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On the nature of the Pygmy Dipole Resonance

The investigation of the same nuclear excitation using different complementary probes can yield important details on the underlying structure of the excitation mode. In the case of the Pygmy Dipole Resonance (PDR) our experiments using the (α,α′γ) reaction at Eα = 136 MeV have revealed a structural splitting of the PDR when compared to corresponding (γ,γ′) results: Whereas the low energy part of the E1 strength is excited by the (γ,γ′) as well as by the (α,α′γ) reaction, the high energy part is not excited in the α-scattering experiment [1,2,3]. This different excitation pattern is an experimental evidence for different structures of the two groups of 1− excitations. Corresponding investigations of the isoscalar and isovector E1 strength in QPM and RQTBA calculations show a qualitative agreement to these experimental observations and identify the lower energy E1 excitations as the neutron-skin oscillation often assigned to the PDR. The combined results of experiment and calculations thus provides for the first time an experimental identification of the E1 excitations showing the structure associated with the PDR picture of a neutron-skin oscillation [4]. This shows the importance of experimental investigations using complementary probes.

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[2] J. Endres et al., Phys. Rev. C 80, 034302 (2009)
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