Contact Information

Name :	Mandilara
Given Name :	Aikaterini
Born :	1979
Nationality :	Greek
Mailing Address :	Nazarbayev University Department of Physics School of Science and Humanities Nur-Sultan, Kazakhstan
Telephone :	+7 (705) 4258003, +30 6970426917
E-mail :	mandkat@gmail.com
website :	www.qubit.kz
Current Position :	Assistant Professor, Nazarbayev University

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, Optics, 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. Diakonos

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 2008 :	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 Outcomes

— A error-detection scheme applicable to multi-modal photonic signals
∗ A methodology for performing probabilistic quantum control
— An algebraic technique for characterizing multipartite entanglement in pure states
∗ An efficient algorithm for analyzing entanglement in mixed multipartite quantum states
— A method for generating representative families of bound entangled states
∗ A compiling method for multi-qubit gates over circuits of fixed architecture
— A representation for symmetric states of spin 1/2 systems over spin coherent states
∗ An extended uncertainty relation saturated by all number states of harmonic oscillator
— An extension to Solovay-Kitaev algorithm to the case where the inverse of gates are not available
∗ A secure quantum optical protocol for performing bit commitment
— A first extension of Hudson's theorem to mixed quantum states
∗ A scheme for coherent and dispersionless propagation of multi-modal optical signals
— Contributing to the identification of a new class on non-Hermitian Hamiltonians with real spectrum

Grants

2018-20 : ORAU Grant -Nazarbayev University), PI, USD 300,000
'Dissecting the Collective Dynamics of Arrays of Superconducting Circuits and Quantum Metamaterials'

2016-17 : MES Grant - Ministry of Education and Science of the Republic of Kazakhstan, PI, USD 80,000, 'Superconducting and Quantum Metamaterials'

2018-20 : MES RK state-targeted program BR05236454.

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*
	-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 2014/15/17/18	Mathematical Methods in Physics
Spring 2015/16/17	Physics II for physics and non-physics majors
Fall 2016/17/18	Quantum Computing*
Fall 2016	Advanced Mathematical Methods*
Spring 2018/19	Quantum Mechanics*

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

Supervising and Related Service

* Bachelor's thesis : 'Quantum Cryptography : the BB84 protocol', Elnar Shayakhmetov, Nazarbayev University, May 2019.
* 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', Anaelle Hertz, Université Libre de Bruxelles, February 2018.

Research projects with students :
— Yertay Zhiyenbayev, undergraduate, 'Geometric aspects of quantum compiling'
— Elnar Shayakhmetov, undergraduate, 'Essentially entangled component and linear programming'
— Rahul P. Singh, undergraduate, 'Quantum compiling on circuits of fixed architecture'
— Daulet Turganov, undergraduate, 'Entanglement purification on quantum networks' (on-going)
— Ayatola Gabdulin, graduate, 'Bound entangled states and distillation'
— Yerassyl Balkybek, graduate, 'Schemes against photon losses' (on-going)

Publications

1. *Investigating bound entangled two-qutrit states via the best separable approximation*, A. Gabdulin and A. Mandilara, Phys. Rev. A 100, 062322 (2019).
2. *Classical and quantum dispersion-free coherent propagation by tailoring multimodal coupling*, A. Mandilara, C. A. Valagiannopoulos and V. M. Akulin, Phys. Rev. A 99, 023849 (2019).
3. *Quantum compiling with diffusive sets of gates*, Y. Zhiyenbayev, V. M. Akulin, A. Mandilara, Phys. Rev. A 98, 012325 (2018).
4. *Self-induced transparency of the optical phonons*, A. Mandilara, Z. Ivić, D. Čevizović, Ž. Pržulj, Chaos, Solitons and Fractals 105, 14-20 (2017).
5. *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).
6. *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).
7. *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).
8. *Purity and Gaussianity bounded uncertainty relation*, A. Mandilara, E. Karpov, and N. J. Cerf, J. Phys. A. 47, 045302 (2014).
9. *Quantum uncertainty relation saturated by the eigenstates of the harmonic oscillator*, A. Mandilara, and N. J. Cerf, Phys. Rev. A 86, 030102R (2012).
10. *Quantum Bit Commitment under Gaussian Constraints*, A. Mandilara, and N. J. Cerf, Phys. Rev. A 85, 062310 (2012).
11. *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).

12. *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)
13. *Extending Hudson's theorem to mixed quantum states*, A. Mandilara, E. Karpov and N. J. Cerf, Phys. Rev. A 79, 062302 (2009).
14. *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).
15. *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).
16. *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).
17. *Nilpotent polynomials approach to four-qubit entanglement*, A. Mandilara and L. Viola, J. Phys. B : At. Mol. Opt. Phys. 40, S167-S180 (2007).
18. *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).
19. *Control of multiatom entanglement in a cavity*, A. Mandilara, V. M. Akulin, M. Kolar and G. Kurizki, Phys. Rev. A 75, 022327 (2007).
20. *Quantum entanglement via nilpotent polynomial*s, A. Mandilara, V. M. Akulin, A. V. Smilga and L. Viola, Phys. Rev. A 74, 022331 (2006).
21. *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).
22. *Probabilistic quantum control via indirect measurement*, A. Mandilara and J. W. Clark, Phys. Rev. A 71 013406, (2005).
23. *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. *Detecting the event of a single photon loss on quantum signals*, A. Mandilara, Y. Balkybek, and V. M. Akulin, arXiv : 2003.10654.

2. *Quantum compiling with locally adjusted circuits*, R. P. Singh and A. Mandilara, arXiv :1908.03994.

Oral Presentations [1]

International Conferences

1. Asian Quantum Information Science Conference, KIAS, Seoul, Korea. 20/08/2019.
2. XVI International Conference on Quantum Optics and Quantum Information 2019, Minsk, Belarus. 15/05/2019. *Invited*
3. Asia-Pacific conference and workshop on Quantum Information Science, IISER, Kolkata, India. 20/12/2018. *Invited*
4. Asia-Pacific conference and workshop on Quantum Information Science, Khiva, Uzbekistan. 26/10/2017. *Invited*
5. Quantum Metamaterials & Quantum Technology 2016 Workshop, Spetses, Greece. 23/06/2016. *Invited*
6. ICSSUR 2015, 14th International Conference on Squeezed States and Uncertainty Relations, Gdansk, Poland. 01/07/2015.
7. ICTP School on Modern Trends in Theoretical Physics : from Low-Dimensional Nanoscale Systems to Advanced Materials for Photovoltaics, Khiva, Uzbekistan. 27/05/2015.
8. Dynamics Days Central Asia : 21st Century Silk Road for Science and Peace, Khiva, Uzbekistan. 26/05/2015. *Invited*
9. New Concepts in Condensed Matter Physics, Almaty,Kazakhstan. 17/11/2014.
10. 4th International Workshop on statistical mechanics and dynamical systems, Athens, Greece. 18/07/2014. *Invited*
11. Continuous Variables and Quantum Information Processing, CVQIP'13 workshop, Paris, France. 30/01/2013. *Invited*
12. GDR-Quantum Information, Grenoble, France. 28/11/2012.

Seminars

1. 12/12/2019, Physics Department, University of Crete, Greece.
2. 17/10/2019, Laboratoire Aimé Cotton, Orsay, France.
3. 24/10/2019, Laboratoire dInformatique de Paris 6, CNRS, Sorbonne University, France.
4. 01/06/2018, COSA seminar, Demokritos National Center for Scientific Research, Athens, Greece.
5. 07/02/2018, Center for Quantum Information and Computation (QuIC), ULB, Brussels, Belgium.

1. during the last seven years

6. 27/10/2017, Summer School in New advances in Condensed Matter Physics, Khiva, Uzbekistan.
7. 08/06/2017, Summer School : Mathematical Methods in Science and Technology, Nazarbayev University, Kazakhstan.
8. 06/12/2016, Center for Photonics and Quantum Materials, Skoltech, Russia.
9. 01/12/2016, Superconducting Metamaterials Laboratory, MISiS, Russia.
10. 23/12/2015, COSA seminar, Demokritos National Center for Scientific Research, Athens, Greece.
11. 09/10/2015, Crete Center for Quantum Complexity & Nanotechnology, University of Crete, Greece.
12. 14/06/2015, Group of Quantum Information, Telecom ParisTech, Paris, France.
13. 15/05/2015, Physics Colloquium, Nazarbayev University, Kazakstan.
14. 03/07/2014, Laboratoire de Physique Théorique et Modélisation, Université de Cergy-Pontoise, France.
15. 10/06/2014, Centre for Quantum Complexity & Nanotechnology, Physics Department, University of Crete, Greece.
16. 25/05/2014, Research In Action Seminar Series, Mathematics Department of Nazarbayev University.
17. 17/02/2012, Laboratoire de Physique Théorique et Modélisation, Université de Cergy-Pontoise, France.
18. 02/10/2012, Laboratoire Matériaux et Phénomènes Quantiques, Université Paris 7, France.
19. 15/03/2012, Télécom ParisTech**,** Paris, France.

Poster Presentations

1. 04/07/2018, Workshop PRACQSYS 2018 : Principles and Applications of Control in Quantum Systems, Henri Poincare Institute, Paris, France.
2. 11/09/2018, 18th Asian Quantum Information Science Conference, Nagoya, Japan.
3. 29/08/2015, Conference on Frontiers of Nanoscience, ICTP, Italy.
4. 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..

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

— Regular Associate at Abdus Salam International Center for Theoretical Physics, Italy since 2017
— Member of the Institutional Research Ethics Committee at Nazarbayev University (2016-19)
— Ladies Physics Club, Nazarbayev University
— 3rd Dynamic Days in Central Asia (2016)–main local organizer
— Madeira Math Encounters XXIX (2005)

Languages

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