Splitting of the Pygmy Dipole Resonance

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In recent years investigations have been made to study the electric Pygmy Dipole Resonance (PDR) systematically, mainly in semi-magic nuclei. For this purpose the well understood high resolution ($\gamma,\gamma'$) photon scattering method is used [1]. In ($\alpha,\alpha'$) coincidence experiments at $E_\alpha = 136$ MeV a similar energy resolution and a high selectivity to $E_1$ transitions can be obtained at the Big-Bite Spectrometer (BBS) at KVI, Groningen. In comparison to the ($\gamma,\gamma'$) method a structural splitting of the PDR could be observed in the N=82 nuclei $^{138}\text{Ba}$ and $^{140}\text{Ce}$ and in the Z=50 isotope $^{124}\text{Sn}$ [2,3,4]. There is a low energy part which could be excited in ($\gamma,\gamma'$) as well as in ($\alpha,\alpha'$) and there is a high energy part which could only be observed in ($\gamma,\gamma'$). The experimental results and theoretical QPM and RQTBA calculations on $^{124}\text{Sn}$ will be presented which are able to reproduce the splitting of the PDR. The low-lying group of $J^\pi = 1^-$ states seem to represent the more isoscalar neutron-skin oscillation of the PDR while the energetically higher lying states seemingly belong to the tail of the isovector Giant Dipole Resonance (GDR).

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