

¹⁶⁴Dy($\alpha,3n\gamma$) 1970Hj02

Type	Author	History	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh and Jun Chen		NDS 194,460 (2024)	31-Oct-2022

Includes ¹⁶³Dy($\alpha,2n\gamma$) from 1974An04.

1970Hj02: E(α)=38 MeV. Measured E γ , I γ , $\gamma\gamma$ -coin, $\gamma(\theta)$, $\gamma(t)$. Measurements made at the University of Stockholm 225 cm cyclotron.

1974An04: ¹⁶³Dy($\alpha,2n\gamma$),E(α)=27 MeV. Measured E γ , $\gamma\gamma(t)$ at the Rossendorf cyclotron U-120. Decay of ¹⁶⁵Tm was also studied by ce and $\gamma(ce)(t)$ measurements, the latter for level half-lives of in the region of <5 ns.

¹⁶⁵Er Levels

All levels have T_{1/2}<10 ns from $\gamma\gamma(t)$.

E(level) [†]	J ^{π‡}	T _{1/2}	Comments
0.0@	5/2 ⁻		
46.6# 7	5/2 ⁺		
62.6# 5	7/2 ⁺		
77.7@ 4	7/2 ⁻		
97.4# 6	9/2 ⁺		
166.9# 5	11/2 ⁺		
176.1@ 4	9/2 ⁻		
237.6# 5	13/2 ⁺		
242.2& 5	3/2 ⁻		
296.2& 4	5/2 ⁻		
296.2@ 5	11/2 ⁻		
371.8# 6	15/2 ⁺		
463.1# 6	17/2 ⁺		
551.4 ^a 4	11/2 ⁻	250 ns 30	%IT=100 T _{1/2} : from $\gamma(t)$ (1974An04). Other: >100 ns (1970Hj02).
677.7# 7	19/2 ⁺		
707.0 ^a 6	13/2 ⁻		
769.2# 8	21/2 ⁺		
882.9 ^a 6	15/2 ⁻		
1078.5 7	17/2 ⁻		E(level): level proposed in 1974An04.
1079.6# 9	23/2 ⁺		
1152.9# 10	25/2 ⁺		
1621.6 [?] # 11	29/2 ⁺		E(level): this level is not included in the Adopted Levels, Gammas dataset, as 29/2 ⁺ member of this band is identified at 1610.7 level in ¹⁶⁰ Gd(⁹ Be,4n γ),E=42,45 MeV (2011Wa19).

[†] From least-squares fit to E γ data, assuming uncertainty of 0.5 keV for each E γ value.

[‡] As given in 1970Hj02, based on assignments in literature for the low-lying and low-spin levels, and from the present works for high-spin states, based on $\gamma(\theta)$ data and band structures.

Band(A): Band based on 5/2⁺. Mixed configurations: 1/2[660], 3/2[651], 5/2[642], 7/2[633], 9/2[624].

@ Band(B): ν 5/2[523] band.

& Band(C): ν 3/2[521] band.

^a Band(D): ν 11/2[505] band.

¹⁶⁴Dy($\alpha,3n\gamma$) **1970Hj02** (continued)

$\gamma(^{165}\text{Er})$

E_γ	I_γ	$E_i(\text{level})$	J_i^π	E_f	J_f^π	Mult.	Comments
62.9	15.0	62.6	7/2 ⁺	0.0	5/2 ⁻		$A_2=+0.18$ 20
69.4	12.6	166.9	11/2 ⁺	97.4	9/2 ⁺	D+Q	$A_2=-0.25$ 9
71.2	7.9	237.6	13/2 ⁺	166.9	11/2 ⁺	D+Q	$\delta(E2/M1)=+0.02$ to -0.16 or -3.3 to -8 (1970Hj02). $A_2=-0.47$ 22
77.6	3.3	77.7	7/2 ⁻	0.0	5/2 ⁻		$\delta(E2/M1)=-0.16$ to -0.29 or -2.3 to -3.3 (1970Hj02). $A_2=+0.19$ 16
^x 88.8 [†]	1.2						
91.5	12.6	463.1	17/2 ⁺	371.8	15/2 ⁺	D+Q	$A_2=-0.23$ 9 $\delta(E2/M1)=-0.29$ to -2.47 (1970Hj02).
^x 94.2 [†]	‡						
98.5	2.0	176.1	9/2 ⁻	77.7	7/2 ⁻		$T_{1/2}>100$ ns.
104.6	5.9	166.9	11/2 ⁺	62.6	7/2 ⁺		$T_{1/2}>100$ ns.
^x 110.2	1.5						
^x 113.3	4.3						$A_2=-0.39$ 40 $T_{1/2}>100$ ns.
^x 116.1	0.70						$A_2=+0.05$ 30 $T_{1/2}>100$ ns.
120.1 ^{#@}	0.32 [#]	296.2	5/2 ⁻	176.1	9/2 ⁻		
120.1 [#]	0.32 [#]	296.2	11/2 ⁻	176.1	9/2 ⁻		
^x 124.6	0.40						$A_2=-0.6$ 6
134.3	22.0	371.8	15/2 ⁺	237.6	13/2 ⁺	D+Q	$A_2=-0.76$ 11
140.3	17.4	237.6	13/2 ⁺	97.4	9/2 ⁺	(Q)	$A_2=+0.27$ 7
^x 149.4	0.42						
^x 153.3	0.78						$A_2=-0.58$ 29 A_2 for 153.3 γ +155.6 γ .
155.6	11.3	707.0	13/2 ⁻	551.4	11/2 ⁻	D	$A_2=-0.58$ 29 E_γ : 155.6+153.3 form a doublet with 12% component having $T_{1/2}>100$ ns, and 88% component <10 ns. The 153.3 γ is unassigned. A_2 for 153.3 γ +155.6 γ .
^x 159.9	1.5						$A_2=+0.16$ 23
^x 166.9	1.1						$A_2=-0.01$ 13 A_2 for 166.9 γ +168.6 γ .
^x 168.6	5.9						$A_2=-0.01$ 13 A_2 for 166.9 γ +168.6 γ .
175.8 [#]	19.3 [#]	176.1	9/2 ⁻	0.0	5/2 ⁻		$A_2=-0.03$ 11
175.8 [#]	19.3 [#]	882.9	15/2 ⁻	707.0	13/2 ⁻		$A_2=-0.03$ 11
^x 188.7	1.8						
^x 191.7	0.48						
195.6 ^{#@}	4.3 [#]	242.2	3/2 ⁻	46.6	5/2 ⁺		
195.6 [#]	4.3 [#]	1078.5	17/2 ⁻	882.9	15/2 ⁻		Placement from 1974An04. In 1970Hj02, this γ is tentatively placed from 242 level.
205.1	47.1	371.8	15/2 ⁺	166.9	11/2 ⁺		$A_2=+0.32$ 5
^x 213.3	2.5						$A_2=-0.7$ 8
214.3	12.1	677.7	19/2 ⁺	463.1	17/2 ⁺	D+Q	$A_2=-1.1$ 9
218.5 [#]	13.3 [#]	296.2	5/2 ⁻	77.7	7/2 ⁻		$A_2=+0.26$ 7
218.5 ^{#@}	13.3 [#]	296.2	11/2 ⁻	77.7	7/2 ⁻	(Q)	$A_2=+0.26$ 7
^x 222.1	4.4						
225.2	49.4	463.1	17/2 ⁺	237.6	13/2 ⁺	(Q)	$A_2=+0.36$ 5
^x 237.8	0.61						
242.2	2.9	242.2	3/2 ⁻	0.0	5/2 ⁻		
^x 243.7	5.7						

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<u>¹⁶⁴Dy($\alpha,3n\gamma$) 1970Hj02 (continued)</u>							
<u>$\gamma(^{165}\text{Er})$ (continued)</u>							
<u>E_{γ}</u>	<u>I_{γ}</u>	<u>E_i(level)</u>	<u>J_i^{π}</u>	<u>E_f</u>	<u>J_f^{π}</u>	<u>Mult.</u>	<u>Comments</u>
^x 249.8	1.0						
^x 259.0	14.6						A ₂ =+0.71 14
^x 264.1	3.5						
^x 267.7	5.8						
^x 276.9	6.2						
296.3	7.7	296.2	5/2 ⁻	0.0	5/2 ⁻		
^x 299.9	17.1						A ₂ =+0.58 12
^x 304.1	9.9						
306.1 [#]	100 [#]	677.7	19/2 ⁺	371.8	15/2 ⁺	(Q)	A ₂ =+0.38 3 A ₂ for 306.1 γ +309.0 γ .
306.1 [#]	100 [#]	769.2	21/2 ⁺	463.1	17/2 ⁺	(Q)	A ₂ =+0.38 3 A ₂ for 306.1 γ +309.0 γ .
^x 309.0	12.9						A ₂ =+0.38 3 A ₂ for 309 γ +306 γ .
314.8	19.1	551.4	11/2 ⁻	237.6	13/2 ⁺		A ₂ =+0.32 8 E _{γ} : 314.8+311.8 form a doublet with 25% component having T _{1/2} >70 ns, and 75% component <10 ns. The 311.8 γ belongs to ¹⁶⁴ Er. A ₂ for 314.8 γ +311.8 γ .
^x 316.7	4.2						
331.5	2.4	882.9	15/2 ⁻	551.4	11/2 ⁻		
^x 333.7	2.4						
^x 339.8	1.9						
^x 344.2	3.0						T _{1/2} >100 ns.
^x 347.2 [†]	0.79						
^x 354.7	2.2						
^x 357.3	6.8						
^x 359.2	6.0						
^x 361.3	3.3						
371.6	3.2	1078.5	17/2 ⁻	707.0	13/2 ⁻		Placement from 1974An04; unplaced in 1970Hj02.
375.0 [@]	20.4	551.4	11/2 ⁻	176.1	9/2 ⁻		A ₂ =+0.22 8 E _{γ} : doublet: 60% component with T _{1/2} <10 ns, 40% component with T _{1/2} ≈120 ns. Only one component is assigned here.
383.7 [#]	58.4 [#]	551.4	11/2 ⁻	166.9	11/2 ⁺		A ₂ =+0.25 6 E _{γ} : doublet: 60% component with T _{1/2} <10 ns, 40% component with T _{1/2} ≈150 ns.
383.7 [#]	58.4 [#]	1152.9	25/2 ⁺	769.2	21/2 ⁺	(Q)	A ₂ =+0.25 6
^x 393.9	1.4						
^x 399.2	3.9						
401.9	28.4	1079.6	23/2 ⁺	677.7	19/2 ⁺	(Q)	A ₂ =+0.44 8 A ₂ =+0.17 18 E _{γ} : possible doublet.
^x 410.1	15.9						
^x 417.5	1.4						
^x 428.5	1.9						
^x 442.5	12.5						T _{1/2} >100 ns.
^x 446.6	2.7						
^x 456.8	19.9						
^x 464.6	3.5						
468.7 [@]	8.2	1621.6?	29/2 ⁺	1152.9	25/2 ⁺		
473.7	4.6	551.4	11/2 ⁻	77.7	7/2 ⁻		
^x 479.2	2.2						
^x 490.7	16.2						T _{1/2} >100 ns.
^x 497.0	8.9						
^x 501.4	7.9						

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$^{164}\text{Dy}(\alpha,3n\gamma)$ 1970Hj02 (continued) $\gamma(^{165}\text{Er})$ (continued)

<u>E_γ</u>	<u>I_γ</u>	<u>$E_i(\text{level})$</u>	<u>E_γ</u>	<u>I_γ</u>	<u>$E_i(\text{level})$</u>	<u>E_γ</u>	<u>I_γ</u>	<u>$E_i(\text{level})$</u>	<u>E_γ</u>	<u>I_γ</u>	<u>$E_i(\text{level})$</u>
^x 507.7	5.0		^x 523.6	6.9		^x 543.1	3.5		^x 564.0	5.3	
^x 517.7 [†]	[‡]		^x 530.1	2.2		^x 548.1	3.7		^x 569.5	8.9	
^x 520.4	3.9		^x 537.6	4.8		^x 552.3	6.8		^x 582.9	3.9	

[†] Uncertain assignment.

[‡] Weak γ ray.

Multiply placed with undivided intensity.

@ Placement of transition in the level scheme is uncertain.

^x γ ray not placed in level scheme.

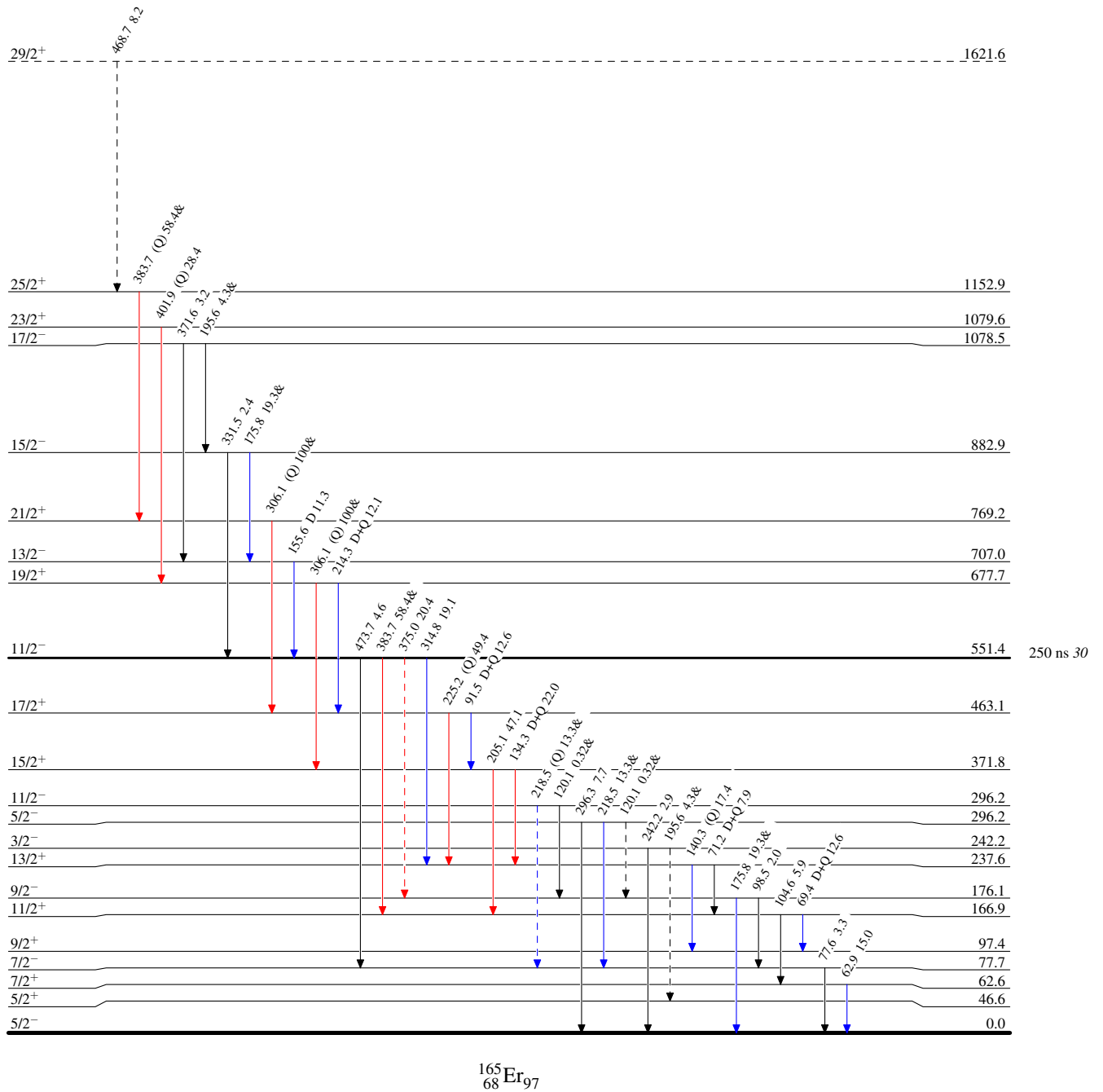
¹⁶⁴Dy($\alpha, 3n\gamma$) 1970Hj02

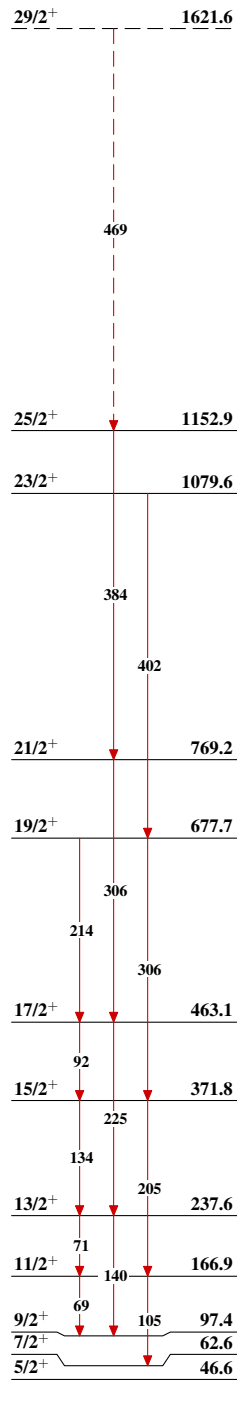
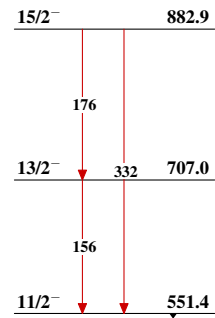
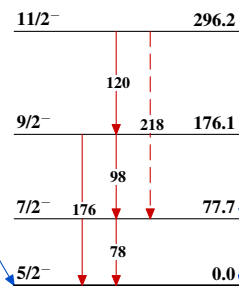
Level Scheme

Intensities: Relative I _{γ}
& Multiply placed: undivided intensity given

Legend

- I _{γ} < 2% × I _{γ} ^{max}
- I _{γ} < 10% × I _{γ} ^{max}
- I _{γ} > 10% × I _{γ} ^{max}
- - - - - γ Decay (Uncertain)



$^{164}\text{Dy}(\alpha, 3n\gamma)$ 1970Hj02Band(A): Band based on $5/2^+$ Band(D): $\nu 11/2[505]$ bandBand(B): $\nu 5/2[523]$ bandBand(C): $\nu 3/2[521]$ band