

PROBING THE CHARACTER OF THE PYGMY DIPOLE RESONANCE

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The electric dipole strength distribution in atomic nuclei is dominated by the well known isovector Giant Dipole Resonance (IVGDR). In neutron-rich nuclei an additional concentration of low-lying $E1$ strength, the electric Pygmy Dipole Resonance (PDR), below and around the particle threshold has been observed. Real-photon scattering experiments are a common tool to study the PDR, because they provide a highly selective excitation of low-spin states from the ground state. On the contrary, e.g. α particles are a complementary probe that interacts with the nucleus also through strong interaction.

Therefore the $(\alpha, \alpha'\gamma)$ reaction was used systematically in the semi-magic nuclei ^{140}Ce , ^{138}Ba , ^{124}Sn , the non-magic nucleus ^{94}Mo , and the lighter and doubly-magic nucleus ^{48}Ca , in order to gain knowledge about the PDR structure [1, 2, 3]. The $(\alpha, \alpha'\gamma)$ coincidence experiments were performed at the Big-Bite Spectrometer (BBS) at KVI, Groningen, together with an array of HPGe detectors for γ spectroscopy. Experimental methods and results for the experiments with a focus on ^{94}Mo and ^{48}Ca will be presented.

Supported by the DFG (ZI 510/4-1 and ZI 510/4-2), by the EU under EURONS Contract No. RII3-CT-2004-506065 in the 6th framework programme, and by the Alliance Program of the Helmholtz Association (HA216/EMMI). V.D is member of the Bonn-Cologne Graduate School of Physics and Astronomy.

References

- [1] D. Savran, *et al.*, Phys. Rev. Lett., **97**, (2006), 172502
- [2] J. Endres, *et al.*, Phys. Rev. C, **80**, (2009), 034302
- [3] J. Endres, *et al.*, Phys. Rev. Lett., **105**, (2010), 212503