

Collective dipole excitations in neutron-rich nuclei from ^{132}Sn mass region, the nuclear symmetry energy and neutron skins

Adam Klimkiewicz, IF UJ, Krakow

May 30, 2008

The dipole strength distributions in heavy unstable neutron-rich nuclei $^{129-132}\text{Sn}$ and $^{133,134}\text{Sb}$ have been measured with the LAND-FRS setup at GSI, Darmstadt, by exploiting Coulomb dissociation of high-energy radioactive beams. A sizable fraction of “pygmy” dipole strength, energetically located below the giant dipole resonance, is observed in all of these nuclei [1, 8]. A comparison with available low-lying strength data in stable nuclei [2, 3, 4] indicates a clear trend of strength increasing with the proton-to-neutron asymmetry. Advanced theoretical models predict a strong correlation between the pygmy strength and parameters describing the density dependence of the nuclear symmetry energy, and also with the thicknesses of the neutron skins [5, 6]. The experimental pygmy strength revealed in neutron-rich even-even Sn isotopes has been translated, by utilizing the RQRPA theoretical approach [7], into parameters of the symmetry energy $a_4=32.0 \pm 1.8$ MeV and $p_o = 2.3 \pm 0.8$ MeV/fm³ and neutron skin thickness $R_n - R_p$ of 0.24 ± 0.04 fm in doubly magic ^{132}Sn nucleus.

References

- [1] P.Adrich *et al.*, Phys. Rev. Lett.**95**(2005)132501
- [2] A.Volz *et al.*, Nucl. Phys. A**779**(2006)1
- [3] N.Ryezayeva *et al.*, Phys. Rev. Lett.**89**(2002)272502

- [4] K.Govaert *et al.*, Phys. Rev. C **57**(1998)2229
- [5] R.J.Furnstahl, Nucl. Phys. A**706**(2002)85
- [6] J.Piekarewicz, Phys. Rev. C **73**(2006)044325
- [7] N.Paar *et al.*, Phys. Lett. B**606**(2005),288-294
- [8] A. Klimkiewicz *et al.*, Phys. Rev. C**76**(2007)051603