CURRICULUM VITAE

OLEG V. ZHIROV

Born:	May 26, 1952 in Taseevo, Taseevsky rajon, Krasnoyarsky kraj, Russia
Graduated:	1974, Novosibirsk State University, Department of physics.
Practical student:	1974-1976. Novosibirsk Institute of Nuclear Physics.
Postgraduate student:	1976-1979. Novosibirsk Institute of Nuclear Physics.
Scientific degree:	1981. Candidate of Phys.- Mat. Science. (Ph.D.)
Permanent position:	1979-1986: Junior researcher of Novosibirsk Institute of Nuclear Physics, 1986-now: Senior researcher of Novosibirsk Institute of Nuclear Physics.
Teaching:	1993-1996,2003-now. Assistant professor at Novosibirsk State Technical University 1991-2003. Assistant professor at Novosibirsk State University; 1994-1996. Assistant professor at High Colledge of Informatics of Novosibirsk State University.
Visits:	17 Jan.- 14 Apr 2000, 26 Nov. - 24 Dec. 2000, 13 June - 26 July 2001 - Visiting Fellow Researcher at International Center for the the Study of Dynamical Systems, University of Como (Italy). 10 Oct. - 30 Dec. 2001, 20 Oct. - 20 Dec. 2003, 21 June - 14 Sept. 2004 - Visiting Fellow Researcher at Laboratoire de Physique Quantique, UMR C5926 du CNRS, Universite Paul Sabatier (Toulouse, France)

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

References

[1] O.V. Zhirov and E.V. Shuryak, Multiparticle production of hadrons and predictions of Landau theory. Yad. Fiz. **21** (1975) 861.

[2] O.V. Zhirov and E.V. Shuryak, e^+e^- annihilation into hadrons in the hydrodynamical theory of of multiparticle production. Yad. Fiz. **24** (1976) 195.

[3] O.V. Zhirov and E.V. Shuryak, A simple model of collective phenomena in high-energy hadron-nucleus collisions. Yad. Fiz. **28** (1978) 485.

[4] O.V. Zhirov, On the existence of the local termodynamical equilibrium in hadron-hadron collisions. Yad. Fiz. **30** (1979) 1098.

[5] On the applicability limits of parton and hydrodynamical description in hadronic collisions. Preprint INP-79-114 (Novosibirsk, 1979).

[6] E.V. Shuryak and O.V. Zhirov, Vacuum pressure effects in low-p_t hadronic spectra. Phys. Lett. B **89** (1980) 253.

[7] O.V. Zhirov, Hadron-Nucleus collisions. 1. Relativistic cascade models. Preprint INP-81-30 (Novosibirsk, 1981).

[8] O.V. Zhirov, Nontrivial variations of p_t slope as a good tool for separation of production mechanisms. Preprint INP-81-31 (Novosibirsk 1981)

[9] O.V. Zhirov, Hadron-Nucleus collisions. 2. Collective cascade models. Preprint INP-81-58 (Novosibirsk, 1981).

[10] O.V. Zhirov, Thermodynamical stage of the hadron-hadron collision process and its contribution into spectra of produced particles. Ph D thesis, Novosibisk, 1981.

[11] O.V. Zhirov and P.K. Lebedev, On the production of low-energy hadrons in proton-nucleus collisions at 70 GeV. Preprint INP-82-96 (Novosibirsk, 1982).

[12] L.M. Barkov, O.V. Zhirov, P.K. Lebedev, L.A. Makarina, A.P. Mishakova, Yu.N. Pestov, G.V. Fedotovich, Measurement of production cross-sections for production of low-energy hadrons in proton-nucleus collisions at the IHEP accelerator (proposal for experiment) Preprint INP-82-106 (Novosibirsk, 1982).

[13] E.V. Zhirov and E.V. Shuryak, Testing Monte Carlo methods for path integrals in some quantum mechanical problems. Nucl.Phys. **242** (1984) 393.

[14] O.V. Zhirov, Numerical calculation of relativistic propagators via Feynman Path in proper time formalism. Preprint INP 84-128 (Novosibirsk, 1984).

[15] E.V. Shuryak and O.V. Zhirov, Is the explosion of quark-gluon matter found? Phys. Lett. **B171** 199.

[16] E.V. Shuryak and O.V. Zhirov, Sum rules for heavy quarkonia without operator expansion. *in:* Proceedings of VIII International seminar on problems of high-energy physics, vol.1, p.152 (Dubna, 1986).

[17] E.V. Shuryak and O.V. Zhirov, Study of coulomb-type interactions of b-quarks. Nucl.Phys. **B292** (1987) 714.

[18] O.O. Tursunov and O.V. Zhirov, Numerical simulation of fermi systems. Phys. Lett. **222** (1989) 110.

[19] O.V. Zhirov, Probabilistic simulation of fermion path. Preprint INP-89-169 (Novosibirsk, 1989).

[20] O.V. Zhirov. Density-Density Correlators at finite separations in infinite Banded Random Matrices, preprint Budker INP 97-95, Novosibirsk, 1997; chao-dyn/9712001.

[21] G. Casati, B.V. Chirikov and O.V. Zhirov. How long does the quantum chaos last? chao-dyn/9702012 (1997).

[22] O.V. Zhirov. Density-Density Correlators in infinite Random Matrices, chao-dyn/9712001 (1997).

[23] Existence of a long time scale in quantum chaos, Phys. Rev. **E55** (1997) 7757.

[24] V.V. Sokolov, O.V. Zhirov, G. Casati and D.Alonso. Quantum Resonances of the Kicked Rotor and SU(q) group. Phys.Rev.Lett. **84** (2000) 3566.

[25] V.V. Sokolov, O.V. Zhirov, G. Casati and D.Alonso. Quantum resonances and regularity islands in quantum maps. Phys.Rev. **E61** (2000) 5057.

[26] G. Casati, B.V. Chirikov and O.V. Zhirov, How many "arrows of time" do we really need to comprehend statistical laws? Phys. Rev. Lett. **85** (2000) 896.

[27] B.V. Chirikov and O.V. Zhirov, On the Fluctuation Law(s) for Hamiltonian systems (with equilibrium steady state): A Comment on cond-mat/0008421, cond-mat/0009125 (2000).

[28] V.V. Sokolov, O.V. Zhirov, G. Casati and D. Alonso, Phantom of regularity in the sea of quantum chaos, Physica E **9** (2001) 554.

[29] B.V. Chirikov, O.V. Zhirov, Big Entropy Fluctuations in Statistical Equilibrium: The Microscopic Kinetics , nlin.CD/0010056 (2001); JETP **93** (2001) 188.

[30] B.V. Chirikov, O.V. Zhirov, Big Entropy Fluctuations in Statistical Equilibrium: The Fluctuation Law, nlin.CD/0102028 (2001).

[31] O.V. Zhirov, G. Casati, and D.L. Shepelyansky, Fractal Spin Glass Properties of Low Energy Configurations in the Frenkel-Kontorova chain, cond-mat/010107131 (2001); Phys. Rev. E **65** (2002) 026220.

[32] O.V. Zhirov, G. Casati, and D.L. Shepelyansky, Quantum phase transition in the Frenkel-Kontorova chain: From pinned instanton glass to sliding phonon gas, Phys. Rev. E **67** (2003) 056209.

[33] A.A. Pomeransky, O.V. Zhirov, and D.L. Shepelyansky, Phase diagram for the Grover algorithm with static imperfections, quant-ph/0403138, (2004); Eur. Phys. J. **D** 31, 131-135 (2004)

[34] A.A. Pomeransky, O.V. Zhirov, and D.L. Shepelyansky, Effects of decoherence and imperfections for quantum algorithms, quant-ph/0407264, (2004); *in*: Proceedings of ERATO conference (EQSIS'04) (sept.1-5, Tokyo, Japan) p.171 (2004).

[35] O.V. Zhirov, G. Casati, and D.L. Shepelyansky, Phonon modes in the Frenkel-Kontorova chain: exponential localization and the number theory properties of frequency bands, cond-mat/0501188 (2005).