

Short curriculum vitae

Coordinates

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Education

Westfälische Wilhelms-Universität Münster, Germany (1995-2001)

- ❑ October 1995 - May 2001: Studies of Mathematics and Physics.
- ❑ Diploma thesis “Applications of Renormalization Group Transformations to Reaction Diffusion Systems and Scalar Field Theories”. Advisors: Prof. Dr. Gernot Münster, Priv.-Doz. Dr. Christian Wieczerkowski.
- ❑ 22/02/2001: Diplom in Physics.

Institut für Theoretische Physik, Universität Hannover, Germany (2001-2004)

- ❑ June 2001 - May 2004: PhD studies in the group of Prof. Dr. Maciej Lewenstein.
- ❑ Topic: “Detecting Quantum Entanglement – Entanglement Witnesses and Uncertainty Relations.” Referees: Prof. Dr. Maciej Lewenstein, Priv.-Doz. Dr. Dagmar Bruß.
- ❑ 01/07/2004: PhD (“Dr. rer. nat.”) in Physics.

Institut für Quantenoptik und Quanteninformation, Österreichische Akademie der Wissenschaften, Innsbruck, Austria (2004-)

- ❑ Since June 2004: Postdoc in the group of Prof. Dr. Hans J. Briegel.
- ❑ Since April 2008: Junior research group leader, funded by the “START Prize”.

Publications

2002

1. 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); [quant-ph/0205089].

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2. 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 (2003); [quant-ph/0210134].
3. K. Eckert, O. Gühne, F. Hulpke, P. Hyllus, J. Korbicz, J. Mompart, D. Bruß, M. Lewenstein, A. Sanpera: *Entanglement properties of composite quantum systems*. In: G. Leuchs, T. Beth (Eds.): „Quantum information processing“, Wiley-VCH (Berlin) 2003; [quant-ph/0210107].
4. O. Gühne and P. Hyllus: *Investigating three qubit entanglement with local measurements*. Int. J. Theor. Phys. **42**, 1001 (2003); [quant-ph/0301162].

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5. O. Gühne: *Characterizing entanglement via uncertainty relations*. Phys. Rev. Lett. **92**, 117903 (2004); [quant-ph/0306194].
6. 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); [quant-ph/0309043].
7. 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).
8. O. Gühne and M. Lewenstein: *Entropic uncertainty relations and entanglement*. Phys. Rev. A **70**, 022316 (2004); [quant-ph/0403219].
9. J. Eisert, P. Hyllus, O. Gühne and M. Curty: *Complete hierarchies of efficient approximations to problems in entanglement theory*. Phys. Rev. A **70**, 062317 (2004); [quant-ph/0407135].
10. G. Tóth and O. Gühne: *Two measurement settings can suffice to verify multipartite entanglement*. AIP Conf. Proc. **734**, 234 (2004); [quant-ph/0409132].
11. O. Gühne and M. Lewenstein: *Separability criteria from uncertainty relations*. AIP Conf. Proc. **734**, 230 (2004); [quant-ph/0409140].
12. M. Curty, O. Gühne, M. Lewenstein and N. Lütkenhaus: *Quantum correlations for quantum key distribution protocols*. AIP Conf. Proc. **734**, 307 (2004).

2005

13. G. Tóth and O. Gühne: *Detecting genuine multipartite entanglement with two local measurements*. Phys. Rev. Lett. **94**, 060501 (2005); [quant-ph/0405165].
14. M. Curty, O. Gühne, M. Lewenstein and N. Lütkenhaus: *Detecting two-party quantum correlations in quantum key distribution protocols*. Phys. Rev. A **71**, 022306 (2005); [quant-ph/0409047].
15. M. Curty, O. Gühne, M. Lewenstein and N. Lütkenhaus: *Detecting quantum correlations for quantum key distribution*. Proc. SPIE **5631**, 9 (2005).

16. M. Curty, O. Gühne, M. Lewenstein und N. Lütkenhaus: *Quantum correlations as basic resource for quantum key distribution*. In: G. Leuchs, T. Beth (Eds.): „*Quantum information processing*“ (second edition), Wiley-VCH (Berlin) 2005.
17. O. Gühne, G. Tóth, P. Hyllus and H.J. Briegel: *Bell inequalities for graph states*. Phys. Rev. Lett. **95**, 120405 (2005); [quant-ph/0410059].
18. G. Tóth, and O. Gühne: *Entanglement detection in the stabilizer formalism*. Phys. Rev. A **72**, 022340 (2005); [quant-ph/0501020].
19. O. Gühne, G. Tóth, and H.J. Briegel: *Multipartite entanglement in spin chains*. New J. Phys. **7**, 229 (2005); [quant-ph/0502160].
20. P. Hyllus, O. Gühne, D. Bruß, and M. Lewenstein: *Relations between entanglement witnesses and Bell inequalities*. Phys. Rev. A **72**, 012321 (2005); [quant-ph/0504079].
21. G. Tóth, O. Gühne, M. Seevinck, and J. Uffink: *Addendum to “Sufficient conditions for three-particle entanglement and their tests in recent experiments”*. Phys. Rev. A **72**, 014101 (2005); [quant-ph/0505100].
22. N. Kiesel, C. Schmid, U. Weber, G. Tóth, O. Gühne, R. Ursin, and H. Weinfurter: *Experimental analysis of a four-qubit cluster state*. Phys. Rev. Lett. **95**, 201502 (2005); [quant-ph/0508128].
23. C. Becher, J. Benhelm, D. Chek-al-kar, M. Chwalla, W. Dür, O. Gühne, H. Häffner, W. Hänsel, T. Körber, A. Kreuter, G.P.T. Lancaster, T. Monz, E.S. Phillips, U.D. Rapol, M. Riebe, C.F. Roos, C. Russo, F. Schmidt-Kaler, and R. Blatt: *Entanglement of trapped ions*. Laser Spectroscopy (eds. E.A. Hinds, A. Ferguson, E. Riis) p. 381, World Scientific, 2005.
24. H. Häffner, W. Hänsel, C. 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: *Scalable multiparticle entanglement of trapped ions*. Nature **438**, 643 (2005); [quant-ph/0603217].

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25. G. Tóth and O. Gühne: *Detection of multipartite entanglement with two-body correlations*. Applied Phys. B **82**, 237 (2006); [quant-ph/0602068].
26. J. Rigas, O. Gühne, and N. Lütkenhaus: *Entanglement verification for quantum key distribution systems with an underlying bipartite qubit-mode structure*. Phys. Rev. A **73**, 012341 (2006); [quant-ph/0510022].
27. G. Tóth, O. Gühne, and H.J. Briegel: *Two-setting Bell inequalities for graph states*. Phys. Rev. A **73**, 022303 (2006); [quant-ph/0510007].
28. O. Gühne and N. Lütkenhaus: *Nonlinear entanglement witnesses*. Phys. Rev. Lett. **96**, 170502 (2006); [quant-ph/0512164].
29. O. Gühne and G. Tóth: *Energy and multipartite entanglement in multidimensional and frustrated spin models*. Phys. Rev. A **73**, 052319 (2006); [quant-ph/0510186].

30. O. Gühne, M. Mechler, G. Tóth, and P. Adam: *Entanglement criteria based on local uncertainty relations are strictly stronger than the computable cross norm criterion*. Phys. Rev. A **74**, 010301(R) (2006); [quant-ph/0604050].
31. J. K. Korbicz, O. Gühne, M. Lewenstein, H. Häffner, C.F. Roos and R. Blatt: *Generalized spin squeezing inequalities in N qubit systems: theory and experiment*. Phys. Rev. A **74**, 052319 (2006); [quant-ph/0601038].

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32. C.-Y. Lu, X.-Q. Zhou, O. Gühne, W.-B. Gao, J. Zhang, Z.-S. Yuan, A. Goebel, T. Yang and J.-W. Pan: *Experimental entanglement of six photons in graph states*. Nature Physics **3**, 91 (2007); [quant-ph/0609130].
33. O. Gühne, M. Reimpell, and R.F. Werner: *Estimating entanglement measures in experiments*. Phys. Rev. Lett. **98**, 110502 (2007); [quant-ph/0607163].
34. T. Konrad, O. Gühne, J. Audretsch and H.J. Briegel: *Parameter estimation for mixed states from a single copy*. Phys. Rev. A **75**, 062101 (2007); [quant-ph/0702211].
35. O. Gühne and N. Lütkenhaus: *Nonlinear entanglement witnesses, covariance matrices and the geometry of separable states*. J. Phys.: Conf. Ser. **67**, 012004 (2007); [quant-ph/0612108].
36. O. Gühne and H. Häffner, *Tomografie eines Quantenzustands – Verschränkung und Reinheit* Elektrotechnik und Informationstechnik **124**, 131 (2007).
37. O. Gühne, P. Hyllus, O. Gittsovich, and J. Eisert: *Covariance matrices and the separability problem*. Phys. Rev. Lett. **99**, 130504 (2007); [quant-ph/0611282].
38. O. Gühne, C.-Y. Lu, W.-B. Gao, and J.-W. Pan: *Toolbox for entanglement detection and fidelity estimation*. Phys. Rev. A **76**, 030305(R) (2007); [arXiv:0706.2432v1].
39. G. Tóth, C. Knapp, O. Gühne and H.J. Briegel: *Optimal spin squeezing inequalities detect bound entanglement in spin models*. Phys. Rev. Lett. **99**, 250405 (2007); [quant-ph/0702219].

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40. O. Gühne and A. Cabello: *Generalized Ardehali-Bell inequalities for graph states*. Phys. Rev. A **77**, 032108 (2008); [arXiv:0806.2769].
41. A. Cabello, O. Gühne, P. Moreno and D. Rodríguez: *Nonlocality for graph states*, Laser Phys. **18**, 335 (2008).
42. O. Gühne, M. Reimpell, and R.F. Werner: *Lower bounds on entanglement measures from incomplete information*. Phys. Rev. A. **77**, 052317 (2008); [arXiv:0802.1734]
43. A. Cabello, O. Gühne, and D. Rodríguez: *Mermin inequalities for perfect correlations*. Phys. Rev. A **77**, 062106 (2008); [arXiv:0708.3208].
44. J. Richert and O. Gühne: *Low energy properties of even-legged d -dimensional quantum spin systems: a variational approach*. Phys. Status Solidi B **245**, 1552 (2008).

45. W. Wieczorek, C. Schmidt, N. Kiesel, R. Pohlner, O. Gühne, and H. Weinfurter: *Experimental observation of an entire family of four-photon entangled states*. Phys. Rev. Lett. **101**, 010503 (2008); [arXiv:0806.1882].
46. T. Moroder, O. Gühne, and N. Lütkenhaus: *Iterations of nonlinear entanglement witnesses*. Phys. Rev. A **78**, 032306 (2008); [arXiv:0806.0855].
47. H. Häffner, W. Hänsel, C.F. Roos, P.O. Schmidt, M. Riebe, M. Chwalla, D. Chek-al-kar, J. Benhelm, U.D. Rapol, T. Körber, C. Becher, O. Gühne, W. Dür, and R. Blatt, *Quantum Computing with Trapped Ions*. In H. Takayanagi, J. Nitta, H. Nakano (Eds.): “Controllable Quantum States”, p. 403, World Scientific (Singapore), 2008.
48. O. Gittsovich, O. Gühne, P. Hyllus, and J. Eisert: *Unifying several separability conditions using the covariance matrix criterion*. Phys. Rev. A **78**, 052319 (2008); [arXiv:0803.0757].
49. O. Gühne, F. Bodoky, and M. Blaauboer: *Multipartite entanglement under the influence of decoherence*. Phys. Rev. A **78**, 060301(R) (2008); [arxiv:0805.2873].

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50. C.-Y. Lu, W.-B. Gao, O. Gühne, X.-Q. Zhou, Z.-B. Chen and J.-W. Pan: *Demonstrating Anyonic Fractional Statistics with a Six-Qubit Quantum Simulator*. Phys. Rev. Lett. **102**, 030502 (2009); [arXiv:0710.0278].
51. G. Tóth, C. Knapp, O. Gühne and H.J. Briegel: *Spin squeezing and entanglement*. Phys. Rev. A **79**, 042334 (2009); [arXiv:0806.1048].
52. O. Gühne and G. Tóth: *Entanglement detection*. Physics Reports **474**, 1 (2009); [arXiv:0811.2803].
53. G. Tóth, C. Knapp, O. Gühne and H.J. Briegel: *Generalized spin squeezing criteria: Entanglement detection with collective measurements*. AIP Conf. Proc. **1110**, 41 (2009).
54. O. Gittsovich, O. Gühne, P. Hyllus, and J. Eisert: *Covariance matrix criterion for separability*. AIP Conf. Proc. **1110**, 63 (2009).
55. G. Tóth and O. Gühne: *Entanglement and permutational symmetry*. Phys. Rev. Lett. **102**, 170503 (2009). [arXiv:0812.4453].
56. G. Kirchmair, F. Zähringer, R. Gerritsma, M. Kleinmann, O. Gühne, A. Cabello, R. Blatt, and C. Roos: *State independent experimental test of quantum contextuality*. Nature **460**, 494 (2009); [arXiv:0904.1655].
57. F. Bodoky, O. Gühne, and M. Blaauboer: *Modeling the decay of entanglement for electron spin qubits in quantum dots*. J. Phys.: Condens. Matter **21**, 395602 (2009); [arXiv:0809.3561].
58. R. Hübener, M. Kleinmann, T.-C. Wei, C. González-Guillén, and O. Gühne: *The geometric measure of entanglement for symmetric states*. Phys. Rev. A (in press); [arXiv:0905.4822].

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59. W.-B. Gao, C.-Y Lu, X.-C. Yao, P. Xu, O. Gühne, A. Goebel, Y.-A. Chen, C.-Z. Peng, Z.-B. Chen, and J.-W. Pan: *Experimental demonstration of a hyper-entangled ten-qubit 'Schrödinger cat' state*. [arXiv:0809.4277].
60. O. Gühne and M. Seevinck, *Separability criteria for genuine multiparticle entanglement*. [arXiv:0905.1349].
61. W.-B. Gao, P. Xu, X.-C. Yao, O. Gühne, A. Cabello, C.-Y Lu, C.-Z. Peng, Z.-B. Chen and J.-W. Pan: *Experimental realization of a controlled-NOT gate with four photon six-qubit cluster states*. [arXiv:0905.2103].
62. W.-B. Gao, X.-C. Yao, P. Xu, O. Gühne, A. Cabello, C.-Y Lu, T. Yang, Z.-B. Chen and J.-W. Pan: *Experimental Test of Quantum Nonlocality with Two Different Four-Photon Six-Qubit Graph States*. [arXiv:0906.3390].
63. G. Tóth and O. Gühne, *Separability criteria and entanglement witnesses for symmetric quantum states*. [arXiv:0908.3679]