

Contact Information

Name : Mandilara
Given Name : Aikaterini
Born : 1979
Nationality : Greek
Mailing Address : Nazarbayev University
Department of Physics
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Current Position : Assistant Professor, Nazarbayev University
Associate : Abdus Salam International Center for Theoretical Physics, Italy

Education

PhD 2005 Washington University in St. Louis, U.S.A.
Msc in Physics 2003 Washington University in St. Louis, U.S.A.
BSc Physics 2001 National and Kapodistrian University of Athens

Research Interests

Quantum control, entanglement, information and computing

Research Experience

UNDERGRADUATE

Diploma Thesis : PT symmetric Hamiltonians with real spectra/ Prof C. Ktorides
Signatures of chaos in hadronic chains/ Prof F. Diakonov

GRADUATE

PhD Thesis : Studies in Quantum Control and Quantum Entanglement
Supervisor : Prof. J. W. Clark
Institute : Washington University in St. Louis, MO, USA
Department : Physics Department
Starting Date : January 2003
Date of Defense : 22 December 2005
Jury : Mark Alford, Mark S. Byrd,
Anders E. Carlsson, Michael C. Ogilvie,
Joseph O'Sullivan, Tzyh J. Tarn

POSTDOCTORAL

Jan 2006-Aug 2007 : Laboratoire Aimé Cotton, Orsay, France
Group : Theory of Complex Quantum Systems
Research Director : V. M. Akulin

Sep 2008-Dec 2011 : Université Libre de Bruxelles, Belgium
Institute : Centre for Quantum Information and Communication
Research Director : Prof N. Cerf

Jan-Jun 2012 : Télécom ParisTech, CNRS
Research Directors : D. Markham and E. Diamanti

Jul 2012-Dec 2013 : Université Paris Diderot, Paris 7
Institute : Matériaux et Phénomènes Quantiques
Research Directors : P. Milman and Prof. T. Coudreau

Main Research Results

- A proof on the advantages of probabilistic quantum control
- A technique for characterizing multipartite entanglement
- An efficient algorithm for analyzing entanglement in mixed multipartite quantum states
- A representation for describing symmetric states of spin 1/2 systems over coherent states
- An extended uncertainty relation saturated by all number states of harmonic oscillator
- A method for performing quantum compiling without the inverses
- A secure quantum optical protocol for performing Bit Commitment
- A first extension of Hudson's theorem to mixed quantum states
- A scheme for protecting multi-mode quantum signals from quadratic dispersion
- Contributing to the identification of a new class on non-Hermitian Hamiltonians with real spectrum

Grants

2017-19 : ORAU Grant, PI, USD 300,000

'Dissecting the Collective Dynamics of Arrays of Superconducting Circuits and Quantum Metamaterials'

Orau Grants are financed by Nazarbayev University and refereed by scientists in U.S.A.

2018-20 : MES Grant, PI, USD 80,000

'Superconducting and Quantum Metamaterials'

MES grants are allocated by the Ministry of Education and Science of Kazakhstan and refereed by local scientists.

Teaching Experience

TEACHING ASSISTANT	Part-time position as graduate student at -Washington University in St. Louis
Aug 2001-Dec 2002 :	Lab instructor : General Physics I, II
Jan 2003- Dec 2004 :	Help Sections and Grading for : Introduction to Nuclear and Particle Physics, Epics of Evolution, Concepts of Physics, Quantum Mechanics*, Classical Electrodynamics*
July 2005 :	Short Course : Introduction to Quantum Information for Electrical Engineers*
	-Dartmouth College
Mar-May 2005 :	Help Sections : Introduction to Quantum Information*
A.T.E.R.**	University Paris-Sud 11
Sept 2007-Aug 2008 :	Lab Instructor /268 hours : Optics*, Wave Mechanics, Mechanics
ASSISTANT PROFESSOR	Nazarbayev University
Spring 2014	Classical Mechanics II
Fall 2014/15/17	Mathematical Methods in Physics
Spring 2015/16/17	Physics II for physics and non-physics majors
Fall 2016/17	Quantum Computing* for computer science students
Fall 2016	Advanced Mathematical Methods*
Spring 2018	Quantum Mechanics*

(*) : Graduate level courses

(**) : Attaché Temporaire d'Enseignement et de Recherche.

Supervising and related service :

- Bachelor's thesis : 'Monogamy relations for tanglemeter coefficients', Yenglik Kuanyshbay, Nazarbayev University, May 2018.
- Member of PhD thesis jury : 'Exploring continuous-variable entropic uncertainty relations and separability criteria in quantum phase space', Anaëlle Hertz, Université Libre de Bruxelles, February 2018.

Publications

1. *Self-induced transparency of the optical phonons*, A. Mandilara, Z. Ivić, D. Čevizović, Ž. Pržulj, *Chaos, Solitons and Fractals* 105, 14-20 (2017).
2. *Detection of non-Gaussian entangled states with an improved continuous-variable separability criterion*, A. Hertz, E. Karpov, A. Mandilara, N. J. Cerf, *Phys. Rev. A* 93, 032330 (2016).
3. *Essentially Entangled Component of Multipartite Mixed Quantum States, its Properties and an Efficient Algorithm for its Extraction*, V. M. Akulin, G. A. Kabatyanski and A. Mandilara, *Phys. Rev. A* 92, 042322 (2015).
4. *Entanglement classification of pure symmetric states via spin coherent states*, A. Mandilara, T. Coudreau, A. Keller, and P. Milman, *Phys. Rev. A* 90, 050302(R), (2014).
5. *Purity and Gaussianity bounded uncertainty relation*, A. Mandilara, E. Karpov, and N. J. Cerf, *J. Phys. A*. 47, 045302 (2014).
6. *Quantum uncertainty relation saturated by the eigenstates of the harmonic oscillator*, A. Mandilara, and N. J. Cerf, *Phys. Rev. A* 86, 030102R (2012).
7. *Quantum Bit Commitment under Gaussian Constraints*, A. Mandilara, and N. J. Cerf, *Phys. Rev. A* 85, 062310 (2012).
8. *Aspects of Entanglement in quantum many-body systems*, J. W. Clark, H. Habibian, A. Mandilara and M. L. Ristig, *Found. Phys* 40, 1200-1220 (2010).
9. *Gaussianity Bounds for quantum mixed states with a positive Wigner function*, A. Mandilara, E. Karpov, and N. J. Cerf, *J. Phys. : Conf. Ser.* 254, 012011 (2010). (refereed)
10. *Extending Hudson's theorem to mixed quantum states*, A. Mandilara, E. Karpov and N. J. Cerf, *Phys. Rev. A* 79, 062302 (2009).
11. *Entanglement Properties Of Quantum Many-Body Wave Functions*, J. W. Clark, A. Mandilara and M. L. Ristig, *Int. J. Mod. Phys. B* 23, 4041 (2009).
12. *Population dynamics in cold gases resulting from the long-range dipole-dipole interaction*, A. Mandilara, V. M. Akulin and P. Pillet, *J. Phys. B : At. Mol. Opt. Phys.* 42, 215301 (2009).
13. *Entanglement studies in a simple two-electron atomic model*, F. Carlier, A. Mandilara and A. Sarfati, *J. Phys. B : At. Mol. Opt. Phys.* 40, S199-S207 (2007).
14. *Nilpotent polynomials approach to four-qubit entanglement*, A. Mandilara and L. Viola, *J. Phys. B : At. Mol. Opt. Phys.* 40, S167-S180 (2007).
15. *Cooperative behavior of qutrits via dipole-dipole interactions*, A. Mandilara and V. M. Akulin, *J. Phys. B : At. Mol. Opt. Phys.* 40, S95-S102 (2007).
16. *Control of multiatom entanglement in a cavity*, A. Mandilara, V. M. Akulin, M. Kolar and G. Kurizki, *Phys. Rev. A* 75, 022327 (2007).

17. *Quantum entanglement via nilpotent polynomials*, A. Mandilara, V. M. Akulin, A. V. Smilga and L. Viola, Phys. Rev. A 74, 022331 (2006).
18. *Elliptical Orbits in the Bloch sphere*, A. Mandilara, J. W. Clark and M. S. Byrd, J. Opt. B : Quantum Semiclass. Opt. 7, S277-S282 (2005).
19. *Probabilistic quantum control via indirect measurement*, A. Mandilara and J. W. Clark, Phys. Rev. A 71 013406, (2005).
20. *Generalized PT symmetry and real spectra*, C. M. Bender, M. V. Berry and A. Mandilara, J. Phys. A 35, L467-L471 (2002).

Proceedings

1. *Quantum Algorithmic Complexity of Three-Qubit Pure States*, M. Lukac and A. Mandilara, 2016 IEEE 46th International Symposium on Multiple-Valued Logic, 253-257 (2016).
2. *Uncertainty, Entropy and non-Gaussianity for mixed states*, A. Mandilara, E. Karpov and N. J. Cerf, Proc. SPIE 7727, 77270H (2010).
3. *Entanglement via Nilpotent Polynomials*, A. Mandilara and V. M. Akulin, in 'Quantum Dynamics and Information' : Proceedings of the 46th Karpacz Winter School of Theoretical Physics', Ladek Zdrój, Poland, 8 -13 February 2010, World Scientific (2010).

In Preparation

1. *Quantum compiling with diffusive sets of gates* Y. Zhiyenbayev, V. M. Akulin, A. Mandilara, arXiv :1708.08909.
2. *Multi-mode Waveguides with Tailored Dispersion - a Way for Coherent and Dispersion-Free Propagation of Classical and Quantum Optical Signals*, C. A. Valagiannopoulos, A. Mandilara, S. A. Moiseev, V. M. Akulin, arXiv :1701.03251.

Oral Presentations ¹

International Conferences

1. Asia-Pacific conference and workshop on Quantum Information Science, Khiva, Uzbekistan. 26/10/2017. *Invited*
2. Quantum Metamaterials & Quantum Technology 2016 Workshop, Spetses, Greece. 23/06/2016. *Invited*
3. ICSSUR 2015, 14th International Conference on Squeezed States and Uncertainty Relations, Gdansk, Poland. 01/07/2015.
4. ICTP School on Modern Trends in Theoretical Physics : from Low-Dimensional Nanoscale Systems to Advanced Materials for Photovoltaics, Khiva, Uzbekistan. 27/05/2015.
5. Dynamics Days Central Asia : 21st Century Silk Road for Science and Peace, Khiva, Uzbekistan. 26/05/2015. *Invited*

1. during the last six years

6. New Concepts in Condensed Matter Physics, Almaty, Kazakhstan. 17/11/2014.
7. 4th International Workshop on statistical mechanics and dynamical systems, Athens, Greece. 18/07/2014. *Invited*
8. Continuous Variables and Quantum Information Processing, CVQIP'13 workshop, Paris, France. 30/01/2013. *Invited*
9. GDR- Quantum Information, Grenoble, France. 28/11/2012.
10. Photonics at Belgium -annual network meeting, University of Lille, Lille, France. 21/10/2011.
11. Quantum Information in Paris, QuPa meeting, Henri Poincare Institute, Paris, France. 29/09/2011.
12. High performance coherent quantum communications kick-off meeting and workshop, Télécom ParisTech, Paris, France. 25/09/2011.
13. 12th International Conference on Squeezed states and Uncertainty relations and 5th Feynman Festival, Foz do Iguacu, Brazil. 02/05/2011.

Seminars

1. 07/02/2018, Center for Quantum Information and Computation (QuIC), ULB, Brussels, Belgium.
2. 27/10/2017, Summer School in New advances in Condensed Matter Physics, Khiva, Uzbekistan.
3. 08/06/2017, Summer School : Mathematical Methods in Science and Technology, Nazarbayev University, Kazakhstan.
4. 06/12/2016, Center for Photonics and Quantum Materials, Skoltech, Russia.
5. 01/12/2016, Superconducting Metamaterials Laboratory, MISiS, Russia.
6. 23/12/2015, COSA seminar, Demokritos National Center for Scientific Research, Athens, Greece.
7. 09/10/2015, Crete Center for Quantum Complexity and Nanotechnology, University of Crete, Greece.
8. 14/06/2015, Group of Quantum Information, Telecom ParisTech, Paris, France.
9. 15/05/2015, Physics Colloquium, Nazarbayev University, Kazakstan.
10. 03/07/2014, Laboratoire de Physique Théorique et Modélisation, Université de Cergy-Pontoise, France.
11. 10/06/2014, Centre for Quantum Complexity & Nanotechnology, Physics Department, University of Crete, Greece.
12. 25/05/2014, Research In Action Seminar Series, Mathematics Department of Nazarbayev University.
13. 17/02/2012, Laboratoire de Physique Théorique et Modélisation, Université de Cergy-Pontoise, France.
14. 02/10/2012, MPQ, Université Paris 7, France.

15. 15/03/2012, Télécom ParisTech, Paris, France.
16. 25/02/2011, Condensed Matter Section, ICTP Institute, Italy.

Poster Presentations

1. 29/08/2015, Conference on Frontiers of Nanoscience, ICTP, Italy.
2. 03/06/2015, Closing the entanglement gap : Quantum information, quantum matter, and quantum fields, Kavli Institute for Theoretical Physics, University of California, Santa Barbara, U.S..
3. 05/09/2011, Quantum Information Processing and Communication, Zurich, Switzerland.
4. 04/05/2011, 12th International Conference on Squeezed states and Uncertainty relations and 5th Feynman Festival, Foz do Iguacu, Brazil.

Referee

Journal of Physics A : Mathematical and Theoretical –Advisory Panel Member
Journal of Physics B : Atomic, Molecular and Optical Physics
Europhysics Letters
Physica Scripta
Physical Review A
Physical Review Letters

Scholarships

2009-11 : Postdoctoral fellowship of F.R.F.C.-FNRS
2006-07 : Région Île-de-France Postdoctoral Fellowship
2001-03 : The Judith Ross Scholarship in Mathematics and Physics
1996-97 : Award from IKY (National Greek Fund of Scholarships)
FNRS : Belgian National Fund for Scientific Research

Organization and other Service

- 3rd Dynamic Days in Central Asia (2016) <http://www.dd3ca.kz/>
- Madeira Math Encounters XXIX (2005)
- Member of the Institutional Research Ethics Committee at Nazarbayev University since September 2016

Languages

Greek : Mother tongue
English : Fluent
French : Fluent
Russian : Low Intermediate