5	$\leq 62^{\circ}$	$3/3.24 \ 5/2^{+}$ $353.28 \ 7/2^{+}$		
		1492.2.3	100 15	$222.43 \ 3/2^+$	E1	
		1714.7 5	18 6	0.0 7/2-	21	
1740.42	5/2-	913.3 9	55	826.62 5/2-		
		980.2 <sup>b</sup> 2	≤26 <sup>b</sup>	760.44 5/2+		Mult.: assigned M1 (1979DzZZ), but $\gamma$ multiply placed.
		1147.3 5	32 6	592.66 3/2-		
		1293.6 6	52	446.83 5/2+		
		1387.04	114	353.28 7/2+		
		1488.4 <sup>0</sup> 4	30	252.68 7/2+		
		151/.85	12.5	222.43 3/2		
		1640.5 5	$\leq 6.2^{\circ}$	$99.63 \ 9/2$	M1	
1745 90	$(3/2^+ 5/2^+)$	1740.0 5	86 43	$446.83 5/2^+$	1011	
1715.90	(3/2 ,3/2 )	1371.8 6	100 43	373.24 5/2+		
		1392.8 <sup>b</sup> 3	<376 <sup>b</sup>	353.28 7/2+		
		$1429.2^{b}3$	<1430 <sup>b</sup>	316.56 5/2+		Mult : assigned M1 (1979DzZZ) but $\gamma$ multiply placed
		$1447.2^{b}.5$	<129 <sup>b</sup>	298.68 3/2+		indian accigned in (1779 dele), out / manupi praced.
		152/3b 7	<22129 <2221b	220.00 5/2		
		1524.5 7	$\leq 224^{\circ}$ 62 24	222.43  5/2 211 15 $1/2^+$		
1762 30	23/2+	249 <sup>#</sup>	02 27	1514.03 21/2+		
1702.30	23/2	277		1317.03 21/2		

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## $\gamma$ <sup>(161</sup>Ho) (continued)</sup>

$E_i$ (level)	$J_i^{\pi}$	$E_{\gamma}^{\dagger}$	Ι <sub>γ</sub> @	E <sub>f</sub>	$J_f^{\pi}$ N	Ault.&	Comments
1762.30	23/2+	483.9 2	100	1278.33 19	9/2+ (0	Q)	
		595#	,	1167.29 21	$1/2^{-}$		
1776.43	$(3/2, 5/2)^+$	1183.3 <sup>b</sup> 4	≤215 <sup>b</sup>	592.66 3/	/2-		Mult.: assigned E1 (1979DzZZ), but $\gamma$ multiply placed.
		1250.4 <sup>b</sup> 4	15 <sup>b</sup>	525.92 3/	/2-		
		1318.2 <sup>b</sup> 4	≤82 <sup>b</sup>	458.87 5/	$/2^{-}$		
		1352.4 6	13 7	423.91 1/	/2-		
		1477.8 6	22 7	298.68 3/	/2 <sup>+</sup>		
		1553.8 3	100 12	222.43 3/	/2⁺ E	£2,M1	
		1565.6 <sup>0</sup> 4	≤13 <sup>0</sup>	211.15 1/	/2+		
1786.37	23/2+	320.2 2	25	1465.62 21	$1/2^{-}$		
		4/4.6 <i>I</i>	100	1311.78 19	9/2 C	Į	
1817.96	5/2+,7/2,9/2	$1447.2^{\circ} 5$	$\leq 540^{\circ}$	370.77 9/	/2+ /2+		Mult assigned M1 (1070D-777) but a multiply placed
		$1404.4^{\circ}$ 3	$\leq 4400^{\circ}$	353.28 7/	/2 /2+		Mult.: assigned M1 (1979DZZZ), but $\gamma$ multiply placed.
		1365.6° 4	$\leq 340^{\circ}$	252.68 //	/2 <sup>+</sup>		
1829 97	$3/2^{-}$ $5/2$	1236 8 9	12.9	592.66 3/	12-		
1029.97	5/2 ,5/2	1383.2 3	100 11	446.83 5/	/2 <sup>+</sup>		
		1456.4 <sup>b</sup> 9	≤18 <sup>b</sup>	373.24 5/	/2+		
		1531.6 <sup>b</sup> 6	≤16 <sup>b</sup>	298.68 3/	$2^{+}$		
		1829.8 5	40 4	0.0 7/	/2-		
1848.0		1531.6 <sup>b</sup> 5	≤165 <sup>b</sup>	316.56 5/	/2+		
		1549.7 9	63 44	298.68 3/	$2^{+}$		
		1625.4 <i>4</i>	100 <i>36</i>	222.43 3/	/2+		
1868.7	3/2-,5/2,7/2-	1276.4 <sup>b</sup> 4	≤270. <sup>b</sup>	592.66 3/	/2-		
		1342.9 6	100 33	525.92 3/	/2-		
		1495.2 9	22 16	373.24 5/	/2 <sup>+</sup>		
1026.03	25/2-	1807.8 0	27 7	0.0 //	1/2-		L : doublet, but other component not placed in in beam
1920.93	23/2	401.5 1	100	1403.02 21	1/2		$\gamma_{\gamma}$ . doublet, but other component not placed in m-beam. Mult : $\gamma(\theta)$ indicates O but $\gamma$ is doublet
1938.67	27/2-	260.1 2	41	1678.38 25	5/2-		
	·	534.5 1	100	1404.22 23	$3/2^{-}$ Q	2	
2023.0	$25/2^+$	260		1762.30 23	3/2+		
		510		1514.03 21	$1/2^+$		
2102.0	25/2+	619		1404.22 23	$\frac{5}{2}$		
2192.9	23/2	407 518		1/80.37 23	5/2 1/2+		
2239.9	29/2-	301		1938.67 27	7/2-		
	- / -	562		1678.38 25	5/2-		

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## $\gamma$ (<sup>161</sup>Ho) (continued)

2292.6         71/2*         70         2023.0         52/7           50         1763.30         32/7*           2310.7         27/7*         383         1926.93         52/7           2462         29/2*         555         1976.93         52/7           2510.9         31/2*         271         239.9         32/7           2569.0         29/2*         772         1938.67         27/7         Q           2569.0         29/2*         276*         292.6         27/7         Q           2869.0         29/2*         276*         292.6         27/7*         Q           2813.8         33/2*         303         25/7*         289.0         31/7*           573         2290.0         27/7*         2         Q         Mult: quoted asseming that this y is the same as the 573.3 y in the (a.2ny) study, for which mult=Q is reported.           2863         31/2*         553         2290.0         27/7*           3065         33/2*         553         2290.0         27/7*           3079.9         35/2*         556         206.0         29/2*           3277         33/2*         559.8         100         211.9         30/2* <tr< th=""><th>E<sub>i</sub>(level)</th><th><math>\mathbf{J}_i^{\pi}</math></th><th><math>E_{\gamma}^{\dagger}</math></th><th><math>I_{\gamma}^{@}</math></th><th><math>\mathrm{E}_{f}</math></th><th><math>\mathbf{J}_{f}^{\pi}</math></th><th>Mult.&amp;</th><th>Comments</th></tr<>	E <sub>i</sub> (level)	$\mathbf{J}_i^{\pi}$	$E_{\gamma}^{\dagger}$	$I_{\gamma}^{@}$	$\mathrm{E}_{f}$	$\mathbf{J}_{f}^{\pi}$	Mult.&	Comments
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	2292.6	27/2+	270 530		2023.0 1762.30	$25/2^+$ $23/2^+$ $25/2^-$		
246229/25351926 9328/227102712239.929/25721938.67272Q2569.029/2*276°292.6271329/2*546202.025/2*2813.833/230.32510.931/2*2845.631/2*276*259.029/2*2845.631/2*250.929/2*2845.631/2*276*250.9573292.627/2*286331/2*553292.65742310.727/2*286331/2*568.91003079.935/2*260.0568.981003079.735/2*281.3.8337/2*546281.3.8337/2*546281.3.8337/2*550.029/2*337133/2*550.0392568.9100306.637/2*372737/2*550392550306.637/2*372737/2*372737/2*372737/2*384137/2*392563314835/2*3925633149360.637/2*372737/2*372737/2*384137/2*384137/2*384137/2*384137/2*384137/2*384137/2*384137/2* <td>2310.7</td> <td>27/2+</td> <td>383 525</td> <td></td> <td>1926.93 1786 37</td> <td><math>25/2^{-}</math> <math>25/2^{-}</math> <math>23/2^{+}</math></td> <td></td> <td></td>	2310.7	27/2+	383 525		1926.93 1786 37	$25/2^{-}$ $25/2^{-}$ $23/2^{+}$		
2110512198.67272Q552198.67272Q269.0 $29/2^+$ 276e' $2292.6$ $27/2^+$ 5462023.0 $25/2^+$ 2813.8332303 $2510.9$ $31/2^-$ 5742239.9 $99/2^-$ 2845.6 $31/2^+$ $552$ $2310.7$ $77/2^+$ 2863 $31/2^+$ $552$ $2310.7$ $77/2^+$ 3065 $33/2^ 603$ $2462$ $29/2^ 553$ $2292.6$ $27/2^+$ $568.9$ $8$ $100$ $2510.9$ $31/2^ 568.9$ $8$ $100$ $2510.9$ $31/2^ 568.9$ $556$ $286.0$ $29/2^+$ $3127$ $637/2^ 556$ $286.3$ $3127$ $576^+$ $2569.0$ $29/2^+$ $3321.6$ $37/2^ 548$ $2103.8$ $3322^ 576^+$ $2569.0$ $29/2^+$ $3330.3$ $39/2^ 58/2$ $316.6$ $37/2^ 569.0$ $39/2^+$ $3324^ 536^ 31/2^+$ $3324^ 559^ 366.6$ $37/2^ 550^ 332.7^ 327$ $37/2^+$ $547^ 327^+$ $559^ 361.6$ $37/2^+$ $559^ 3381.6$ $37/2^ 381.16^ 37/2^+$ $4419^ 41/2^ 59^ 361.6$ $37/2^+$ $3981^ 381.6^ 37/2^+$ $4419^ 41/2^ 5$	2462 2510 9	$\frac{29}{2^{-}}$	535 271		1926.93 2239.9	$\frac{25}{2^{-}}$		
259.0 $29/2^+$ $276^c$ $229.6$ $27/2^+$ 2738 $29/2^+$ $545$ $219.29$ $25/2^+$ 281.38 $33/2^ 30.3$ $2510.9$ $31/2^ 574$ $2239.9$ $29/2^-$ 2845.6 $31/2^+$ $277^c$ $2560.0$ $29/2^+$ $535$ $229.6$ $27/2^+$ $3065$ $33/2^ 603$ $2462$ $29/2^ 3079.9$ $552^ 266^{44}$ $2813.8$ $33/2^ 508.9 8$ $100$ $2510.9$ $31/2^ 3079.9$ $557^ 2569.0$ $9/2^+$ $3127$ $33/2^+$ $539$ $2738$ $29/2^+$ $331.6$ $37/2^ 286.3$ $31/2^+$ $3327^ 539^ 2738$ $29/2^+$ $3361.6$ $37/2^ 548$ $2813.8$ $332^ 539^ 2738$ $39/2^+$ $33418$ $35/2^+$ $545$ $2845.6$ $31/2^+$ $535$ $286.3$ $31/2^+$ $3418$ $37/2^+$ $543$ $337^ 320.4$ $11/2^ 563$ $3418$ $392.4$ $37/2^ 563$ $3361.6$ $37/2^ 563$ $3361.6$ $37/2^ 4402$ $41/2^+$ $578$ $382.4$ $37/2^ 563$ $3418$ $360.3$ $392.4$ $41/2^ 578$ $324.4$ $4115$ $43/2^ 591$ $360.3$ $392.4$ $41/2^ 578$ $324.4$ $4119$ $41/2^ 578$ $327.7$	2510.7	51/2	572		1938.67	$\frac{29}{2}^{-}$	Q	Mult.: quoted assuming that this $\gamma$ is the same as the 573.3 $\gamma$ in the ( $\alpha$ ,2n $\gamma$ ) study, for which mult=Q is reported.
2738 2813829/2* 332-545 303 2510921/2* 21/2*2845.6 $31/2^+$ 574 2553 2553 23062229/2* 27/2*2863 $31/2^+$ 553 2017271/2* 271/2*3065 $33/2^-$ 603 266*2813.8 2812*3079.9 $35/2^-$ 568.9 & 100 210.9210.9 21/2*31257 3277 3361.637/2- 282 37/2*266* 2813.8 33/2-3301.6 $37/2^-$ 282 3361.631/2* 21/2*3302 35/2*555 50 50 3361.631/2* 31/2*3322 	2569.0	29/2+	276 <sup>c</sup> 546		2292.6 2023.0	27/2 <sup>+</sup> 25/2 <sup>+</sup>		
2813.8 $33/2$ $2303$ $23103$ $2312$ 574 $22393$ $29/2^+$ 553 $22926$ $27/2^+$ 3005 $33/2^ 603$ $2462$ $29/2^-$ 563 $22926$ $27/2^+$ $3079.9$ $35/2^ 266^{49}$ $2813.8$ $33/2^-$ 3079.9 $35/2^ 266^{49}$ $2813.8$ $33/2^ (Q)$ 31257 $(33/2^+)$ $557^ 2590.0$ $29/2^+$ 3361.6 $37/2^ 282$ $3079.9$ $35/2^ 548$ $2813.8$ $33/2^ 539$ $35/2^ 3630.3$ $39/2^ 269$ $3616.3$ $31/2^+$ $3630.3$ $39/2^ 550$ $303.3$ $32/2^ 3727$ $37/2^ 662$ $3065$ $32/2^ 3824$ $37/2^+$ $547$ $33/2^ 3920.4$ $41/2^ 290$ $3630.3$ $39/2^ 3981$ $39/2^+$ $563$ $3418$ $35/2^+$ $4530.4$ $47/2^-$	2738	$\frac{29}{2^+}$	545 202		2192.9	$25/2^+$		
2845.6 $31/2^+$ $277^ 2690.0$ $29/2^+$ 2863 $31/2^+$ $552$ $2310.7$ $27/2^+$ 3005 $33/2^ 603$ $2462$ $29/2^ 3079.9$ $35/2^ 266\#$ $813.8$ $33/2^ 31257$ $(33/2^+)$ $557^ 2560.0$ $29/2^+$ $3361.6$ $37/2^ 282$ $3079.9$ $35/2^ 3361.6$ $37/2^ 282$ $3079.9$ $35/2^ 3392$ $35/2^+$ $546$ $2813.8$ $33/2^ 3392$ $35/2^+$ $546$ $2843.6$ $31/2^+$ $3418$ $35/2^+$ $555$ $2863$ $31/2^+$ $3824$ $37/2^ 59$ $3361.6$ $37/2^ 3981$ $39/2^+$ $563$ $418$ $35/2^+$ $3125$ $692$ $3727$ $37/2^ 581$ $3630.3$ $39/2^ 3981$ $39/2^+$ $578$ $3981$ $39/2^+$ $578$ $3624$ $37/2^ 581$ $3630.3$	2013.0	33/2	503 574		2239.9	$\frac{31/2}{29/2^{-}}$		
2863 $31/2^+$ 552 $2310.7$ $27/2^+$ 3005 $33/2^ 603$ $2462$ $29/2^ 3079.9$ $35/2^ 568.98$ $100$ $2510.9$ $31/2^-$ (Q) $3125?$ $(33/2^+)$ $557^ 2569.0$ $29/2^+$ $3361.6$ $37/2^ 282$ $3079.9$ $35/2^ 548$ $2813.8$ $33/2^ 548$ $2813.8$ $33/2^ 548$ $2813.8$ $33/2^ 548$ $2813.8$ $31/2^+$ $3418$ $35/2^+$ $555$ $2863$ $3727$ $37/2^ 662$ $3065$ $33/2^+$ $3361.6$ $37/2^ 3727$ $37/2^ 662$ $3065$ $33/2^+$ $3361.6$ $37/2^ 3981$ $39/2^+$ $563$ $3418$ $35/2^+$ $563$ $3418$ $35/2^+$ $4402$ $41/2^ 578$ $3824$ $37/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ $39/2^ 581$ $3630.3$ <td>2845.6</td> <td>31/2+</td> <td>277<sup>C</sup> 553</td> <td></td> <td>2569.0 2292.6</td> <td>29/2<sup>+</sup> 27/2<sup>+</sup></td> <td></td> <td></td>	2845.6	31/2+	277 <sup>C</sup> 553		2569.0 2292.6	29/2 <sup>+</sup> 27/2 <sup>+</sup>		
$3065$ $33/2^ 603$ $2462$ $29/2^ 3079.9$ $35/2^ 266^{\#}$ $2813.8$ $33/2^ 568.9.8$ $100$ $2510.9$ $31/2^ (Q)$ $3125?$ $(33/2^+)$ $557^ 2569.0$ $29/2^+$ $3277$ $33/2^+$ $539$ $2738$ $29/2^+$ $3361.6$ $37/2^ 824$ $3079.9$ $35/2^ 548$ $2813.8$ $33/2^ 548$ $2845.6$ $31/2^+$ $3418$ $35/2^+$ $546$ $2845.6$ $31/2^+$ $3418$ $35/2^+$ $546$ $2845.6$ $31/2^+$ $3424$ $37/2^ 662$ $3065$ $33/2^ 3727$ $37/2^ 662$ $3065$ $33/2^ 3824$ $37/2^+$ $547$ $3277$ $33/2^+$ $3920.4$ $41/2^ 59$ $361.6$ $37/2^ 4402$ $41/2^+$ $578$ $3824$ $37/2^ 4402$ $41/2^+$ $578$ $3824$ $37/2^-$	2863	$31/2^{+}$	552		2310.7	$27/2^+$		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	3065	33/2-	603		2462	$29/2^{-}$		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	3079.9	35/2-	266 <sup>#</sup> 568.9 8	100	2813.8 2510.9	33/2 <sup>-</sup> 31/2 <sup>-</sup>	(Q)	
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	3125?	$(33/2^+)$	557 <sup>C</sup>		2569.0	$29/2^+$		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	3277	$33/2^{+}$	539		2738	$29/2^{+}$		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3361.6	37/2-	282 548		3079.9 2813.8	35/2 <sup>-</sup> 33/2 <sup>-</sup>		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	3392	$35/2^{+}$	546		2845.6	$31/2^{+}$		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	3418	$35/2^+$	555		2863	$31/2^{+}$		
$3727$ $37/2^ 662$ $3075$ $33/2^ 3824$ $37/2^+$ $547$ $3277$ $33/2^+$ $3920.4$ $41/2^ 290$ $3630.3$ $39/2^ 559$ $3361.6$ $37/2^ 3981$ $39/2^+$ $563$ $3418$ $35/2^+$ $4211.5$ $43/2^ 291$ $3920.4$ $41/2^ 581$ $3630.3$ $39/2^ 4402$ $41/2^+$ $578$ $3824$ $37/2^+$ $4419$ $41/2^ 692$ $3727$ $37/2^ 4536.0$ $45/2^ 324$ $4211.5$ $43/2^ 616$ $3920.4$ $41/2^ 616$ $3920.4$ $4536.0$ $45/2^ 324$ $4211.5$ $43/2^ 616$ $3920.4$ $41/2^ 41/2^ 45/2^ 4853.4$ $47/2^ 317$ $4536.0$ $45/2^-$	3630.3	39/2-	269 550		3361.6 3079.9	37/2 <sup>-</sup> 35/2 <sup>-</sup>		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3727	$37/2^{-}$	662		3065	$33/2^{-}$		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	3824	$37/2^+$	547		3277	$33/2^{+}$		
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$	3920.4	$41/2^{-}$	290		3630.3	39/2-		
$3981$ $39/2^+$ $563$ $3418$ $35/2^+$ $4211.5$ $43/2^ 291$ $3920.4$ $41/2^ 581$ $3630.3$ $39/2^ 4402$ $41/2^+$ $578$ $3824$ $37/2^+$ $4419$ $41/2^ 692$ $3727$ $37/2^ 4536.0$ $45/2^ 324$ $4211.5$ $43/2^ 616$ $3920.4$ $41/2^ 4583$ $43/2^+$ $602$ $3981$ $39/2^+$ $4536.0$ $45/2^-$			559		3361.6	$37/2^{-}$		
$4211.5$ $43/2^ 291$ $3920.4$ $41/2^ 581$ $3630.3$ $39/2^ 4402$ $41/2^+$ $578$ $3824$ $37/2^+$ $4419$ $41/2^ 692$ $3727$ $37/2^ 4536.0$ $45/2^ 324$ $4211.5$ $43/2^ 4583$ $43/2^+$ $602$ $3981$ $39/2^+$ $4853.4$ $47/2^ 317$ $4536.0$ $45/2^-$	3981	39/2+	563		3418	$35/2^{+}$		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4211.5	43/2-	291 581		3920.4 3630.3	41/2 <sup>-</sup> 39/2 <sup>-</sup>		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4402	$41/2^{+}$	578		3824	37/2+		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4419	41/2-	692		3727	37/2-		
$\begin{array}{cccccccccccccccccccccccccccccccccccc$	4536.0	45/2-	324 616		4211.5 3920 4	$43/2^{-}$ $41/2^{-}$		
4853.4 47/2 <sup>-</sup> 317 4536.0 45/2 <sup>-</sup>	4583	$43/2^{+}$	602		3981	$39/2^+$		
	4853.4	47/2-	317		4536.0	$45/2^{-}$		

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<sup>161</sup><sub>67</sub>Ho<sub>94</sub>-14

From ENSDF

#### $\gamma$ <sup>(161</sup>Ho) (continued)</sup>

E <sub>i</sub> (level)	$\mathbf{J}_i^{\pi}$	$E_{\gamma}^{\dagger}$	$E_f$	$\mathbf{J}_f^{\pi}$
4853.4	$47/2^{-}$	642	4211.5	43/2-
5223.7	$49/2^{-}$	370	4853.4	$47/2^{-}$
		688	4536.0	$45/2^{-}$
5239	$47/2^{+}$	656	4583	$43/2^{+}$
5562	$51/2^{-}$	709	4853.4	$47/2^{-}$
5949	$51/2^{+}$	710	5239	$47/2^{+}$

<sup>†</sup> From decay-scheme studies (primarily 1972Ka37 and 1972Wo08) and in-beam studies (primarily 1971Fu08 and 2004Es01). Unplaced  $\gamma$ 's from <sup>161</sup>Er  $\varepsilon$  decay and in-beam studies are not included here.  $\gamma$ 's listed only to the nearest keV are generally from 2004Es01.

<sup>‡</sup> See the comment on this  $\gamma$  in the <sup>161</sup>Er  $\varepsilon$  decay data set.

<sup>#</sup> From 2004Es01,  ${}^{160}$ Gd( ${}^{7}$ Li,6n $\gamma$ ).  $\gamma$  not reported in the other in-beam studies.

<sup>@</sup> Average of available data from decay scheme and in-beam studies.

& Multipolarities are based primarily on relative internal-conversion subshell intensities (1965Gr35) and  $\alpha$ (K)exp values (1972Ka37) in <sup>161</sup>Er  $\varepsilon$  decay, and  $\gamma(\theta)$  from  $(\alpha, 2n\gamma)$  study (1971Fu08). The Q are generally taken to be stretched E2. See the <sup>161</sup>Er  $\varepsilon$  decay and  $(\alpha, 2n\gamma)$  for the experimental results.

<sup>*a*</sup> Total theoretical internal conversion coefficients, calculated using the BrIcc code (2008Ki07) with Frozen orbital approximation based on  $\gamma$ -ray energies, assigned multipolarities, and mixing ratios, unless otherwise specified.

<sup>b</sup> Multiply placed with undivided intensity.

<sup>c</sup> Placement of transition in the level scheme is uncertain.

From ENSDF

## Level Scheme

Intensities: Relative photon branching from each level

Legend

 $--- \blacktriangleright \gamma$  Decay (Uncertain)



<sup>161</sup><sub>67</sub>Ho<sub>94</sub>

Legend

#### Level Scheme (continued)

Intensities: Relative photon branching from each level & Multiply placed: undivided intensity given

 $\gamma$  Decay (Uncertain)



<sup>161</sup><sub>67</sub>Ho<sub>94</sub>

Level Scheme (continued)

Intensities: Relative photon branching from each level & Multiply placed: undivided intensity given



<sup>161</sup><sub>67</sub>Ho<sub>94</sub>

#### Level Scheme (continued)

Intensities: Relative photon branching from each level & Multiply placed: undivided intensity given



<sup>161</sup><sub>67</sub>Ho<sub>94</sub>

Level Scheme (continued)

Intensities: Relative photon branching from each level & Multiply placed: undivided intensity given





Legend

## Adopted Levels, Gammas

## Level Scheme (continued)

Intensities: Relative photon branching from each level & Multiply placed: undivided intensity given γ Decay (Uncertain) ----1396.95  $\frac{3/2^{-}}{(1/2^{+},3/2)}$ 1394.46 (3/2,5/2)+ 1325.20 19/2+ 1311.78 25.8  $19/2^{+}$ 1 . 1278.33 -0 101 101 200 200 80 80 80 80 80 80 (1/2,3/2,5/2)+ i. I 1240.07 1 \*\*0,0 | |0,235,0 |0  $(3/2)^+$ 1232.85  $17/2^{+}$ .\_\_\_\_ \_\_\_ .8 1210.89 1167.29  $21/2^{-}$ | | | | |\_ \_| \_|\_ |\_ (5/2,7/2)-\_1<u>1</u>3<u>7</u>.<u>1</u> I I I I 1  $(15/2^+)$ 1096.01 Ý 1084.41 17/2 ¥ 1 1 1 1059.53  $17/2^{+}$ 1 I. 1  $\frac{19/2^{-}}{(13/2^{+})}$ 1 931.64 ¥ 920.68 -i-¥ 15/2+ 906.84 1 1 I I 15/2+ 857.30 5/2 826.62  $13/2^{+}$ 821.08 1 1 1 13/2 788.12 i i i 5/2+ 760.44 ¥  $11/2^{+}$ 732.94 -|----|--17/2 \_ 726.42 L 1 i i 649.02 5/2 3/2-592.66 1 I 1 1 525.92 3/2-1 1 458.87 5/2-I i i 1/2-423.91 I. 373.24 5/2+ T 7/2+ i v 353.28 0.52 ns 15 5/2+ 316.56 ¥ 3/2+ ¥ 298.68  $7/2^+$ 252.68  $\leq 0.2 \text{ ns}$ 222.43 211.15  $\frac{3/2^{+}}{1/2^{+}}$ ¥ ¥ 6.76 s 7 7/2-0.0 2.48 h 5

<sup>161</sup><sub>67</sub>Ho<sub>94</sub>



<sup>161</sup><sub>67</sub>Ho<sub>94</sub>

Level Scheme (continued) Intensities: Relative photon branching from each level

& Multiply placed: undivided intensity given



<sup>161</sup><sub>67</sub>Ho<sub>94</sub>

#### Level Scheme (continued)

Intensities: Relative photon branching from each level & Multiply placed: undivided intensity given



<sup>161</sup><sub>67</sub>Ho<sub>94</sub>



<sup>161</sup><sub>67</sub>Ho<sub>94</sub>



<sup>161</sup><sub>67</sub>Ho<sub>94</sub>

Band(M): 1/	2[420] band
<b>(3/2</b> <sup>+</sup> )	1545
(5/2+)	1529

(1/2<sup>+</sup>) 1436

Band(L): 9/2[514] bandhead

(11/2<sup>-</sup>) 1280

Band(I): 5/2[532] band

11/2- 1128

Band(K): K-2 $\gamma$ vibr
based on 5/2[402]

1/2<sup>+</sup> 1100

(9/2-) 1030 Band(H): 5/2[413] band (9/2+) 992 Band(J): K-2 γ vibr based on 7/2[404] 3/2+ 955 7/2-906 **7/2**<sup>+</sup> 860  $5/2^{-}$ 826.62 <u>5/2</u>+ 760.44

<sup>161</sup><sub>67</sub>Ho<sub>94</sub>