

¹⁵⁰Nd(¹²C, α 3n γ),¹⁵⁰Nd(⁹Be,4n γ) **1999Ha48,1993Ri05**

Type	Author	History Citation	Literature Cutoff Date
Full Evaluation	N. Nica	NDS 160, 1 (2019)	21-Oct-2019

Data set derived from the XUNDL data set compiled by J. Chenkin and B. Singh (McMaster) May 9, 2000.

1999Ha48: ¹⁵⁰Nd(¹²C, α 3n γ), E=65 MeV. Self-supporting metallic target, thickness=2 mg/cm², 96.1% enrichment. γ radiation studied using an array of 11 HPGe detectors (FWHM=2.0-2.3 keV at 1.3 MeV) with BGO Compton suppressors in coincidence with a Si-ball particle filter containing 20 detector segments. Measured E γ , $\gamma\gamma$, I γ and $\gamma\gamma(\theta)$.

1993Ri05: ¹⁵⁰Nd(⁹Be,4n γ), E(⁹Be)=55 MeV. Measured reaction γ rays using the TESSA2 detector array. The positive-parity yrast band was observed up to a tentative 53/2⁺ level.

Related laboratory reports by many of the authors of **1998Ha48** are **1998HaZN** and **1999HaZT**. **2000HaZP** briefly discuss identical bands in ¹⁵³Sm and ¹⁵⁵Gd.

¹⁵⁵Gd Levels

E(level) [†]	J π [‡]	Comments
0.0	3/2 ⁻	
60.01 [#]	5/2 ⁻	Additional information 1.
86.55 ^{&}	5/2 ⁺	
105.31 ^{#@}	3/2 ⁺	Additional information 2.
107.58 ^{#&}	9/2 ⁺	Additional information 3.
118.00 ^{#@}	7/2 ⁺	Additional information 4.
121.04 ^{#a}	11/2 ⁻	Additional information 5.
214.01 ^{& 17}	13/2 ⁺	
229.73 ^{@ 13}	11/2 ⁺	
282.55 ^{b 16}	13/2 ⁻	
423.45 ^{& 23}	17/2 ⁺	
453.30 ^{@ 18}	15/2 ⁺	
463.85 ^{a 16}	15/2 ⁻	
663.56 ^{b 19}	17/2 ⁻	
736.4 ^{& 3}	21/2 ⁺	
786.36 ^{@ 23}	19/2 ⁺	
880.64 ^{a 21}	19/2 ⁻	
1113.10 ^{b 23}	21/2 ⁻	
1144.0 ^{& 3}	25/2 ⁺	
1219.9 ^{@ 3}	23/2 ⁺	
1359.84 ^{a 25}	23/2 ⁻	
1460.7 ^{c 3}	(19/2 ⁻)	
1619.2 ^{b 3}	25/2 ⁻	
1635.1 ^{& 4}	29/2 ⁺	
1679.3 ^{d 3}	(21/2 ⁻)	
1742.9 ^{@ 3}	27/2 ⁺	
1889.8 ^{a 3}	27/2 ⁻	
1913.2 ^{c 3}	(23/2 ⁻)	
2161.1 ^{d 4}	(25/2 ⁻)	
2170.3 ^{b 3}	29/2 ⁻	
2198.8 ^{& 5}	33/2 ⁺	
2344.9 ^{@ 4}	31/2 ⁺	
2421.7 ^{c 4}	(27/2 ⁻)	
2460.0 ^{a 3}	31/2 ⁻	

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¹⁵⁰Nd(¹²C, α 3n γ), ¹⁵⁰Nd(⁹Be,4n γ) **1999Ha48,1993Ri05 (continued)**

¹⁵⁵Gd Levels (continued)

E(level) [†]	J ^π [‡]	E(level) [†]	J ^π [‡]	E(level) [†]	J ^π [‡]	E(level) [†]	J ^π [‡]
2694.6 ^d 4	(29/2 ⁻)	3276.1 ^d 5	(33/2 ⁻)	4038.6 ^b 5	41/2 ⁻	5343.0 [@] 6	47/2 ⁺
2758.0 ^b 4	33/2 ⁻	3379.5 ^b 4	37/2 ⁻	4234.3 ^{&} 6	45/2 ⁺	5829? ^{&}	(53/2 ⁺)
2825.1 ^{&} 5	37/2 ⁺	3505.4 ^{&} 5	41/2 ⁺	4379.5 ^a 9	43/2 ⁻	6240.6 [@] 6	(51/2 ⁺)
2978.5 ^c 4	(31/2 ⁻)	3579.2 ^c 5	(35/2 ⁻)	4503.6 [@] 5	43/2 ⁺		
3014.9 [@] 5	35/2 ⁺	3702.7 ^a 4	39/2 ⁻	4735.1 ^b 9	45/2 ⁻		
3064.3 ^a 4	35/2 ⁻	3730.1 [@] 5	39/2 ⁺	5009.1 ^{&} 6	49/2 ⁺		

[†] From a least-squares fit to the listed E_γ values.

[‡] From Adopted Values.

Nominal value from the Adopted Levels.

@ Band(A): Mixed positive-parity band, signature=-1/2.

& Band(a): Mixed positive-parity band, signature=+1/2.

^a Band(B): ν 11/2[505] band, signature=-1/2.

^b Band(b): ν 11/2[505] band, signature=+1/2.

^c Band(C): Probable negative-parity band, signature=-1/2 portion. The bandhead most likely lies below the (19/2⁻) level (1999Ha48).

^d Band(c): Probable negative-parity band, signature=+1/2 portion.

$\gamma(^{155}\text{Gd})$

Asymmetry Ratio R=(I_{γγ}(γ_1) at 32°, γ_1 for all angles)/(I_{γγ}(γ_1) at 90°, γ_2 for all angles). 1999Ha48 state that R>1 indicates mult=Q and R<1 indicates mult=D.

E _γ [†]	I _γ	E _i (level)	J _i ^π	E _f	J _f ^π	Mult. [#]	Comments
13.47 [‡]		121.04	11/2 ⁻	107.58	9/2 ⁺		
21.04 [‡]		107.58	9/2 ⁺	86.55	5/2 ⁺		
57.98 [‡]		118.00	7/2 ⁺	60.01	5/2 ⁻		
60.01 [‡]		60.01	5/2 ⁻	0.0	3/2 ⁻		
86.3 2	10×10 ² 2	86.55	5/2 ⁺	0.0	3/2 ⁻	D	R=0.69 5.
105.31 [‡]		105.31	3/2 ⁺	0.0	3/2 ⁻		
106.4 2	481 74	214.01	13/2 ⁺	107.58	9/2 ⁺	Q	R=1.18 10.
111.8 2	49 9	229.73	11/2 ⁺	118.00	7/2 ⁺		R=1.09 35.
122.1 2	66 11	229.73	11/2 ⁺	107.58	9/2 ⁺		R=1.03 24.
161.4 2	347 54	282.55	13/2 ⁻	121.04	11/2 ⁻	D	R=0.55 6.
181.1 2	313 50	463.85	15/2 ⁻	282.55	13/2 ⁻	D	R=0.51 7.
199.6 2	236 36	663.56	17/2 ⁻	463.85	15/2 ⁻	D	R=0.60 4.
209.4 2	915 92	423.45	17/2 ⁺	214.01	13/2 ⁺	Q	R=1.37 9.
217.1 2	210 21	880.64	19/2 ⁻	663.56	17/2 ⁻	D	R=0.83 6.
218.4 2	50 6	1679.3	(21/2 ⁻)	1460.7	(19/2 ⁻)		R=0.9 11.
223.6 2	207 22	453.30	15/2 ⁺	229.73	11/2 ⁺	Q	R=1.24 15.
232.4 2	130 13	1113.10	21/2 ⁻	880.64	19/2 ⁻	D	R=0.69 7.
233.6 2	30 6	1913.2	(23/2 ⁻)	1679.3	(21/2 ⁻)	D	R=0.62 36.
239.3 2	88 10	453.30	15/2 ⁺	214.01	13/2 ⁺	D	R=0.65 14.
246.6 2	107 11	1359.84	23/2 ⁻	1113.10	21/2 ⁻	D	R=0.86 8.
247.9 2	16 5	2161.1	(25/2 ⁻)	1913.2	(23/2 ⁻)	D	R=0.59 30.
259.2 2	69 4	1619.2	25/2 ⁻	1359.84	23/2 ⁻	D	R=0.81 14.

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¹⁵⁰Nd(¹²C, α 3n γ), ¹⁵⁰Nd(⁹Be,4n γ) **1999Ha48,1993Ri05 (continued)**

γ (¹⁵⁵Gd) (continued)

E_γ †	I_γ	E_i (level)	J_i^π	E_f	J_f^π	Mult. #	Comments
260.7 2	11 4	2421.7	(27/2 ⁻)	2161.1	(25/2 ⁻)		R=0.9 8.
270.5 2	52 3	1889.8	27/2 ⁻	1619.2	25/2 ⁻		R=1.02 23.
273.0 @ 8		2694.6	(29/2 ⁻)	2421.7	(27/2 ⁻)		
280.5 2	36 3	2170.3	29/2 ⁻	1889.8	27/2 ⁻		R=0.92 19.
289.5 2	27 3	2460.0	31/2 ⁻	2170.3	29/2 ⁻		R=0.91 25.
297.8 2	18 2	2758.0	33/2 ⁻	2460.0	31/2 ⁻	D	R=0.88 14.
306.3 2	14 2	3064.3	35/2 ⁻	2758.0	33/2 ⁻	D	R=0.59 29.
313.0 2	839 43	736.4	21/2 ⁺	423.45	17/2 ⁺	Q	R=1.29 8.
316.0 8	9 2	3379.5	37/2 ⁻	3064.3	35/2 ⁻		R=1.3 4.
333.1 2	261 15	786.36	19/2 ⁺	453.30	15/2 ⁺	Q	R=1.31 14.
342.9 2	80 9	463.85	15/2 ⁻	121.04	11/2 ⁻		R=1.5 7.
362.8 2	96 7	786.36	19/2 ⁺	423.45	17/2 ⁺		R=0.93 21.
381.1 2	109 9	663.56	17/2 ⁻	282.55	13/2 ⁻	Q	R=1.32 16.
407.6 2	691 36	1144.0	25/2 ⁺	736.4	21/2 ⁺	Q	R=1.22 8.
416.8 2	117 7	880.64	19/2 ⁻	463.85	15/2 ⁻	Q	R=1.36 14.
433.5 2	256 15	1219.9	23/2 ⁺	786.36	19/2 ⁺	Q	R=1.46 16.
449.5 2	119 7	1113.10	21/2 ⁻	663.56	17/2 ⁻	Q	R=1.31 13.
452.7 2	24 5	1913.2	(23/2 ⁻)	1460.7	(19/2 ⁻)		R=1.10 41.
479.3 2	124 7	1359.84	23/2 ⁻	880.64	19/2 ⁻	Q	R=1.34 13.
481.9 2	26 4	2161.1	(25/2 ⁻)	1679.3	(21/2 ⁻)		R=1.3 5.
483.6 2	52 6	1219.9	23/2 ⁺	736.4	21/2 ⁺		R=0.95 32.
491.1 2	441 24	1635.1	29/2 ⁺	1144.0	25/2 ⁺	Q	R=1.28 10.
506.1 2	122 7	1619.2	25/2 ⁻	1113.10	21/2 ⁻	Q	R=1.23 13.
508.4 2	25 3	2421.7	(27/2 ⁻)	1913.2	(23/2 ⁻)	Q	R=0.93 4.
523.0 2	196 13	1742.9	27/2 ⁺	1219.9	23/2 ⁺	Q	R=1.31 17.
530.0 2	92 5	1889.8	27/2 ⁻	1359.84	23/2 ⁻	Q	R=1.49 15.
533.5 2	16 5	2694.6	(29/2 ⁻)	2161.1	(25/2 ⁻)		R=1.8 11.
551.2 2	73 5	2170.3	29/2 ⁻	1619.2	25/2 ⁻	Q	R=1.49 19.
556.8 2	19 4	2978.5	(31/2 ⁻)	2421.7	(27/2 ⁻)		R=2.5 23.
563.7 2	288 16	2198.8	33/2 ⁺	1635.1	29/2 ⁺	Q	R=1.19 10.
570.2 2	69 5	2460.0	31/2 ⁻	1889.8	27/2 ⁻	Q	R=1.23 20.
581.5 2	12 4	3276.1	(33/2 ⁻)	2694.6	(29/2 ⁻)		R=1.3 7.
587.8 2	47 4	2758.0	33/2 ⁻	2170.3	29/2 ⁻		R=1.4 5.
599.0 2	39 9	1742.9	27/2 ⁺	1144.0	25/2 ⁺		R=0.85 18.
600.7 2	21 6	3579.2	(35/2 ⁻)	2978.5	(31/2 ⁻)		R=0.8 6.
602.0 2	85 10	2344.9	31/2 ⁺	1742.9	27/2 ⁺		R=1.08 20.
604.5 2	42 5	3064.3	35/2 ⁻	2460.0	31/2 ⁻	Q	R=1.35 24.
621.5 2	37 3	3379.5	37/2 ⁻	2758.0	33/2 ⁻	Q	R=1.2 4.
626.3 2	147 10	2825.1	37/2 ⁺	2198.8	33/2 ⁺	Q	R=1.24 19.
638.3 2	17 2	3702.7	39/2 ⁻	3064.3	35/2 ⁻		R=1.9 12.
659.1 2	10 2	4038.6	41/2 ⁻	3379.5	37/2 ⁻		R=1.8 18.
670.0 2	53 6	3014.9	35/2 ⁺	2344.9	31/2 ⁺	Q	R=1.5 4.
676.8 8	9 2	4379.5	43/2 ⁻	3702.7	39/2 ⁻		R=1.3 7.
680.3 2	62 6	3505.4	41/2 ⁺	2825.1	37/2 ⁺	Q	R=1.46 28.
696.5 8	9 3	4735.1	45/2 ⁻	4038.6	41/2 ⁻		R=1.4 12.
715.1 2	43 5	3730.1	39/2 ⁺	3014.9	35/2 ⁺	Q	R=1.6 5.
728.9 2	34 4	4234.3	45/2 ⁺	3505.4	41/2 ⁺	Q	R=1.8 7.
773.5 2	34 5	4503.6	43/2 ⁺	3730.1	39/2 ⁺		R=1.4 8.
774.8 2	22 4	5009.1	49/2 ⁺	4234.3	45/2 ⁺		R=1.4 7.
820 @		5829?	(53/2 ⁺)	5009.1	49/2 ⁺		E_γ : γ reported only by 1993Ri05.
839.4 2	34 5	5343.0	47/2 ⁺	4503.6	43/2 ⁺		R=1.4 5.
897.6 @ 2	30 5	6240.6	(51/2 ⁺)	5343.0	47/2 ⁺		R=1.4 8.
996.8 2	65 13	1460.7	(19/2 ⁻)	463.85	15/2 ⁻		R=1.1 5.

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$^{150}\text{Nd}(^{12}\text{C},\alpha 3n\gamma), ^{150}\text{Nd}(^9\text{Be},4n\gamma)$ [1999Ha48,1993Ri05](#) (continued)

$\gamma(^{155}\text{Gd})$ (continued)

† Based on a general statement of [1999Ha48](#) that the uncertainties in the γ -ray energies range from 0.2 to 0.8 keV, the uncertainties are given here as 0.8 keV for $I_\gamma < 10$ and 0.2 keV for $I_\gamma > 10$.

‡ Nominal value from Adopted Gammas.

From measured asymmetry ratios of [1999Ha48](#).

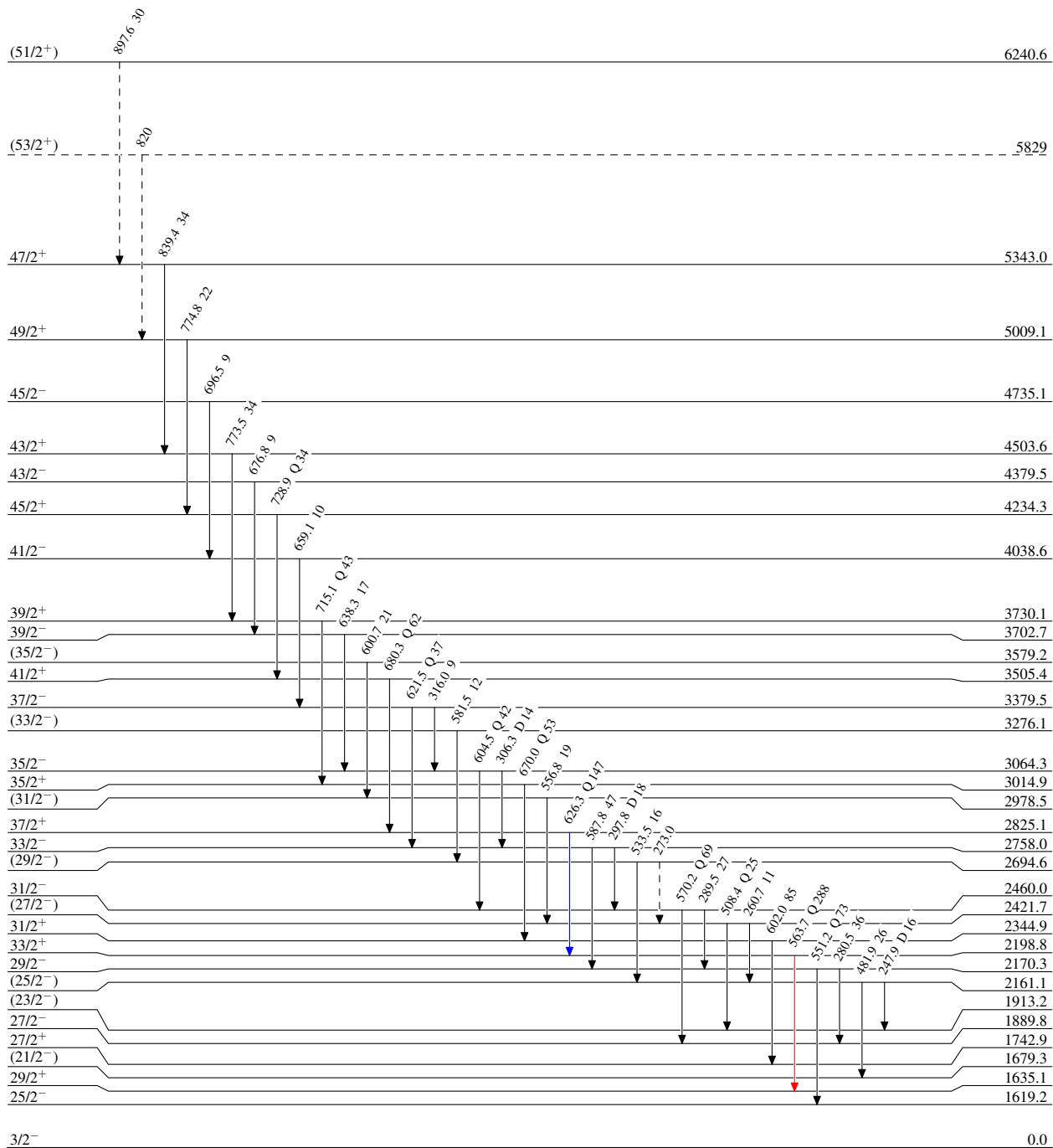
@ Placement of transition in the level scheme is uncertain.

$^{150}\text{Nd}(^{12}\text{C},\alpha 3n\gamma), ^{150}\text{Nd}(^9\text{Be},4n\gamma)$ 1999Ha48,1993Ri05

Legend

Level Scheme
Intensities: Relative I_γ

- $I_\gamma < 2\% \times I_\gamma^{\text{max}}$
- $I_\gamma < 10\% \times I_\gamma^{\text{max}}$
- $I_\gamma > 10\% \times I_\gamma^{\text{max}}$
- - - - -→ γ Decay (Uncertain)



$^{155}_{64}\text{Gd}_{91}$

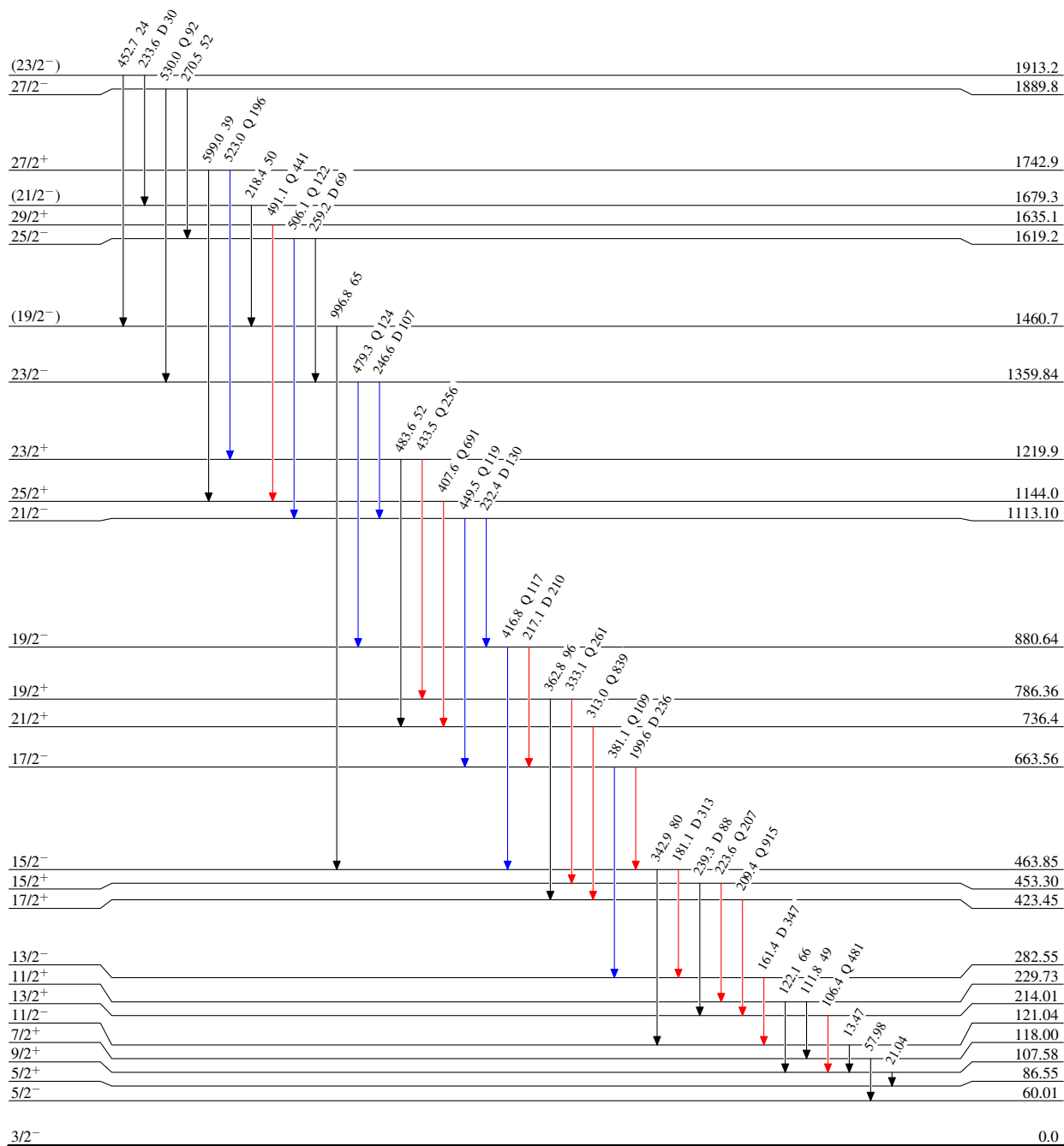
$^{150}\text{Nd}(^{12}\text{C},\alpha 3n\gamma), ^{150}\text{Nd}(^9\text{Be},4n\gamma)$ 1999Ha48,1993Ri05

Level Scheme (continued)

Intensities: Relative I_γ

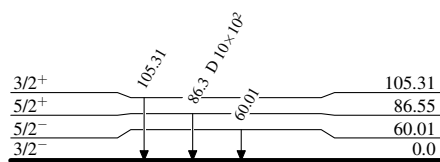
Legend

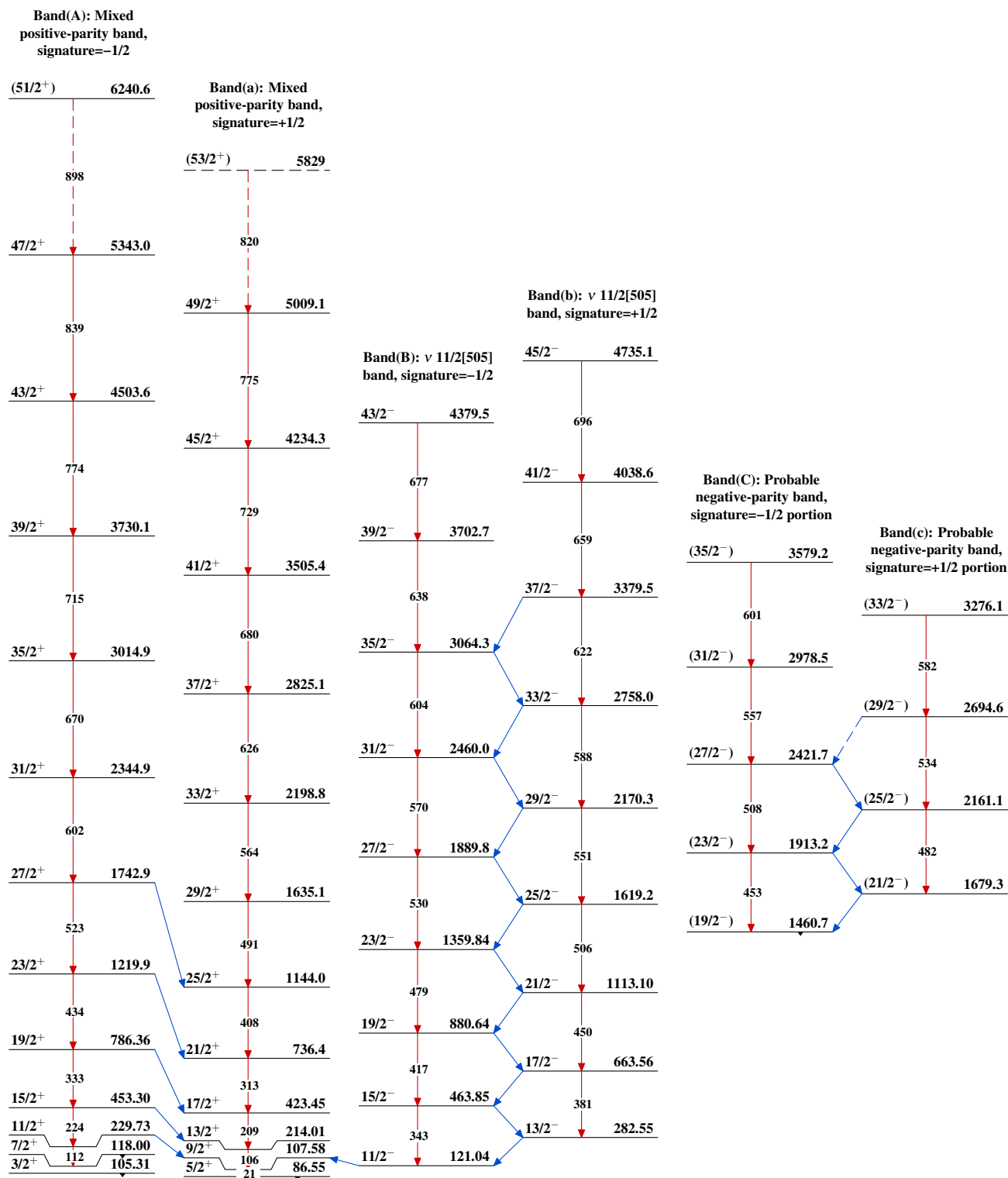
- $I_\gamma < 2\% \times I_\gamma^{max}$
- $I_\gamma < 10\% \times I_\gamma^{max}$
- $I_\gamma > 10\% \times I_\gamma^{max}$



$^{155}_{64}\text{Gd}_{91}$

 $^{150}\text{Nd}(^{12}\text{C},\alpha 3n\gamma), ^{150}\text{Nd}(^9\text{Be},4n\gamma)$ 1999Ha48,1993Ri05

Level Scheme (continued)Intensities: Relative I_γ  $^{155}_{64}\text{Gd}_{91}$

$^{150}\text{Nd}(^{12}\text{C},\alpha 3n\gamma), ^{150}\text{Nd}(^9\text{Be},4n\gamma)$ 1999Ha48,1993Ri05 $^{155}_{64}\text{Gd}_{91}$