Curriculum Vitae

Dr. Andreas Ruschhaupt

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University College Cork
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Education

17/11/2009 **"Habilitation" in Theoretical Physics** (Quantum Optics), Technical University of Braunschweig (Germany)

20/12/2001 **Doctor of natural sciences/Physics** (Mathematical Physics), University of Bielefeld (Germany)
Doctoral grade: ausgezeichnet ("with distinction", best possible grade)
Supervisor: Prof. Dr. Ph. Blanchard

31/03/1998: **Diploma in Physics**, University of Bielefeld (Germany)
Diploma grade: ausgezeichnet ("with distinction", best possible grade)
Supervisor: Prof. Dr. Ph. Blanchard

Employment

Since 09/2012 **Lecturer in Physics** at University College Cork (Ireland)
(Permanent position, establishment period successfully completed)

11/2005 – 08/2012

Junior Professor at the Technical University of Braunschweig (Germany) and at the Leibniz University of Hanover (Germany) in the quantum information group of Prof. Dr. R. F. Werner. Main achievements during this period were:

Founder of the research field of "Shortcuts to Adiabaticity": I have been a founder of "Shortcuts to adiabaticity", an internationally strongly growing field with the goal of developing new schemes for controlling quantum systems. I am still performing research in this field. The first paper has currently 159 citations. Currently, I have more than 20 publications in this field in international refereed journals.

Important improvements in the theory of "Quantum Mechanics of Time" and their applications in the tomography of single-photons: I supported the national metrology institute (PTB) in Germany in the development of a tomography setup for single-photon sources. This collaboration has been carried out inside the EPHQUAM Network Grant financed by the BMBF (Ministry of Germany). I have also produced – together with J. G. Muga and A. del Campo- as editors, the book "Time in Quantum Mechanics – Vol. 2" (Lecture Notes in Physics, Vol. 789, Springer, 2009).

05/2003 - 09/2005

Postdoctoral position at the University of the Basque Country (Bilbao, Spain) in the quantum optics group of Prof. Dr. J. G. Muga. Main achievements during this time were:

Invention of the atom diode: Together with J. G. Muga, I have developed theoretically an atom diode, i.e. a device for unidirectional motion of atoms. The initial paper has currently 59 citations. This atom diode was also used, in collaboration with M. G. Raizen, for proposing an optical realisation of Maxwell's demon. M. G. Raizen has also founded "The Pointsman Foundation" (http://www.pointsman.org/, using uni-directional barrier ideas for production and use of stable isotopes for medical treatments, diagnostics, and research).

First proposal of a physical realization of Parity-Time (PT) symmetric potentials: J. G. Muga and I proposed, for the first time, a physical realization of scattering by PT-symmetric potentials. This paper has currently 200 citations.

04/2002 - 03/2003

Postdoctoral position at the University of Bielefeld (Germany) in the mathematical physics group of Prof. Dr. Ph. Blanchard

04/1998 - 12/2001

Doctoral study at the University of Bielefeld (Germany) in the mathematical physics group of Prof. Dr. Ph. Blanchard

Leadership

2017	Chair of the sub-committee "Quantum Optics and Quantum Technology" at "Photonics Ireland 2017" (Galway, Ireland)
2016	Organizer of the summer school "Shortcuts to Adiabaticity 2016" in Cork
2015	Chair of the sub-committee "Quantum Optics and Quantum Technology" at "Photonics Ireland 2015" (Cork, Ireland)
2014	Invited Organizer of the international workshop "Shortcuts to Adiabaticity 2014" in Shanghai (China)
2012	Invited Organizer of the international workshop "Shortcuts to Adiabaticity 2012" in Bilbao (Spain) (20 invited speakers, 55 participants from 16 different states)
2007 - 2009	Responsible for the development and implementation of a new master degree in physics at the TU Braunschweig, the degree was first offered in 2009 and is still running with minor changes

Publications (Summary)

Number of publications in international, peer-reviewed journals:	**63**
Book (as editor):	1
Chapters in books:	3
h-index (Web of Science):	**20**
Sum of the Times Cited (Web of Science):	**1800**
Average Citations per Item (Web of Science):	**27.69**

Supervision

PhD Theses:	**2** (current, since Oct. 2015 and Oct. 2017) / **2** (completed)
Master Theses:	**2** (current)
Post-doctoral student:	**1** (project completed)
Diploma/Master Theses:	**4** (completed)
Bachelor/4th year projects:	**8** (completed)

Lectures

Total number of independently taught modules: 33

Lectures in English (Selection):

Advanced Quantum Mechanics, Quantum Optics,
Introduction to Computational Physics,
Physics 1 (Service teaching with approx. 300 students)

Lectures in German (Selection):

Statistische Physik,
Theoretische Physik für Lehramtsstudierende,
Numerische Modellierung,
Quantentheorie, Quantenoptik,
Mathematik-Vorkurs für Physiker

Book (as editor)

„Time in Quantum Mechanics - Vol. 2“
Lecture Notes in Physics, Vol. 789 (Springer, 2009)
J. G. Muga, A. Ruschhaupt and A. del Campo (editors)

Five most cited research papers

A. Ruschhaupt, F. Delgado and J. G. Muga, „Physical realization of PT-symmetric potential scattering in a planar slab waveguide“, Journal of Physics A: Math. Gen. 38, L171-L176 (2005) **(200 citations)**

X. Chen, A. Ruschhaupt, S. Schmidt, A. del Campo, D. Guéry-Odelin and J. G. Muga, „Fast Optimal Frictionless Atom Cooling in Harmonic Traps: Shortcut to Adiabaticity“, Physical Review Letters 104, 063002 (2010) **(159 citations)**

E. Torrontegui, S. Ibánez, S. Martínez-Garaot, M. Modugno, A. del Campo, D. Guéry-Odelin, A. Ruschhaupt, X. Chen and J. G. Muga, „Shortcuts to Adiabaticity“, Advances In Atomic, Molecular, And Optical Physics, 62, 117 (2013) **(140 citations)**

X. Chen, I. Lizuain, A. Ruschhaupt, D. Guéry-Odelin and J. G. Muga, „Shortcut to Adiabatic Passage in Two- and Three-Level Atoms“, Physical Review Letters 105, 123003 (2010) **(113 citations)**

A. Ruschhaupt, X. Chen, D. Alonso and J.G. Muga, „Optimally robust shortcuts to population inversion in two-level quantum systems“, New Journal of Physics 14, 093040 (2012**) (79 citations)**

Other research papers in international, peer-reviewed journals

A. Benseny, A. Kiely, Y. Zhang, T. Busch, A. Ruschhaupt, „Spatial non-adiabatic passage using geometric phases“, EPJ Quantum Technology 4 (2017) 3

A. Kiely, J. G. Muga and A. Ruschhaupt, „Effect of Poisson noise on adiabatic quantum control”, Phys. Rev. A 95 (2017) 012115

A. Kiely, A. Benseny, Th. Busch and A. Ruschhaupt, „Shaken, not stirred: Creating exotic angular momentum states by shaking an optical lattice“, J. Phys. B 49 (2016) 215003

M. Palmero, S. Martinez-Garaot, U. G. Poschinger, A. Ruschhaupt and J. G. Muga, „Fast separation of two trapped ions“, New. J. Phys. 17 (2015) 093031

S. Martínez-Garaot, A. Ruschhaupt, J. Gillet, Th. Busch and J. G. Muga, „Fast quasiadiabatic dynamics“, Phys. Rev. A 92 (2015) 043406

M. Ndong,G. Djotyan, A. Ruschhaupt and S. Guerin, „Robust coherent superposition of states by single-shot shaped pulse“, Journal of Physics B: Atomic, Molecular and Optical Physics 48 (2015) 174007

X.-J. Lu, M. Palmero, A. Ruschhaupt, Xi Chen and J. G. Muga, „Optimal transport of two ions under slow spring-constant drifts“, Physica Scripta 90 (2015) 074038

A. Kiely, J. P. L. McGuinness, J. G. Muga and A. Ruschhaupt, „Fast and stable manipulation of a charged particle in a Penning trap“, Journal of Physics B: Atomic, Molecular and Optical Physics 48 (2015) 07550

X-L Lu, J.G. Muga, X. Chen, U. G. Poschinger, F. Schmidt-Kaler and A. Ruschhaupt, „Fast shuttling of a trapped ion in the presence of noise“, Physical Review A 89, 063414 (2014)

A. Kiely and A. Ruschhaupt, „Inhibiting unwanted transitions in population transfer in two- and three-level quantum systems“, Journal of Physics B: At. Mol. Opt. Phys. 47, 115501 (2014)

D. Daems, A, Ruschhaupt, D. Sugny and S. Guérin, „Robust Quantum Control by a Single-Shot Shaped Pulse“, Physical Review Letters 111, 050404 (2013)

A. Ruschhaupt and J.G. Muga, „Shortcuts to adiabaticity in two-level systems: control and optimization“, Journal of Modern Optics DOI:10.1080/09500340.2013.846431 (2013)

X-L Lu, X. Chen, A. Ruschhaupt, D. Alonso, S. Guérin and J.G. Muga, „Fast and robust population transfer in two-level quantum systems with dephasing noise and/or systematic frequency errors“, Physical Review A 88 , 033406 (2013)

J. Kiukas, A. Ruschhaupt and R.F. Werner, „Full counting statistics of stationary particle beams“, Journal of Mathematical Physics 54, 042109 (2013)

S. Ibánez, X. Chen, E. Torrontegui, J. G. Muga and A. Ruschhaupt, „Multiple Schrödinger Pictures and Dynamics in Shortcuts to Adiabaticity“, Physical Review Letters 109, 100403 (2012) (46 citations)

V.P. Singh and A. Ruschhaupt, „Optimizing the catching of atoms or molecules in two-dimensional traps“, Physical Review A 86, 043834 (2012)

E. Torrontegui, S. Martinez-Garaot, A. Ruschhaupt, and J. G. Muga, „Shortcuts to adiabaticity: Fast-forward approach“, Physical Review A 86, 013601 (2012)

J. Kiukas, A. Ruschhaupt, P. O. Schmidt and R. F. Werner, „Exact Energy-Time Uncertainty Relation for Arrival Time by Absorption“, Journal of Physics A: Math. Theor. 45, 185301 (2012)

W. Schmunk, M. Gramegna, G. Brida, I. P. Degiovanni, M. Genovese, H. Hofer, S. Kück, L. Lolli, M. G. A. Paris, S. Peters, M. Rajteri, A. M. Racu, A. Ruschhaupt, E. Taralli and P. Traina, „Photon Number Statistics of NV Centre Emission“, Metrologia 49, S156 (2012)

E. Torrontegui, X. Chen, M. Modugno, S. Schmidt, A. Ruschhaupt , D. Guéry-Odelin and J. G. Muga, „Transitionless expansion of cold atoms in optical Gaussian beam traps“, Physical Review A 85, 033605 (2012)

E. Torrontegui, X. Chen, M. Modugno, S. Schmidt, A. Ruschhaupt and J. G. Muga, „Fast transport of Bose-Einstein condensates“, New Journal of Physics, 14, 013031 (2012)

E. Torrontegui, S. Ibáñez, X. Chen, A. Ruschhaupt, D. Guéry-Odelin and J. G. Muga, „Fast atomic transport without vibrational heating“, Physical Review A 83, 013415 (2011) (76 citations)

E. Torrontegui, A. Ruschhaupt, D. Guéry-Odelin and J. G. Muga, „Simulation of quantum collinear chemical reactions with ultracold atoms“, Journal of Physics B: At. Mol. Opt. Phys. 44, 195302 (2011)

J. G. Muga, X. Chen, E. Torrontegui, S. Ibáñez, I. Lizuain and A. Ruschhaupt, „Shortcuts to quantum adiabatic processes“, Journal of Physics: Conference Series 306, 012022 (2011)

I. Lizuain, J. Echanobe, A. Ruschhaupt, J. G. Muga and D. A. Steck, „Structural and dynamical aspects of avoided-crossing resonances in a 3-level Λ system“, Physical Review A 82, 065602 (2010)

E. Torrontegui, J. Echanobe, A. Ruschhaupt, D. Guéry-Odelin and J. G. Muga, „Cold-atom dynamics in crossed-laser-beam waveguides“, Physical Review A 82, 043420 (2010)

E. Ya. Sherman, J. G. Muga, V. K. Dugaev and A. Ruschhaupt, „Strong electron spin-Hall effect by a coherent optical potential“, Semiconductor Science and Technology 25, 0905004 (2010)

J. G. Muga, X. Chen, S. Ibáñez, I. Lizuain and A. Ruschhaupt, „Transitionless quantum drivings for the harmonic oscillator“, Journal of Physics B: At. Mol. Opt. Phys. 43, 085509 (2010)

X. Chen, A. Ruschhaupt, S. Schmidt, S. Ibáñez and J. G. Muga, „Review: Shortcut to adiabaticitiy in harmonic traps“, Journal of Atomic and Molecular Sciences 1, 1 (2010)

J. G. Muga, Xi Chen, A. Ruschhaupt and D. Guéry-Odelin, „Frictionless dynamics of Bose-Einstein condensates under fast trap variations“, Journal of Physics B: At. Mol. Opt. Phys. 42, 241001 (2009) (62 citations)

Xi Chen, J. G. Muga, A. del Campo and A. Ruschhaupt, „Atom cooling by nonadiabatic expansion“, Physical Review A 80, 063421 (2009)

S. Schmidt, J. G. Muga and A. Ruschhaupt, „Stopping particles of arbitrary velocities with an accelerated wall“, Physical Review A 80, 023406 (2009)

J. Kiukas, A. Ruschhaupt and R. F. Werner, „Tunneling Times with Covariant Measurements”, Foundation of Physics 39, 829-846 (2009)

A. Ruschhaupt, A. del Campo and J. G. Muga, „Momentum-space interferometry with trapped ultracold atoms“, Physical Review A 79, 023616 (2009)

A. Ruschhaupt and J. G. Muga, „Control of atomic motion with an atom-optical diode on a ring“, Journal of Physics B: At. Mol. Opt. Phys. 41, 205503 (2008)

A. Ruschhaupt and J. G. Muga, „The atom diode - A one-way laser barrier for cooling atoms“, European Physical Journal Special Topics 159, 127–134 (2008)

A. Ruschhaupt and J. G. Muga, „Three-dimensional effects in atom diodes: Atom-optical devices for one-way motion“, Physical Review A 76, 013619 (2007)

A. Ruschhaupt, A. del Campo and J. G. Muga, „Momentum interferences of a freely expanding Bose-Einstein condensate due to interatomic interaction change“, European Physical Journal D 40, 399-403 (2006)

F. Delgado, J. G. Muga and A. Ruschhaupt, „Preparation of ultralow atomic velocities by transforming boand states into tunneling resonances“, Physical Review A 74, 063618 (2006)

I. Lizuain, J. G. Muga and A. Ruschhaupt, „Laser excitation of transverse modes in an atomic waveguide“, Physical Review A 74, 053608 (2006)

A. Ruschhaupt, J. G. Muga and M. G. Raizen, „One-photon atomic cooling with an optical Maxwell's demon valve“, Journal of Physics B: At. Mol. Opt. Phys. 39, 3833 (2006)

A. Ruschhaupt, J. G. Muga and M. G. Raizen, „Improvement by laser quenching of an `atom diode': a one-way barrier for ultra-cold atoms“, Journal of Physics B: At. Mol. Opt. Phys. 39, L133-L138 (2006)

A. Ruschhaupt and J. G. Muga, „Adiabatic interpretation of a two-level atom diode, a laser device for unidirectional transmission of ground-state atoms“, Physical Review A 73, 013608 (2006)

A. Ruschhaupt, F. Delgado and J. G. Muga, „Velocity selection of ultra-cold atoms with Fabry-Perot laser devices: improvements and limits“, Journal of Physics B: At. Mol. Opt. Phys. 38, 2665-2674 (2005)

Ph. Blanchard, T. Krueger and A. Ruschhaupt, „Small world graphs by iterated local edge formation“, Physical Review E 71, 046139 (2005)

A. Ruschhaupt and J. G. Muga, „Atom diode: a laser device for a unidirectional transmission of ground-state atoms“, Physical Review A 70, 061604(R) (2004) (50 citations)

A. Ruschhaupt and J. G. Muga, „Simultaneous Arrival of Information in Absorbing Waveguides“, Physical Review Letters 93, 020403 (2004)

A. Ruschhaupt, B. Navarro and J. G. Muga, „Perfect detection of ultra-cold atoms by laser-induced ionization“, Journal of Physics B: At. Mol. Opt. Phys. 37, L313-319 (2004)

A. Ruschhaupt, J. A. Damborenea, B. Navarro, J. G. Muga and G. C. Hegerfeldt, „Exact and approximate complex potentials for modelling time observables“, Europhysics Letters 67, 1-7 (2004)

F. Delgado, J. G. Muga and A. Ruschhaupt, „Ultrafast propagation of Schrödinger waves in absorbing media“, Physical Review A 69, 022106 (2004)

F. Delgado, J. G. Muga, A. Ruschhaupt, G. Garcia-Calderon and J. Villavicencio, „Tunneling dynamics in relativistic and nonrelativistic wave equations“, Physical Review A 68, 032101 (2003)

I. L. Egusquiza, J. G. Muga, B. Navarro and A. Ruschhaupt, „Comment on: On the standard quantum-mechanical approach to times of arrival“, Physics Letters A 313, 498-501 (2003)

A. Ruschhaupt, „Relativistic time of arrival and traversal time“, Journal of Physics A: Math. Gen. 35, 10429-10443 (2002)

A. Ruschhaupt, „A relativistic extension of event enhanced quantum theory“, Journal of Physics A: Math. Gen. 35, 9227-9243 (2002)

Ph. Blanchard, A. Jadczyk and A. Ruschhaupt, „How events come into being: EEQT, particle tracks, quantum chaos and tunnelling time“, Journal of Modern Optics 47, 2247-2263 (2000)

A. Ruschhaupt, „Simulations of barrier traversal and reflection times based on event enhanced quantum theory“, Physics Letters A 250, 249-256 (1998)

Book chapters

A. Ruschhaupt and R. F. Werner, „Quantum Mechanics of Time“ in „The Message of Quantum Science” (Ph. Blanchard, J. Fröhlich, Editoren, Springer, 2015)

A. Ruschhaupt, J. G. Muga and G. C. Hegerfeldt, „Detector models for the quantum time of arrival“, in „Time in Quantum Mechanics - Vol. 2“ (Lecture Notes in Physics, Vol. 789, 2009), J. G. Muga, A. Ruschhaupt and A. del Campo (Editoren)

A. Ruschhaupt, „An Application of EEQT: Tunneling Times“ in Ph. Blanchard et. al. (Editoren) „Decoherence: Theoretical, Experimental, and Conceptual Problems“ (LNP 538, Springer, 2000)