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2013 J. Phys. B: At. Mol. Opt. Phys. 46 100201

(http://iopscience.iop.org/0953-4075/46/10/100201)

J. Phys. B: At. Mol. Opt. Phys. **46** (2013) 100201 (1pp) doi:10.1088/0953-4075/46/10/100201

EDITORIAL

The 20th anniversary of quantum state engineering

Rainer Blatt
Institut für Expermentalphysik, Universität Innsbruck and Institut für Quantenoptik und Quanteninformation (IQOQI) Innsbruck, Austria
E-mail: Rainer.Blatt@uibk.ac.at

Gerard J Milburn
Centre for Engineered Quantum Systems and Australian Research Council Centre of Excellence, The University of Queensland, Queensland, Australia

Alex Lvovksy
Department of Physics and Astronomy, University of Calgary, Canada

This special issue is dedicated to the 20th anniversary of quantum state engineering, a field which studies techniques of preparation, manipulation and characterization of arbitrary quantum states within a Hilbert space associated with a particular physical system. The development of the field became possible due to technological achievements that enabled active control over the coherent dynamics of various quantum-mechanical systems at the level of their individual components. The issue features 12 articles on quantum engineering of various systems, therefore presenting a comprehensive account of the field's current state.

Over the past two decades, the field has made dramatic advances. Not only have we been able to synthesize and measure new quantum states, but also expand the realm of quantum engineering to completely new physical systems, such as quantum gases, mechanical oscillators, superconducting circuits. Perhaps the strongest evidence of the field's success is the 2012 Nobel Prize, awarded for the results that can be defined as quantum engineering of electromagnetic oscillators and vibrational states of a trapped ion collective.

Quantum state engineering is of interest from both basic and applied points of view. It sets up a test bed for studying fundamental unresolved questions of quantum physics. For example, at which size, if any, does a physical system lose its quantum properties and become classical? At the same time, quantum state engineering is the basis for many quantum technologies of the future, such as quantum communications, sensing, computation, simulation and metrology. In the next century, these technologies are expected to have a profound effect not only on physics, but on society as a whole. Therefore publication of an issue on this subject by *Journal of Physics B* appears particularly timely.

