

Personal Details of Dr Philipp Hyllus

Date of birth: May 4, 1976
Place of birth: Wolfenbüttel (Germany)
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**Research career**

- March 2011 - Research assistant at the University of the Basque Country (Bilbao) in the group of Prof. Dr Géza Tóth. Research area: *Entanglement Theory and Quantum Interferometry*.
- Jan. 2009 - Feb. 2011 Research assistant at the INO-CNR-BEC center of the Università di Trento in the group of Dr Augusto Smerzi. Research area: *Quantum Interferometry*.
- July 2006 - Dec. 2008 Research assistant at the Leibniz Universität Hannover in the group of Prof. Dr Luis Santos. Research area: *Ultracold spinor gases*.
- May 2005 - July 2006 Research assistant at the Imperial College, London (UK), in the group of Prof. Dr Jens Eisert. Research area: *Entanglement Theory*.
- Oct. 2001 - April 2005 PhD student in the group of Prof. Dr Maciej Lewenstein at the institute for theoretical physics of the university of Hannover (Germany). Research area: *Entanglement Theory*. Graduation: January 17, 2005. Grade: *summa cum laude*. Thesis: *Witnessing entanglement in qudit systems*.

Scientific experience

- Fields of Research: (see also the account of my research below)
 - Entanglement Theory: Criteria for the Detection of Entanglement.
 - Ultra-cold Atomic Gases and Linear Optics.
 - Precision measurements: Quantum Interferometry and Parameter Estimation Theory.
- Publications:

19 publications in peer-review journals (Phys. Rev. Lett.: 8, Phys. Rev. A: 9, New. J. Phys: 1, Found. Phys.: 1). 4 articles published in conference proceedings and 1 book contribution. 1 submitted article. In total 508 citations according to the Web of Science. See the publication list below for details.
- Presentations:

8 invited talks at conferences and in research institutes, 11 talks and 11 poster presentations at conferences and workshops. See also the list of recent presentations below.
- Referee activity:

for *Physical Review Letters*, *Physical Review A*, *New Journal of Physics*, *Journal of Physics A*, *QIC (Quantum Information and Communication)*, and *European Physics Letters*.

Submitted articles

- [1] Philipp Hyllus, Wiesław Laskowski, Roland Krischek, Christian Schwemmer, Witłef Wiczyrek, Harald Weinfurter, Luca Pezzé, and Augusto Smerzi, *Fisher information, spin squeezing, and multiparticle entanglement*, preprint: arXiv:1006.4366.

Publications in peer-reviewed journals

- [2] Philipp Hyllus, Luca Pezzé, and Augusto Smerzi, *Entanglement and sensitivity in precision measurements with states of a fluctuating number of particles*, Phys. Rev. Lett. **105**, 120501 (2010).
- [3] Oleg Gittsovich, Philipp Hyllus, and Otfried Gühne, *Multiparticle covariance matrices and the impossibility of detecting graph state entanglement with two-particle correlations*, Phys. Rev. A **82**, 032306 (2010).
- [4] Philipp Hyllus, Otfried Gühne, and Augusto Smerzi, *Not all pure entangled states are useful for sub shot-noise interferometry*, Phys. Rev. A **82**, 012337 (2010).
- [5] C. Klempt, O. Topic, G. Gebreyesus, M. Scherer, T. Henninger, P. Hyllus, W. Ertmer, L. Santos, and J.J. Arlt, *Parametric amplification of vacuum fluctuations in a spinor condensate*, Phys. Rev. Lett. **104**, 195303 (2010).
- [6] A. Osterloh and P. Hyllus, *Estimating multipartite entanglement measures*, Phys. Rev. A **81**, 022307 (2010).
- [7] C. Klempt, O. Topic, G. Gebreyesus, M. Scherer, T. Henninger, P. Hyllus, W. Ertmer, L. Santos, and J. J. Arlt, *Multiresonant Spinor Dynamics in a Bose-Einstein Condensate*, Phys. Rev. Lett. **103**, 195302 (2009).
- [8] N. Bornemann, P. Hyllus, L. Santos, *Resonant spin-changing collisions in spinor Fermi gases*, Phys. Rev. Lett. **100**, 205302 (2008).
- [9] O. Gittsovich, O. Gühne, P. Hyllus, J. Eisert, *Unifying several separability conditions using the covariance matrix criterion*, Phys. Rev. A **78**, 052319 (2008).
- [10] O. Gühne, P. Hyllus, O. Gittsovich, and J. Eisert, *Covariance matrices and the separability problem*, Phys. Rev. Lett. **99**, 130504 (2007).
- [11] P. Hyllus and J. Eisert, *Optimal entanglement witnesses for continuous-variable systems*, New J. Phys. **8**, 51 (2006).
- [12] K. Eckert, P. Hyllus, D. Bruß, U.V. Poulsen, M. Lewenstein, C. Jentsch, T. Müller, E.M. Rasel, and W. Ertmer, *Differential atom interferometry beyond the standard quantum limit*, Phys. Rev. A **73**, 013814 (2006).
- [13] P. Hyllus, O. Gühne, D. Bruß, and M. Lewenstein, *Relations between Entanglement Witnesses and Bell Inequalities*, Phys. Rev. A **72**, 012321 (2005).
- [14] O. Gühne, G. Tóth, P. Hyllus, and H.J. Briegel, *Bell inequalities for graph states*, Phys. Rev. Lett. **95**, 120405 (2005).

- [15] J. Eisert, P. Hyllus, O. Gühne, and M. Curty: *Hierarchies of efficient approximations to problems in entanglement theory*, Phys. Rev. A **70**, 062317 (2004).
- [16] P. Hyllus, C. Moura Alves, D. Bruß, and C. Macchiavello: *Generation and detection of bound entanglement*, Phys. Rev. A **70**, 032316 (2004).
- [17] M. Bourennane, M. Eibl, C. Kurtsiefer, S. Gaertner, H. Weinfurter, O. Gühne, P. Hyllus, D. Bruß, M. Lewenstein, and A. Sanpera: *Experimental detection of multipartite entanglement using witness operators*, Phys. Rev. Lett. **92**, 087902 (2004).
- [18] P. Hyllus and E. Sjöqvist: *Precession and interference in the Aharonov-Casher and scalar Aharonov-Bohm effect*, Found. Phys. **33**, 1085 (2003).
- [19] O. Gühne, P. Hyllus, D. Bruß, A. Ekert, M. Lewenstein, C. Macchiavello, and A. Sanpera: *Detection of entanglement with few local measurements*, Phys. Rev. A **66**, 062305 (2002).
- [20] P. Hyllus and E. Sjöqvist: *Comment on “Complementarity between local and nonlocal topological effects”*, Phys. Rev. Lett. **89**, 198901 (2002).

Contributions to conference-proceedings

- [21] O. Topic, G. Gebreyesus, M. Scherer, T. Henninger, P. Hyllus, C. Klempt, W. Ertmer, L. Santos, and J. J. Arlt, *Resonant Amplification of Quantum Fluctuations in a Spinor Gas*, Las. Phys. **20**, 1 (2010).
- [22] M. Bourennane, M. Eibl, S. Gaertner, C. Kurtsiefer, H. Weinfurter, A. Cabello, O. Gühne, P. Hyllus, D. Bruß, M. Lewenstein, and A. Sanpera: *Four Photon Polarization Entanglement: Tests and Applications*. Int. J. Quant. Inf. **2**, 133 (2004).
- [23] O. Gühne and P. Hyllus: *Investigating three qubit entanglement with local measurements*. Int. J. Theor. Phys. **42**, 1001-1013 (2003).
- [24] O. Gühne, P. Hyllus, D. Bruß, A. Ekert, M. Lewenstein, C. Macchiavello, and A. Sanpera: *Experimental detection of entanglement via witness operators and local measurements*. J. Mod. Opt. **50**, 1079-1102 (2003).

Book contributions

- [25] K. Eckert, O. Gühne, F. Hulpke, P. Hyllus, J. Korbicz, J. Mompart, D. Bruß, M. Lewenstein, and A. Sanpera: *Entanglement properties of composite quantum systems*. In: G. Leuchs, T. Beth (Editors): *Quantum information processing*, Wiley-VCH (Berlin) 2003, ISBN 3-527-40371-X. Preprint: quant-ph/0210107.

Invited talks

- 02.12.2010: *Multiparticle entanglement and phase estimation* at the National Center for Quantum Computing in Sopot (Poland).
- 31.08.2010: *Entanglement and sensitivity in precision measurements with states of a fluctuating number of particles* at the Quantum Technologies Conference in Torun (Poland).
- 06.06.2008: *Resonant spin-changing collisions in spinor Fermi gases* at the BEC-INFM in Trento (Italy).
- 04.03.2007: *Optimal entanglement witnesses for continuous-variable systems* at the ICFO in Barcelona (Spain).
- 13.07.2006: *Optimal entanglement witnesses for continuous-variable systems* at the 6. conference on mathematics and computer science in Pécs (Hungary).
- 03.05.2006: *Variational ground state approximation with Gaussian states* at a Symposiums concerning the simulation of quantum mechanical multiparticle systems in Innsbruck (Austria), hosted by the research group of Prof. Dr Hans Briegel.
- 17.01.2005: *Differential interferometry beyond the standard quantum limit* at the Workshop „Quantum engineering with photons, atoms, and molecules“ in Les Houches (France), organized by the SFB 407 of the German Research Council (DFG) and international partners.
- 28.09.2004: *Sagnac interferometry beyond the standard quantum limit* in Århus (Denmark).

Recent conference contributions

- 05.10.2010: Poster *Entanglement and Interferometry* at the International Conference on Quantum Information and Computation in Stockholm (Sweden).
- 08.03.2010: Talk *Entanglement and sensitivity in precision measurements with states of a fluctuating number of particles* at the spring meeting of the German Physical Society (DPG) in Hannover (Germany).
- 06.11.2009: Poster *Not all entangled states are useful for sub shot-noise interferometry* at the Italian Quantum Information Science Conference 2009 in Pisa (Italy).
- 21.09.2009: Poster *Not all entangled states are useful for sub shot-noise interferometry* at the QIPC 2009: *International Conference on Quantum Information Processing and Communication* in Rome (Italy).
- 13.03.2008 Talk *Resonant spin-changing collisions in spinor Fermi gases* at the spring meeting of the German Physical Society (DPG) in Darmstadt (Germany).
- 23.05.2006: Talk *Optimal entanglement witnesses for continuous-variable systems*. QUOXIC meeting at the Imperial College London (UK).
- 08.12.2005: Poster *Optimal entanglement witnesses for continuous variable systems* at the German - american GDEST workshop „Quantum Information and Coherence“ in Munich (Germany).