

# THE STRUCTURE OF LOW-LYING EXCITED STATES OF $^{69}\text{Ga}$ AND $^{71}\text{Ga}$

D.S. Andreev, K.I. Erokhina, V.S. Zvonov and  
I.Kh. Lemberg

A.F. Ioffe Physico-Technical Institute, USSR Academy of  
Sciences, Leningrad, USSR

The Coulomb excitation of  $^{69}\text{Ga}$  and  $^{71}\text{Ga}$  has been studied in [1,2] using cyclotron-accelerated  $\alpha$ -particles with energies from 6 to 8 MeV as well as 27 MeV carbon ions and 36 MeV nitrogen ions as projectiles.

Measurements of the gamma-ray output and the Doppler shift attenuation yielded the values of the transition probabilities ( $B(E2)$  and  $B(M1)$ ).

In [3] the results of calculations of the structure of low-lying excited states for  $^{69}\text{Ga}$  within the framework of the semimicroscopic Alaga model taking into account the coupling of the cluster of three valent protons to the quadrupole oscillations of the core with  $Z=28$  are reported.

In the table the experimental and calculated values of  $B(E2)_{\downarrow}$  and  $B(M1)_{\downarrow}$  for  $^{69}\text{Ga}$  are listed for comparison.

As may be seen from the table, in a number of cases the experimental and calculated values are significantly different.

What is more, a rather general conclusion from the model, i.e. that in case of three particles above the core  $B(E2) (3/2_2 \rightarrow 3/2_1) > B(E2) (1/2_1 \rightarrow 3/2_1)$ , is not confirmed. It has been known that in case of one particle above the core just the opposite occurs, as for copper isotopes:  $B(E2) (3/2_2 \rightarrow 3/2_1)$  is substantially less than  $B(E2) (1/2_1 \rightarrow 3/2_1)$ .

V. Paar suggested [4] that the experimentally observed 871.7 keV transition may correspond to the level excitation of a different nature, for instance, of 4p-1h type. In such a case, the theoretical value of  $B(E2) (3/2_2 \rightarrow 3/2_1) = 0.031 e^2 b^2$  should correspond to the experimental value of

Transi- tion $I_f \rightarrow I_i$	Experimental results			Theoretical values		
	E (keV)	B(E2) $\dagger$ ( $e^2b^2$ )	B(M1) $\dagger$ (n.m.) $^2$	E (keV)	B(E2) $\dagger$ ( $e^2b^2$ )	B(M1) $\dagger$ (n.m.) $^2$
1/2 3/2	318.4	0.013 (2)	0.01 <sup>c)</sup>	318	0.012	0.17
5/2 3/2	574.0	0.00041 (8)	0.047 <sup>c)</sup>	524	0.004	- <sup>b)</sup>
3/2 3/2	871.7	0.0041 (10)	0.25 <sup>d)</sup>	930	0.031	0.11
1/2 3/2	1027.0	0.0028 (10)	0.009 <sup>e)</sup>	1100	0.025	0.01
3/2 3/2	1106.4	0.019 (6)	0.17 <sup>d)</sup>	1520	0.002	0.01
7/2 3/2	1136.1	0.012 (3)	0	1170	0.037	0
5/2 3/2	255.4	0.020 (5)	0	206	0.013	0

- NOTES: (a) Spin values for all levels, except for the 1106.4 keV level, are given in |6|. The 1106.4 keV level spin is, as has been presented in |7|.
- (b) For 1-forbidden transitions no calculations of B(M1) were made.
- (c)  $\tau$  is as given in |8|, when calculating B(M1).
- (d)  $\tau$  is from |2|.
- (e)  $\tau$  is from |9|.

$B(E2) (3/2_3 \rightarrow 3/2_1) = 0.019 e^2b^2$  for the 1106.4 keV level. Both values are in agreement. They are large enough and larger than  $B(E2) (1/2_1 \rightarrow 3/2_1)$ .

Nevertheless, even considering the above, the causes of discrepancy between the experimental and predicted values of B(E2) in cases of the  $5/2_1 \rightarrow 3/2_1$  and  $1/2_2 \rightarrow 3/2_1$  transitions remain unclarified.

As previously noted in |3|, one likely cause is the fact that the core with  $Z=28$  cannot be considered as a closed one. It is possible that the choice of the parameters used in the calculations is not optimum.

The results of comparison between the values of B(E2) for  $^{71}\text{Ga}$  measured by the authors and values of the calcula-

tion made within the framework of the shell model considering the residual interaction between three protons in the field of a double-magic core for  $^{68}\text{Ni}$  are presented in |5|. The experimental values of  $B(E2)$  used in this study have recently been improved in |1|.

#### REFERENCES

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