

CURRICULUM VITAE

Dr. Mikhail Stepanov

PERSONAL DETAILS

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Date and place of birth August 6, 1974, Novosibirsk, USSR

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RESEARCH INTERESTS

- Information theory, error-correcting codes
- Turbulence theory
- Non-adiabatic molecular dynamics
- Fiber optics
- Diffusion-limited aggregation
- Data clusterization
- Nonlinear spectroscopy

EMPLOYMENT

- jul 2004 – present** Postdoctoral fellow, T-13 / CNLS, Los Alamos National Laboratory, Los Alamos, NM 87545, USA
- jan 2004 – jun 2004** Research associate, Department of Mathematics, University of Arizona, Tucson, AZ 85721, USA
- nov 2002 – may 2003** Member, School of Mathematics, Institute for Advanced Study, Princeton, NJ 08540, USA
- oct 1999 – dec 2001** Postdoctoral fellow, Physics of Complex Systems, Weizmann Institute of Science, Rehovot 76100, Israel
- may 1999 – present** Research fellow (senior research fellow from November 2003), Photonics Laboratory, Institute of Automation and Electrometry, Novosibirsk 630090, Russia (on leave)

EDUCATION

- jul 1997 – apr 1999** Ph.D. student, Laser Physics Laboratory, Institute of Automation and Electrometry, Novosibirsk 630090, Russia
- sep 1995 – jun 1997** M.Sc. student, Department of Physics, Novosibirsk State University, Novosibirsk 630090, Russia
- sep 1991 – jun 1995** B.Sc. student, Department of Physics, Novosibirsk State University, Novosibirsk 630090, Russia

Ph.D. thesis: “Strong field effects in nonlinear plasma spectroscopy”
M.Sc. thesis: “Diffusive broadening of Autler-Townes doublet”
B.Sc. thesis: “Narrowing of nonlinear resonances in a collisional plasma”
Ph.D./M.Sc./B.Sc. supervisors: D.A. Shapiro and E.V. Podivilov

AWARDS AND DISTINCTIONS

2005 Co-PI in DOE sponsored project “Novel Physics Inspired Approach to Error-Correction”, FY06–08, budget: \$700K
2002 travel grant for “Stochastic PDE and Models of Turbulence” program, Institute for Advanced Study, Princeton
2000 travel grant for Les Houches 2000 Summer School “New Trends in Turbulence”
1998 INTAS grant within the program of the ICFPM for best young physicists-theorists in Russia
1998 George Soros graduate student grant
1995, 1997 B.Sc. and M.Sc. honor diplomas, Novosibirsk State University
1995, 1996, 1997 George Soros student grant

PROFESSIONAL AND TEACHING ACTIVITIES

- Teaching assistant, Spring 2004, MATH 322, University of Arizona
- Teaching assistant, 5 terms, “Methods of mathematical physics”, Novosibirsk State University, Novosibirsk, Russia
- Organizer of “Los Alamos Days 2005” (January 28–29, 2005, University of Arizona)
- Organizer of CNLS summer student seminar, 2005
- Referee for Physical Review Letters, Physics of Fluids
- Mentoring Konstantin Turitsyn, summer GRA, Los Alamos National Laboratory, 2005
- Mentoring Dmitri Zakharov, summer GRA, Los Alamos National Laboratory, 2004

MEDIA COVERAGE

- P. Ball, *Turbulence whips up rainstorms*, Nature Science Update (12 Sep 2002)
- D. Blumenthal, *Weather: rain math*, Newsweek (18 Nov 2002)
- S. Graham, *Turbulence within clouds triggers rain*, Sci. Am. (12 Sep 2002)

PUBLICATIONS

- [21] M.G. Stepanov, V. Chernyak, M. Chertkov, B. Vasic, *Diagnosis of weaknesses in modern error correction codes: a physics approach*, **Phys. Rev. Lett.** **95** (22) 228701 (2005).
- [20] A. Piryatinski, M. Stepanov, S. Tretiak, V. Chernyak, *Semiclassical scattering on conical intersections*, **Phys. Rev. Lett.** **95** (22) 223001 (2005).
- [19] V. Chernyak, M. Chertkov, M.G. Stepanov, B. Vasic, *Error correction on a tree: an instanton approach*, **Phys. Rev. Lett.** **93** (19) 198702 (2004).
- [18] A.M. Balk, G. Falkovich, M.G. Stepanov, *Growth of density inhomogeneities in a flow of wave turbulence*, **Phys. Rev. Lett.** **92** (24) 244504 (2004).
- [17] G. Falkovich, M.G. Stepanov, M. Vucelja, *Rain initiation time in turbulent warm clouds*, physics/0411201, **accepted by J. Appl. Met.**

- [16] S.A. Babin, M.G. Stepanov, D.V. Churkin, D.A. Shapiro, *Coulomb broadening of the peak of electromagnetically induced transparency in plasma*, **Zh. Eksp. Teor. Fiz.** **125** (5) 1092-1099 (2004) [Engl. transl.: **JETP** **98** (5) 953-959 (2004)].
- [15] G. Falkovich, A. Fouxon, M.G. Stepanov, *Acceleration of rain initiation by cloud turbulence*, **Nature** **419**, 151-154 (2002).
- [14] G. Falkovich, M.G. Stepanov, *Role of interaction in causing errors in optical soliton transmission*, **Opt. Lett.** **27** (1) 13-15 (2002).
- [13] G.E. Falkovich, M.G. Stepanov, S.K. Turitsyn, *Statistics of interacting optical solitons*, **Phys. Rev. E** **64** (6) 067602 (2001).
- [12] D. Volk, M.G. Stepanov, *Resampling methods for document clustering*, **cond-mat/0109006**.
- [11] A.I. Chernykh, M.G. Stepanov, *Large negative velocity gradients in Burgers turbulence*, **Phys. Rev. E** **64** (2) 026306 (2001).
- [10] M.G. Stepanov, L.S. Levitov, *Laplacian growth with separately controlled noise and anisotropy*, **Phys. Rev. E** **63** (6) 061102 (2001).
- [9] S.A. Babin, S.I. Kablukov, S.V. Khorev, E.V. Podivilov, V.V. Potapov, D.A. Shapiro, M.G. Stepanov, *Resonant peak in the output spectral profile of an ionic anti-Stokes Raman laser*, **Phys. Rev. A** **63** (6) 063804 (2001).
- [8] Yu.I. Belousov, E.V. Podivilov, M.G. Stepanov, D.A. Shapiro, *Nonlinear resonances free of field and Doppler broadening*, **Zh. Eksp. Teor. Fiz.** **118** (2) 328-339 (2000) [Engl. transl.: **JETP** **91** (2) 287-297 (2000)].
- [7] I. Kolokolov, V. Lebedev, M. Stepanov, *Passive scalar in a large-scale velocity field*, **Zh. Eksp. Teor. Phys.** **115** (3) 920-939 (1999) [**JETP** **88** (3) 506-516 (1999)].
- [6] M.G. Stepanov, *Autler-Townes doublet probed by strong field*, **J. Phys. B** **32** (3) 649-661 (1999).
- [5] D.A. Shapiro, M.G. Stepanov, *Diffusion-broadened line shape near a turning point*, **Pis'ma v Zh. Eksp. Teor. Fiz.** **68** (1) 27-32 (1998) [**JETP Letters** **68** (1) 29-35 (1998)].
- [4] D.A. Shapiro, M.G. Stepanov, *Power broadening of a diffusion resonance*, **Zh. Eksp. Teor. Fiz.** **113** (5) 1632-1648 (1998) [Engl. transl.: **JETP** **86** (5) 888-896 (1998)].
- [3] D.A. Shapiro, M.G. Stepanov, *Diffusion-broadened lineshape under strong field*, **J. Phys. B** **30** (11) L377-L381 (1997).
- [2] E.V. Podivilov, M.G. Stepanov, D.A. Shapiro, *Narrowing of nonlinear resonances in a collisional plasma*, **Zh. Eksp. Teor. Fiz.** **107** (2) 418-428 (1996) [Engl. transl.: **JETP** **82** (2) 221-227 (1996)].
- [1] E.V. Podivilov, D.A. Shapiro, M.G. Stepanov, *Narrowing of the Bennett hole in collisional plasma*, **Phys. Rev. Lett.** **74** (20) 3979-3982 (1995).

PRESENTATIONS

- [P7] *The error-floor of LDPC codes in the Laplacian channel* — 43rd Allerton Conference on Communication, Control, and Computing (September 28–30, 2005, Allerton House, Monticello, IL, USA), cs.IT/0507031.
- [P6] *Instanton approach for codes without/with loops* — Applications of Statistical Physics to Coding Theory (January 10–12, 2005, Santa Fe, NM, USA).

- [P5] *Instanton method of post-error-correction analytical evaluation* — 2004 IEEE Information Theory Workshop (October 24–29, 2004, San Antonio, TX, USA).
- [P4] *Collision rate of droplets in a turbulent cloud* — Conference on Turbulence (March 20–22, 2003, IAS, Princeton, NJ, USA).
- [P3] *Viscous instanton for large negative velocity gradients in Burgers turbulence* — Solitons, collapses and turbulence (August 18–22, 2002, LITP, Chernogolovka, Russia).
- [P2] *Modification of spectra of three-level system driven by strong field under soft collisions* (poster) — International Conference “Quantum Optics IV” (June 17–24, 1997, Jaszowiec, Poland).
- [P1] *Diffusion broadening of ion line in strong light field* — Fundamental Atomic Spectroscopy 15 (December 1996, Zvenigorod, Russia).

REFERENCES

- **Michael Chertkov** — error-correcting codes, turbulence, fiber optics
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