^{155}Gd(^{3}He,4nγ) 2018Zi02

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 200,2 (2025)	22-Aug-2022

2016Zi04 compiled for XUNDL database by H. Zaneb (Government College University, Lahore) and M.S. Basunia (LBNL).
2018Zi02 compiled for XUNDL database by J. Chen (NSCL, MSU).
2019Ma70 compiled for XUNDL database by E.A. McCutchan (NNDC, BNL).
2016Zi04, 2018Zi02, 2019Ma70: E=37.5 MeV ^{3}He beam from the iThemba Laboratory on 3.2 mg/cm^2-thick 99% ^{155}Gd target. Measured Eγ, Iγ, $\gamma\gamma$, $\gamma\gamma(\theta)$ and $\gamma\gamma$(lin pol) with AFRODITE multidetector array consisting of 9 HPGe clover detectors with BGO shields with only 2018Zi02 listing values for $\gamma\gamma(\theta)$ and $\gamma\gamma$(lin pol). 2016Zi04 found three band sequences and 2018Zi02 added another three bands. 2019Ma70 rediscussed four out of the six bands and list $B(E2)_{out}/B(E2)_{in}$ values for seven transitions.

^{154}Dy Levels

E(level)[†]	J$^\pi$[‡]	Comments
0.0[&]	0$^+$	
334.59[&] *18*	2$^+$	
659.87[b] *19*	0$^+$	
747.02[&] *18*	4$^+$	
905.31[b] *14*	2$^+$	$B(E2)_{out}/B(E2)_{in}$=0.008 *3* (2019Ma70).
1027.39[@] *21*	2$^+$	
1207.8[d] *8*	3$^-$	
1224.22[&] *19*	6$^+$	
1252.03[b] *18*	4$^+$	
1334.56[#] *19*	3$^+$	
1442.65[@] *19*	4$^+$	$B(E2)_{out}/B(E2)_{in}$=0.007 *1* (2019Ma70).
1507.5[c] *5*	2$^+$	
1546.0[d] *6*	5$^-$	
1659.25[b] *20*	6$^+$	
1740.16[#] *20*	5$^+$	$B(E2)_{out}/B(E2)_{in}$=0.025 *2* (2019Ma70).
1748.04[&] *20*	8$^+$	
1782.0 *8*	3$^+$	
1818.6[c] *6*	4$^+$	
1885.82[@] *20*	6$^+$	$B(E2)_{out}/B(E2)_{in}$=0.003 *1* (2019Ma70).
1965.2[d] *6*	7$^-$	
2163.91[b] *21*	8$^+$	
2183.57[#] *20*	7$^+$	$B(E2)_{out}/B(E2)_{in}$=0.016 *1* (2019Ma70).
2192.8[c] *6*	6$^+$	
2305.33[&] *21*	10$^+$	
2371.14[@] *21*	8$^+$	$B(E2)_{out}/B(E2)_{in}$=0.001 *1* (2019Ma70).
2422.3[d] *6*	9$^-$	
2472.1 *6*	7$^+$	
2568.2[c] *7*	8$^+$	
2678.51[#] *22*	9$^+$	$B(E2)_{out}/B(E2)_{in}$=0.013 *1* (2019Ma70).
2759.38[b] *23*	10$^+$	
2884.2[d] *6*	11$^-$	
2894.42[&] *24*	12$^+$	
2912.80[@] *25*	10$^+$	
3034.2[c] *12*	10$^+$	

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^{155}Gd(^{3}He,4nγ) 2018Zi02 (continued)

^{154}Dy Levels (continued)

E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡	E(level)†	Jπ‡
3223.54[#] *23*	11^+	3596.2[c] *16*	12^+	4175.2[&] *3*	16^+	5344.8[d] *17*	19^-
3290.65[b] *23*	12^+	3681.6[a] *7*	14^+	4638.7[a] *13*	18^+	5567.0[&] *4*	20^+
3393.8[d] *7*	13^-	3810.2[#] *11*	13^+	4647.8[d] *13*	17^-	5935.7[a] *20*	22^+
3510.7[&] *3*	14^+	3987.8[d] *9*	15^-	4871.2[&] *3*	18^+	6041.8[d] *20*	21^-
3515.0[@] *4*	12^+	4092.7[a] *8*	16^+	5250.7[a] *17*	20^+		

† From least-squares fit to γ-ray energies assuming 1.0 keV uncertainty for γ-ray energies reported with no uncertainty.
‡ As given in 2018Zi02 based on adopted multipolarities and previous studies, except as postulated in 2016Zi04 based on assumed $K^\pi=3^-$ octupole band structure.
[#] Band(a): 3^+_γ band.
[@] Band(A): 2^+_γ band.
[&] Band(B): Ground-state band.
[a] Band(C): S band.
[b] Band(D): Band based on 0^+_2.
[c] Band(E): $2^+_{2\gamma}$ band.
[d] Band(F): $K^\pi=3^-$ octupole band.

γ(^{154}Dy)

Unplaced γ's are from 2016Zi04.
Expected DCO ratios ≈1.1 for quadrupole transition and ≈0.6 for dipole with gate on a stretched quadrupole transition; DCO≈1 for dipole and ≈1.5 for quadrupole with gate on stretched dipole (2018Zi02). All quoted DCO values are for gates on stretched quadrupole transitions, unless otherwise noted. All values are from 2018Zi02.
Polarization anisotropy P is positive for stretched electric transitions and negative for stretched magnetic transitions when there is little or no mixing. All values are from 2018Zi02.

E_γ†	E_i(level)	J^π_i	E_f	J^π_f	Mult.[@]
[x]76					
[x]90					
[x]108					
[x]118					
125‡	2884.2	11^-	2759.38	10^+	[E1]
[x]134					
[x]147					
[x]156					
[x]167					
[x]184					
[x]197					
[x]217					
[x]226					
[x]244					
245.46 *13*	905.31	2^+	659.87	0^+	
259‡	2422.3	9^-	2163.91	8^+	[E1]
[x]267					
294‡	1546.0	5^-	1252.03	4^+	[E1]
306‡	1965.2	7^-	1659.25	6^+	
308[#]	1334.56	3^+	1027.39	2^+	(M1)

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^{155}Gd(^{3}He,4nγ) 2018Zi02 (continued)

$\gamma(^{154}Dy)$ (continued)

E_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [@]	Comments
311[#]	1818.6	4^+	1507.5	2^+	(E2)	
326 *12*	659.87	0^+	334.59	2^+		
335	334.59	2^+	0.0	0^+		
338[‡]	1546.0	5^-	1207.8	3^-		
346.71 *13*	1252.03	4^+	905.31	2^+		
367.1 *13*	1027.39	2^+	659.87	0^+		
374	2192.8	6^+	1818.6	4^+	E2	POL=+0.42 *3*
375[#]	2568.2	8^+	2192.8	6^+	E2	DCO=1.15 *7* POL=+0.33 *2* DCO for gate on 968γ, ΔJ=0.
391[#]	3681.6	14^+	3290.65	12^+		
396[#]	3290.65	12^+	2894.42	12^+	(M1+E2)	
405[#]	2568.2	8^+	2163.91	8^+	(M1+E2)	DCO=0.67 *4*
405.68 *14*	1740.16	5^+	1334.56	3^+		
407.07[#] *13*	1659.25	6^+	1252.03	4^+		
411[#]	4092.7	16^+	3681.6	14^+		
412.5 *1*	747.02	4^+	334.59	2^+		
415.26 *16*	1442.65	4^+	1027.39	2^+		
416.30 *14*	2163.91	8^+	1748.04	8^+		
419[‡]	1965.2	7^-	1546.0	5^-		
435.13[#] *14*	1659.25	6^+	1224.22	6^+		
443.35 *13*	1885.82	6^+	1442.65	4^+	(E2)	
443.47 *13*	2183.57	7^+	1740.16	5^+		
457[‡]	2422.3	9^-	1965.2	7^-		
462[‡]	2884.2	11^-	2422.3	9^-		
466[#]	3034.2	10^+	2568.2	8^+	E2	DCO=1.25 *1* POL=+0.12 *1*
477.2 *1*	1224.22	6^+	747.02	4^+		
479[‡]	3987.8	15^-	3510.7	14^+		
485.43 *13*	2371.14	8^+	1885.82	6^+	E2	DCO=1.22 *1* POL=+0.51 *2*
495.01 *13*	2678.51	9^+	2183.57	7^+	E2	DCO=0.92 *11* POL=+0.79 *4* DCO for gate on 959γ, ΔJ=1.
498[‡]	3393.8	13^-	2894.42	12^+		
504.59 *13*	2163.91	8^+	1659.25	6^+		
504.86 *13*	1252.03	4^+	747.02	4^+		
509[‡]	3393.8	13^-	2884.2	11^-		
523.7 *1*	1748.04	8^+	1224.22	6^+		
531.54 *14*	3290.65	12^+	2759.38	10^+		
541.66 *14*	2912.80	10^+	2371.14	8^+	E2	DCO=1.14 *9* POL=+0.73 *4*
545.11 *14*	3223.54	11^+	2678.51	9^+	E2	DCO=1.15 *17* POL=+0.54 *2*
546[#]	4638.7	18^+	4092.7	16^+		
557.1 *1*	2305.33	10^+	1748.04	8^+		
562[#]	3596.2	12^+	3034.2	10^+	E2	DCO=1.06 *2* POL=+0.38 *2*
566[#]	1818.6	4^+	1252.03	4^+	(M1+E2)	DCO=0.74 *1* DCO for gate on 505γ, ΔJ=0.

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^{155}Gd(^{3}He,4nγ) 2018Zi02 (continued)

$\gamma(^{154}Dy)$ (continued)

E_γ [†]	E_i(level)	J_i^π	E_f	J_f^π	Mult. [@]	Comments
570.71 *13*	905.31	2^+	334.59	2^+		
578[‡]	2884.2	11^-	2305.33	10^+		
582[#]	4092.7	16^+	3510.7	14^+		
586.63	3810.2	13^+	3223.54	11^+	E2	DCO=1.14 *13* POL=+0.69 *5*
587.75 *14*	1334.56	3^+	747.02	4^+		
589.1 *1*	2894.42	12^+	2305.33	10^+		
592[‡]	3987.8	15^-	3393.8	13^-		
595.73 *13*	2759.38	10^+	2163.91	8^+		
602[#]	1507.5	2^+	905.31	2^+		
602.22 *25*	3515.0	12^+	2912.80	10^+	E2	DCO=1.04 *27* POL=+0.60 *34*
607[#]	2912.80	10^+	2305.33	10^+		
612[#]	5250.7	20^+	4638.7	18^+		
616.33 *12*	3510.7	14^+	2894.42	12^+		
622.81 *16*	2371.14	8^+	1748.04	8^+		
660[‡]	4647.8	17^-	3987.8	15^-		
661.60 *14*	1885.82	6^+	1224.22	6^+		
664.49 *12*	4175.2	16^+	3510.7	14^+		
674[‡]	2422.3	9^-	1748.04	8^+		
685[#]	5935.7	22^+	5250.7	20^+		
692.82 *15*	1027.39	2^+	334.59	2^+		
695.81 *14*	5567.0	20^+	4871.2	18^+		
695.82 *13*	1442.65	4^+	747.02	4^+		
696.00 *11*	4871.2	18^+	4175.2	16^+		
697[‡]	5344.8	19^-	4647.8	17^-		
697[‡]	6041.8	21^-	5344.8	19^-		
724[#]	2472.1	7^+	1748.04	8^+		
732[#]	2472.1	7^+	1740.16	5^+		
741[‡]	1965.2	7^-	1224.22	6^+		
755[#]	1782.0	3^+	1027.39	2^+		
787[#]	3681.6	14^+	2894.42	12^+		
799[‡]	1546.0	5^-	747.02	4^+		
820[#]	2568.2	8^+	1748.04	8^+		
847[#]	1507.5	2^+	659.87	0^+		
873[‡]	1207.8	3^-	334.59	2^+		
905.29 *14*	905.31	2^+	0.0	0^+		
918.12 *15*	3223.54	11^+	2305.33	10^+		
930.47 *18*	2678.51	9^+	1748.04	8^+		
939[#]	2163.91	8^+	1224.22	6^+	(E2)	
941	2192.8	6^+	1252.03	4^+	E2	POL=+0.208 *9*
959.36 *14*	2183.57	7^+	1224.22	6^+		
968	2192.8	6^+	1224.22	6^+		
985.01 *15*	3290.65	12^+	2305.33	10^+	E2	DCO=1.05 *17*
993.14 *13*	1740.16	5^+	747.02	4^+		
999.82 *14*	1334.56	3^+	334.59	2^+		
1010[#]	2759.38	10^+	1748.04	8^+	E2	DCO=1.18 *6* POL=+0.65 *7*
1072[#]	1818.6	4^+	747.02	4^+		

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^{155}Gd(^{3}He,4nγ) 2018Zi02 (continued)

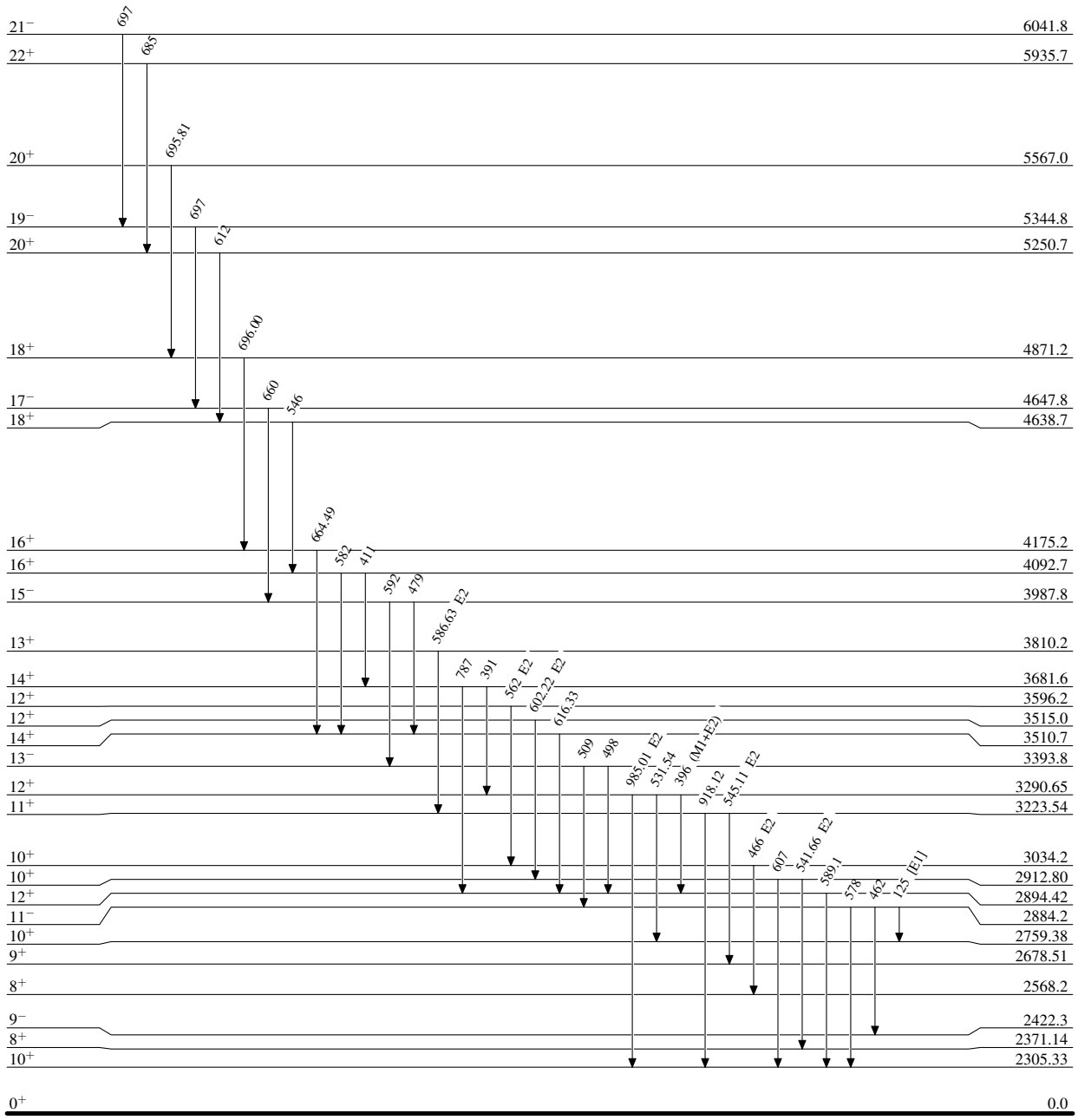
$\gamma(^{154}Dy)$ (continued)

E_γ †	E_i(level)	J_i^π	E_f	J_f^π	E_γ †	E_i(level)	J_i^π	E_f	J_f^π
1108.05 *15*	1442.65	4^+	334.59	2^+	1248#	2472.1	7^+	1224.22	6^+
1138.69 *16*	1885.82	6^+	747.02	4^+	1447#	1782.0	3^+	334.59	2^+
1147.12 *19*	2371.14	8^+	1224.22	6^+	1508#	1507.5	2^+	0.0	0^+
1173#	1507.5	2^+	334.59	2^+					

† From 2019Ma70 unless not otherwise specified.
‡ From 2016Zi04.
# From 2018Zi02.
@ From 2018Zi02 based on measured $\gamma\gamma$(DCO) and γ(lin pol). Values listed by 2019Ma70 with no proof are not adopted (it is unclear if the values are deduced based on measurements or from $\Delta J\Delta\pi$ considerations).
x γ ray not placed in level scheme.

^{155}Gd(^{3}He,4nγ) 2018Zi02

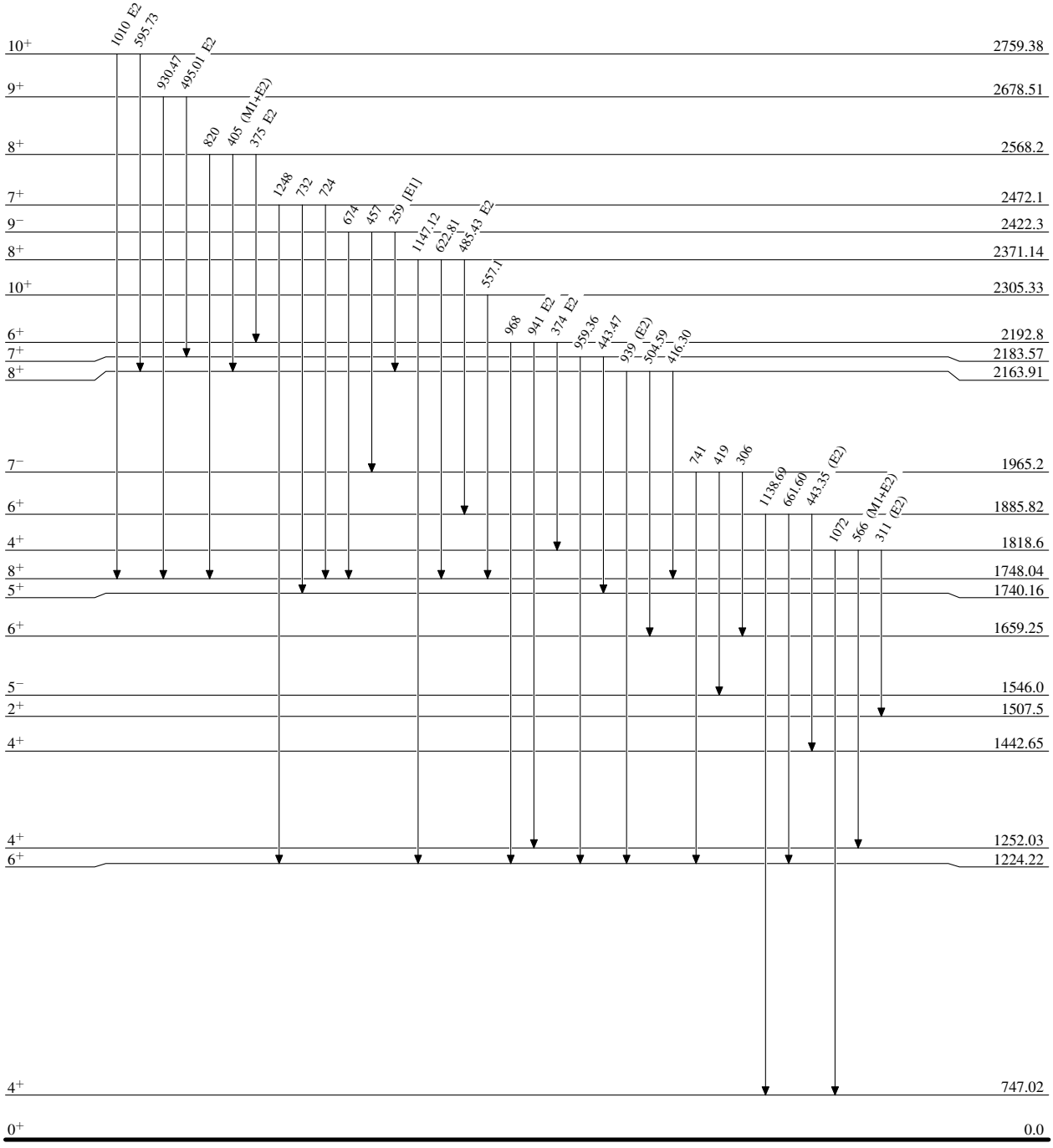
Level Scheme



$^{154}_{66}Dy_{88}$

^{155}Gd(^{3}He,4nγ) 2018Zi02

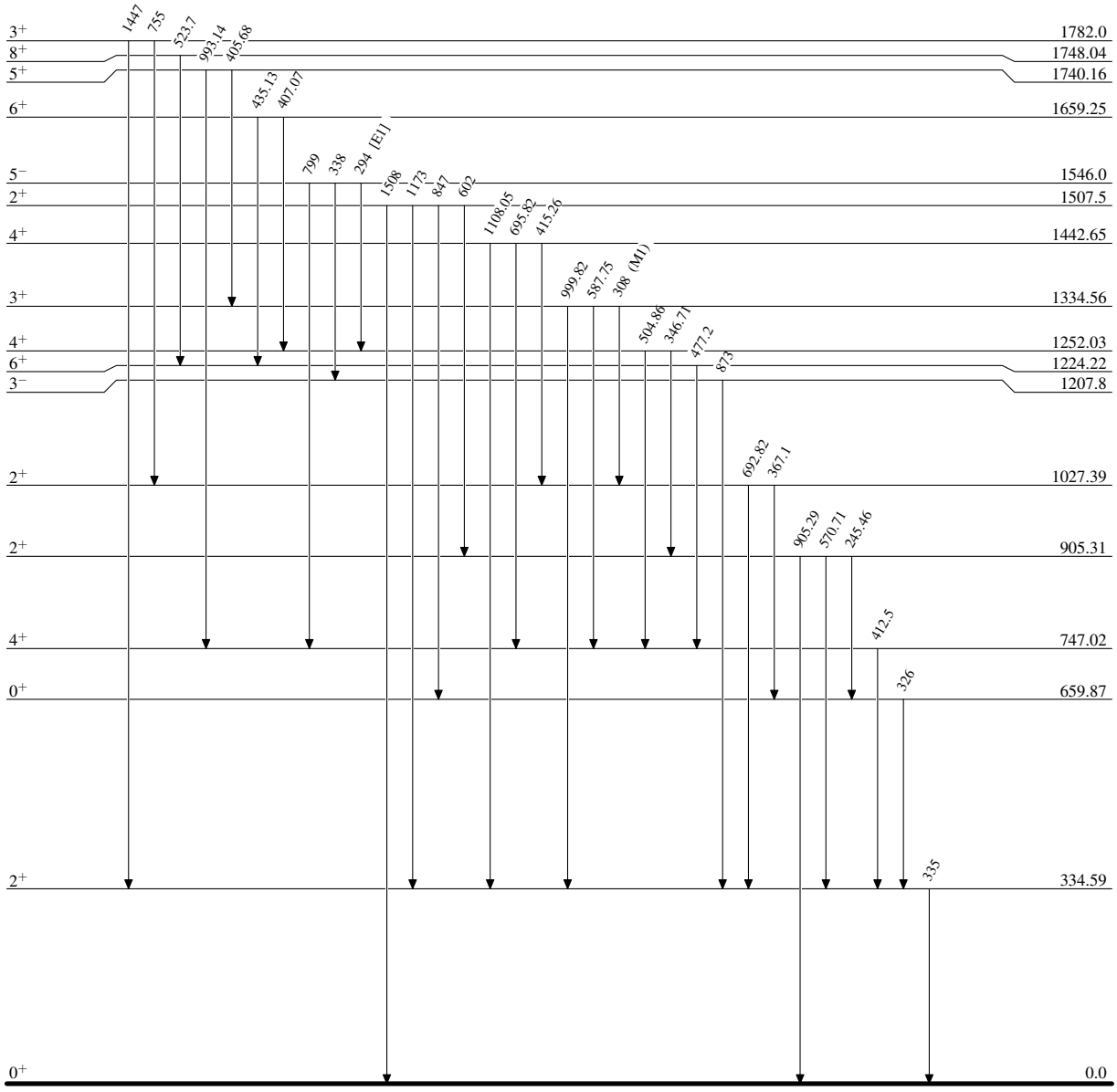
Level Scheme (continued)



$^{154}_{66}Dy_{88}$

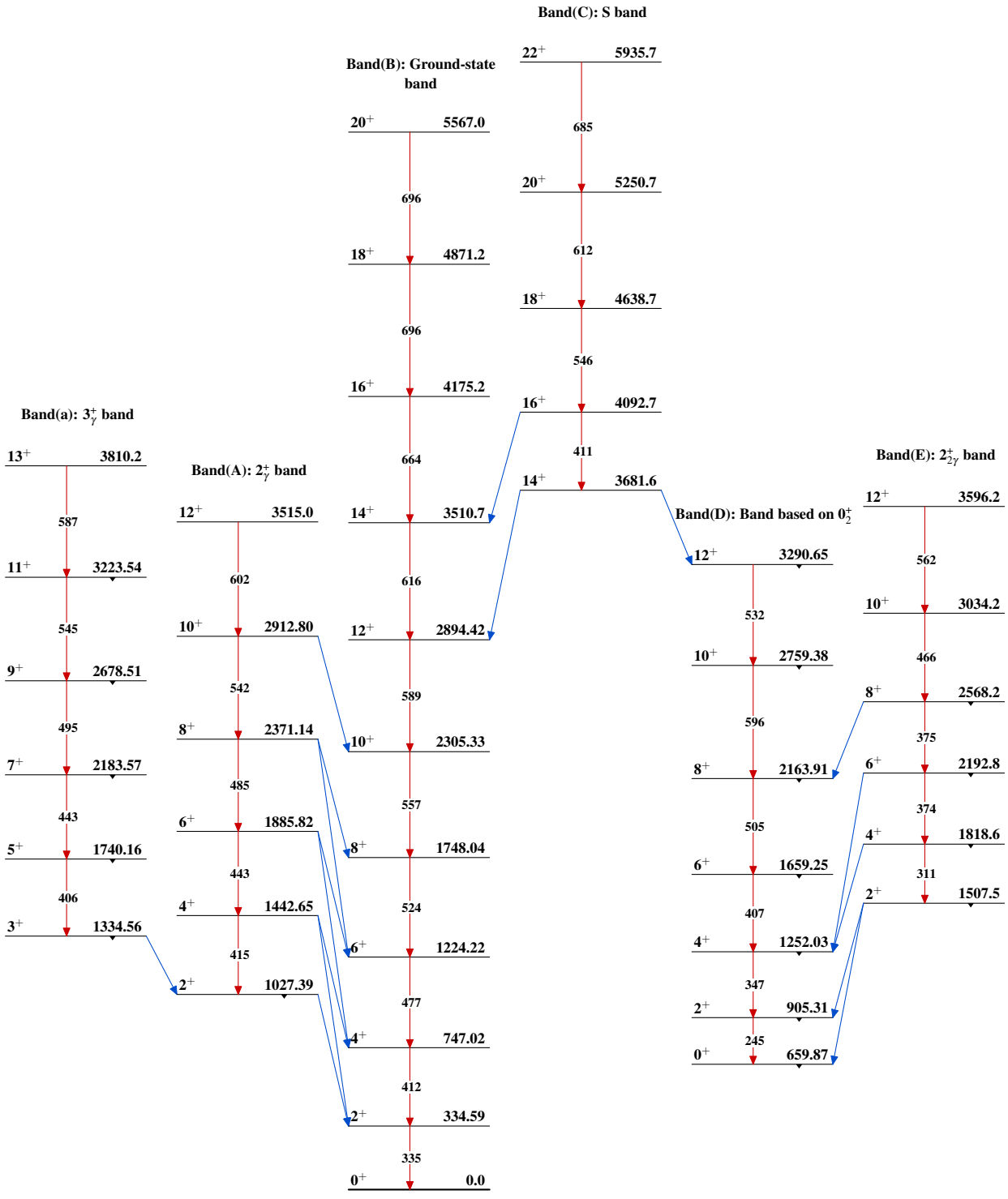
^{155}Gd(^{3}He,4nγ) 2018Zi02

Level Scheme (continued)



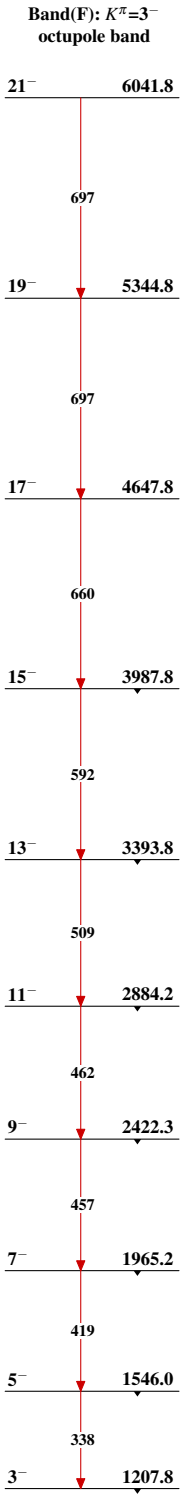
$^{154}_{66}Dy_{88}$

^{155}Gd(^{3}He,4nγ) 2018Zi02



$^{154}_{66}Dy_{88}$

^{155}Gd(^{3}He,4nγ) 2018Zi02 (continued)



$^{154}_{66}Dy_{88}$