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Soft dipole resonance and halo structure of ^{11}Li[1]

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The discovery of the nuclear halo [1,2] in rare isotopes has ushered a new era in nuclear science breaking the boundaries of conventional concepts. The halo properties elucidate new features that till date remain a challenge to decipher from fundamental principles. Our knowledge on the halo is still gradually unfolding and reaching new levels of precision as efforts continue towards new experimental developments. In recent times, low-energy reactions in inverse kinematics have become possible providing a wealth of new structure information. In this presentation we will introduce a new reaction spectroscopy facility, IRIS, [3] with a novel thin windowless solid H_2/D_2 target for studying transfer and inelastic scattering reactions of rare isotopes with very low yields. It was postulated [4] that the loosely bound halo of two neutrons may lead to a core-halo oscillation resulting in dipole resonance(s) at very low excitation energy, called soft dipole resonance. Despite decades of search for this new phenomenon using various techniques, such as [5-9], no firm conclusion was reached. The presentation will discuss new results from IRIS that shows evidence of a soft dipole resonance state and further unveils its isoscalar character [10]. New results of neutron transfer from ^{11}Li will be presented showing resonance state(s) in the neutron unbound ^{10}Li subsystem hence facilitating a description of the wavefunction of ^{11}Li. [1] I. Tanihata et al., Phys. Rev. Lett. 55 (1985) 2676. [2] P.G. Hansen and B. Jonson, Eur. Phys. Lett. B 4 (1987) 409. [3] R. Kanungo, Hyperfine Interact, 225 (2014) 235 [4] K. Ikeda, Nucl. Phys. A 538 (1992) 355c. [5] T. Kobayashi et al., Nucl. Phys. A 538 (1992) 343c. [6] M. G. Gornov et al., Phys. Rev. Lett. 81 (1998) 4325. [7] A.A. Korshennikov et al., Phys. Rev. C 53 (1996) R537. [8] T. Nakamura et al., Phys. Rev. Lett. 96 (2006) 252502. [9] M. Zinser et al., Nucl. Phys. A 619 (1997) 151. [10] R. Kanungo et al., Phys. Rev. Lett. 114 (2015) 192502.

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