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Probing the pygmy dipole resonance of ^{50}Ca by Coulomb excitation

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Astrophysical objects such as neutron star formation and structure and supernovae explosion, as well as nuclei properties and structure are described using the equation of state of nuclear matter. However, the coefficients of the equation state describing the nuclear matter with a huge charge asymmetry, notably the symmetry energy, is lacking constraints [1,2].

When a medium-to-heavy neutron-rich nuclei near the neutron drip-line is submitted to an external electric field, its response is concentrated in the Giant Dipole Resonance (GDR) and particularly in its low lying part, referred as the Pygmy Dipole Resonance (PDR). The electric dipole polarizability a_D , which represents the inversely energy-weighted sum of dipole strength, allow to quantify this response.

Neutron skin presents a strong correlation to symmetry energy and can be constrained through the use of a_D [3,4], and theoretical calculation has shown that the PDR strength has a rapid increase with the neutron number number in the range $15 < N \leq 16$, $28 < N \leq 34$, and $50 < N \leq 56$ [5]. In this context, both ^{50}Ca and ^{52}Ca , who respectively have 30 and 32 neutrons, has been a subject to experimental investigation: they were produced in flight at RIBF – RIKEN and they have been submitted to coulomb excitation using a ^{208}Pb target in order to probe the neutron number dependence of PDR. We will present preliminary results for ^{50}Ca .

[1] F. J. Fattoyev and J. Piekarewicz – Phys. Rev. C 86, 015802 (2012)

[2] J. Margueron et al – Phys. Rev. C 97, 025805 (2018)

[3] A. Tamii et al. – Phys. Rev. Lett., 107 062502 (2011)

[4] A. Tamii et al. – Eur. Phys. J. A, 50 (2014) 28

[5] T. Inakura et al – Phys. Rev. C 84, 021302R (2011)

Collaboration

SAMURAI collaboration

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