^{160}Gd(pol t,α) 1979Bu05

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	Balraj Singh	ENSDF	07-June-2023

1979Bu05: E(t)=17 MeV. Measured α particles, analyzing powers ($A_y(\theta)$) and $\sigma(\theta)$ from 10° to 50°. The α particles were analyzed using a Q3D magnetic spectrometer, and detected by a helical-cathode position-sensitive counter at the tandem Van de Graaff accelerator of the Los Alamos Scientific Laboratory. FWHM=15-16 keV. Target was Gd_2O_3 enriched to 95.95% in ^{160}Gd, evaporated on a ≈80 μg/cm^2 carbon foil. The uncertainties in the absolute cross sections estimated as 20%, while in relative cross sections as 10%. DWBA analysis of $\sigma(\theta)$ and $A_y(\theta)$ data.

^{159}Eu Levels

E(level)[†]	J$^\pi$[‡]	L[@]	Nuclear structure factors.[&]	Comments
0[a]	5/2$^+$	2	0.02	dσ/dΩ(25°)=10 μb/sr; A_y(25°)=+0.20 *19*.
75[a] *4*	7/2$^+$	4	0.87	dσ/dΩ(25°)=110 μb/sr; A_y(25°)=−0.56 *6*.
≈172[a]	9/2$^+$	4	≤0.10	J$^\pi$: could be mixed with 5/2$^-$ from π5/2[532] Nilsson orbital. dσ/dΩ(25°)=18 μb/sr; A_y(25°)=0.00 *12*.
≈190[b]	5/2$^-$	3		dσ/dΩ(25°)=≤4 μb/sr.
255[b] *4*	7/2$^-$	3	0.11	dσ/dΩ(25°)=43 μb/sr; A_y(25°)=+0.47 *8*.
291[a] *4*	(11/2$^+$)	(5)		dσ/dΩ(25°)=9 μb/sr.
337[c] *4*	3/2$^+$&9/2$^-$	2+5	≤0.10,0.33	E(level): doublet. Nuclear structure factors.: first value for 3/2$^+$, second for 9/2$^-$. dσ/dΩ(25°)=35 μb/sr; A_y(25°)=−0.70 *9* for a doublet.
392[c] *4*	5/2$^+$	2	0.28	dσ/dΩ(25°)=114 μb/sr; A_y(25°)=+0.35 *7*.
442[b] *4*	11/2$^-$	5	1.57	A weak peak for 7/2$^+$ member of the π3/2[411] band near this energy is probably obscured the strong peak from 11/2$^-$ member of the π5/2[532] band (1979Bu01). dσ/dΩ(25°)=220 μb/sr; A_y(25°)=+0.31 *5*.
571[c] *4*	9/2$^+$&(13/2$^-$)	4+(7)	0.12	E(level): doublet. Nuclear structure factors.: for 9/2$^+$; no value listed for (13/2$^-$). dσ/dΩ(25°)=24 μb/sr; A_y(25°)=−0.16 *14* for doublet.
704[b] *4*	(15/2$^-$)	(7)		dσ/dΩ(25°)=23 μb/sr.
806[e] *4*	(3/2$^+$)	(2)	0.11	dσ/dΩ(25°)=37 μb/sr; A_y(25°)=−0.35 *9*.
887 *4*				dσ/dΩ(25°)=17 μb/sr; A_y(25°)=−0.02 *12*.
1076[d] *4*	1/2$^+$	0	0.19	dσ/dΩ(25°)=85 μb/sr; A_y(25°)=−0.22 *7*.
1140[d]	5/2$^+$&(3/2$^+$)	2	0.40	Nuclear structure factors.: for 5/2$^+$, no value listed for an uncertain (3/2$^+$) at ≈1140 keV. dσ/dΩ(25°)=175 μb/sr; A_y(25°)=+0.17 *5*.
≈1260				dσ/dΩ(25°)=18 μb/sr; A_y(25°)=0.00 *14*.
≈1287[#]				dσ/dΩ(25°)=27 μb/sr; A_y(25°)=−0.08 *10*.
≈1310[d]	(7/2$^+$)	(4)	0.32	dσ/dΩ(25°)=42 μb/sr; A_y(25°)=−0.11 *10*.
1488[#]				J$^\pi$: L+1/2 from $A_y(\theta)$. dσ/dΩ(25°)=38 μb/sr; A_y(25°)=+0.31 *7*.
1635[#]				J$^\pi$: L+1/2 from $A_y(\theta)$. dσ/dΩ(25°)=31 μb/sr; A_y(25°)=+0.18 *9*.
≈1670				dσ/dΩ(25°)≈30 μb/sr for 1670+1690; A_y(25°)=0.00 *10* for 1670+1690.
≈1690				dσ/dΩ(25°)≈30 μb/sr for 1690+1670; A_y(25°)=0.00 *10* for 1690+1670.
1765[#]				J$^\pi$: L+1/2 from $A_y(\theta)$. dσ/dΩ(25°)=33 μb/sr; A_y(25°)=+0.32 *11*.
≈1803				dσ/dΩ(25°)≈60 μb/sr for 1803+1825; A_y(25°)=0.00 *6* for 1670+1690.
≈1825				dσ/dΩ(25°)≈30 μb/sr for 1825+1803; A_y(25°)=0.00 *10* for

Continued on next page (footnotes at end of table)

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^{159}Eu Levels (continued)

E(level)[†]	Comments
	1825+1803.
1905	dσ/dΩ(25°)=43 μb/sr; A_y(25°)=−0.05 *7*.
1954	dσ/dΩ(25°)=35 μb/sr; A_y(25°)=+0.07 *9*.
≈2460	J^π: L+1/2 from $A_y(\theta)$. dσ/dΩ(25°)≈80 μb/sr; A_y(25°)=+0.05 *7*.

[†] Uncertainties stated by 1979Bu05 as ≤4 keV for levels below ≈1.2 MeV, and larger for levels of higher energies.
[‡] Authors′ assignments deduced from cross sections and analyzing powers; these are the same as those in Adopted Levels.
[#] The $\sigma(\theta)$ and $A_y(\theta)$ plots shown in Fig. 7 of 1979Bu05, but no spin-parity assigned.
[@] The L-transfers are not explicitly stated in the tabular data in 1979Bu05, but are implied from the assigned J^π values from $\sigma(\theta)$ and analyzing powers, and some of the L-transfers are mentioned by the authors in the text.
[&] Nuclear structure factor=dσ/dΩ(exp)/[2N×dσ/dΩ(DWBA)]; 1979Bu05 mention that uncertainty could be 30-50% due to ambiguities in the choice of optical model parameters. Comparison is made with the theoretical values from Nilsson model.
[a] Band(A): π5/2[413].
[b] Band(B): π5/2[532].
[c] Band(C): π3/2[411].
[d] Band(D): π1/2[420].
[e] Band(E): π1/2[411].

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Band(D): π1/2[420]

$(7/2^+)$ **≈1310**

$5/2^+$&$(3/2^+)$ **1140**

$1/2^+$ **1076**

Band(E): π1/2[411]

$(3/2^+)$ **806**

Band(B): π5/2[532]

$(15/2^-)$ **704**

Band(C): π3/2[411]

$9/2^+$&$(13/2^-)$ **571** **$9/2^+$&$(13/2^-)$** **571**

$11/2^-$ **442**

$5/2^+$ **392**

$3/2^+$&$9/2^-$ **337** **$3/2^+$&$9/2^-$** **337**

Band(A): π5/2[413]

$(11/2^+)$ **291**

$7/2^-$ **255**

$5/2^-$ **≈190**

$9/2^+$ **≈172**

$7/2^+$ **75**

$5/2^+$ **0**

$^{159}_{63}Eu_{96}$