Contribution ID: **346** Type: **Oral report**

On the Possibilities of Using the Basic Principles of Quantum Field Theory for Modeling the Interaction of Neutrinos with a Strongly Inhomogeneous Medium

Wednesday, 22 September 2021 16:20 (25 minutes)

Recently, much attention has been paid to the effects of interaction of quantised fields with macro-objects. This area of research is important for the development of both theoretical and experimental physics, and there is every reason to believe that their results will find many scientific and technical applications. Here, to construct the models necessary for theoretical research, the Symanzik approach can be used, which was initially proposed for the description of quantum field systems with inhomogeneous space-time [1]. It was developed to describe the effects of the interaction of fields of quantum electrodynamics (QED) with two-dimensional materials. The requirements of locality, renormalisability and gauge invariance impose essential restrictions on the admissible form of the modified Lagrangian. To describe in the framework of a unified model all the effects of interaction of a homogeneous and isotropic material plane with QED fields, in the most general case, no more than nine additional dimensionless constants are sufficient [2-9].

It is proposed to apply the Symanzik approach to modeling the processes of neutrino propagation in a strongly inhomogeneous medium, taking into account the possibility of calculating the characteristics of the oscillation regime [10-12]. Scattering of neutrinos on a homogeneous isotropic plane is considered as a simple example. The analysis of the influence of their collisions with the plane on the oscillation processes is carried out.

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Session Classification: Section 4. Relativistic nuclear physics, elementary particle physics and high-energy physics

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