^{156}Gd(d,t) 1986Sc25,1969Ja04,1967Tj01

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

Additional information 1.

1986Sc25: E(d)=14 MeV and 20 MeV. Enriched (95% ^{156}Gd) targets of Gd_2O_3, having a thickness of 50 μg/cm^2, were deposited on 4.3 μg/cm^2 thick carbon backings. Outgoing tritons were analyzed in a Q3D spectrograph and were detected using a multiwire detector. The resolution (FWHM) was 3 keV. Energy spectra and cross sections were measured at θ=45° only.

1969Ja04: E(d)=12.1 MeV. Experimental procedures were similar to those described by 1967Ja03, who used enriched Gd-metal targets evaporated onto carbon backings. The target thickness here was ≈160 μg/cm^2. The triton reaction products were analyzed in a high-resolution magnetic spectrograph and recorded in photographic plates. Overall energy resolution was ≈10 keV at forward angles and ≈15 keV at backward angles. Measured (d,t) angular distributions and deduced L values for the transferred nucleon.

1967Tj01: E(d)=12.1 MeV. Targets prepared by deposition on carbon foils (thickness≈40 μg/cm^2) of isotope-separated Gd material in an isotope separator. Reaction products were analyzed in a broad-range magnetic spectrograph and detected in photographic plates. The resolution (FWHM)≈9 keV. The accuracy of the measured excitation energies was 3 keV below 1 MeV and 5 keV otherwise. Measured triton spectra at θ=60°, 90° and 125°.

^{155}Gd Levels

E(level)[#]	J$^\pi$[@]	L[†]	S[&a]	Comments
0.0[b]	3/2$^-$	1	0.372 *15*	E(level): determined as 0.18 *16* by 1986Sc25.
59.97[b] *10*	5/2$^-$		0.029 *7*	
86.37[c] *17*	5/2$^+$	2	0.054 *8*	
105.32[‡c]	3/2$^+$		1.03 *13*	L: L=2+4 for the unresolved 105+107 peak (1969Ja04).
107.58[‡c]	9/2$^+$		0.63 *12*	L: L=2+4 for the unresolved 105+107 peak (1969Ja04).
121.05[o] *19*	11/2$^-$	5	0.49 *4*	
146.00[b] *14*	7/2$^-$	3	0.516 *20*	
214.42[c] *15*	13/2$^+$	6	0.351 *18*	
230.1[c] *3*	11/2$^+$		0.054 *7*	
251.78[b] *17*	9/2$^-$	5	0.106 *11*	
268.62[d] *13*	3/2$^+$	2	2.11 *4*	
286.86[e] *16*	3/2$^-$	2,3	0.163 *11*	L: Reported values are inconsistent with the adopted J^π. From (d,p), 1986Sc25 report L=0,1,4.
321.38[‡e]	5/2$^-$	3,2	0.497 *17*	L: in the study of 1969Ja04, this peak probably includes contributions from both the 321 and the 326 levels.
326.09[‡d]	5/2$^+$		0.147 *12*	
350.32[f] *22*	7/2$^+$		0.101 *11*	
367.61[g] *12*	1/2$^+$	0	4.67 *9*	
393.44[e] *13*	7/2$^-$	3	0.266 *19*	
423.41[‡d]	7/2$^+$		0.063 *14*	J$^\pi$: 1986Sc25 report J^π=(5/2$^+$),7/2$^+$.
427.24[‡g]	3/2$^+$		0.347 *23*	
450.56[‡h]	3/2$^-$	1	1.82 *8*	
454.47[‡i]	5/2$^-$		0.08 *4*	
485.02[e] *25*	(9/2$^-$)		0.20 *3*	J$^\pi$: 1986Sc25 report J^π=5/2$^-$,7/2,9/2,11/2$^-$.
488.82[g] *15*	5/2$^+$	(2)	0.46 *3*	
533.7[b] *4*	13/2$^-$		0.009 *4*	
553.52[i] *16*	(7/2)$^-$	(3)	0.185 *17*	L: from 1969Ja04 for E=556. This peak most likely includes contributions from both the 553 and 559 levels.
559.31[j] *14*	1/2$^-$	0,1	0.123 *11*	L: from 1986Sc25. J$^\pi$: 1986Sc25 report J^π=1/2$^-$,3/2$^-$.
581.9[h] *3*	5/2$^-$		0.047 *5*	

Continued on next page (footnotes at end of table)

^{156}Gd(d,t) 1986Sc25,1969Ja04,1967Tj01 (continued)

^{155}Gd Levels (continued)

E(level)[#]	Jπ[@]	L[†]	S[&a]	Comments
592.57[k] 15	3/2−	1	0.136 9	
610.8[g] 7	7/2+		0.026 7	
614.92[j] 19	3/2−		0.15 5	
648.3[k] 4	5/2−		0.011 6	
659.01[j] 16	5/2−		0.056 8	
714.0 6			0.027 6	
720.50[l] 24	1/2+,3/2+,5/2+	3	0.198 23	L: value inconsistent with the adopted J^π. Jπ: 1986Sc25 show $J^\pi=5/2^+$ in parentheses.
752.67[l] 18	5/2+	1,3	0.22 3	L: value inconsistent with the adopted J^π.
786.87[j] 22	7/2−		0.088 13	
804.1 3	(9/2−)		0.032 7	Jπ: 1986Sc25 report $J^\pi=7/2^+$ to $13/2^+$ or $9/2^-$. They indicate that this may be the $9/2^-$ member of 1/2[530].
815.9[m] 3	3/2+,5/2+	5	0.058 10	L: associated by 1969Ja04 with a peak having E=813. However, this peak may correspond to the 804 peak or a composite of the 804, 816 and 827 peaks of 1986Sc25.
860.17 21	(13/2)+	6	0.007 3	Possibly the $13/2^+$ member of the 5/2[642] band (1986Sc25). L: from 1986Sc25.
873.48[m] 21	(5/2)+		0.038 5	Jπ: 1986Sc25 report $J^\pi=5/2^+$.
1013.13[n] 21	3/2−		0.023 4	
1027.3 6	1/2−,3/2,5/2−		0.0026 15	
1035.1 3	1/2+,3/2+		0.027 5	
1079.65 20	1/2−,3/2−		0.009 3	
1092.2 4			0.022 6	
1104.49[n] 23	(7/2−)		0.011 3	Jπ: 1986Sc25 report $J^\pi=7/2^-$.
1112.02 21			0.021 6	
1129.89 22	3/2−	0,1,2,4	0.034 7	E(level): From (d,p) only (1986Sc25). L: from 1986Sc25. Jπ: 1986Sc25 report 1/2−,3/2−.
1140.9 4			0.0048 22	
1146.5 6	1/2+,3/2+,5/2+		0.010 3	
1173.3 3			0.013 3	
1192.59 16	1/2+,3/2+		0.053 8	
1225.17 20	3/2−,5/2,7/2		0.026 5	Jπ: 1986Sc25 report $J^\pi=5/2,7/2$.
1229.0 9	3/2−		0.013 6	
1246.5 3	(1/2−,3/2−)		0.086 12	E(level): From (d,p) only (1986Sc25).
1269.6 5			0.018 8	
1286.7 6			0.036 8	
1297.24[p] 18	7/2+	4	1.6 4	Jπ: 1986Sc25 report $J^\pi=5/2^+,7/2^+$.
1335.16 22			0.053 10	Jπ: 1986Sc25 report $J^\pi=5/2^-,7/2^-$.
1362.2 3	5/2,7/2+		0.033 9	Jπ: 1986Sc25 report $J^\pi=5/2^+$.
1368.2 9			0.007 3	
1399.9 6			0.028 9	Jπ: 1986Sc25 report $J^\pi=1/2,3/2,5/2^+$.
1415.9 7			0.012 5	
1427.5 5			0.032 9	
1437.53 20			0.031 9	Jπ: 1986Sc25 report $J^\pi=5/2^-,7/2^-$.
1458.1 5			0.042 12	
1481.8 4			0.10 3	
1492.7 5			0.053 15	
1526.1 6			0.049 16	
1542.5 6			0.038 13	E(level): 1986Sc25 associate an (n,γ) level at 1551.3 with this state and assign $J^\pi=(1/2^+,3/2^+)$. However, the evaluator has assumed that this is in error and that the correct association is to be made with the 1551.7 level. This latter choice is the one shown here.
1551.7 4	(1/2+,3/2+)		0.24 6	See the comment on the 1542.5 level.

Continued on next page (footnotes at end of table)

^{156}Gd(d,t) 1986Sc25,1969Ja04,1967Tj01 (continued)

^{155}Gd Levels (continued)

† Unless noted otherwise, the listed values are from (1969Ja04).
‡ Listed value is taken from the (n,γ) data, which were used by 1986Sc25 to obtain a more accurate split of the intensity in peaks that correspond to more than one level.
# Values are those of 1986Sc25 and represent averages of their (d,p) and (d,t) measurements.
@ From adopted values. Cases where these differ from those deduced from these studies are pointed out. The values reported by 1986Sc25 take into account information from other sources as well as from their data.
& Label=dσ/dΩ(d,t) (mb/sr).
a Values at θ=45° and E(d)=20 MeV.
b Band(A): 3/2[521] band, g.s. band.
c Band(B): 3/2[651] band.
d Band(C): 3/2[402] band.
e Band(D): 3/2[532] band.
f Band(E): 5/2[642] band.
g Band(F): 1/2[400] band.
h Band(G): 1/2[530] band.
i Band(H): 5/2[523] band.
j Band(I): 1/2[521] band.
k Band(J): "beta vibration" built on the g.s. ($K^{\pi}=3/2^{-}$).
l Band(K): 1/2[660] band.
m Band(L): "beta vibration" built on the 3/2[651] band ?
n Band(M): K-2 γ vibration built on the g.s.
o Band(N): 11/2[505] bandhead.
p Band(O): 7/2[404] bandhead.

^{156}Gd(d,t) 1986Sc25,1969Ja04,1967Tj01

Band(A): 3/2[521] band, g.s. band

13/2$^-$ 533.7

9/2$^-$ 251.78

7/2$^-$ 146.00

5/2$^-$ 59.97

3/2$^-$ 0.0

$^{155}_{64}Gd_{91}$

^{156}Gd(d,t) 1986Sc25,1969Ja04,1967Tj01 (continued)

Band(C): 3/2[402] band

$7/2^+$ 423.41

$5/2^+$ 326.09

$3/2^+$ 268.62

Band(B): 3/2[651] band

$11/2^+$ 230.1

$13/2^+$ 214.42

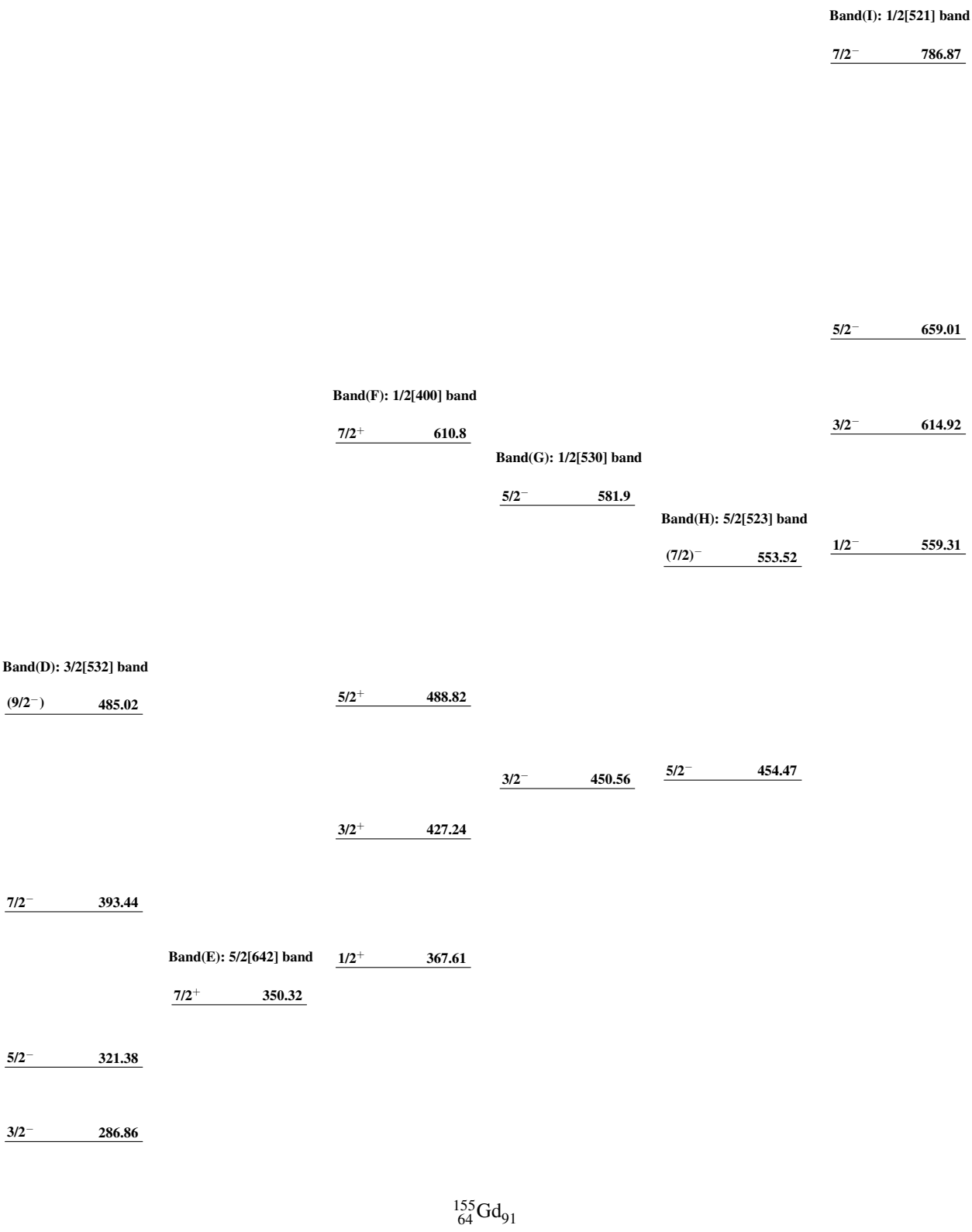
$9/2^+$ 107.58

$3/2^+$ 105.32

$5/2^+$ 86.37

$^{155}_{64}Gd_{91}$

^{156}Gd(d,t) 1986Sc25,1969Ja04,1967Tj01 (continued)



$^{155}_{64}Gd_{91}$

^{156}Gd(d,t) 1986Sc25,1969Ja04,1967Tj01 (continued)

Band(O): 7/2[404] bandhead

7/2$^+$ 1297.24

Band(M): K-2 γ vibration built on the g.s

(7/2$^-$) 1104.49

3/2$^-$ 1013.13

Band(L): "beta vibration" built on the 3/2[651] band ?

(5/2)$^+$ 873.48

3/2$^+$,5/2$^+$ 815.9

Band(K): 1/2[660] band

5/2$^+$ 752.67

1/2$^+$,3/2$^+$,5/2$^+$ 720.50

Band(J): "beta vibration" built on the g.s. (K$^\pi$=3/2$^-$)

5/2$^-$ 648.3

3/2$^-$ 592.57

Band(N): 11/2[505] bandhead

11/2$^-$ 121.05

$^{155}_{64}Gd_{91}$