^{158}Gd(d,t),(p,d),(^{3}He,α) 1967Tj01,1969Ya08,1971Lo01

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Full Evaluation	N. Nica	NDS 132, 1 (2016)	4-Dec-2015

Data given here are from (d,t) study of 1967Tj01, unless otherwise noted.

The following n-pickup reactions have been studied: (d,t) (1967Tj01) with E_d=12.2 MeV, outgoing t measured in magnetic spectrometer at 60° and 90° with FWHM=9 keV; (p,d) (1969Ya08) with E_p=55 MeV, outgoing d measured in magnetic spectrometer from 5° to 50° and FWHM of the order of 100 keV (estimated by evaluator from spectrum); (p,d) (1992Na21) with 3 levels reported, and (^{3}He,α) (1971Lo01) with E(^{3}He)=20.3 MeV, outgoing α measured in magnetic spectrograph at 60° and 90° and FWHM ≈ 30 keV; (p,d) (2013Ro23) with E_p=25 MeV, outgoing d measured in ΔE-E silicon telescope in coincidence with γ rays measured with five Compton-suppressed clover Ge detectors. Eleven levels up to 2000 keV are shown in Fig. 4 (of which eight of them were assigned Nilsson structures). 2012Ro14 (same reaction and setup) deduced entry spin distributions for the quasicontinuum.

^{157}Gd Levels

Additional information 1.

E(level)[†‡]	Jπ[#@]	L	S[&a]	Comments
0.0[fg]	3/2−		100	L: 1 in (p,d) for level near this energy (1969Ya08).
≈53[g]	5/2−		2	
≈63[h]	5/2+		2	
≈115[h]	7/2+		3	
132[fg] 3	7/2−		150	L: 3 in (p,d) for level near this energy (1969Ya08).
181[eh] 3	9/2+		65	
227[g] 3	9/2−		13	
≈349[g]	11/2−		9	
361[eh]	13/2+	6	49	
≈372			3	
426[fi] 3	11/2−		69	L: 5 in (p,d) for level near this energy (1969Ya08).
435[j] 3	5/2−		24	
475[fk] 3	3/2+		404	L: 2 in (p,d) for level near this energy (1969Ya08).
513 3			46	
523[j] 3	7/2−		9	Jπ: Assignment in Adopted Levels is 5/2+.
618[ej] 3	9/2−		11	
665 3			37	
684[fl] 3	1/2+		844	
700[dm] 3	[1/2−]		59	Jπ: (d,t) study gives 3/2,3/2[532]?, but others give 1/2−[521]. This suggests a possible doublet, but averaged-resonance n-capture data argue for only one level of low spin. L: 0 and 1 in (p,d) for level near this energy (1969Ya08).
718 3			45	
744[m] 3	3/2−		9	
751 3			13	Jπ: (d,t) study gives 5/2,3/2[532]?, but other experiments give 3/2+ or 1/2+. Probably 3/2+ or a doublet.
770 3			10	
792[n] 3	[1/2−]		66	Jπ: Assignment in Adopted Levels is 1/2−,3/2−.
809[n] 3	3/2−		260	
813[m] 3	[5/2−]		143	Jπ: (d,t) study gives 7/2,3/2[532], but others give 3/2− or 5/2,3/2[532]. Possible doublet.
837[fn] 3	5/2−		43	Jπ: The assignments are 5/2,1/2[530] (1967Tj01) and L=1 for level of this energy (1969Ya08). 1971Lo01 suggest that there is also an L=6 component in (^{3}He,α) peak.
850 3			20	
901[n] 3	7/2−		20	Jπ: This level has also been assigned as the 7/2,5/2[512] state.

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^{158}Gd(d,t),(p,d),(^{3}He,α) 1967Tj01,1969Ya08,1971Lo01 (continued)

^{157}Gd Levels (continued)

E(level)[†][‡]	J$^\pi$[#][@]	S[&][a]	Comments
918[o] 3	(9/2$^-$)	7	J$^\pi$: Assignment questionable (1967Tj01). J$^\pi$: Assignment in Adopted Levels is 5/2$^+$,7/2,9/2$^-$.
962[n] 3	9/2$^-$	12	
981[f] 3		6	J$^\pi$: The assignments are L=1 for a level near this energy (1969Ya08) and L ≈ 5 which suggests 9/2,1/2[530] or 9/2,3/2[532] (1971Lo01).
≈1060[n]	11/2$^-$		
1093 5			
1113 5			
1141 5		22	
1175[d] 5		6	
1203 5		3	
1246 5		3	
1296 5		11	
1305 5		7	
1316 5		3	
1339[d] 5		5	
1352 5		4	
1396 5		6	
1414 5		3	
1466 5		6	
1524 5		4	
1556 5		23	
1569 5		11	
1589 5		31	L: 2 in (p,d) for level near this energy (1969Ya08).
1611 5		4	
1635 5		4	
1670 5		4	
1720 5		6	
1731 5		7	
1738 5		19	
1811 5		6	
1825[ep] 5	7/2$^+$	61	
1840[b] 20			L: 2 in (p,d) for level near this energy (1969Ya08).
1902[cq] 15	11/2$^-$		J$^\pi$: From 1971Lo01.
1960[b] 20			L: (1) in (p,d) for level near this energy (1969Ya08).
2390[b] 20			L: (2) in (p,d) for level near this energy (1969Ya08).

[†] Level reported only in (d,t) reaction (1967Tj01), unless otherwise indicated.

[‡] Specific uncertainties assigned by evaluator. For (d,t) study, uncertainty is 3 keV below 1 MeV and 5 keV otherwise, from a general statement (1967Tj01); for (p,d) study, uncertainty is 20 keV; and for (^{3}He,α) study, uncertainty is ≈ 15 keV.

[#] Nilsson configuration and J^π assignments are from (1967Tj01), unless otherwise noted and are based on comparison of measured and theoretical DWBA cross sections to the various band members and take into account both the (d,t) and the related (d,p) study (1967Tj01). Assignments agree with those in the Adopted Levels, except where noted, otherwise.

[@] Several L values are given by 1969Ya08. Since their FWHM is of the order of 100 keV, their values may be averages over several levels. Therefore, they have been given only in comments associated with one of the nearby levels. Also, L values are deduced by 1971Lo01 from (^{3}He,α)/(d,t) cross section ratios with the data calibrated by L values deduced from the assignments of 1967Tj01. In this case L=2 and L=4 give a similar response.

[&] Label=Cross section.

[a] Cross section in μb/sr for (d,t) at 12 MeV and 90° (1967Tj01).

[b] Reported in (p,d) (1969Ya08) only.

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^{158}Gd(d,t),(p,d),(^{3}He,α) 1967Tj01,1969Ya08,1971Lo01 (continued)

^{157}Gd Levels (continued)

[c] Reported in (^{3}He,α) (1971Lo01) only.
[d] Reported in (d,t) and (p,d).
[e] Reported in (d,t) and (^{3}He,α).
[f] Reported in (d,t), (p,d), and (^{3}He,α).
[g] Band(A): 3/2[521] band.
[h] Band(B): 5/2[642] band.
[i] Band(C): 11/2[505] band.
[j] Band(D): 5/2[523] band.
[k] Band(E): 3/2[402] band.
[l] Band(F): 1/2[400] band.
[m] Band(G): 1/2[521] band.
[n] Band(H): 1/2[530] band.
[o] Band(I): Possibly 3/2[532] band.
[p] Band(J): 7/2[404] band.
[q] Band(K): 9/2[514] band.

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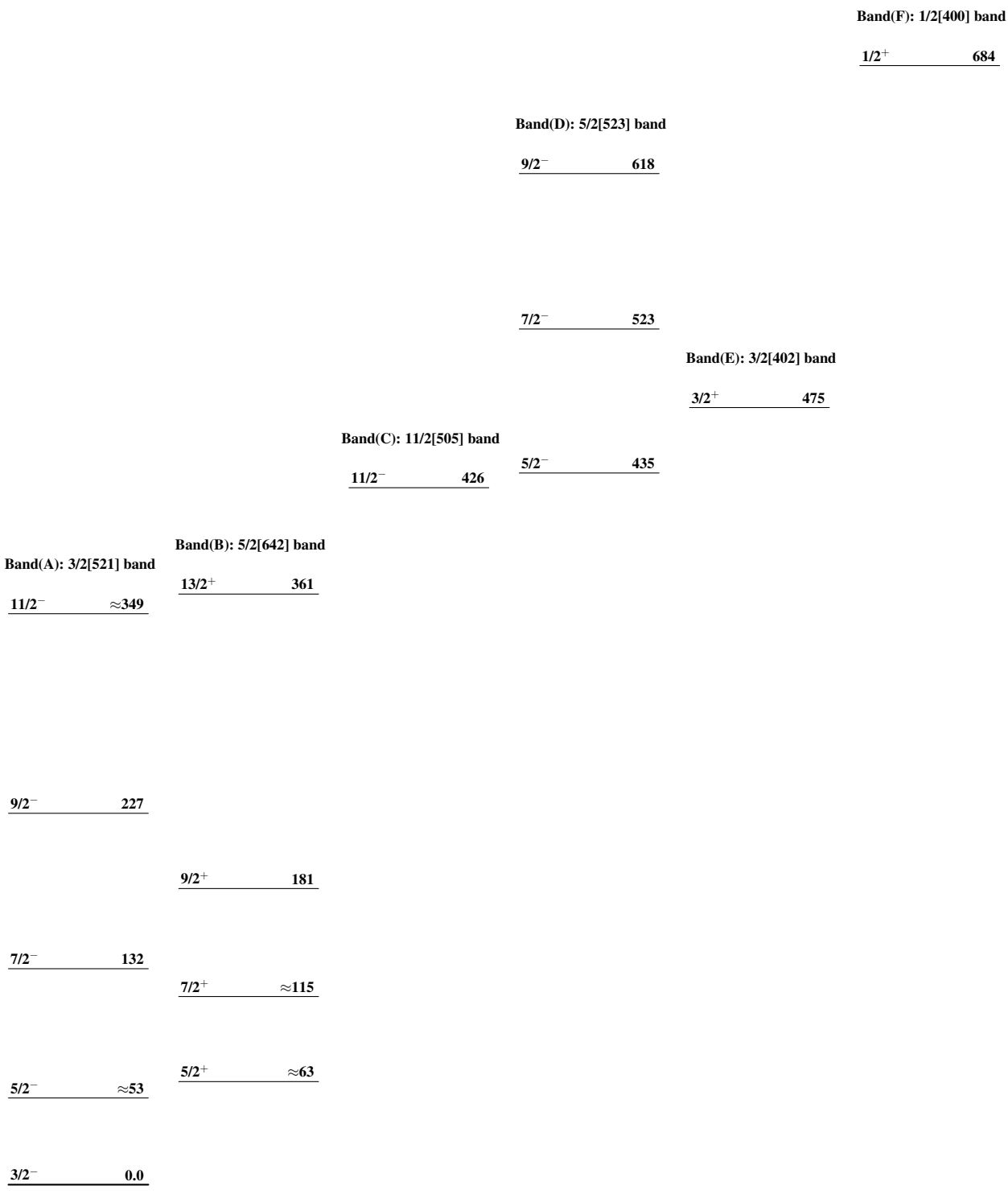
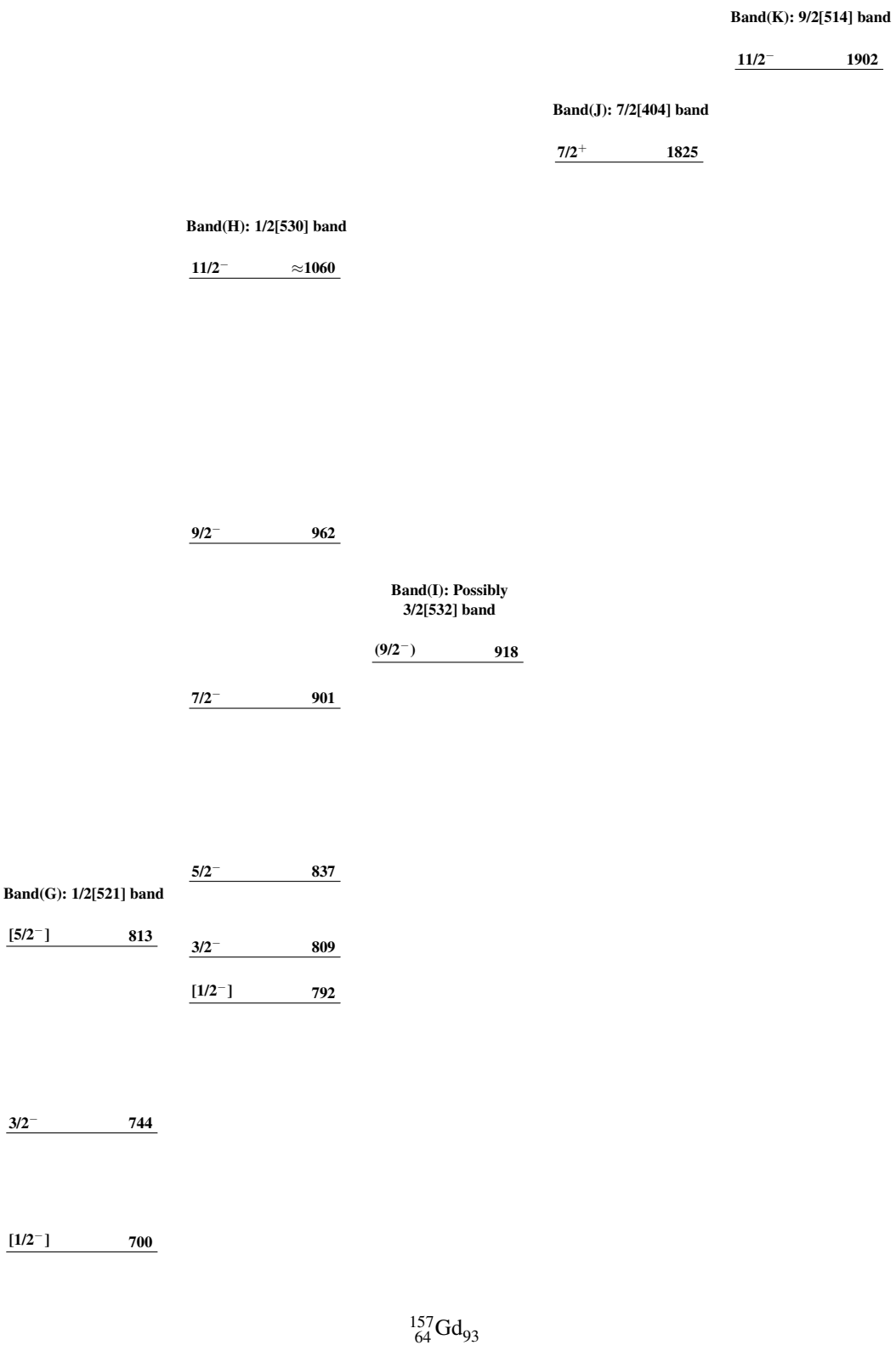


$^{157}_{64}Gd_{93}$

^{158}Gd(d,t),(p,d),(^{3}He,α) 1967Tj01,1969Ya08,1971Lo01 (continued)



$^{157}_{64}Gd_{93}$