Ultrametric models in theory of symbolic sequences.

Motivated by possible applications of the ultrametric random processes in complex biological systems we are going to discuss a random process on a hierarchical space of states, which is described by a master equation with a modified pseudo-differential operator Q of ultrametric diffusion [1]. Contrary to the known p-adic model for description of the ligand binding kinetics in Myoglobin [2], where the diffusion is described by Vladimirov p-adic pseudodifferential operator, which, in particular, implies degeneration of the free-energy minima of the modelled system, the operator Q represents a stochastic ultrametric diffusion joined with a deterministic dynamics. The latter, to some extent, can be considered as a flux against the potential gradient. Interesting, that the above random process can be mapped on a process defined on a set of cyclic symbolic sequences. We are going to discuss the properties of such process and of the operator Q.

The symbolic sequences is a fundamental concept of modern science and technology, and widely used in such fields as information theory and bioinformatics, analysis of experimental and financial data, theory of chaos and dynamical systems. In the lecture we are going to spend some time for discussion of conceptual extensions of the above ultrametric model for applications in theory of quantum chaos and bioinformatics [3].

[1] B.Gutkin, V.Al.Osipov, "Spectral Problem of Block-rectangular Hierarchical Matrices" J. Stat. Phys. **143** (2011) 72

[2] V.A.Avetisov, A.H.Bikulov, S.V.Kozyrev, V.Al.Osipov, "p–Adic Models of Ultrametric Diffusion Constrained by Hierarchical Energy Landscapes" *J. Phys. A: Math. Gen.* **35** (2002) 177

[3] V.Al.Osipov "Wavelet Analysis on Symbolic Sequences and Two-Fold de Bruijn Sequences" J. Stat. Phys. **164** (2016) 142