

CURRICULUM VITAE

Davronbek Matrasulov

Date and place of birth: July 8, 1971, Khorezm, Uzbekistan.

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Education:

1989-1993 Tashkent State University, Physics Faculty, Department of Theoretical Physics.
1995-1999 PhD student at Heat Physics Department of the Uzbek Academy of Sciences.
Degree obtained: Doctor of Phys.-Math. Sciences (2000).

Career/Employment:

1999-2000 Researcher at Heat Physics Department of the Uzbek Academy of Sciences.
March 2000-June 2000, senior researcher.
2001-2003 Postdoctoral Fellow at the Physics Department, University of Alberta (Canada)
2003-2010 Head of the Laboratory of Advanced Studies at Heat Physics Department
of the Uzbek Academy of Sciences.
2009-present Chairman of the Physical Society of Uzbekistan
2010—present Head of the Innovation Center , Turin Polytechnic University in
Tashkent
2010—present Head of the Laboratory for Advanced Studies, Turin Polytechnic
University in Tashkent

Honors, awards:

1998 - Young Scientist Award of the Uzbek Academy of Sciences
1999 - Award of the State Committee for Science and Technology of Uzbekistan
2000 - Award of the Uzbek Academy of Sciences for the Best Research of the Year.
2001 - NSERC-NATO Fellowship (Canada)
2002 - COBASE Grant of the U.S. National Research Council
2003- Award of the Third World Academy of Sciences
2003 - Matsumae International Foundation Fellowship (Japan).
2004 - NATO-DAAD Fellowship
2004 - NATO Collaborative Linkage Grant
2005 - NATO Reintegration Grant
2005 - JSPS Short-Term Fellowship(Japan)
2006 - INTAS GSI Collaborative Grant
2006 – Volkswagen Foundation Grant
2007 - INTAS YS Fellowship
2007- DAAD Fellowship
2012 - NATO grant for Advanced Research Workshop
2013 – DAAD Fellowship

2013 - TWAS Research grant

Research visits abroad:

International Center for Theoretical Physics (Trieste, Italy) 2000;
Physics Department, University of Alberta (Edmonton, Canada) 2001-2003;
Physics Department, City University of New York 2002;
Physics Department, Tokai University (Hiratsuka, Kanagawa, Japan) 2003-2004;
Physics Department, City University of New York 2004;
Helmholtz Institute, University of Bonn 2004;
GSI, Darmstadt (Darmstadt, Germany) 2004;
Institute for Nuclear Physics, Research Center at Juelich 2004;
Feza Gursev Institute (Istanbul, Turkey) 2005;
Physics Department, City University of New York 2004;
Physics Department, University of Alberta (Edmonton, Canada) 2005;
GSI, Darmstadt (Darmstadt, Germany) 2005;
Applied Physics Department, City University of Osaka (Osaka, Japan) 2005;
Institute of Theoretical Chemistry, University of Heidelberg (Heidelberg, Germany) 2006
Department of Physics and Astronomy, University of Heidelberg (2007-2009)
Theoretical Physics Institute, University of Dusseldorf (Dusseldorf, Germany) 2012
Theoretical Physics Institute, University of Dusseldorf 2012
Max Planck Institute for Dynamics and self-Organization (Goettingen Germany) 2013
University of Oldenburg (Oldenburg, Germany) 2013
University of Dusseldorf 2013
University of Oldenburg – 2014
University of Dusseldorf – 2014
Waseda University -2015
Tokyo Metropolitan University – 2015
Osaka University - 2015
University of Freiburg – 2015
University of Oldenburg – 2015
University of Wurzburg -2015
ICTP, Trieste -2016
University of Freiburg -2016
University of Wuppertal – 2017
University of Dusseldorf – 2017
ICTP, Trieste -2017
Mathematisches Forschungsinstitut Oberwolfach - 2017

Membership in academic societies

Member of the Physical Society of Uzbekistan (since 2005)
Chairman of the Physical Society of Uzbekistan (since 2009)
ICTP Regular Associate Member (Since 2012)

International meetings attended:

Participated, presented talks at more than 50 international conferences, workshops and symposia.

Organization of international conferences:

2004 - Co-director of the NATO Advanced Research Workshop, "Nonlinear Dynamics and Fundamental Interactions", October 11-16, Tashkent, Uzbekistan (www.ndfi04.uzsci.net).

- 2008 - Co-director of NATO Advanced Research Workshop, "Recent Advances in Nonlinear Dynamics and Complex System Physics: From Natural to Social Sciences and Security", October 6-11, Tashkent, Uzbekistan (<http://nonlin08.fan.uz/>).
- 2008 - Co-organizer of the Young Scientists Workshop on Condensed Matter Physics, December 18-19, 2009, Tashkent, Uzbekistan.
- 2012 – Co-organizer of the International Conference “Complexity in Earthquake Dynamics”, January 25-26, Tashkent, Uzbekistan (<http://seismo2012.sci.uz>)
- 2012 – Organizer of the Advanced Research Workshop “Recent Trends and Prospects for Renewable Energy”, October 2-3, Tashkent, Uzbekistan (<http://www.energy2012.sci.uz>)
- 2012 – Co-organizer of the NATO Advanced Research Workshop “Recent Trends in Energy Security: With special emphasis on low-dimensional functional materials”, October 15 – 19, Tashkent, Uzbekistan.
- 2013 - Co-director of the NATO Advanced Research Workshop “New Challenges in Complex System Physics: Disaster forecasting, crisis modeling, and sustainable development”, May 20-14, Samarkand, Uzbekistan (<http://csp2013.sci.uz>)
- 2013 – Co-organizer of International Symposium “Complex Nonlinear Systems: From basic science to applications”, October 7 – 11, 2013, Samarkand, Uzbekistan (<http://cns-samarkand.sci.uz>)
- 2013 - Co-director of International Conference “First Dynamics Days Central Asia”, October 11 – 13, 2013, Samarkand, Uzbekistan (<http://dynamicsdays-ca.sci.uz>)
- 2015 – Co-director of ICTP Summer School “Modern Trends in Theoretical Condensed Matter Physics: From Low-Dimensional Nanoscale Systems to Advanced Materials for Photovoltaic May 18-29, 2015 Khiva, Uzbekistan” (<http://tcmp2015.sci.uz/>)
- 2015 – Co-director of International Conference “Second Dynamics Days Central Asia”, May 25-27, 2015, Khiva, Uzbekistan (<http://ddays2.sci.uz/>)
- 2016 – Organizer of the International workshop “Wave Dynamics in Networks and Branched Structures: From Nano to Macro Scale”, May 25-27, Tashkent, Uzbekistan (<http://network2016.las.uz/>)
- 2016 - Organizer of the International Conference, “Recent Advances in Photovoltaics: Novel materials and device concepts for flexible and thin-film solar cells”, September 28 – October 01, Bukhara, Uzbekistan
- 2017 – Co-director of the International Summer School, New Advances in Condensed Matter Physics, September 20 -27, Khiva, Uzbekistan
- 2017 – Co-organizer, Asia Pacific Conference and Workshop on Quantum Information Science, September 26 -28, Khiva, Uzbekistan
- 2017 – Co-director of Fourth Dynamics Days Central Asia, October 21 -23, Bukhara, Uzbekistan.

Languages:

Uzbek, Russian(bilingual),
 English(fluent)
 French(conversational level)
 Turkish(conversational level)

Current Research Interests:

Nonlinear dynamics, chaos theory and complex system physics:

Nonlinear dynamics in mesoscopic and nanoscale systems;
 Nonlinear waves in networks and branched structures;
 Deterministic chaos in atomic, molecular and supramolecular systems;
 Earthquake dynamics and modeling;
 Theory of complex networks and its applications;

Nanophysics:

Thermal and thermoelectric transport in low-dimensional systems and nanostructures;
Quantum transport in nanostructures;
Classical and quantum dynamics of confined nanoscale systems;
Cavity quantum electrodynamics;
Casimir effect in nanoscale systems;
Finite-temperature field theories and its application to nanoscale systems.
Graphene, Majorana fermions and topological insulators.

Atomic and molecular physics

Elementary processes in high and low- energy ion-atom collisions
Cold atoms and BEC
Relativistic atoms and molecules;
Collisions of atoms with high energy photons;
Vacuum effects in atom interacting with strong electromagnetic fields.

PUBLICATIONS

Newspaper articles and interviews:

More than 20 interviews and articles in different local newspapers on the issues of nanotechnology, renewable energy and complex systems.

Selected research articles:

1. D.U. Matrasulov. Wave functions and energy terms of the Schroedinger equation with two-center Coulomb plus harmonic oscillator potential. **Theor. and Math. Phys.** **117**, 364 (1998).
2. P.K. Khabibullaev, V.I. Matveev, and D.U. Matrasulov. Inelastic collisions of relativistic highly charged ions with atoms and K-vacancy production. **J. Phys. B** **31**, L607 (1998).
3. V.I. Matveev, D.U. Matrasulov, and P.K.Khabibullaev. On the theory of inelastic collisions of highly charged ions with atoms. **Doklady Physics** **43**, 481 (1998).
4. V.I. Matveev, D.U. Matrasulov, and Kh.Yu. Rakhimov. Relativistic electron in the field of two Coulomb centers. **Turkish J. Phys.** **22**, 343 (1998).
5. D.U. Matrasulov. A Relativistic hydrogen-like atom in a monochromatic field. **Optics and Spectroscopy** **86**, 629 (1999).
6. D.U. Matrasulov. Diffusive ionization of relativistic hydrogen-like atom. **Phys. Rev. A** **60**, 700 (1999).
7. D.U. Matrasulov, V.I. Matveev, and M.M. Musakhanov. Eigenvalue problem for the relativistic electric-dipole system. **Phys. Rev. A** **60**, 4140 (1999).
8. V.I. Matveev and D.U. Matrasulov. Single and Double K-vacancy production in the collisions of relativistic highly charged ions with atoms. **Physica Scripta** **89**, 429 (1999).
9. V.I. Matveev, Kh.Yu. Rakhimov, D.U. Matrasulov. Inelastic collisions of relativistic highly charged ions with atoms. **J. Phys. B** **32**, 3849 (1999).
10. D.U. Matrasulov, V.I. Matveev and P.K. Khabibullaev. Stochastic dynamics of the relativistic atom interacting with monochromatic field. **Doklady Physics** **44**, 420 (1999).
11. D.U. Matrasulov, V.I. Matveev, and P.K. Khabibullaev. Chaotic autoionization of the relativistic two-electron atom. **Uzbek J. Phys.** **1**, 132 (1999).
12. V.I. Matveev, D.U. Matrasulov and Kh.Yu. Rakhimov. On the critical distance in the collisions of heavy ions. **Technical Physics** **44**, 992 (1999).
13. D.U. Matrasulov. Stochastic ionization of a relativistic hydrogen-like atom. **Technical Physics** **44**, 249 (1999).
14. V.I. Matveev, D.U. Matrasulov, Kh.Yu. Rakhimov. Two-center problem for the Dirac equation. **Phys. At. Nuclei** **63**, 318 (2000).
15. D.U. Matrasulov, M.M. Musakhanov, and T. Morii. Spectra of doubly heavy baryons. **Phys. Rev. C** **61**, 045204 (2000).

16. V.I. Matveev and D.U. Matrasulov. Finite-size projectile effects in the relativistic ion-atom collisions. **J. Phys. B** **33**, 2721 (2000).
17. V.I. Matveev, D.U. Matrasulov and M.M. Musakhanov. Relativistic Electron in the Field of Finite Electric Dipole. **Doklady Physics** **45**, 22 (2000).
18. V.I. Matveev, D.U. Matrasulov and P.K. Khabibullaev. Chaotization of a supercritical atom. **Doklady Physics** **45**, 142 (2000).
19. D.U. Matrasulov and P.K. Khabibullaev. Classical autoionization of a relativistic two- electron atom. **Doklady Physics** **45**, 443 (2000).
20. P.K. Khabibullaev, V.I. Matveev and D.U. Matrasulov. K-vacancy production in the collision of highly charged relativistic ions with heavy atoms. **Turkish J. Phys.** **24**, 709 (2000).
21. D.U. Matrasulov, A.K. Ruzibaev and V.I. Matveev. Excitation of heavy atom by impact of relativistic highly charged ion. **Uzbek J. Phys.** **2**, 372 (2000).
22. D.U. Matrasulov. Chaos in a supercritical atom. **Phys. At. Nuclei** **64**, 253 (2001).
23. D.U. Matrasulov and D.M. Otajanov. Relativistic Kepler map. **J. Phys. A** **34**, 3477 (2001).
24. D.U. Matrasulov and A.S. Rakhmatov. Stochastic autoionization of the relativistic two-electron atom. **Optics and Spectroscopy** **91**, 827 (2001).
25. D.U. Matrasulov, G.M. Milibaeva and P.K. Khabibullaev. Relativistic Quantum Rotator in a Periodic Field. **Physics Doklady** **47**, 286 (2002).
26. D.U. Matrasulov, F.C. Khanna, Kh.Yu. Rakhimov and Kh.T. Butanov. Spectra of baryons containing two heavy quarks. **Eur. Phys. J. A** **14**, (2002).
27. D.U. Matrasulov, F.C. Khanna, Kh.Yu. Rakhimov and Kh.T. Butanov. Spectroscopy of doubly heavy baryons in Fundamental Interactions, World Scientific, (2002).
28. D.U. Matrasulov. Chaos in the relativistic two-electron atom. **CHAOS** **12**, 650 (2002).
29. D.U. Matrasulov and F.C. Khanna, Properties of hadrons in nuclear matter. In Physics of JHF, World Scientific, (2002)
30. D.U. Matrasulov, F.C. Khanna, and H. Yusupov Spectra of heavy-light mesons. **J. Phys. G** **29**, 473 (2003).
31. D.U. Matrasulov, F.C. Khanna, Kh.Yu. Rakhimov and H. Yusupov. Hadrons containing heavy quarks in the relativistic approach. **Nuclear physics B** **115**, 195 (2003).
32. D.U. Matrasulov and G.M. Milibaeva, Relativistic periodically driven rotator. **Physica Scripta** **68**, 215 (2003)
33. D.U. Matrasulov and Sh. Ataev, An approximate analytical solution of the Klein-Gordon equation for the finite electric dipole potential **J. Phys. A** **36**, 10227 (2003).
34. D.U. Matrasulov and G.M. Milibaeva, Relativistic kicked rotor in a magnetic field. **Uzbek J. Phys.** **6**, 198 (2004).
35. D.U. Matrasulov, F.C. Khanna, A.E. Santana and U.R. Salomov. Quantum chaos in Yang-Mills-Higgs system at finite-temperature. **Eur. Phys. J. C** **42**, 183 (2005).
36. D.U. Matrasulov, G.M. Milibaeva, U.R. Salomov and Bala Sundaram. Relativistic kicked rotor. **Phys. Rev. E** **72**, 016213 (2005).
37. V.I. Matveev, D.U. Matrasulov, and S.V. Ryabchenko. Lost of electrons by heavy structured ions with atoms. **JETP Lett.** **82**, 404 (2005).
38. V.I. Matveev, E.S. Gusarevich, D.U. Matrasulov, Kh.Yu. Rakhimov, Th. Stoehlker and G. Baur. Projectile electron losses in the collisions with neutral targets: sudden-perturbation approximation. **J. Phys. B** **39**, 1447 (2006).
39. D.U. Matrasulov, F.C. Khanna, Kh.T. Butanov and Kh.Yu. Rakhimov. Spectra of quarkonia at finite-temperature. **Mod. Phys. Lett. A** **21**, 1391 (2006).
40. D.U. Matrasulov, F.C. Khanna, U.R. Salomov and G.M. Milibaeva. Finite temperature quantum billiards. In "Non-linear Dynamics and Fundamental Interactions" (Eds. F. Khanna and D. Matrasulov) 167, Springer (2006).
41. D.U. Matrasulov, F.C. Khanna, U.R. Salomov and A.E. Santana. Quantum chaos at finite temperature. In "Non-linear Dynamics and Fundamental Interactions" (Eds. F. Khanna and D. Matrasulov) 341, Springer (2006).
42. D.U. Matrasulov, F.C. Khanna, and D.M. Otajanov. Chaotization of the periodically driven quarkonia. In "Non-linear Dynamics and Fundamental Interactions" (Eds. F. Khanna and D. Matrasulov) 335, Springer (2006).
43. V.I. Matveev, D.U. Matrasulov, and S.V. Ryabchenko. Multiple Electron Loss by Structured Heavy Ions in Fast Collisions with Complex Atoms. **JETP** **102**, 1 (2006).
44. D.U. Matrasulov, G.M. Milibaeva, U.R. Salomov and B. Sundaram. Chaotic dynamics of the relativistic kicked rotor. In "Non-linear Dynamics and Fundamental Interactions" (Eds. F. Khanna and D. Matrasulov) 173, Springer (2006).

45. D.U. Matrasulov, F.C. Khanna, Kh.T. Butanov and Kh.Yu. Rakhimov. Spectra of quarkonia at finite-temperature. In “Non-linear Dynamics and Fundamental Interactions” (Eds. F. Khanna and D. Matrasulov) 329, Springer (2006).
46. A.E. Atamuratov, D.U. Matrasulov, and P.K. Khabibullaev. Detection of a charge built in the oxide layer of a metal-oxide-semiconductor field-effect transistor by lateral C-V measurement. **Physics Doklady** **52**, 322 (2007).
47. D.U. Matrasulov, Kh.Yu. Rakhimov and F.C. Khanna. Finite-temperature pair creation in the collisions of relativistic heavy ions. **Uzbek J. Phys.** **9**, 302 (2007).
48. D.U. Matrasulov, F.C. Khanna, Kh.T. Butanov. Casimir effect at finite temperature: the role of space-time compactification. **Uzbek J. Phys.** **9**, 7 (2007).
49. D.U. Matrasulov, Z.A. Sobirov and K.K. Sobirov. Inverse spectral problem for atom-like mesons. **Mod. Phys. Lett. A** **23**, 1913 (2008).
50. D.U. Matrasulov, P.K. Khabibullaev, F.C. Khanna and D.M. Otajanov. Periodically driven dynamics of a particle moving in the field of Coulomb plus confining potential. **Phys. Scripta** **78**, 065003 (2008).
51. V.I. Matveev, S.V. Ryabchenko, D.U. Matrasulov, Kh.Yu. Rakhimov, S. Fritzsche and Th. Stoehlker. Electron loss of fast heavy projectiles in collision with neutral targets. **Phys. Rev. A** **79**, 042710 (8) (2009)
52. D.U. Matrasulov, T. Ruzmetov, D.M. Otajanov, P.K. Khabibullaev, A.A. Saidov, and F.C. Khanna. Finite-temperature nonlinear dynamics in cavity QED: A Thermofield Dynamics Approach. **Phys. Lett.A** **373**, 238 (2009).
53. P. Schmelcher, F. Lenz, D. Matrasulov, Z.A. Sobirov, S.K. Avazbaev. Time-dependent Quantum Billiards. In *Complex Phenomena in Nanoscale Systems*, Eds. G. Casati, D. Matrasulov, (Springer 2009).
54. Z. Sobirov, D. Matrasulov, K. Sabirov, S. Sawada, and K. Nakamura. Integrable nonlinear Schrödinger equation on simple networks: Connection formula at vertices. **Phys. Rev. E** **81**, 066602 (2010)
55. K. Nakamura, D. Matrasulov, U. Salomov, G. Milibaeva, J. Yusupov, T. Ohta and M. Miyamoto. Quantum transport in ladder-type networks: the role of nonlinearity, topology and spin. **J. Phys. A** **43**, 145101 (2010)
56. D. Matrasulov, U. Salomov, G. Milibaeva and N.E. Iskandarov. Classical Dynamics and Particle Transport in Kicked Billiards. **Physica D** **240**, 470 (2011)
57. K. Nakamura, Z.S. Sobirov, D. Matrasulov, S.K. Avazbaev and T. Monnai. Quantum ideal gas in an expanding cavity: Nature of non-adiabatic force. **Phys. Rev. E** **83**, 041133 (2011)
58. K. Nakamura, Z.S. Sobirov, D. Matrasulov, S. Sawada, Transport in simple networks described by an integrable discrete nonlinear Schrödinger equation. **Phys. Rev. E** **84**, 026609 (2011)
59. Katsuhiko Nakamura, Zarifboy A. Sobirov, Davron U. Matrasulov, and Sanat K. Avazbaev. Bernoulli's formula and Poisson's equations for a confined quantum gas: Effects due to a moving piston. **Phys. Rev. E** **86**, 061128 (2012)
60. V.I. Matveev and D.U. Matrasulov. Radiation spectra and interference effects in the interaction of multi-atomic targets with the ultrashort pulses of electromagnetic field. **JETP Lett.**, **96**, 700 (2012)
61. Katsuhiko Nakamura, Doniyor Babajanov, Davron Matrasulov, and Michikazu Kobayashi. Dynamics of inertial vortices in multicomponent Bose-Einstein condensates. **Phys. Rev. A** **86**, 053613 (2013)
62. K.K. Sabirov, Z.A. Sobirov, D. Babajanov and D.U. Matrasulov. Stationary Nonlinear Schrödinger Equation on Simplest Graphs. **Phys. Lett. A** **377**, 860 (2013)
63. A. De Martino, D. Kloepfer, D. Matrasulov, R. Egger. Electric dipole induced universality for Dirac fermions in graphene. **Phys. Rev. Lett.** **112**, 186603 (2014)
64. Denis Kloepfer, Alessandro De Martino, Davron U. Matrasulov and Reinhold Egger. Scattering theory and ground-state energy of Dirac fermions in graphene with two Coulomb impurities. **Eur. Phys. J. B** **87**, 187 (2014)
65. Doniyor Babajanov, Davron U. Matrasulov and Reinhold Egger. Particle transport in graphene driven by ultrashort pulses. **Eur. Phys. J. B** **87**, 258 (2014)
66. Hannes Uecker, Daniel Grieser, Zarif Sobirov, Doniyor Babajanov and Davron Matrasulov. Soliton transport in tubular networks: transmission at vertices in the shrinking limit. **Phys. Rev. E** **91**, 023209 (2015)
67. D.B. Babajanov, D.U. Matrasulov, Z.A. Sobirov, S.K. Avazbaev and O.V. Karpova. Time-dependent quantum circular billiard. **NANOSYSTEMS: Physics, Chemistry, Mathematics**, **6**, 224 (2015)
68. K. Nakamura, D. Babajanov, D. Matrasulov, M. Kobayashi, and P. Muruganandam. Dynamics of trapped interacting vortices in Bose-Einstein condensates: Role of breathing degree of freedom

- J. Phys. A.** **49** 315102 (2016)
69. Z. Sobirov, D. Babajanov, D. Matrasulov, K. Nakamura, H. Uecker, Sine-Gordon solitons in networks: Scattering and transmission at vertices, **EPL**, **115**, 50002 (2016).
70. Z. Sobirov, D. Babajanov, D. Matrasulov, Nonlinear standing waves on planar branched systems: Shrinking into metric graph **NANOSYSTEMS: Physics, Chemistry, Mathematics**, **6** 29 (2017).
71. **K. Sabirov, S. Rakhmanov, D. Matrasulov, H. Susanto.** The stationary sine-Gordon equation on metric graphs: Exact analytical solutions for simple topologies. **Phys. Lett. A** **382**, 1092 (2018).
72. J.R. Yusupov, D.M. Otajanov, V.E. Eshnivazov, D.U. Matrasulov. *Classical and quantum dynamics of a kicked relativistic particle in a box.* **Phys. Lett. A** **382**, 633 (2018).
73. K.K. Sabirov, D.B. Babajanov, D.U. Matrasulov, P.G. Kevrekidis, Dynamics of Dirac solitons in networks, **arXiv:1701.05707** (Submitted to J.Math.Phys.).
74. S. Rakhmanov, D. Matrasulov, V.I. Matveev, Quantum dynamics of a hydrogen-like atom in a time-dependent box: Cooling, compressing and diffusive ionization in non-adiabatic regime **arXiv:1703.04945** (Submitted to EPJD).

Books

1. Non-linear Dynamics and Fundamental Interactions, Springer (2006) (with F.C. Khanna).
2. Complex phenomena in nanoscale systems, Springer (2009) (with G. Casati).
3. Low-dimensional Functional Materials, Springer (2013) (with R.Egger and Kh.Rakhimov)
4. Nonlinear Phenomena in Complex Systems: From Nano to Macro Scale (Springer 2014) (with H.E. Stanley)