CURRICULUM VITAE

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Scientific interests and main results:

- Phenomenology of multiparticle production in high-energy hadronic interactions.

Main directions: thermodynamical description of multiparticle production mechanism and study of its applicability limits.

Main results: there were found indications on the existence of the *local* (in space-time) thermodynamical equilibrium not only at latest stages of the process of multiparticle production but at intermediate ones. New criteria for thermolization, based on the dilepton spectra analysis [4] were proposed and applied to experimental data. It had been shown [4, 5] that there exist a domain in the inclusive particle production spectra, which is compatible with the thermodynamical description [1, 2, 4, 5]. The found ranges of this doman are in agreement with the position of the crossover [8] in p_t dependence of inclusive pion spectra. Detailed analysis of particle spectra inside this domain had allowed to get estimates for effective temperature at different stages of hadronic system space-time expansion [4, 5], as well as estimates for equation of state for hadronic matter [1, 4, 5, 6]. An interesting (however optimistic) interpretation of inclusive particle spectra analysis had also provided a first estimate for temperature of phase transition from hadronic matter to quark-gluon plasma to be at $T_{eff} \sim 0.25$GeV. Success of thermodynamical (classical) treatment of the multiparticle production process had allowed to extent classical approach to the hadron-nucleus collision [3, 7, 9, 11, 12]. The whole picture were summarized in Ph. D. thesis [10].

- Monte Carlo simulations of quantum systems.

Main directions: simulations of Feynman path integral, application to nonpertubative phenomena in QCD, fermion simulation.

Main results: Our first work [13] is devoted as to novel developments of the method, as to study generic features of instantons on the example of two-well quantum mechanical problem. Futher the method for simulations of Feynman path integral was developed for relativistic particles in the external field [14], which allows, in principle, to calculate (in quenched approximation) scalar and fermion loops in external QCD potentials. In works [16, 17] Mothe Carlo methods were applied to nonrelativistic sum rules for $b\bar{b}$ quark production. It were found that Coulomb-like forces dominate for this system. As a result, we impose coming from data restrictions on the b-quark mass and QCD parameter $\Lambda_{\bar{m}s}$.

- Chaotical and disorder systems in quantum and classical systems.

Main directions: banded random matrix (BRM) model, quantum kicked rotator (QKR) model, interrelevance between chaos and disorder.

Main results: in the work [20, 22] ising BRM model we have calculated the "time-averaged" density-density correlator, known in the chaodynamics as "steady-state distribution", where it has been intensively studied in the context of QKR model. More recent works [24, 25] are devoted to a longstanding problem of quantum resonances in QKR model. A new approach to the problem is proposed, based on mapping of the QKR problem onto the SU[q] group. Generic features of the time evolution, their dependence on the detuning from the resonances were studied in detail. Near each of the resonances a domain of *regular* motion is found, where a pertirbation theory is developed, which for the resonances with order $q \geq 4$ is found to be supercovergent [25, 28]. Most recent works address to a problem of large statistical

fluctuations [27, 29, 30] and to novel classical and quantum phenomena in the Frenkel-Kontorova chain [31, 32, 35], the generic model of incommensurate structures in the solid state physics.

- Quantum Computing.

Main directions: Influence of static imperfections and enviroment on quantum computations.

Main results: It was shown, that Grover quantum algorithm with respect to strength of static imperfection has the domain of stability [33]: inside this domain the operation subspace of algoritm is low-dimentional, while outside this subspace is completely broken; the transition is in fact a quantum phase transition, and the order parameter is the dimensionality of the operational subspace. In [34] we propose some algorithm-independent way of error correction and consider decoherence effects induced by enviroment.

List of Publications

by Oleg V. Zhirov

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