

Publications

(January 8, 2009)

Articles in refereed journals

42. *Geometric phase gate on an optical transition for ion trap quantum computation*, K. Kim, C. F. Roos, L. Aolita, H. Häffner, V. Nebendahl, R. Blatt, Phys. Rev. A **77**, 050303(R) (2008).
41. *Nonlinear coupling of continuous variables at the single quantum level*, C. F. Roos, T. Monz, K. Kim, M. Riebe, H. Häffner, D. F. V. James, R. Blatt, Phys. Rev. A **77**, 040302(R) (2008).
40. *High-fidelity ion-trap quantum computation with hyperfine clock states*, L. Aolita, K. Kim, J. Benhelm, C. F. Roos, H. Häffner, Phys. Rev. A **76**, 040303 (2007).
39. *Universal quantum computation in decoherence-free subspaces with hot trapped ions*, L. Aolita, L. Davidovich, K. Kim, H. Häffner, Phys. Rev. A **75**, 052337 (2007).
38. *Quantum teleportation with atoms: quantum process tomography*, M. Riebe, M. Chwalla, J. Benhelm, H. Häffner, W. Hänsel, C. F. Roos, R. Blatt, New J. Phys. **9**, 211 (2007).
37. *Robust state preparation of a single trapped ion by adiabatic passage*, C. Wunderlich, T. Hannemann, T. Körber, H. Häffner, C. F. Roos, W. Hänsel, R. Blatt, F. Schmidt-Kaler, J. Mod. Opt. **54** 1541 (2007).
36. *Generalized spin-queezing inequalities in N -qubit systems*, J. Korbicz, O. Gühne, M. Lewenstein, H. Häffner, C. F. Roos, R. Blatt, Phys. Rev. A **74**, 052319 (2006).
35. *Process tomography of ion trap quantum gates*, M. Riebe, K. Kim, P. Schindler, T. Monz, P. O. Schmidt, T. Körber, W. Hänsel, H. Häffner, C. F. Roos, R. Blatt, Phys. Rev. Lett. **97**, 220407 (2006).

34. *Highly charged ions, quantum-electrodynamics, and the electron mass*,
G. Werth, J. Alonso, T. Beier, K. Blaum, S. Djekic, H. Häffner, N. Hermanspahn, W. Quint, S. Stahl, J. Verdu, T. Valenzuela, M. Vogel,
International Journal of Mass Spectrometry **251**, 152 (2006).
33. *Transport of atoms in a quantum conveyor belt*,
A. Browaeys, H. Häffner, C. McKenzie, S. L. Rolston, K. Helmerson,
W. D. Phillips,
Phys. Rev. A **72**, 053605 (2005).
32. *Single photons on demand from 3D photonic band gap structures*,
M. Florescu, S. Scheel, H. Häffner, H. Lee, D. Strekalov, P. L. Knight,
J. P. Dowling,
Europhys. Lett. **69**, 945 (2005).
31. *Scalable multi-particle entanglement of trapped ions*,
H. Häffner, W. Hänsel, C. F. Roos, J. Benhelm, D. Chek-al-kar, M. Chwalla,
T. Körber, U. D. Rapol, M. Riebe, P. O. Schmidt, C. Becher, O. Gühne,
W. Dür, R. Blatt,
Nature **438**, 643 (2005).
30. *Robust entanglement*,
H. Häffner, F. Schmidt-Kaler, W. Hänsel, C. F. Roos, T. Körber, M. Chwalla,
M. Riebe, J. Benhelm, U. D. Rapol, C. Becher, R. Blatt,
Appl. Phys. B **81**, 151 (2005).
29. *New experimental and theoretical approach to the 3d 2D-level lifetimes of $^{40}\text{Ca}^+$* ,
A. Kreuter, C. Becher, G. P. T. Lancaster, A. B. Mundt, C. Russo, H. Häffner,
C. Roos, W. Hänsel, F. Schmidt-Kaler, R. Blatt, M. S. Safronova,
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28. *Deterministic quantum teleportation with atoms*,
M. Riebe, H. Häffner, C. F. Roos, W. Hänsel, J. Benhelm, G. P. T. Lancaster,
T. W. Körber, C. Becher, F. Schmidt-Kaler, D. F. V. James,
R. Blatt,
Nature **429**, 734 (2004).
27. *Control and Measurement of Three-Qubit Entangled States*,
C. F. Roos, M. Riebe, H. Häffner, W. Hänsel, J. Benhelm, G. P. T. Lancaster,
C. Becher, F. Schmidt-Kaler, R. Blatt,
Science **304**, 1478 (2004).

26. *Bell States of Atoms with Ultralong Lifetimes and Their Tomographic State Analysis*,
C. F. Roos, G. P. T. Lancaster, M. Riebe, H. Häffner, W. Hänsel, S. Gulde, C. Becher, J. Eschner, F. Schmidt-Kaler, R. Blatt,
Phys. Rev. Lett. **92**, 220402 (2004).
25. *Spontaneous Emission Lifetime of a Single Trapped Ca^+ Ion in a High Finesse Cavity*,
A. Kreuter, C. Becher, G. P. T. Lancaster, A. B. Mundt, C. Russo, H. Häffner, C. Roos, J. Eschner, F. Schmidt-Kaler, and R. Blatt,
Phys. Rev. Lett. **92**, 203002 (2004).
24. *Quantized AC-Stark shifts and their use for multiparticle entanglement and quantum gates*,
F. Schmidt-Kaler, H. Häffner, S. Gulde, M. Riebe, G. Lancaster, J. Eschner, C. Becher and R. Blatt,
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23. *How to realize a universal quantum gate with trapped ions*,
F. Schmidt-Kaler, H. Häffner, S. Gulde, M. Riebe, G. P. T. Lancaster, T. Deuschle, C. Becher, W. Hänsel, J. Eschner, C. F. Roos, R. Blatt,
Appl. Phys. B: Lasers and Optics (2003), DOI: 10.1007/s00340-003-1346-9.
22. *Doppler cooling a single Ca^+ ion with a violet extended-cavity diode laser*,
G.P.T. Lancaster, H. Häffner, M.A. Wilson, C. Becher, J. Eschner, F. Schmidt-Kaler, R. Blatt,
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21. *Precision measurement and compensation of optical Stark shifts for an ion-trap quantum processor*,
H. Häffner, S. Gulde, M. Riebe, G. Lancaster, C. Becher, J. Eschner, F. Schmidt-Kaler, and R. Blatt,
Phys. Rev. Lett. **90**, 143602 (2003).
20. *Realization of the Cirac-Zoller controlled-NOT quantum gate*,
F. Schmidt-Kaler, H. Häffner, M. Riebe, S. Gulde, G. P. T. Lancaster, T. Deuschle, C. Becher, C. F. Roos, J. Eschner, R. Blatt,
Nature **422**, 408 (2003).
19. *The magnetic moment anomaly of the electron bound in hydrogen-like oxygen $^{16}O^{7+}$* ,
J. Verdú, T. Beier, S. Djekić, H. Häffner, H.-J. Kluge, W. Quint,

- T. Valenzuela, M. Vogel and G. Werth,
J. Phys. B: At. Mol. Opt. Phys. **36**, 655 (2003).
18. *The coherence of qubits based on single Ca^+ ions*,
F. Schmidt-Kaler, S. Gulde, M. Riebe, T. Deuschle, A. Kreuter, G. Lancaster, C. Becher, J. Eschner, H. Häffner and R. Blatt,
J. Phys. B: At. Mol. Opt. Phys. **36**, 623 (2003).
17. *Double Penning trap technique for precise g factor determinations in highly charged ions*,
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16. *Implementation of the Deutsch-Jozsa algorithm on an ion-trap quantum computer*,
Stephan Gulde, Mark Riebe, Gavin P. T. Lancaster, Christoph Becher, Jürgen Eschner, Hartmut Häffner, Ferdinand Schmidt-Kaler, Isaac L. Chuang, Rainer Blatt,
Nature **421**, 48 (2003).
15. *Mass of the Electron from the Electronic g Factor in Hydrogenlike Carbon – the Influence of Other Fundamental Parameters*,
Thomas Beier, H.-Jrgen Kluge, Wolfgang Quint, Hartmut Häffner, Günther Werth,
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14. *A Bose-Einstein condensate in an optical lattice*,
J. Hecker Denschlag, J. E. Simsarian, H. Häffner, C. McKenzie, A. Browaeys, D. Cho, K. Helmerson, S. L. Rolston, and W. D. Phillips,
J. Phys. B **35**, 3095 (2002).
13. *Measurement of the g_j factor of a bound electron in hydrogen-like Oxygen $^{16}O^{7+}$* ,
J. Verdú, T. Beier, S. Djekic, H. Häffner, H.-J. Kluge, W. Quint, T. Valenzuela and G. Werth,
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12. *Photoassociation of Sodium in a Bose-Einstein Condensate*,
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11. *The measurement of the electronic g factor in hydrogenlike ions - a promising tool for determining fundamental and nuclear constants*,
T. Beier, H. Häffner, N. Hermanspahn, S. Djekić, H.-J. Kluge, W. Quint,
S. Stahl, T. Valenzuela, J. Verdú and G. Werth,
Europ. Phys. J. A **15**,41(2002).
10. *A new determination of the electron's mass*,
T. Beier, H. Häffner, N. Hermanspahn, S. Karshenboim, H.-J. Kluge,
W. Quint, S. Stahl, J. Verdú, and G. Werth,
Phys. Rev. Lett. **88**, 011603 (2002).
9. *HITRAP: A Facility for Experiments with Trapped Highly Charged Ions*,
W. Quint, J. Dilling, S. Djekić, H. Häffner, N. Hermanspahn, H.-J. Kluge,
G. Marx, R. Moore, D. Rodriguez, J. Schnfelder, G. Sikler, T. Valenzuela,
J. Verdú, C. Weber, G. Werth,
Hyperfine Interactions **132**(1/4), 453 (2001).
8. *A Possible New Value for the Electron Mass from g -Factor Measurements on Hydrogen-Like Ions*,
G. Werth, H. Häffner, H.-J. Kluge, W. Quint, T. Valenzuela, J. Verdú,
Hyperfine Interactions **132**(1/4), 209 (2001).
7. *Dynamical tunnelling of ultracold atoms*,
W. K. Hensinger, H. Häffner, A. Browaeys, N. R. Heckenberg, K. Helmer-
son, C. M^cKenzie, G. J. Milburn, W. D. Phillips, S. L. Rolston, H. Rubinsztein-
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Nature **412**, 52 (2001).
6. *High-Accuracy Measurement of the Magnetic Moment Anomaly of the Electron Bound in Hydrogenlike Carbon*,
H. Häffner, T. Beier, N. Hermanspahn H.-J. Kluge, W. Quint, S. Stahl,
J. Verdú, and G. Werth,
Phys. Rev. Lett. **85**, 5308 (2000).
5. *g_j factor of an electron bound in a hydrogenlike ion*,
Thomas Beier, Ingvar Lindgren, Hans Persson, Sten Salomonson, Per
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Phys. Rev. A **62**, 032510 (2000).
4. *Testing Atomic Structure Theories with High-Accuracy Mass Measurements on Highly Charged Ions*,
H. Häffner, N. Hermanspahn, P. Indelicato, H.-J. Kluge, E. Lindroth,

- V. Natarajan, W. Quint, S. Stahl, J. Verdú, and G. Werth,
Hyperfine Interactions **127**, 271 (2000).
3. *Observation of the Continuous Stern-Gerlach Effect on an Electron Bound in an Atomic Ion*,
N. Hermanspahn, H. Häffner, H.-J. Kluge, S. Stahl, W. Quint, J. Verdú,
and G. Werth,
Phys. Rev. Lett. **84**, 427 (2000).
2. *The g-factor of the Electron Bound in Hydrogen-like Ions*,
M. Diederich, H. Häffner, N. Hermanspahn, M. Immel, H.-J. Kluge,
R. Ley, R. Mann, W. Quint, S. Stahl, J. Verdú and G. Werth,
Physica Scripta **T80**, 437 (1999).
1. *Observing a single hydrogen-like ion in a Penning trap at $T = 4$ K*,
M. Diederich, H. Häffner, N. Hermanspahn, M. Immel, H.-J. Kluge,
R. Ley, R. Mann, S. Stahl, W. Quint, and G. Werth,
Hyperfine Interactions **115**, 185 (1998).

Review articles

2. *Quantum computing with trapped ions*,
H. Häffner, C. F. Roos, R. Blatt,
Physics Reports **469**, 155-203 (2008).
1. *Continuous Stern-Gerlach effect on atomic ions*,
Günther Werth, Hartmut Häffner and Wolfgang Quint
Advances in Atomic, Molecular and Optical Physics, **48**, pages 191-217,
B. Bederson (editor), Academic Press (2002).

Contributions to books

3. *Quantum Computing with Trapped Ions*,
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, R. Blatt,
Controllable Quantum States, Eds.: J. Nitta, H. Nakano, World Scien-
tific (2008).

2. *Controlling three atomic qubits*,
H. Häffner, M. Riebe, F. Schmidt-Kaler, W. Hänsel, C. F. Roos, M. Chwalla,
J. Benhelm, T. W. Körber, C. Becher, D.F.V. James, R. Blatt,
Physical Realizations of Quantum Computing, Eds.: M. Nakahara, S.
Kanemitsu, M.M. Salomaa, S. Takagi, World Scientific (2006).
1. *The g Factor of Hydrogenic Ions: A Test of Bound State QED*,
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J. Verdú,
The Hydrogen Atom: Precision Physics of Simple Atomic Systems,
Eds.: S. G. Karshenboim, F. S. Pavone, G. F. Bassani, M. Inguscio,
and T. W. Häsch, Springer-Verlag (2000).

Edited books

1. Atomic Physics 20, AIP conference proceedings **869**, Melville, New York, 2006, Eds.: R. Blatt, H. Häffner, C. F. Roos.

Proceedings and not refereed articles

9. *Tomografie eines Quantenzustands – Verschränkung und Reinheit*,
O. Gühne, H. Häffner,
e & i Elektrotechnik und Informationstechnik **124** 5, 131 (2007).
8. *Long lived entangled states*, proceedings of the ISQM-Tokyo 2005,
H. Häffner, F. Schmidt-Kaler, 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, R. Blatt,
Foundations of Quantum Mechanics in the Light of New Technology,
Eds.: S. Ishioka, K. Fujikawa, World Scientific, Singapore (2006).
7. *Entanglement of trapped ions*, proceedings of the ICOLS 2005,
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,
R. Blatt,
Laser Spectroscopy, Eds.: A. Ferguson, E. Riis, E. A. Hinds, World Scientific, Singapore (2005).
6. *Teleportation with Atoms*, proceedings of the ICAP 2004
H. Häffner, M. Riebe, F. Schmidt-Kaler, W. Hänsel, C. F. Roos, M. Chwalla,
J. Benhelm, T. Körber, C. Becher, D.F.V. James, R. Blatt,
Atomic Physics 19, AIP conference proceedings **770**, Eds.: L. Marcassa,
K. Helmerson, V. Bagnato, Melville, New York (2005).
5. *Quantum information processing in ion traps I*, proceedings of the Summer School Les Houches 2003,
R. Blatt, H. Häffner, C. F. Roos, C. Becher, F. Schmidt-Kaler,
Quantum Entanglement and Information Processing, Session LXXIX 79,
Eds.: J.M. Raimond, J. Dalibard, D. Estève, Elsevier Science, Amsterdam (2004).
4. *Ion Trap Quantum Computing with Ca^+ Ions*,
R. Blatt, H. Häffner, C.F. Roos, C. Becher, and F. Schmidt-Kaler,
Quant. Inf. Proc. 3, Nos. 1-5, (2004).
3. *Quantum information processing and cavity QED experiments with trapped Ca^+ ions*, proceedings of the ICAP 2002,
S. Gulde, H. Häffner, M. Riebe, G. Lancaster, A. Mundt, A. Kreuter,
C. Russo, C. Becher, J. Eschner, F. Schmidt-Kaler, I. L. Chuang, R.

Blatt,

Atomic Physics 18, Eds.: D. Prichard, W. Ketterle and R. Heller, World Scientific, New Jersey (2003).

2. *Cold atoms in an amplitude modulated optical lattice – dynamical tunnelling*, proceedings of the ICOLS 2001
W. K. Hensinger, H. Häffner, A. Browaeys, N. R. Heckenberg, K. Helmer-son, C. M^cKenzie, G. J. Milburn, W. D. Phillips, S. L. Rolston, H. Rubinsztein-Dunlop & B. Upcroft,
Laser Spectroscopy, Eds. V. Vuletic, S. Chu, A. J. Kerman, and Cheng Chin, World Scientific, Singapore, (2001).
1. *The g-factor of hydrogen-like ions*, proceedings of the ICAP 1998,
M. Diederich, H. Häffner, N. Hermanspahn, M. Immel, H.-J. Kluge,
R. Ley, R. Mann, W. Quint, S. Stahl, and G. Werth, Atomic Physics
16, Eds.: W.E. Baylis and G.W.F. Drake, Springer, Berlin (1999).

Invited seminars, talks and colloquia

26. *Wiring up trapped ions*, talk, summer school on "Modern Applications of Trapped Ions", Les Houches, France, May 22 2008.
25. *Perspectives of quantum information processing with trapped ions*, seminar talk at UC Berkeley, CA, USA, Feb 12 2008.
24. *Quantum computation with trapped ions*, colloquium at UC Berkeley, CA, USA, Feb 11 2008.
23. *Quantenphysik mit Ionen*, Universität Kaiserslautern, Nov 12 2007.
22. *Quantum computing with trapped ions*, IBM T.J. Watson Research Center, Yorktown Heights, NY, USA, Oct 10 2007.
21. *Experimental quantum information*, tutorial, Informal Quantum Information Gathering, Innsbruck, Mar 13 2007.
20. *Perspectives of ion trap quantum computing*, seminar for quantum information Singapore, Singapore, Feb 7 2007.
19. *Error correction, fault tolerance, threshold: experimental perspectives*, talk, 7th European QIPC Workshop Quantum Information Processing and Communication, London, UK, Oct 13 2006.

18. *Ein Modell eines Quantencomputers*, talk on experimental quantum computing for the general public, International Lübeck symposium for health care in Europe, Hannover, Germany, Sep 4 2006.
17. *Quantum computation with trapped ions*, talk, Conference on Quantum Information and Quantum Control II, Toronto, Canada, Aug 8 – 11 2006.
16. *Das IQOQI*, Übersichtsvortrag über die Aktivitäten des Instituts für Quantenoptik und Quanteninformation in Innsbruck, Konsulententag der Austrian Business Agency, Innsbruck, Austria, Mar 26 2006.
15. *Coupling trapped ions via transmission lines for quantum computing*, talk, DPG-Tagung Frankfurt, Germany, Mar 12 2006.
14. *Quantum computation with trapped ions*, talk, International Symposium on Mesoscopic Superconductivity and Spintronics 2006, Tokyo, Japan, Feb 27 – Mar 3 2006.
13. *Quantum information processing with trapped ions*, talk, GDEST EU-US workshop on quantum information, Munich , Germany, Dec 8 2005.
12. *Quantum information processing with trapped ions*, colloquium, Cuernavaca, Mexico, Nov 30 2005.
11. Lectures series together with Christian Roos on *Ion trap quantum information processing*, International Summer School on Quantum Information, Dresden, Germany, Aug 29 – Sep 30 2005.
10. *Quantum computation with trapped ions*, talk, ISQM 2005, Tokyo , Japan, Aug 24 2005.
9. *Quantum computation with trapped ions*, talk, Quantum Optics VI, Krynica , Poland, June 13–18 2005.
8. *Teleportation with atoms*, talk, ICAP 2004, Rio de Janeiro, Brazil, July 25–30 2004.
7. *Quantum information processing with trapped ions*, seminar, Poznan University of Technology, Poznan, Poland, June 18 2004.
6. *Using entanglement as a resource for teleportation of atomic states*, talk, symposium "Entanglement, Information & Noise", Krzywowa, Poland, June 14–20 2004.

5. *Quantum computation with trapped ions – Teleportation with atoms*, talk, workshop "Are the DiVincenzo Criteria fulfilled in 2004?", Kinki University, Osaka, Japan, May 7–8 2004.
4. *Quantum computation with trapped ions*, talk, The 2004 "LATSIS Symposium", Lausanne, March 1–3 2004.
3. *Dynamical Tunneling of Cold Atoms*, talk, WE-Heraeus-seminar "Chaos and Quantum Transport", Bad Honnef, 23–27 March 2003.
2. *Dynamical Tunneling of Cold Atoms*, seminar "Quantum Dynamics", Max-Planck-Institut für Physik komplexer Systeme, Dresden, July 17 2002.
1. *Precision measurement of the g -factor of the electron bound in Hydrogen-like Carbon*, Chalmers University of Technology, Göteborg, Dec 15 1999.

Number of non-invited talks: >20

Number of poster contributions: >40