¹²⁰Sn(³⁷Cl,4nγ):SD 1997Ap02

		History	
Туре	Author	Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 170, 1 (2020)	16-Aug-2020

 120 Sn(37 Cl,4n γ) at 177 MeV with γ measured in Ge detector (Eurogam II) array. 1997Ap05 is superseded by 1997Ap02.

Superdeformed bands assigned to 153 Ho on basis of coincidences with γ 's assigned to low-lying normal-deformed levels and on population intensities relative to those in normal-deformed channels.

¹⁵³Ho Levels

The population intensity of the SD-1 band relative to that of the 913 γ (35/2⁺ at 3687 keV to 31/2⁺ normal-band transition) feeding the 229-ns isomer at 2772 keV is \approx 0.4%; population intensity for SD-2 band is 30% 5 of SD-1 band, and population intensity of SD-3band is also 30% 5 of SD-1 band.

E(level) [†]	$J^{\pi \#}$	Comments
x&	J	J^{π} : $J \approx 51/2^-$.
x+651.3 ^{&} 14	J+2	
x+1347.1 ^{&} 8	J+4	
x+2087.1 ^{‡&}	J+6	
x+2871.1 ^{&} 2	J+8	
x+3701.7 ^{&} 5	J+10	
x+4577.3 ^{&} 6	J+12	
x+5499.6 ^{&} 7	J+14	
x+6469.1 ^{&} 8	J+16	
x+7484.0 ^{&} 10	J+18	
x+8543.9 ^{&} 10	J+20	
x+9647.0 ^{&} 11	J+22	
x+10791.4 ^{&} 11	J+24	
x+11971.7 ^{&} 12	J+26	
x+13187.2 ^{&} 12	J+28	
x+14438.3 ^{&} 12	J+30	
x+15733.5 ^{&} 14	J+32	
x+17076 ^{&} 2	J+34	
x+18466 ^{&} 2	J+36	
y ^a	J1	$J^{\pi}: J_1 \approx (57/2^-).$
$y + /13^{4} 2$	J1+2	
$y + 14/4.0^{+\alpha}$	J1+4 I1+6	
$y+2282.4 \ 3$ $y+3136.5^{a} \ 4$	J1+0 J1+8	
y+4036.8 ^{<i>a</i>} 5	J1+10	
y+4983.4 ^a 6	J1+12	
y+5976.5 ^{<i>a</i>} 8	J1+14	
$y + /01 / .8^{a} 9$ $y + 8105 4^{a} 10$	J1+16 I1+18	
$v+9239.1^{a}$ 11	J1+10 J1+20	
y+10421.4 ^a 12	J1+22	
y+11651.0 ^{<i>a</i>} 12	J1+24	
$y+12929.4^{a}$ 13	J1+26	
y+14255.6° 13	J1+28	

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¹⁵³Ho Levels (continued)

E(level) [†]	$J^{\pi \#}$	Comments
y+15632.6 ^{<i>a</i>} 14	J1+30	
y+17058 ^{<i>a</i>} 2	J1+32	
z ^b	J2	$J^{\pi}: J_2 \approx (49/2^-).$
z+657.0 ^b 9	J2+2	
z+1340.3 ^b 5	J2+4	
z+2066.6 [‡]	J2+6	
z+2837.4 ^b 3	J2+8	
z+3653.7 ^b 4	J2+10	
z+4515.0 ^b 5	J2+12	
z+5421.9 <mark>b</mark> 7	J2+14	
z+6375.2 ^b 8	J2+16	
z+7371.6 ^b 9	J2+18	
z+8417.7 ^b 10	J2+20	
z+9510.4 ^b 11	J2+22	
z+10653.7 ^b 12	J2+24	
z+11848.6 ^b 13	J2+26	
z+13096.0 ^b 16	J2+28	
z+14393.4 ^b 19	J2+30 [@]	
z+15744 ^b 3	J2+32 [@]	

[†] Since the energies of the γ rays at the bottom of the SD bands are not the most precise values in the bands, and in fact some of these γ 's are only tentatively placed, the uncertainties in the level energies are computed relative to the third or fourth member of each band.

[‡] Taken as reference energy for this band for relative uncertainty assignment.

[#] Assigned by authors and assigned relative to the spins of the yrast SD band in ¹⁵²Dy. Configurations in the bands are discussed in detail in 1997Ap02.

^(a) Based on assignment of 657 γ as 53/2⁻ to 49/2⁻ transition, the 1351 γ should be assigned as a 113/2⁻ to 109/2⁻ transition, not 117/2⁻ to 113/2⁻ transition as assigned by 1997Ap02.

& Band(A): SD-1 band (1997Ap02). Configuration= $\pi 6^4 v 7^2 \otimes (\pi 1/2[530])$, $\alpha = -1/2$ at lower frequencies and $\pi 6^4 v 7^2 (\pi 1/2[770])$, $\alpha = -1/2$ at higher frequencies. The crossing of 1/2[770] proton orbital occurs at $\hbar \omega \approx 0.6$ MeV (1997Ap02). $\pi 6^4 v 7^2$ is the configuration assigned to the yrast SD band in ¹⁵²Dy.

^{*a*} Band(B): SD-2 band (1997Ap02). Configuration= $\pi 6^4 \nu 7^2 \otimes (\pi 1/2[530]), \alpha = +1/2$; signature partner of SD-1 band (1997Ap02).

^b Band(C): SD-3 band (1997Ap02). Configuration= $\pi 6^4 \nu 7^2 \otimes (\pi 7/2[523]), \alpha = +1/2$ (1997Ap02).

$\gamma(^{153}\mathrm{Ho})$

Eγ	I_{γ}^{\dagger}	E _i (level)	\mathbf{J}_i^{π}	E_f	\mathbf{J}_f^π	Mult. [‡]	Comments
651.3 19	0.44 5	x+651.3	J+2	Х	J		
657 [#] 2		z+657.0	J2+2	Z	J2		
683.3 7	0.28 5	z+1340.3	J2+4	z+657.0	J2+2		
695.8 11	0.75 8	x+1347.1	J+4	x+651.3	J+2	(E2)	R(asymmetry)=1.5 4.
713 [#] 2		y+713	J1+2	у	J1		
726.3 5		z+2066.6	J2+6	z+1340.3	J2+4		
740.0 8	0.95 8	x+2087.1	J+6	x+1347.1	J+4	(E2)	R(asymmetry)=1.3 3.
761 [#] 2		y+1474.0	J1+4	y+713	J1+2		

Continued on next page (footnotes at end of table)

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$\gamma(^{153}\text{Ho})$ (continued)

Eγ	I_{γ}^{\dagger}	E _i (level)	\mathbf{J}_i^{π}	E_f	J_f^{π}	Mult. [‡]	Comments
770.8 3	0.25 5	z+2837.4	J2+8	z+2066.6	J2+6		
784.0 2	0.99 8	x+2871.1	J+8	x+2087.1	J+6	(E2)	R(asymmetry)=1.4 4.
808.4 <i>3</i>	0.12 3	y+2282.4	J1+6	y+1474.0	J1+4		
816.3 <i>3</i>	0.29 5	z+3653.7	J2+10	z+2837.4	J2+8		
830.6 5		x+3701.7	J+10	x+2871.1	J+8		
854.1 <i>3</i>	0.22 3	y+3136.5	J1+8	y+2282.4	J1+6		
861.3 3	0.30 6	z+4515.0	J2+12	z+3653.7	J2+10	(7.6)	
875.63	0.97 10	x+4577.3	J+12	x+3/01.7	J+10	(E2)	R(asymmetry)=1.3 2.
900.3 3	0.38 7	y+4036.8	J1+10	y+3136.5	JI+8		
906.9 5	1.06.0	z+5421.9	J2+14	z+4515.0	J2+12		
922.3 3	1.06 9	x+5499.6	J+14	x+4577.3	J+12		
946.6 3	0.29 0	y+4983.4	J1+12 J2+16	y+4036.8	J1+10 I2+14		
953.3 3	0.27.5	Z+63/5.2	J2+10	z+5421.9	J2+14	$(\mathbf{D}\mathbf{A})$	$\mathbf{P}(\mathbf{x}, \mathbf{y}) = 1 2 2$
969.5 5	0.89 9	X+6469.1	J+10	x+5499.6	J+14	(E2)	R(asymmetry)=1.3 3.
995.15		y+3970.3	J1+14 J2+10	y+4985.4	J1+12 J2+16		
990.4 5	0.02.8	Z + 7484.0	J2+18 L+19	Z+05/5.2	$J_{2}+10$ J_{1} 16	(E2)	$\mathbf{P}(asymmetry) = 1.4.2$
1014.9 5	0.92 0	x + 7017.8	$J \pm 10$ $I1 \pm 16$	x+0409.1	J + 10 I1 + 14	(E2)	R(asymmetry) = 1.4 5.
1041.5 5	0.20.4	y + 7017.0	12 + 20	y+3970.3	J1 + 14 J2 + 18		
1040.1 4	0.20 4	2+0+17.7	$J_{2} + 20$ $J_{1} - 20$	2 ± 7371.0	$J_{\perp} = 10$	(F2)	P(asymmetry) = 1.6.6
1039.9 3	0.00 10	x + 0.045.9	J+20 I1 + 19	x + 7017.8	$J \pm 10$ $I1 \pm 16$	(E2)	R(asymmetry) = 1.0 0.
1007.0 5	0.310 0.21 Λ	y + 8103.4 z + 9510.4	17 ± 10 12 ± 22	$y \pm 7017.8$ $z \pm 8/17.7$	12 ± 20		
1092.7 3	0.214 0.7110	2 ± 9510.4	JZTZZ I+22	$2 \pm 0 \pm 17.7$	$J_{2} + 20$ $J_{1} - 20$		
1103.1 5	0.71 10	x + 90 + 7.0	$J \pm 22$ $I1 \pm 20$	x+8105 4	$J \pm 20$ $I1 \pm 19$		
1133.7 0	0.28 5	y + y = 2.5 y = 1 z + 10653.7	17+20 12+24	7+9510.4	17+10 12+22		
1144 4 3	$0.17 \neq$ 0.41 7	$x \pm 10791.4$	J_{\pm}^{72}	x + 9647.0	$J_{\pm 22}$		
1180 3 3	0.52.8	x + 110771.7	I+26	x + 10791.4	I + 24		
1182.3.3	0.28 5	v + 10421.4	I1+22	v+9239 1	11+20		
1194.9.5	0.20 5	z+11848.6	J_{2+26}	z+10653.7	J_{2+24}		
1215.5 3	0.27 6	x + 13187.2	J+28	x+11971.7	J+26		
1229.6 3	0.25 5	v+11651.0	J1+24	v+10421.4	J1+22		
1247.4 10	0.15 3	z+13096.0	J2+28	z+11848.6	J2+26		
1251.1 3	0.27 5	x+14438.3	J+30	x+13187.2	J+28		
1278.4 4	0.21 4	y+12929.4	J1+26	y+11651.0	J1+24		
1295.2 6		x+15733.5	J+32	x+14438.3	J+30		
1297.4 19	0.10 3	z+14393.4	J2+30	z+13096.0	J2+28		
1326.2 4	0.07 3	y+14255.6	J1+28	y+12929.4	J1+26		
1343 [#] 1		x+17076	J+34	x+15733.5	J+32		
1351 2		z+15744	J2+32	z+14393.4	J2+30		I _{γ} : 0.32 9 (scaled value=0.10 3) given by 1997Ap02 is the same as that for 1297.4 γ . It is probably a misprint since such a peak is not apparent in figure 1 of 1007Ap02
1377 0 4		v+15632.6	11 ± 30	v±14255.6	11+28		01 1997Ap02.
1300# 1		$y \pm 13032.0$ $y \pm 18466$	J1730	y + 1 + 255.0	J1+20		
1390 1		A+10400	J+30	x+1/0/0	J+34		
1425" 2		y+17058	J1+32	y+15632.6	J1+30		

[†] The authors' I γ for the first band have been quoted here. For the other two bands, the authors' tabulated values have been scaled by their relative band intensities of 0.30 5 and 0.30 5 so that all of the values given here are on the same scale.

[±] R(asymmetry)= $I\gamma$ (forward+backward)/ $I\gamma$ (90°)=1.49 15 is consistent with stretched quadrupole transition and the quadrupole transitions are assumed to be E2.
Placement of transition in the level scheme is uncertain.

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<u>Level Scheme</u> Intensities: Relative I_{γ} Legend



J2+32	<u> </u>	z+15744
	5 ^{7.}	
J2+30		z+14393.4
<u>J2+28</u>		z+13096.0
J2+26		z+11848.6
J2+24		z+10653.7
J2+22		z+9510.4
J2+20		z+8417.7
J2+18		z+7371.6
J2+16	ک ^۲	z+6375.2
J2+14	and the second s	z+5421.9
J2+12		z+4515.0
J2+10	\$ \$ 	z+3653.7
J2+8		z+2837.4
J2+6		z+2066.6
J2+4	€°	z+1340.3
J2+2	\$	z+657.0
J2 11+32	×	<u>z</u>
<u>J1+J2</u>		
J1+30	→ ⁵ <u>6</u>	y+15632.6
11+28		y+14255.6
J1+26	¹	y+12929.4
J1+24		y+11651.0
J1+22		y+10421.4
<u>J1+20</u>		y+9239.1
J1+18		y+8105.4
J1+16		y+7017.8
J1+14		y+5976.5
J1+12		y+4983.4

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¹⁵³₆₇Ho₈₆

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		Band(C): SD-3 band (1997Ap02)
		J2+32 z+15744
		J2+30 ¹³⁵¹ z+14393.4
		J2+28 ¹²⁹⁷ z+13096.0
		J2+26 ¹²⁴⁷ z+11848.6
		J2+24 ¹¹⁹⁵ z+10653.7
		J2+22 1143 z+9510.4
		$\frac{J2+20}{12+18} \xrightarrow{1093} z+8417.7$
		$\frac{J2+16}{J2+16}$ $\frac{1046}{z+6375.2}$
		J2+14 996 z+5421.9
		$\frac{J2+12}{I2+10} \xrightarrow{953} x+4515.0$
		$\frac{J2+10}{J2+8}$ 861 $z+2837.4$
	Band(B): SD-2 band	J2+6 816 $z+2066.6$
	(1997Ap02)	$\begin{array}{c c} \underline{J2+4} & \underline{771} & \underline{z+1340.3} \\ \hline 12+2 & \underline{726} & \underline{z+657.0} \end{array}$
	J1+32 y+17058	$\frac{\frac{3212}{J2}}{\frac{683}{657}} \frac{\frac{24037.0}{z}}{z}$
	J1+30 ¹⁴²⁵ y+15632.6	
	J1+28 ¹³⁷⁷ y+14255.6	
	J1+26 ¹³²⁶ y+12929.4	
	J1+24 1278y+11651.0	
	J1+22 1230y+10421.4	
	<u>J1+20</u> 1182 y+9239.1	
	J1+18 1134 y+8105.4	
	$\frac{J1+16}{J1+14} \xrightarrow{1088} y+7017.8$	
	$\frac{J1+12}{J1+12}$ $\frac{1041}{993}$ $y+4983.4$	
	<u>J1+10</u> <u>947</u> <u>y+4036.8</u>	
Band(A), SD-1 hand	$\frac{J1+8}{11+6} \xrightarrow{y+3136.5}{y+2282.4}$	
(1997Ap02)	J1+4 854 y+1474.0	
	<u>J1+2</u> 761 y+713	
J+36 x+18466	J1 713 y	
J+34 ¹³⁹⁰ x+17076		
J+32 ¹³⁴³ x+15733.5		
J+30 ¹²⁹⁵ x+14438.3		
J+28 ¹²⁵¹ x+13187.2		
J+26 1216x+11971.7		
J+24 1180x+10791.4		
$\frac{J+22}{J+20} \xrightarrow{1144} x+9647.0$		
$\frac{J+20}{J+18} \xrightarrow{1103} x+343.9}{x+7484.0}$		
J+16 1000 x+6469.1		
$\frac{J+14}{J+12}$ 970 4577.2		
$\frac{J+12}{J+10}$ 922 $\frac{x+4577.3}{y+3701.7}$		
J+8 876 x+2871.1		
$\frac{J+6}{1+4}$ 784 72087.1		
$\frac{J+4}{J+2} \xrightarrow{740} x+651.3$		
$\frac{696}{J}$		

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