

$^{156}\text{Dy}(\text{d,p}), ^{158}\text{Dy}(\text{d,t}), (^3\text{He},\alpha)$ 1970Gr46,1975Gr37

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Measurement results are from 1970Gr46 for $^{156}\text{Dy}(\text{d,p})$ and $^{158}\text{Dy}(\text{d,t})$ on enriched targets with $E_d=12.1$ MeV, and some additional data from 1975Gr37 for $^{158}\text{Dy}(^3\text{He},\alpha)$ on enriched ($> 99\%$) target with $E(^3\text{He})=25.5$ MeV. In all cases reaction products were measured in magnetic spectrometers. Revised configuration assignments have been given by 1974Ny01 and 1975Gr38.

[Additional information 1.](#)

 ^{157}Dy Levels

Levels are reported in both (d,p) and (d,t) studies (1970Gr46), unless otherwise noted. Levels observed in ($^3\text{He},\alpha$) study (1975Gr37) are noted.

[Additional information 2.](#)

E(level) ^{†‡}	J π #	Comments
0 ^f	3/2 ⁻	J π : Calculated configuration (1974Ny01) 99% 3/2[521].
60 ^f 3	5/2 ⁻	J π : Calculated configuration (1974Ny01) 98% 3/2[521].
147 ^f 3	7/2 ⁻	J π : Calculated configuration (1974Ny01) 96% 3/2[521].
161 ^{ap} 3	9/2 ⁺	J π : Calculated mixing (1975Gr38) for 3/2[651], 5/2[642], and 1/2[660] is 54%, 24% and 19%, respectively.
187 ^{&p} 3	5/2 ⁺	J π : Calculated mixing (1975Gr38) for 3/2[651], 5/2[642], and 1/2[660] is 66%, 20% and 10%, respectively.
198 ^{ag} 3	11/2 ⁻	
209 ^{&p} 3	7/2 ⁺	J π : Calculated mixing (1975Gr38) for 3/2[651] and 5/2[642] is 59% and 34%, respectively.
235 ^p 3	3/2 ⁺	J π : Calculated mixing (1975Gr38) for 3/2[651] and 3/2[402] is 66% and 33%, respectively.
239 ^{bp}	13/2 ⁺	J π : Calculated mixing (1975Gr38) for 3/2[651], 5/2[642], and 1/2[660] is 48%, 22% and 27%, respectively.
256 ^f 3	9/2 ⁻	J π : Calculated configuration (1974Ny01) 94% 3/2[521].
306 ^{ah} 3	3/2 ⁺	J π : Calculated mixing (1975Gr38) for 3/2[402] and 3/2[651] is 66% and 31%, respectively.
340 ⁱ 3	5/2 ⁻	J π : Calculated mixing (1974Ny01) for 5/2[523] and 3/2[532] is 69% and 29%, respectively.
350 ^{&k} 3	(3/2 ⁻)	J π : Calculated configuration (1974Ny01) is 98% 3/2[532]. Original assignment 13/2 ⁺ (1970Gr46) and 1975Gr38 suggest that observed peak may include 5/2 ⁺ , 3/2[402].
388 ^j 3	1/2 ⁺	J π : Calculated configuration (1975Gr38) is 98% 1/2[400].
399 ^{&} 3	(11/2 ⁻)	J π : Calculated configuration (1974Ny01) is 91% 3/2[521]. Originally assigned as 3/2, 3/2[532] (1970Gr46), but in 1974Ny01 this assignment is made to the 350 level.
417 ^{ai} 3	7/2 ⁻	J π : Calculated mixing (1974Ny01) for 5/2[523] and 3/2[532] is 61% and 37%, respectively.
432 ^{&k} 3	(5/2 ⁻)	J π : Calculated mixing (1974Ny01) for 3/2[532] and 5/2[523] is 60% and 30%, respectively. Also, 1975Gr38 suggest that observed peak may include 7/2 ⁺ , 3/2[402].
454 ^{&} 3		J π : 1975Gr38 suggest that observed peak may include 3/2 ⁺ , 1/2[400].
464 ^l 3	1/2 ⁻	J π : Calculated configuration (1974Ny01) is 94% 1/2[521].
506 ^{&h} 3	(5/2 ⁺)	J π : Calculated configuration (1975Gr38) is 80% 3/2[402]. J π : No assignment is given in Adopted Levels.
518 ^{cl} 3	3/2 ⁻	J π : Calculated mixing (1974Ny01) for 1/2[521] and 1/2[530] is 50% and 48%, respectively, for this portion of doublet.
518 ^{aci} 3	9/2 ⁻	E(level): In 1975Gr37 the energy of the 9/2 ⁻ level is given as 538. J π : Calculated mixing (1974Ny01) for 5/2[523] and 3/2[532] is 45% and 41%, respectively, for this portion of doublet.
527 ^{&} 3		J π : Original assignment (1970Gr46) 7/2 ⁻ , 3/2[532], which is now assigned to 554 level. Also, 1975Gr38 suggest that observed peak may include a 9/2 ⁺ contribution with mixture for 5/2[642], 1/2[660], and 7/2[633] of 50%, 29%, and 10%, respectively. J π : Assignment in Adopted Levels is 5/2 ⁻ , 7/2 ⁻ .

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$^{156}\text{Dy}(\text{d,p}), ^{158}\text{Dy}(\text{d,t}), (^3\text{He},\alpha)$ 1970Gr46,1975Gr37 (continued) ^{157}Dy Levels (continued)

E(level) ^{†‡}	J ^π #	Comments
554 ^{ck} 3	7/2 ⁻	J ^π : Calculated mixing (1974Ny01) for 3/2[532] and 5/2[523] is 57% and 38%, respectively. Original assignment was doublet of 5/2 ⁻ ,1/2[521] and 3/2 ⁻ ,1/2[530] (1970Gr46).
565 ^l 3	5/2 ⁻	J ^π : Calculated mixing (1974Ny01) for 1/2[521] and 1/2[530] is 82% and 10%, respectively.
607 [@] 3		
672 ^c 3		J ^π : Original assignment mixture of 7/2 ⁻ ,1/2[521] and 7/2 ⁻ ,1/2[530] (1970Gr46).
685 ^{&a} 3		J ^π : Assignment in Adopted Levels is (7/2) ⁻ .
704 [@] 3		
712 ^{&} 3		
730 ^a 3		J ^π : 1975Gr38 suggest that observed peak may include 13/2 ⁺ contribution with mixture for 5/2[642], 1/2(660), and 7/2[633] of 50%, 29%, and 17%, respectively.
754 3		
769 ^l 3	(7/2 ⁻)	J ^π : Calculated mixing (1974Ny01) for 1/2[521] and 1/2[530] is 68% and 25%, respectively.
785 [@] 3		
826 3		
863 [@] 3		
881 [@] 3		
901 [@] 3		
934 [@] 3		
965 [@] 3		
985 ^{@m} 3	7/2 ⁻	J ^π : Calculated configuration (1974Ny01) is 99% 5/2[512].
1013 [@] 5		
1049 [@] 5		
1072 [@] 5		
1085 [@] 5		
1101 [@] 5		
1123 ^{@m} 5	9/2 ⁻	J ^π : Calculated mixing (1974Ny01) for 5/2[512] and 1/2[541] is 82% and 14%, respectively.
1145 [@] 5		
1172 ^{@a} 5		J ^π : Assigned 7/2,7/2[404] by 1975Gr37.
1233 ^{@d} 5		
1245 ^{@d} 5		
1296 ^{@e} 5		
1328 [@] 5		
1346 [@] 5		
1379 [@] 5		J ^π : Assignment in Adopted Levels is 5/2,7/2 ⁻ .
1420 [@] 5		
1452 [@] 5		
1484 [@] 5		
1505 [@] 5		
1524 [@] 5		
1569 ^{@n} 5	3/2 ⁻	
1602 [@] 5		
1632 ^{@n} 5	5/2 ⁻	
1653 [@] 5		E(level): Several unresolved (d,p) groups above this energy.
1682 [@] 5		
1701 ^{@n} 5	7/2 ⁻	
1723 ^{bo} 8	11/2 ⁻	
1797 [@] 5		

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$^{156}\text{Dy}(\text{d,p}), ^{158}\text{Dy}(\text{d,t}), (^3\text{He},\alpha)$ 1970Gr46,1975Gr37 (continued) ^{157}Dy Levels (continued)E(level)^{†‡}

1836@ 5

1978@ 5

2003@ 5

2157@ 5

[†] Energies are averages of values from the various measurements. Values from ($^3\text{He},\alpha$) study (1975Gr37) are relative to those of the levels at 198 and 239 keV.

[‡] The uncertainties are assigned by the evaluator from general statements of the authors.

Assignments of J^π and bands are based on comparison of measured and theoretical DWBA cross sections and are those of the authors. Below 1200 keV, the assignments are from calculations including Coriolis coupling by 1974Ny01 for negative-parity levels and 1975Gr38 for positive-parity levels, above this energy they are from the experimental papers (1970Gr46 and 1975Gr37). Differences between papers are noted. The calculated mixings (1974Ny01 and 1975Gr38) of the configurations are given in comments. Significant differences from the assignments in the Adopted Levels are noted.

@ Level not reported in (d,t) study (1970Gr46).

& Level not reported in (d,p) study (1970Gr46).

^a Level reported in ($^3\text{He},\alpha$) study (1975Gr37).

^b Level only reported in ($^3\text{He},\alpha$) study (1975Gr37).

^c Level assumed to be doublet (1970Gr46) based on expected energies of rotational-band members and reaction cross sections.

^d Not clearly resolved (1970Gr46).

^e Probable doublet (1970Gr46).

^f Band(A): $K^\pi=3/2^-$ band based on 3/2[521].

^g Band(B): bandhead of 11/2[505].

^h Band(C): $K^\pi=3/2^+$ band based on 3/2[402].

ⁱ Band(D): $K^\pi=5/2^-$ band based on 5/2[523].

^j Band(E): bandhead of 1/2[400].

^k Band(F): $K^\pi=3/2^-$ band based on 3/2[532].

^l Band(G): $K^\pi=1/2^-$ band based on 1/2[521].

^m Band(H): $K^\pi=5/2^-$ band based on 5/2[512].

ⁿ Band(I): $K^\pi=1/2^-$ band based on 1/2[510].

^o Band(J): Possible member of the $K^\pi=9/2^-$ band based on 9/2[514].

^p Band(K): Positive-parity band with mixture of 3/2[651], 5/2[642], and 1/2[660].

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			Band(F): $K^\pi=3/2^-$ band based on 3/2[532]
			<u>7/2⁻ 554</u>
	Band(C): $K^\pi=3/2^+$ band based on 3/2[402]	Band(D): $K^\pi=5/2^-$ band based on 5/2[523]	
	<u>(5/2⁺) 506</u>	<u>9/2⁻ 518</u>	
			<u>(5/2⁻) 432</u>
		<u>7/2⁻ 417</u>	Band(E): Bandhead of 1/2[400]
			<u>1/2⁺ 388</u>
		<u>5/2⁻ 340</u>	<u>(3/2⁻) 350</u>
	<u>3/2⁺ 306</u>		
Band(A): $K^\pi=3/2^-$ band based on 3/2[521]			
<u>9/2⁻ 256</u>			
	Band(B): Bandhead of 11/2[505]		
	<u>11/2⁻ 198</u>		
		<u>7/2⁻ 147</u>	
		<u>5/2⁻ 60</u>	
		<u>3/2⁻ 0</u>	

$^{156}\text{Dy}(\text{d,p}), ^{158}\text{Dy}(\text{d,t}), (^3\text{He},\alpha)$ 1970Gr46,1975Gr37 (continued)

		Band(J): Possible member of the $K^\pi=9/2^-$ band based on 9/2[514]
	Band(I): $K^\pi=1/2^-$ band based on 1/2[510]	<u>11/2^-</u> <u>1723</u>
	<u>7/2^-</u> <u>1701</u>	
	<u>5/2^-</u> <u>1632</u>	
	<u>3/2^-</u> <u>1569</u>	
	Band(H): $K^\pi=5/2^-$ band based on 5/2[512]	
	<u>9/2^-</u> <u>1123</u>	
	<u>7/2^-</u> <u>985</u>	
	Band(G): $K^\pi=1/2^-$ band based on 1/2[521]	
	<u>(7/2^-)</u> <u>769</u>	
	<u>5/2^-</u> <u>565</u>	
	<u>3/2^-</u> <u>518</u>	
	<u>1/2^-</u> <u>464</u>	

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**Band(K): Positive-parity
band with mixture of
3/2[651], 5/2[642], and
1/2[660]**

13/2⁺ 239

3/2⁺ 235

7/2⁺ 209

5/2⁺ 187

9/2⁺ 161

$^{157}_{66}\text{Dy}_{91}$