

<sup>154</sup>Gd(p,d $\gamma$ ) 2014Ro25,2013Ro23

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

Data set based on the XUNDL compilations of 2014Ro25, 2013Ro23 done by B. Singh (McMaster).

2014Ro25, 2013Ro23: E(p)=25 MeV beam from LBNL cyclotron facility. Target=1.01 mg/cm<sup>2</sup> thick with 66.53% enrichment.

Measured E $\gamma$ , I $\gamma$ , E(d), d $\gamma\gamma$ -coin, angular distribution of deuterons in coincidence with  $\gamma$  rays using STARS array of Si detectors for particles and LIBERACE array of five HPGe Clover detectors for  $\gamma$  rays. FWHM=150 keV for particle detectors. DWBA analysis for angular distribution of deuterons.

Most details and data are from 2014Ro25; 2013Ro23 give information about new 940.7 $\gamma$  from an 1152.9 keV *I* level assigned  $\nu$ 5/2[402] Nilsson configuration.

<sup>153</sup>Gd Levels

E(level) <sup>†</sup>	J <sup><math>\pi</math></sup> <sup>†</sup>	L	Relative population <sup>‡</sup>	Comments
0.0@	3/2 <sup>-</sup>			
41.6#@	5/2 <sup>-</sup>			
93.3#@	7/2 <sup>-</sup>			E(level): 94.3426 in table V of 2014Ro25 seems a misprint.
95.2#	9/2 <sup>+</sup>			
109.8&	(5/2) <sup>-</sup>		27.4 11	
129.2 <sup>a</sup>	3/2 <sup>-</sup>		6.0 14	
139.8#	13/2 <sup>+</sup>			
183.5#c	5/2 <sup>+</sup>			
212.0 <sup>d</sup>	3/2 <sup>+</sup>		100 3	
216.0&	7/2 <sup>-</sup>		3.6 4	
219.4&	9/2 <sup>-</sup>		7.4 6	
249.6#a	5/2 <sup>-</sup>			
303.5 <sup>d</sup>	5/2 <sup>+</sup>		9.9 11	
315.2 <sup>e</sup>	1/2 <sup>-</sup>		9.3 5	
327.9 <sup>f</sup>	1/2 <sup>+</sup>		88 3	
333.2@	(9/2) <sup>-</sup>		3.1 4	
361.7 <sup>e</sup>	3/2 <sup>-</sup>		43 2	
363.4#b	13/2 <sup>-</sup>			
395.1 <sup>d</sup>	7/2 <sup>+</sup>		1.4 4	
412.9 <sup>f</sup>	3/2 <sup>+</sup>		19.4 1	
436.3 <sup>g</sup>	1/2 <sup>-</sup>		5.3 4	
442.2 <sup>f</sup>	5/2 <sup>+</sup>		4.8 8	
579.1 <sup>e</sup>	(7/2) <sup>-</sup>		5.6 4	
720.3 <sup>g</sup>	5/2 <sup>-</sup> , 7/2 <sup>-</sup>		6.4 8	
945.2	3/2 <sup>+</sup>		8.6 11	
1117.8 2	3/2 <sup>+</sup> , 5/2 <sup>+</sup>	2	5.3 5	Other seven $\gamma$ rays reported in literature from this level were not observed by 2014Ro25, even though expected from intensity detection limits.
1152.9 <i>I</i>	(5/2 <sup>+</sup> )	2	16.5 18	L: from d( $\theta$ ) gated with E $\gamma$ =939-943 keV and detection of deuterons in the 1000-1300 keV range, and comparison with DWBA calculations. J <sup><math>\pi</math></sup> : from L-value and similarity of $\gamma$ -decay paths with those of known 5/2 <sup>+</sup> state in <sup>155</sup> Gd with configuration= $\nu$ 5/2[402]. Configuration= $\nu$ 5/2[402] (2014Ro25). Configuration= $\nu$ 9/2[514] (2014Ro25).
1474.3 4	(11/2 <sup>-</sup> )		6.5 9	
1509.5 3			7.1 11	L: angular distribution data rules out L=0,1,4. L=3 is suggested by $\chi^2$ minimization procedure. Previous assignment of L=4 is not supported by measured deuteron angular distribution in the present work.

Continued on next page (footnotes at end of table)

<sup>154</sup>Gd(p,d $\gamma$ ) **2014Ro25,2013Ro23 (continued)**

<sup>153</sup>Gd Levels (continued)

† Below 1 MeV excitation, rounded off energies and  $J^\pi$  values are from Adopted Levels of <sup>153</sup>Gd. Above this energy all data are from **2014Ro25**.

‡ Relative population of a level measured from area of the deuteron peak in coincidence with a  $\gamma$  ray from that level, corrected for internal conversion and  $\gamma$ -detection efficiency.

# Level not populated directly in the present work.

@ Band(A):  $\nu 3/2[521]$ .

& Band(B):  $\nu 5/2[523]$ .

<sup>a</sup> Band(C):  $\nu 3/2[532]$ .

<sup>b</sup> Band(D):  $\nu 11/2[505]$ .

<sup>c</sup> Band(E):  $\nu 3/2[651]$ .

<sup>d</sup> Band(F):  $\nu 3/2[402]$ .

<sup>e</sup> Band(G):  $\nu 1/2[530]$ .

<sup>f</sup> Band(H):  $\nu 1/2[400]$ .

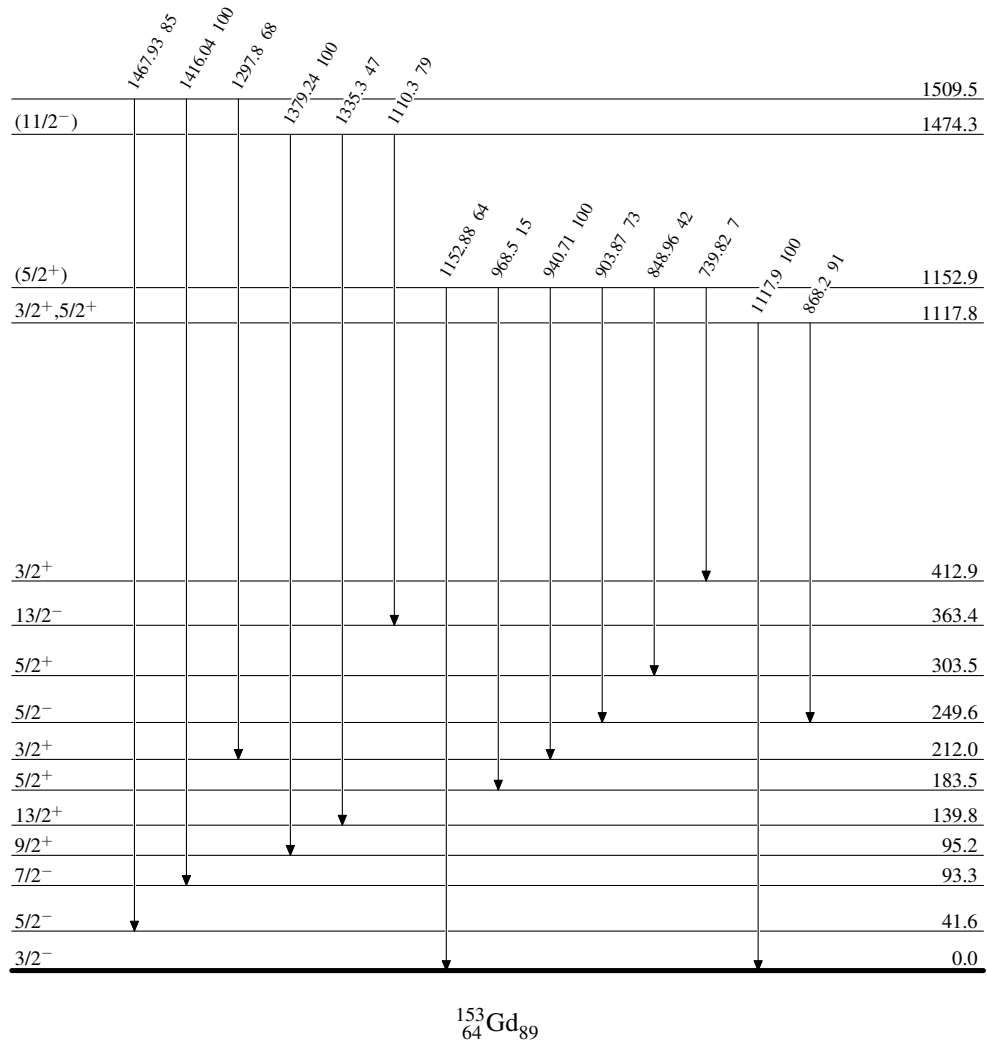
<sup>g</sup> Band(I):  $\nu 1/2[521]$ .

$E_i(\text{level})$	$J_i^\pi$	$E_\gamma$	$I_\gamma$	$E_f$	$J_f^\pi$	$\gamma(^{153}\text{Gd})$	Comments
1117.8	$3/2^+, 5/2^+$	868.2 3	91 8	249.6	$5/2^-$		
		1117.9 2	100 9	0.0	$3/2^-$		
1152.9	$(5/2^+)$	739.82 24	7 3	412.9	$3/2^+$		
		848.96 15	42 6	303.5	$5/2^+$		$E_\gamma$ : poor fit, level-energy difference=849.36.
		903.87 15	73 7	249.6	$5/2^-$		$E_\gamma$ : poor fit, level-energy difference=909.35.
		940.71 9	100 8	212.0	$3/2^+$		940.7 $\gamma$ in coincidence with deuteron group observed at 118 keV 20 (2013Ro23).
		968.5 4	15 4	183.5	$5/2^+$		
		1152.88 14	64 6	0.0	$3/2^-$		
1474.3	$(11/2^-)$	1110.3 3	79 15	363.4	$13/2^-$		
		1335.3 8	47 17	139.8	$13/2^+$		
		1379.24 21	100 15	95.2	$9/2^+$		
1509.5		1297.8 5	68 12	212.0	$3/2^+$		
		1416.04 23	100 13	93.3	$7/2^-$		
		1467.93 16	85 11	41.6	$5/2^-$		

$^{154}\text{Gd}(p,d\gamma)$  2014Ro25,2013Ro23

## Level Scheme

Intensities: Relative photon branching from each level



$^{154}\text{Gd}(\text{p},\text{d}\gamma)$  2014Ro25,2013Ro23

			<b>Band(F): v3/2[402]</b>
			<u>7/2<sup>+</sup> 395.1</u>
		<b>Band(D): v11/2[505]</b>	
		<u>13/2<sup>-</sup> 363.4</u>	
<b>Band(A): v3/2[521]</b>			
<u>(9/2)<sup>-</sup> 333.2</u>			
			<u>5/2<sup>+</sup> 303.5</u>
	<b>Band(C): v3/2[532]</b>		
	<u>5/2<sup>-</sup> 249.6</u>		
	<b>Band(B): v5/2[523]</b>		
	<u>9/2<sup>-</sup> 219.4</u>		
	<u>7/2<sup>-</sup> 216.0</u>		
			<u>3/2<sup>+</sup> 212.0</u>
		<b>Band(E): v3/2[651]</b>	
		<u>5/2<sup>+</sup> 183.5</u>	
		<u>3/2<sup>-</sup> 129.2</u>	
	<u>(5/2)<sup>-</sup> 109.8</u>		
<u>7/2<sup>-</sup> 93.3</u>			
<u>5/2<sup>-</sup> 41.6</u>			
<u>3/2<sup>-</sup> 0.0</u>			

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 $^{154}\text{Gd}(\text{p,d}\gamma)$  2014Ro25,2013Ro23 (continued)Band(I):  $\nu 1/2[521]$ 

<u><math>5/2^-</math></u>	<u>720.3</u>
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Band(G):  $\nu 1/2[530]$ 

<u><math>(7/2)^-</math></u>	<u>579.1</u>
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Band(H):  $\nu 1/2[400]$ 

<u><math>5/2^+</math></u>	<u>442.2</u>
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<u><math>1/2^-</math></u>	<u>436.3</u>
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<u><math>3/2^+</math></u>	<u>412.9</u>
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<u><math>3/2^-</math></u>	<u>361.7</u>
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<u><math>1/2^+</math></u>	<u>327.9</u>
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<u><math>1/2^-</math></u>	<u>315.2</u>
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 $^{153}_{64}\text{Gd}_{89}$