Theoretical studies of isovector soft dipole mode

I. A. Egorova[1], S. N. Ershov[1], A. S. Fomichev[2], L. V. Grigorenko[2], M. S. Golovkov[2], Yu. L. Parfenova[2]

[1] *Bogoliubov Laboratory of Theoretical Physics, JINR, RU-141980, Dubna, Russia*
[2] *Flerov Laboratory of Nuclear Reactions, JINR, RU-141980, Dubna, Russia*

Contact email: *i.a.egorova@gmail.com*

The population of continuum states in ^{6}Be was studied by using a charge-exchange reaction with ^{6}Li beam at ACCULINNA fragment-separator (JINR, Russia) [1]. A strong population of the negative-parity states by $\Delta L = 1$ transitions far exceeding population of the well-known 0^+ and 2^+ resonances was observed in this work. It was suggested in [1] that this can be interpreted in analogy to the soft dipole mode (SDM) in ^{6}He as a novel phenomenon: isovector soft dipole mode (IVSDM).

In contrast with *resonances*, which properties should be independent on the details of population dynamics, the *excitation modes* are strongly dependent on the initial structure and the reaction mechanism. The classification of the dipole excitations in $A = 6$ nuclei is illustrated in Figure 1. The soft excitation (SDM and IVSDM) are connected with cluster degrees of freedom (e.g. with the very low binding energy of the halo nucleon(s) in ^{6}He), while excitation modes as the giant dipole resonance (GDR) are collective on the level of all nucleons.

We have performed theoretical studies of IVSDM in ^{6}Be in a three-body α+p+p model [2,3]. We emphasize analogies with SDM as well as several important differences between the SDM and the IVSDM, which enable us to consider it as novel phenomenon.

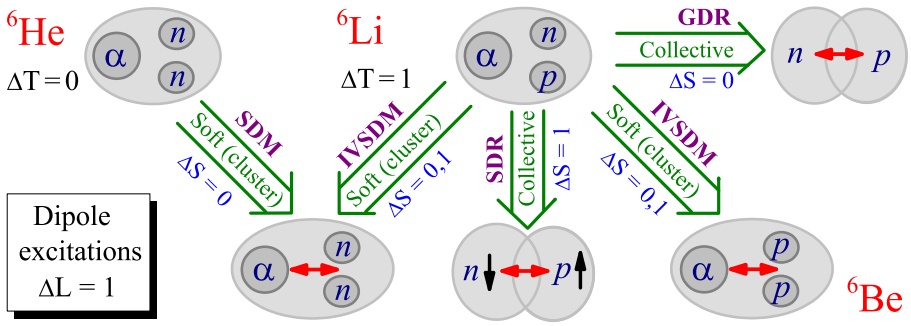

Figure 1: *Classification scheme of dipole excitations in ^{6}He and ^{6}Be produsd in charge-exchange reactions with ^{6}Li [1]. The appearance of the soft dipole mode in the electromagnetic excitation of ^{6}He is shown for comparison. Given is the illustration of difference between the cluster excitations (modes), i.e. the soft dipole mode (SDM) and isovector soft dipole mode (IVSDM), and the collective excitations (resonances), i.e. the giant dipole resonance (GDR) and spin-dipole resonance (SDR).*

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[2] L.V. Grigorenko, *et al.*, Phys. Rev. C 80, 034602 (2009).
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