Contribution ID: **159** Type: **Oral talk (15 min + 5 min questions)**

INTERPLAY OF ORDER AND CHAOS IN NUCLEAR STRUCTURE

Friday, 15 July 2022 17:30 (20 minutes)

We demonstrate the universality of the Random Matrix approach as a tool to detect the chaos-order transition in atomic nuclei. In particular, shell structure phenomenon in octupole deformed nuclei is discussed as the example of the interplay of regular and chaotic dynamics within the harmonic oscillator model with octupole deformations as the effective nuclear structure shell model [1]. It is shown that the chaos-order transition can occur at certain conditions which give rise to dynamical symmetries in chaotic dynamics of nucleons, and may explain the dominance of prolate nuclear shape in nature.
Naturally, one would expect that chaotic component of intrinsic structure of a finite many-body quantum system, exhibited in its spectral properties at low excitation energy, may transform from the secondary constituent to the dominant one in basic characteristics of the considered system with increase of the excitation energy. This might be primarily true in the description of decay widths of nuclear giant dipole resonances, highly excited collective states which centroids are located above the neutron threshold. Indeed, our analysis of the dipole strength distribution in the lead region indicates on the onset of statistical properties close to those of the Gaussian Orthogonal Ensembles. We show that employment of the random distribution for the coupling between microscopic one-phonon states and two-phonon states, generated by the Gaussian Orthogonal Ensembles distribution, gains a better insight into the description of general properties of the spreading widths [2].

1. R.G. Nazmitdinov, Phys.Part.Nucl.Letts 16, 159 (2019).
2. A.P.Severyukhin, S.Åberg, N.N.Arsenyev, R.G. Nazmitdinov, Phys. Rev.C 104, 044327 (2021).

The speaker is a student or young scientist

No

Section

1. Nuclear structure: theory and experiment

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