

NIST Technical Note 1523

Trapped Ions and Laser Cooling, V

Selected publications of the Ion Storage Group
NIST Time and Frequency Division

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24. "Minimization of ion micromotion in a Paul trap," D.J. Berkeland, J.D. Miller, J.C. Bergquist, W.M. Itano, and D.J. Wineland, *J. Appl. Phys.* **83**, 5025-5033 (1998). TN-187

ADDITIONAL PUBLICATIONS

The following publications were published during the period between February 1996 and December 1998 but are not included in this Technical Note.

1. "An all solid-state Hg⁺ optical frequency standard," F.C. Cruz, M. Rauner, J.H. Marquardt, L. Hollberg, and J.C. Bergquist, Proc., Fifth Symposium on Frequency Standards and Metrology, J.C. Bergquist, ed., Singapore: World Scientific (1996), pp. 511-513.
2. "Primary atomic-frequency standards: new developments," R.E. Drullinger, S.L. Rolston, and W.M. Itano, Review of Radio Science, 1993-1996, New York, NY: Oxford Univ. Press (1996), pp. 11-41.
3. "Manipulating the motion of a single trapped atom," C. Monroe, D.M. Meekhof, B.E. King, D. Leibfried, W.M. Itano, and D.J. Wineland, Acct. Chem. Res. **29**, 585-590 (1996).
4. "High-accuracy Hg⁺ microwave and optical frequency standards in cryogenic linear ion traps," D.J. Berkeland, J.D. Miller, F.C. Cruz, J.C. Bergquist, W.M. Itano, and D.J. Wineland, Proc., Workshop on the Scientific Applications of Clocks in Space, JPL Publication 97-15, Pasadena, CA: Jet Propulsion Laboratory (1997), pp. 133-142.
5. "Experimental creation and measurement of motional quantum states of a trapped ion," D.M. Meekhof, D. Leibfried, C. Monroe, B.E. King, W.M. Itano, and D.J. Wineland, Brazilian J. Phys., **27**, 178-192 (1997).
6. "Atomic physics in ion traps," C.J. Monroe and J.J. Bollinger, Phys. World **10**, 37-42 (March 1997).
7. "High-accuracy frequency standards using laser-cooled Hg⁺ ions," D.J. Berkeland, J.D. Miller, B.C. Young, J.C. Bergquist, W.M. Itano, and D.J. Wineland, Methods for Ultrasensitive Detection, Bryan L. Fearey, ed., Proc., SPIE **3270**, 138-146 (1998).
8. "High-accuracy microwave and optical frequency standards using laser-cooled Hg⁺ ions," D.J. Berkeland, J.D. Miller, F.C. Cruz, B.C. Young, J.C. Bergquist, W.M. Itano, and D.J. Wineland, Proc., Second Int. Symp. on Modern Problems of Laser Physics, Sergei N. Bagayev and Vladimir I. Denisov, eds., Laser Physics **8**, 673-678 (1998).
9. "Formation and control of coulomb crystals in trapped ion plasmas," X.-P. Huang, J.J. Bollinger, W.M. Itano, J.N. Tan, B. Jelenković, T.B. Mitchell, and D.J. Wineland, Strongly Coupled Coulomb Systems, Kalman, et al., eds., New York, NY: Plenum, New York (1998), p. 429-432.
10. "Structure and control of coulomb crystals in a penning trap," X.-P. Huang, J.J. Bollinger, W.M. Itano, J.N. Tan, B. Jelenković, T.B. Mitchell, and D.J. Wineland, Hyperfine Interact. **115**, 41-45 (1998).
11. "Quantum state manipulation of trapped atomic ions," D.J. Wineland, C. Monroe, D.M. Meekhof, B.E. King, D. Leibfried, W.M. Itano, J.C. Bergquist, D. Berkeland, J.J. Bollinger, J. Miller, Proc., Workshop on Quantum Computing, Proc. R. Soc. **454**, 411-429 (1998).
12. "Coherent quantum state manipulation of trapped atomic ions," D.J. Wineland, C. Monroe, D.M. Meekhof, B.E. King, D. Leibfried, W.M. Itano, J.C. Bergquist, D. Berkeland, J.J. Bollinger, J. Miller, Proc., Symp. on Modern Trends in Atomic Physics, Adv. Quant. Chem. **30**, 41-64 (1998).
13. "Experimental issues in coherent quantum-state manipulation of trapped atomic ions," D.J. Wineland, C. Monroe, W.M. Itano, D. Leibfried, B.E. King, and D.M. Meekhof, J. Res. Natl. Inst. Stand. Technol. **103** (3), 259-328 (1998) (available at www.nist.gov/jres).

PREFACE

This collection of papers represents the work of the Ion Storage Group, Time and Frequency Division, National Institute of Standards and Technology, from February 1996 to December 1998. It follows the similar collections of papers contained in the previous Tech Notes:

NBS Technical Note 1086, *Trapped Ions and Laser Cooling I* (June 1985)
NIST Technical Note 1324, *Trapped Ions and Laser Cooling II* (September 1988)
NIST Technical Note 1353, *Trapped Ions and Laser Cooling III* (April 1992)
NIST Technical Note 1380, *Trapped Ions and Laser Cooling IV* (February, 1996)

Papers listed on page v were published during the period from February 1996 to December 1998, but are not included here. Copies can be obtained on request. We hope this collection of papers will be useful to our colleagues in this and related fields.

We acknowledge our ion-trap/laser-cooling colleagues whose contributions made this work possible. These include: Jim Beall, Dana Berkeland, Flavio Cruz, Dan Dubin, Dan Heinzen, Leo Hollberg, Pei Huang, Brana Jelenković, David Kielpinski, Brian King, Didi Leibfried, John Marquardt, Dawn Meekhof, John Miller, Travis Mitchell, Chris Myatt, Amy Newbury, Chris Oates, Max Rauner, Andy Steinbach, Michelle Stephens, Joseph Tan, Quentin Turchette, Chris Wood, Brent Young, and in particular, Chris Monroe (now at University of Michigan). We gratefully acknowledge the support of the U.S. Office of Naval Research (ONR), the U.S. Army Research Office (ARO), and the U.S. National Security Agency (NSA). We thank Eyvon Petty and Edie DeWeese for assembling this collection.

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