Contribution ID: **96** Type: **Oral report**

DISCRETE TRANSFORMS IN QUANTUM CHAOS

Thursday, 15 October 2020 17:40 (25 minutes)

We had suggested in our previous publications (see, e.g. [1-2]) the definition of quantum chaos based on the Liouville-Arnold theorem. It states that a system featuring N degrees of freedom is regular if it has M = N linearly independent first integrals of motion in involution. First (global, isolating) integrals of motion are those that, by Noether's theorem, are associated with the symmetry of the system (that is, with the presence of a group of transformations under which the Hamiltonian of the system is invariant). Therefore, it is natural to define a chaotic quantum system as that whose symmetry is so low that the number M of its good quantum numbers is smaller than the number N of its degrees of freedom. We had also stressed [3] that only the Wigner distribution law might be a true signature of the system's hard chaos, while the popular belief about the Poisson level distribution for the regular system is wrong and misleading.
Therefore, we suggested a rather simple way to find whether the quantum system under consideration is chaotic: just to compare the number N of its degrees of freedom with the number M of its integrals of motion (good quantum numbers). If the system's symmetry is so low that the number of its integrals of motion is smaller than the number of its degrees of freedom, then it is chaotic.
However, Noether's theorem is proved only for continuous transforms while in quantum mechanics we face also symmetries arising from discrete transforms, like space and time inversion. The question is whether presence of these symmetries should be taken into account in the above analysis of system's chaoticity.
We demonstrate that an additional good quantum number of parity plays a role of an integral of motion and should be taken into account in calculating M. Time-reversal invariance does not generate any corresponding good quantum number (or integral of motion).

1. V.E.Bunakov// Phys. At. Nucl. 2016. V.79. P.394.
2. V.E.Bunakov// Phys. At. Nucl. 2016. V.79. P.995.
3. V.E.Bunakov// in "LXIX Internationl Conference "NUCLEUS-2019"(Dubna, 1–5 July 2019) Book of Abstracts". Dubna: JINR, 2019, P.156.

Primary author: Prof. BUNAKOV, Vadim (PNPI NRC "Kurchatov Institute")

Presenter: Prof. BUNAKOV, Vadim (PNPI NRC "Kurchatov Institute")

Session Classification: Section 1. Experimental and theoretical studies of the properties of atomic nuclei

Track Classification: Section 1. Experimental and theoretical studies of the properties of atomic nuclei.