SHAPE FLUCTUATION AND EXTRACTION OF THE COLLISIONAL DAMPING WIDTH OF THE GIANT DIPOLE RESONANCE IN MASS REGION A~85

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Giant dipole resonance (GDR) is a fundamental mode of excitation and its strength function is characterized by resonance energy and width. One of the important issues in the GDR studies at finite temperature is to separate the contributions of the widths from the different damping mechanisms so that their dependence on temperature and angular momentum or rotational frequency can be studied. The spreading of the giant resonance strength is mainly due to two mechanisms. The first mechanism is the collisional damping. It arises due to coupling of giant vibrational modes to small amplitude quantal fluctuations of the nuclear surface. The other mechanism is the coupling of GDR vibration to large amplitude fluctuations (shape fluctuations) of nuclear surface that are induced by temperature.

In the present study, the collisional damping width or the intrinsic width (Γ_0) for the reaction ^{28}Si+^{58}Ni at E(^{28}Si)=100 and 125 MeV [1] have been extracted under the shape fluctuation model analysis. The shape fluctuations are described by the Gaussian distributions in β and γ (shape parameters) [2]. The calculated energy dependent average strength function is used in the statistical model code CASCADE [3]. The calculated gamma spectrum (folded with detector response) is then compared with the experimental gamma spectrum in a chi-square minimization procedure to extract the value of Γ_0. The average value of β extracted is ~ 0.25 ± 0.07. For $<T>$ ~ 1.3 MeV, the values of Γ_0 are found to be constant with $<J>$. Above an average temperature of $<T>$ ~ 1.3 MeV, Γ_0 shows a mild T dependence, which is expected from a surface coupling model [4]. A very small value of Γ_0 (~ 3.8 MeV), below $<T>$ ~ 1.3 MeV is difficult to understand. A detailed calculation of the potential energy surfaces for these nuclei would be very interesting.

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[1] S. K. Rathi *et* al., Phys. Rev. C 67, 024603 (2003).

[2] D. R. Chakrabarty *et* al., Phys. Rev. C 53, 2739 (1996).

[3] F. Puhlhofer, Nucl. Physics. **A** 280 (1977) 267.

[4] P. F. Bortignan *et* al., Nucl. Phy. **A** 460, 149 (1986).