STRENGTH DISTRIBUTIONS IN LIGHT HEAVY-ION RESONANCES

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The physical picture that is associated with the fragmentation of a simple excitation due to coupling to background states occurs very frequently in nuclear physics[1]. The cluster or molecular states underlying the light heavy-ion resonances are also often interpreted in this way[1,2]. Here the simple configuration is the single (i.e. bombarding) particle resonance or some other cluster configuration. The quantitative analysis of these intermediate structures may result in some useful information.

Recently we have performed such calculations for a few examples. In Ref. 3 we have analysed three sets of data of cluster or molecular excitations by two methods[4,5]. The $^{12}C+^{12}C$ resonances were treated as fragments of the $\ell=4,6,$ and 8 shape resonances in the first set, and $5/2^+$, $7/2^+$ α-cluster states of ^{19}F as well as 0^+ resonances of the $^{24,26}Mg+\alpha$ systems have been considered in the others. The parameters of the simple states $(E,\Gamma^{\uparrow},\Gamma^{\downarrow})$ have been deduced, and the results of the two methods are in good agreement. The coupling interaction turned out to be moderately week in all cases.

The highly excited 2^+ states of ^{24}Mg which are populated in various reactions have been considered in Ref.6. The fragments of the 2^+ single particle resonance and those of the isoscalar GQR appear in overlapping energy regions. In such a case the intermediate structure analysis may help in the comparision of the fragmented simple configurations.

Finally in Ref.7. we have determined the experimental alpha-particle strength functions from the resonance data of elastic alpha-scattering on target nuclei with mass number $12\leq A\leq 40$. Due to the missing parameters these curves approximate the real strength distributions from below.Nevertheless, their comparison with a model prediction may result in some nontrivial conclusion. We have obtained theoretical strength functions from a local optical potential given by the systematics of Ref. 9,10. Based on this comparison the imaginary part of the potential seems to be overestimated in the resonance region. The real part satisfies better the requirements of the experimental curves, but we did not obtain a general agreement.

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