

# Curriculum Vitae for Assoz. Prof. Mag. Dr. Wolfgang Dür

## Personal details

Date of Birth: 25.10.1973  
Place of Birth: Innsbruck, Austria  
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## Research overview

Publications in refereed journals: >130 (>35 in Phys.Rev.Lett., Nature, Nature Physics)  
Citations: > 6000 (ISI citation index), h-Index 34  
>17000 (Google scholar), h-Index 54  
Book contributions/Proceedings: 10  
Talks at conferences/workshops >20

## Research Interest

Quantum networks  
Quantum metrology  
Measurement-based quantum computation  
Decoherence and large-scale entanglement  
Quantum information theory and multipartite entanglement  
Didactic of physics

## Scientific education

1993- 1998 Undergraduate studies in physics at the University of Innsbruck  
1995 -2000 Undergraduate studies in physics & mathematics (high school teacher education) at the University of Innsbruck  
1998 - 2001 Graduate studies in physics at the University of Innsbruck

## Career History

1998 – 2001 Scientific staff at ITP, University of Innsbruck, Austria, with I. Cirac  
2000 – 2001 High school teacher (1/2 position) at HTL Innbruck, Austria  
2001 Promotion sub. ausp. praes., University Innsbruck, Austria  
2001 – 2003 Scientific staff (PostDoc) at University of Munich, Germany  
2003 – 2005 Scientific staff (PostDoc) at ITP, University of Innsbruck, Austria  
2005 - 2009 Senior Scientist IQOQI (Innsbruck, Austria), group of H.J Briegel  
2008 Habilitation at University of Innsbruck  
2009-2011 Ass. Prof. at ITP, University of Innsbruck; responsible for teacher education  
Since 2011 Associate Professor at ITP, University of Innsbruck; responsible for teacher education

## Fellowship and Awards:

2001 Würdigungspreis des Bundesministeriums für BWK Austria  
2001-2003 Marie-Curie individual fellowship of the European Union  
2003-2005 APART fellowship of Austrian Academy of Sciences  
2007 Felix Kuschenitz award 2007 of Austrian Academy of Sciences  
2009 Outstanding referee award of the American Physical Society  
2010 Number 12 in world-wide ranking “Quantum computer 1999 – 2010” - category “Citations/Paper” - see <http://sciencewatch.com/ana/st/quantum/authors/>

## Projects

2005-2011	Participation in EU projects PROSECCO, QUPRODIS, SCALA, QICS, NAMEQUAM, national partner in FWF project "Entanglement purification as a fundamental tool in quantum information processing"
2005-2008	workpackage leader and associate partner in EU project "Optical Lattices and Quantum Information (OLAQUI)"
2005-2008	Project leader of FWF project 'Classical and quantum simulation of quantum systems'
2008-2012	Project leader of FWF project "Simulation of strongly correlated systems"
2009-2012	co-PI of project P12 "Measurement-based quantum computation" in SFB FOQUS
2012-2016	Project leader of FWF project "Large scale entanglement"
Since 2014	Leader of Regional Educational Competence Centre Physik West
Since 2015	Project leader of FWF project "Hybrid quantum information processing under noise"
Since 2018	Project leader of FWF project "Quantum communication networks: design and applications"

## Referee activities

Outstanding referee award of American Physical Society, 2009

referee activities for following journals: Nature Physics, Nature Photonics, Physical Review Letters (PRL), Physical Review A (PRA), New Journal of Physics (NJP), Journal Physics A – Mathematical and Theoretical, Quantum Information and Computation, Phy. Lett. A, Quantum Information and Computation, npj Quantum Information, PRX, Quantum

Peer Review of project proposals for EPSRC (Research Councils UK), Estonian Research Council, Swiss National Science Fund, European Research Council, Slovak Academy of Sciences, Foundation for Polish Science

## Selected international cooperations

Prof. Stefan Heusler, Münster, Germany (Didactics of Physics)

Prof. M.-A. Martin-Delgado, Madrid, Spain

Dr. Janek Kolodynski, ICFO Barcelona, Spain

Dr. Florian Fröwis & Prof. Nicolas Gisin, GAP Genf, Switzerland

Prof. Robert Raussendorf, University of British Columbia, Vancouver, Canada

Prof. Jens Eisert, Berlin, Germany

Dr. Pavel Sekatski & Prof. Nicolas Sangouard, Basel, Switzerland

Dr. Sabine Wölk, DLR Ulm, Germany

Dr. Michalis Skotiniotis, UAB Barcelona, Spain

## Invited talks and Seminar talks

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- 12/1998, "Quantum Repeaters"  
Seminar talk at "Treffen QIKI", Karlsruhe, Germany, 22/12/1998
- 05/1999, "Separability and distillability of multiparticle quantum systems"  
Talk at SFB meeting, Innsbruck, 28/05/1999
- 07/1999, "Separability and distillability of multiparticle quantum systems"  
Invited talk at "Complexity, Computation and the Physics of Information", Cambridge, U.K.; 13/07/1999
- 04/2000 "Activating bound entanglement in multiparticle systems"  
Talk at University Barcelona, Spain, 13/04/2000
- 05/2000, "Activating bound entanglement in multiparticle systems"  
talk at Hewlett Packard, BRIMS, Bristol, 10/05/2000,
- 07/2000, "Multipartite entanglement and optimal entanglement production"

- Talk at "Workshop on Quantum Information", Benasque Center for Science, Spain; 04/07/2000
- 01/2001, "Non-local operations" talk at Ludwig-Maximilians-University Munich, Institute for Theoretical Physics,
- 12/2001, "Entanglement properties of physical actions"; Invited talk at "Quantum Entropies: Information and Dynamics", S.I.S.S.A, Trieste, Italy, 12/12/2001
- 05/2002, "Universal simulation of quantum dynamics with quantum optical systems" Talk at Max Planck Institute for Quantum Optics, Garching, Germany, 15/05/2002
- 01/2003, "Quantum Information Theory meets Quantum Optics - recent developments and future perspectives"; invited presentation talk, Innsbruck, Austria, 23/01/2003
- 02/2003, "Entanglement purification for quantum computation" Talk at Mini-Symposium MPQ-LMU, Garching, Germany, 04/02/2003
- 06/2003, "Stability of macroscopic entanglement under decoherence"; talk at "Workshop on Quantum Information", Benasque Center for Science, Spain
- 12/2003, "Multiparticle Entanglement", Invited tutorial talk at "IQING", Max Planck Institute for Quantum Optics, Garching, Germany, 02/12/2003
- 09/2004, "Graph states - stability under decoherence, entanglement purification and possible applications", invited talk at "Quantum Information Science – special week on quantum cryptography", Newton Institute, Cambridge, UK
- 03/2005, "Entanglement in spin chains and spin gases", Invited talk at "Quantum Optics Conference", Obergurgl, Austria
- 10/2005, "Quantum Repeater", Invited talk at Colloque thématique du GdR, "Communication Quantique", Thales research center, Palaiseau, France, 19/10/2005
- 02/2006, "Entanglement as a resource for distributed secure application", Talk at QIPC Cluster review 06, Henry Poincare Institute, Paris, France, Review of PROSECCO
- 02/2006, "Entanglement in many body systems," public presentation of QUPRODIS project, QIPC Cluster review 06, Henry Poincare Institute, Paris, France
- 05/2006, "Entanglement in many-body systems" Invited talk at "Gordon research conference on Quantum Information Science", Barga, Italy
- 02/2007, "Quantum Repeaters & applications" Invited talk at "QUROPE winter school on quantum information", Obergurgl, Austria
- 03/2007, "Classical simulation of strongly correlated systems", Invited talk at "Quantum Information and Many-Body Quantum Systems", Centro De Giorgi, Pisa, Italy
- 06/2007, "Novel ideas & concepts for measurement based quantum computation" and "Graph states and one-way quantum computation", talks at "Quantum Information", Benasque Center for Science, Benasque, Spain
- 01/2008, Graph states and one-way quantum computation, SFB Colloquium, Innsbruck, Austria
- 01/2009, Measurement-based Quantum Computation - recent developments and future perspectives, SFB Conference, Innsbruck, Austria
- 06/2009, Unifying all classical spin systems in a lattice gauge theory, Workshop on "Quantum Information", Benasque, Spain
- 03/2010, Quanteninformatiostheorie – ein Thema für den Schulunterricht, eingeladener Hauptvortrag (Fachbereich Didaktik der Physik), DPG Frühjahrstagung 2010, Hannover, Germany
- 02/2011: „Stable macroscopic quantum superpositions“, Max Planck Institut für Quantenoptik, Garching, Germany (Seminar talk)
- 05/2011: "Stable macroscopic quantum superpositions", invited talk at Workshop "Entanglement, Quantum Information and the Quantum to Classical Transition", Accademia dei Lincei, Rome, Italy
- 10/2011: "Quanteninformatiostheorie als Einstieg in die Quantenphysik", invited talk at DPG Lehrerfortbildung "Quantenphysik", Bad Honnef, Germany
- 02/2013 „Small-scale measurement-based processors for error correction & entanglement purification“, Seminar talk, MPQ Garching

- 04/2013: „Measurement based quantum computation and statistical mechanics“, colloquium talk, University of Münster, Germany
- 06/2013: „Macroscopicity of quantum spin systems“, invited talk at Quantum Theory: Advances and Problems - QTAP, Linnaeus University, Växjö, Sweden
- 07/2013: “Quantum metrology beyond the standard scenario”, Seminar talk, Workshop “Quantum Information”, Benasque, Spain
- 02/2014: “Measurement-based quantum information processing with high error thresholds”, invited talk at “Quantum optics 2014” conference, Obergurgl, Austria
- 03/2015: “Measurement-based quantum information processing with high error thresholds”, seminar talk, group of applied physics (GAP), University of Geneva, Switzerland
- 07/2015: “Quanteninformation – von den Wesenszügen der Quantenphysik bis zur aktuellen Forschung”, invited talk at DPG Lehrerfortbildung „Quanteninformation“, Bad Honnef, Germany
- 09/2015: “Visualizing the invisible: The qubit as a key to quantum physics”, talk at Multimedia Physics teaching and Learning (MPTL), Munich, Germany
- 09/2015: "Ultimate limits in quantum metrology", seminar talk, University of Basel, Switzerland
- 02/2016: “Visualisierung des Unsichtbaren: Das Qubit als Schlüssel zur Quantenphysik”, talk at DPG spring meeting, Hannover, Germany
- 07/2016: “Macroscopic quantum states“, Seminar talk, Workshop “Quantum Science: Implementations”, Benasque, Spain
- 07/2016: “Measurement-based quantum information processing and quantum metrology“, Seminar talk, Workshop “Quantum Science: Implementations”, Benasque, Spain
- 09/2017: “Limitations to detect macroscopic quantum superpositions”, invited talk, Quantum Optics IX conference, Gdansk, Poland
- 09/2017: “Scaling of resources for different repeater protocols”, invited talk, 2<sup>nd</sup> workshop for Quantum Repeaters and Networks, Seefeld, Austria
- 03/2018: “Limitations to detect macroscopic quantum superpositions”, talk at "Quantum optics 2018" conference, Obergurgl, Austria
- 07/2018: “Macroscopic quantum states: measures and limitations to detect them”, Seminar talk, Workshop “Quantum Science: Implementations”, Benasque, Spain
- 04/2019: "Macroscopic quantum states: applications and fundamental limitations", Colloquium talk, DQ-mat, University Hannover, Germany.  
<https://www.dq-mat.uni-hannover.de/de/news-veranstaltungen/jour-fixe/>
- 09/2019 “Influence of noise on quantum metrology (and ways around)”, talk at “Quantum Simulation”, ESI Vienna, Austria
- 09/2019 “Entangle me! Grundprinzipien der Quantenphysik spielerisch demonstriert“, talk at GDPC Jahrestagung 2019, Vienna, Austria
- 11/2019 „Quantum information: from principles of quantum mechanics to latest research and technologies“ invited talk at Gulbenkian Programme New Talents in Quantum Technologies. School: Introduction to Quantum Technologies, Lisbon, Portugal, 23.11.2019
- 11/2019 "Macroscopic quantum states: applications and fundamental limitations", Seminar talk, Physics of Information and Quantum Technologies Group, Lisbon, Portugal

### ***Teacher education & public outreach***

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- 01/2008, “Quanteninformation und Quantencomputer – ein neuer Zugang zur Quantenmechanik für den Schulunterricht“, presentation for high school teachers – Fortbildung: Quantencomputer, Innsbruck, Austria
- 03/2008, “Quantum Information and Quantum Computation“, Presentation for high school students and teachers, High school student workshop (Trient/Innsbruck), Innsbruck, Austria
- 11/2008, “Didaktik der Quantenphysik im Schulunterricht“, Presentation for high school teachers – Fortbildung, Innsbruck, Austria

- 1/2009, „Einführung in die Quantenphysik und aktuelle Forschung“, presentation for high school teachers – Fortbildung, PH Niederösterreich, St. Pölten, Austria
- 11/2009, Haben kleinste Teilchen tatsächlich so seltsame Eigenschaften?, public lecture for high school students, Aktionstag Junge Uni 2009, Universität Innsbruck
- 11/2009, Was hat es mit den Quanten und ihren Sprüngen auf sich?, public lecture, Lange Nacht der Forschung 2009, Universität Innsbruck
- 11/2010, Teleportation – Traum oder Wirklichkeit?, public lecture for high school students, Aktionstag Junge Uni 2010, Universität Innsbruck
- 11/2010, Der Quantencomputer, public evening lecture, Uni.com Programm, Volkshochschule Innsbruck & Universität Innsbruck
- 12/2010, Grundzüge der Quantenphysik, public lecture for high-school students, Paulinum Schwaz
- 1/2011, „Quantenphysik in der Schule“, presentation for high school teachers – Fortbildung (AHS/BHS Lehrer), PH Vorarlberg, Bundesrealgymnasium Dornbirn
- 4/2011, Einführung Quantenphysik, presentation for teachers – Fortbildung (Landesarbeitsgemeinschaft Hauptschullehrer Physik), University of Innsbruck
- 11/2011, Fernwirkung und Teleportation, public evening lecture, Uni.com Programm „Physik als Grundlage von Zukunftstechnologien: Vom künstlichen Ohr über die Klimaforschung bis zum Quantencomputer“, Volkshochschule Innsbruck & Universität Innsbruck
- 11/2011, Teleportation – Traum oder Wirklichkeit?, public lecture for high school students, Aktionstag Junge Uni 2011, Universität Innsbruck
- 11/2012, Teleportation – Traum oder Wirklichkeit?, public lecture for high school students, Aktionstag Junge Uni 2012, Universität Innsbruck
- 11/2013, Der Quantencomputer – die Rechenmaschine der Zukunft?, Aktionstag Junge Uni 2013, Universität Innsbruck
- 05/2016, Quantenteleportation und Quantenkommunikation - auf dem Weg zum Quanteninternet, Vortrag bei "A Pint of Science", Das Nax, Innsbruck.
- 01/2018, „Auf dem Weg zum Quanteninternet“, presentation for high school teachers – Fortbildung (AHS/BHS Lehrer), Innsbruck, Austria
- 04/2018, „Ein Kontextorientierter Zugang zur Quantenphysik“, presentation for high school teachers from Salzburg, Innsbruck, Austria
- 11/2019, „Selbständiges Arbeiten im Physikunterricht mit kompetenzfördernden Lernaufgaben“, presentation for high school teachers – Fortbildung (NMS Lehrer), NMS Rum, Austria

### ***Organization of conferences & events***

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- 09/2008 QICS Workshop on "Foundational Structures for Quantum Information and Computation", Obergurgl, Austria, local organization team
- 09/2009, Annual meeting of Austrian Physical Society, Swiss Physical Society and Austrian Society for Astronomy and Astrophysics, University of Innsbruck, scientific program coordination
- 02/2011, SFB Kolloquium, Innsbruck, Austria
- 10/2011, „LehrerInnen und Schülertag“, Week of Physics, Innsbruck, Austria (public event for 500 pupil)
- 3/2012, „Day of physics“, Innsbruck, Austria (public event for 180 pupil)
- 07/2012, 1<sup>st</sup> workshop on “Quantum Information”, Seefeld, Austria
- 09/2012, Quantum Information and Statistical mechanics, Innsbruck, Austria – local organization
- 2/2013, “Day of physics“, Innsbruck, Austria (public event for 300 pupil)
- 2/2014, “Day of physics“, Innsbruck, Austria (public event for 500 pupil)
- 07/2014, 2<sup>nd</sup> workshop on “Quantum Information“, Seefeld, Austria
- 02/2015, “Day of physics“, Innsbruck, Austria (public event for 300 pupil)

- 02/2016, “Day of physics”, Innsbruck, Austria (public event for 400 pupil)
- 07/2016, 3<sup>rd</sup> workshop on “Quantum Information”, Seefeld, Austria
- 07/2018, 4<sup>th</sup> workshop on “Quantum Information”, Seefeld, Austria
- 07/2020, 5<sup>th</sup> workshop on “Quantum Information”, Seefeld, Austria – cancelled due to Covid-19

## ***Publications***

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June 2020, total citations >6000, h-Index: 34 (Science Citation Index – ISI);  
>17000, h-Index: 53; i10 Index: 116 (Google Scholar)

## ***Letters***

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1. H.-J. Briegel, W. Dür, J. I. Cirac, and P. Zoller,  
Phys. Rev. Lett. 81, 5932 (1998).  
"Quantum repeaters: The role of imperfect local operations in quantum communication"
2. W. Dür, J. I. Cirac, and R. Tarrach,  
Phys. Rev. Lett. 83, 3562 (1999).  
"Separability and distillability of multiparticle quantum systems"
3. G. Vidal, W. Dür and J. I. Cirac,  
Phys. Rev. Lett. 85, 658 (2000).  
"Reversible transformation of inequivalent kinds of multipartite entanglement",
4. A. Acin, E. Jane, W. Dür and G. Vidal,  
Phys. Rev. Lett. 85, 4811 (2000).  
"Optimal distillation of a GHZ state "
5. J. I. Cirac, W. Dür, B. Kraus and M. Lewenstein,  
Phys. Rev. Lett. 86, 544 (2001).  
"Entangling operations and their implementation using a small amount of entanglement"
6. W. Dür , G. Vidal, J. I. Cirac, N. Linden and S. Popescu,  
Phys. Rev. Lett. 87, 137901 (2001).  
"Entanglement capabilities of non--local Hamiltonians "
7. W. Dür,  
Phys. Rev. Lett. 87, 230402 (2001).  
"Multipartite bound entangled states that violate Bell's inequality"
8. G. Vidal, W. Dür and J. I. Cirac,  
Phys. Rev. Lett. 89, 027901 (2002).  
"Entanglement cost of bipartite mixed states"
9. W. Dür , G. Vidal and J. I. Cirac,  
Phys. Rev. Lett. 89, 057901 (2002).  
"Optimal conversion of non--local unitary operations",
10. W. Dür, C. Simon and J. I. Cirac,  
Phys. Rev. Lett. 89, 210402 (2002).  
"On the effective size of certain macroscopic superpositions"
11. W. Dür and H.-J. Briegel,  
Phys. Rev. Lett. 90, 067901 (2003).  
"Entanglement purification for quantum computation"

12. T. S. Cubitt, F. Verstraete, W. Dür and J. I. Cirac,  
Phys. Rev. Lett. 91, 037902 (2003).  
"Separable states can be used to distribute entanglement"
13. W. Dür, H. Aschauer and H.-J. Briegel,  
Phys. Rev. Lett. 91, 107903 (2003).  
"Multiparticle entanglement purification for graph states"
14. W. Dür and H.-J. Briegel,  
Phys. Rev. Lett. 92, 180403 (2004).  
"Stability of macroscopic entanglement under decoherence"
15. W. Dür, P. Horodecki and J. I. Cirac,  
Phys. Rev. Lett. 93, 020503 (2004).  
"Non-additivity of quantum capacity for multiparty communication channels"
16. W. Dür, L. Hartmann, M. Hein, M. Lewenstein and H.-J. Briegel,  
Phys. Rev. Lett. 94, 097203 (2005).  
"Entanglement in spin chains and lattices with long range Ising-type interactions"
17. J. M. Taylor, W. Dür, P. Zoller, A. Yacoby, C. M. Marcus, and M. D. Lukin,  
Phys. Rev. Lett. 94, 236803 (2005).  
"Solid-state circuit for spin entanglement generation and purification"
18. J. Calsamiglia, L. Hartmann, W. Dür and H.-J. Briegel,  
Phys. Rev. Lett. 95, 180502 (2005).  
"Spin gases: Quantum entanglement driven by classical kinematics"
19. H. Häffner, W. Hänsel, C. F. Roos, J. Benhelm, D. Chek-al-kar, M. Chwalla, T. Körber, U. Rapol, M. Riebe, P.O. Schmidt, C. Becher, O. Gühne, W. Dür, and R. Blatt,  
Nature 438, 643 (2005).  
"Scalable multi-particle entanglement of trapped ions"
20. S. Anders, M. B. Plenio, W. Dür, F. Verstraete, and H.-J. Briegel,  
Phys. Rev. Lett. 97, 107206 (2006)  
"Ground state approximation for strongly interacting systems in arbitrary dimension"
21. M. Van den Nest, A. Miyake, W. Dür, and H.-J. Briegel,  
Phys. Rev. Lett. 97, 150504 (2006).  
"Universal resources for measurement-based quantum computation"
22. M. Van den Nest, W. Dür, and H.-J. Briegel,  
Phys. Rev. Lett. 98, 117207 (2007).  
"Classical spin models and the quantum stabilizer formalism"
23. M. Van den Nest, W. Dür and H.-J. Briegel,  
Phys. Rev. Lett. 100, 110501 (2008).  
"Completeness of the classical 2D Ising model and universal quantum computation"
24. G. De las Cuevas, W. Dür, H. J. Briegel and M. A. Martin-Delgado,  
Phys. Rev. Lett. 102, 230502 (2009).  
"Unifying all classical spin models in a Lattice Gauge Theory"



25. J.-M. Cai, W. Dür, M. Van den Nest, A. Miyake and H.-J. Briegel,  
Phys. Rev. Lett. 103, 050503 (2009).  
“Quantum computation in correlation space and extremal entanglement”
26. F. Fröwis and W. Dür,  
Phys. Rev. Lett. 106, 110402 (2011).  
“Stable Macroscopic Quantum Superpositions”
27. W. Dür and M. Van den Nest,  
Phys. Rev. Lett. 107, 170402 (2011).  
“Quantum simulation of classical thermal states”
28. F. Fröwis and W. Dür,  
Phys. Rev. Lett. 109, 170401 (2012).  
“Are cloned quantum states macroscopic?”
29. M. Zwerger, H. J. Briegel and W. Dür,  
Phys. Rev. Lett. 110, 260503 (2013).  
“Universal and optimal error thresholds for measurement-based entanglement purification”
30. B. P. Lanyon, P. Jurcevic, M. Zwerger, C. Hempel, E. A. Martinez, W. Dür, H. J. Briegel, R. Blatt and  
C. F. Roos,  
Phys. Rev. Lett. 111, 210501 (2013) (Editors’ Suggestion).  
“Measurement-based quantum computation with trapped ions”
31. W. Dür, M. Skotiniotis, F. Fröwis and B. Kraus,  
Phys. Rev. Lett. 112, 080801 (2014).  
“Improved quantum metrology using quantum error-correction”
32. B. P. Lanyon, M. Zwerger, P. Jurcevic, C. Hempel, E. A. Martinez, W. Dür, H. J. Briegel, R. Blatt and  
C. F. Roos,  
Phys. Rev. Lett. 112, 100403 (2014) (Editors’ Suggestion)  
“Experimental violation of multipartite Bell inequalities with trapped ions”
33. W. Dür, P. Sekatski and M. Skotiniotis,  
Phys. Rev. Lett. 114, 120503 (2015).  
“Deterministic super-replication of one parameter unitary transformations”
34. F. Fröwis, P. Sekatski and W. Dür,  
Phys. Rev. Lett. 116, 090801 (2016).  
“Detecting large quantum Fisher information with finite measurement precision”
35. P. Sekatski, M. Skotiniotis and W. Dür,  
Phys. Rev. Lett. 118, 170801 (2017). <https://doi.org/10.1103/PhysRevLett.118.170801>  
“Improved sensing with a single qubit”
36. M. Zwerger, A. Pirker, V. Dunjko, H.J. Briegel and W. Dür,  
Phys. Rev. Lett. 120, 030503 (2018). <https://doi.org/10.1103/PhysRevLett.120.030503>  
“Long-range big quantum-data transmission”
37. M. Zwerger, W. Dür, J.-D. Bancal and P. Sekatski  
Phys. Rev. Lett. 122, 060502 (2019); <https://doi.org/10.1103/PhysRevLett.122.060502>  
“Device-independent detection of genuine multipartite entanglement for all pure states”

## ***Refereed papers***

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38. H.-J. Briegel, W. Dür, S. J. van Enk, J. I. Cirac, and P. Zoller,  
Phil. Trans. Roy. Soc. Lond. A 356, 1841-1851 (1998).  
"Quantum communication and the creation of maximally entangled pairs of atoms over a noisy channel"
39. W. Dür, H.-J. Briegel, J. I. Cirac, and P. Zoller,  
Phys. Rev. A 59, 169-181 (1999), Erratum: Phys. Rev. A 60, 725 (1999).  
"Quantum repeaters based on entanglement purification"
40. W. Dür and J. I. Cirac,  
Journal of Modern Optics, Vol. 47, No. 2/3, 247-255 (2000).  
"Multiparty teleportation"
41. W. Dür and J. I. Cirac,  
Phys. Rev. A 61, 042314 (2000).  
"Classification of multi-qubit mixed states: separability and distillability properties"
42. W. Dür, J. I. Cirac, M. Lewenstein and D. Bruss,  
Phys. Rev. A 61, 062313 (2000).  
"Distillability and partial transposition in bipartite systems"
43. W. Dür and J. I. Cirac,  
Phys. Rev. A 62, 022302 (2000).  
"Activating bound entanglement in multiparticle systems"
44. W. Dür, G. Vidal and J. I. Cirac,  
Phys. Rev. A 62, 062314 (2000).  
"Three qubits can be entangled in two inequivalent ways"
45. B. Kraus, W. Dür, G. Vidal, J. I. Cirac, M. Lewenstein, N. Linden and S. Popescu,  
Z. Naturforsch. 56a, 91-99 (2001)).  
"Entanglement capability of two-qubit operations"
46. W. Dür,  
Phys. Rev. A 63, 020303(R) (2001).  
"Multipartite entanglement that is robust against disposal of particles "
47. W. Dür and J. I. Cirac,  
Phys. Rev. A 64, 012317 (2001).  
" Non-local Operations: Purification, storage, compression, tomography, and probabilistic implementation "
48. W. Dür, G. Vidal and J. I. Cirac,  
Phys. Rev. A 64, 022308 (2001).  
"Visible compression of commuting mixed states"
49. W. Dür and J. I. Cirac,  
Journal of Physics A: Mathematical and General, Vol. 34, 6837-6850 (2001).  
"Multiparticle entanglement and its experimental detection"

50. W. Dür and J. I Cirac,  
Quant. Inf. Comp., Vol. 2, No. 3, 240-254 (2002).  
"Equivalence classes of non-local unitary operations"
51. W. Dür, R. Raussendorf, V. M. Kendon and H.-J. Briegel,  
Phys. Rev. A 66, 052319 (2002).  
"Quantum walks in optical lattices"
52. E. Jane, G. Vidal, W. Dür, P. Zoller and J. I. Cirac,  
Quant. Inf. Comp., Vol. 3, No. 1, 15-37 (2003).  
"Simulation of quantum dynamics with quantum optical systems"
53. H. Aschauer, W. Dür and H.-J. Briegel,  
Phys. Rev. A 71, 012319 (2005),  
"Multiparticle entanglement purification for two-colorable graph states"
54. M. Hein, W. Dür, H. J. Briegel,  
Phys. Rev. A 71, 032350 (2005),  
"Entanglement properties of multipartite entangled states under the influence of decoherence"
55. W. Dür, J. Calsamiglia and H.-J. Briegel,  
Phys. Rev. A 71, 042336 (2005),  
"Multipartite secure state distribution"
56. W. Dür, M. Hein, J.I. Cirac and H.-J. Briegel,  
Phys. Rev. A 72, 052326 (2005).  
"Standard forms of noisy quantum operations via depolarization"
57. J. Calsamiglia, L. Hartmann, W. Dür and H.-J. Briegel,  
International Journal of Quantum Information, Vol. 5, No. 4, 509-523 (2007).  
"Entanglement and decoherence in spin gases"
58. L. Hartmann, J. Calsamiglia, W. Dür and H.-J. Briegel,  
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"Spin gases as microscopic models for non-Markovian decoherence"
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## ***Proceedings and book contributions***

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## Alumni

### PhD Students

- Caroline Kruszynska (co supervised with H.J. Briegel), *Study on multipartite quantum states: preparation, simulation and characterisation*, 2009
- Robert Hübener (co supervised with H.J. Briegel), *On the Structure and Description of Complex Systems*, 2009
- Gemma De las Cuevas (co supervised with H.J. Briegel), *A Quantum Information approach to Statistical Mechanics*, 2011
- Florian Fröwis, *Macroscopicity and stability of quantum spin systems*, 2012
- Michael Zwerger (co supervised with H.J. Briegel), *Small-scale quantum processors and machines*, 2015
- Walter Boyajian (co-supervisor, main supervisor B. Kraus), *Matchgate circuits and compressed quantum computation*, 2015
- Davide Orsucci (co-supervisor, main supervisor H.J. Briegel), *Machine learning approaches to quantum estimation and deliberation*, 2016 (ongoing)
- Volckmar Nebendahl, *On the simulation of spin systems with tensor networks and the numerical optimization of quantum algorithms*, 2016 (defensio April 2016)
- Katharina Schwaiger (co-supervisor, main supervisor B. Kraus), *Few-Body entanglement*, 2018
- Alexander Pirker (main supervisor, co-supervised by H.J. Briegel), *Secure, entanglement-based quantum networks*, 2016-10/2019
- Julius Wallnöfer, *Multipartite and measurement-based approaches for entanglement distribution*, 2016 -12/2019
- Jorge Miguel-Ramiro, *Quantum networks*, 2018 (ongoing)
- Arne Hamann, *Distributed sensing*, 2019 (ongoing)
- Ferran Riera Sabat, 2020 (ongoing)

### Diploma- and master students (research)

- Daniel Zemann (co supervised with H.J. Briegel), *Diagonal Unitary Operations in Hybrid Quantum Computation*, 2009
- Christoph Reiter, *Entanglement purification for multipartite graph states*, 2011
- Matthäus Pühringer, *Classical simulation of decoherence processes with tensor network methods*, 2012
- Frederik Kesting, *Decay of entanglement in encoded quantum systems*, 2013
- Stefan Hattinger, *Messungsbasierte Quantenfehlerkorrektur*, 2015
- Julius Wallnöfer, *Hybrid fault-tolerant quantum computation*, 2015
- Andrea Lopez-Incera, *Fragility of macroscopic quantum states*, 2018
- Jorge Miguel-Ramiro, *Entanglement purification of multi-level systems*, 2018
- Sonia Lopez Bravo, *Quantum networks*, ongoing
- Ferran Riera Sabat, *Improved hashing protocols*, 2019

### Diploma- and master students (teacher education)

- Peter Niederwieser, *Der Quantencomputer im Schulunterricht*, 2012
- Marion Zöggeler, *Quantenmechanische Verschränkung im Schulunterricht*, 2012
- Josef Gredler, *Zugänge zur Quantenphysik für den Unterricht*, 2013
- Katharina Putzer, *Quantenteleportation im Schulunterricht*, 2014
- Markus Frischauf, *Von Qubits zu Wellenfunktionen*, 2015
- Raphael Lamprecht, *Quantennetzwerke – ein Kontextbezogener Zugang zur Quantenmechanik für den Unterricht*, 2015
- Anja Walder, *Der Feldbegriff im Physikunterricht*, 2016

- Caroline Roos, *Messung der Zeit*, 2016
- Bernhard Nairz, *Entwicklung kompetenzorientierter Lernaufgaben für das Unterrichtsfach Physik*, 2016
- Stefano Flaminio, *Entwicklung und möglicher Einsatz von Skripten für den Physikunterricht*, 2017
- Magdalena Reitmeir, *Einsatz von GeoGebra im Physikunterricht*, 2017
- Johannes Weiss, *Die Bell'sche Ungleichung im Schulunterricht*, 2018
- Martin Bstiel, *Verschränkungs-basierte Quantenkryptographie*, 2018
- Marco Egger, *Der Mikrowellenherd: Grundlagen und Anwendungen*, 2019
- Filomena Orgler, *Zur Interpretation der Quantenphysik*, 2020

#### **Bachelor students**

- Peter Niederwieser, *Quantenalgorithmen*, 2010
- Valentin Torggler, *Quantenkommunikation & Quantenrepeater*, 2011
- Julius Wallnöfer, *Multipartite Verschränkungsreinigung*, 2013
- Raphael Brieger, *Tensornetzwerkzustände*, 2014
- Susanne Kühsling, *Messungsbasierte Quanteninformationsverarbeitung*, 2014
- Georg Gruber, *Quanten Clonen*, 2015
- Tobias Olsacher, *Mermin-Klyshko Ungleichung*, 2016
- Arne Hamann, *Quantensimulatoren*, 2016
- Elisa Brunori, *Verschränkungsreinigung*, 2017
- Olivia Callegari, *Physik im Schisport*, 2019
- Magdalena Salzburger, *Schrödingers Katze im Unterricht*, 2019
- Marco Pritzi, *Bellsche Ungleichung*, 2019
- Rebekka Hilfert, *Mechanik in Action- und Superheldenfilmen*, 2019
- Rupert Dankl, *Physik der Achterbahn*, 2019
- Manuel Zehetner, *Physik des Mountainbikens*, 2020
- Stefan Waldegger, *Quantenkryptographie*, 2020
- Shirin Stührenberg, *Physik im Tanzsport*, 2020
- Heidi Feurstein, *Siedlungswasserwirtschaft Wasserversorgung*, 2020
- Simon Stricker, *Verschränkung*, 2020