

Professor Kai Bongs PhD, FInstP

Professor of Cold Atom Physics
Chair in Cold Atoms and Head of Group

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About

Prof. Kai Bongs leads the Midlands Ultracold Atom Research Centre at the University of Birmingham. He is working in the field of cold atom quantum sensors and quantum gas mixtures.

He coordinates a collaborative European Project "iSense" with nine partners with the aim to realise a portable atom interferometric gravity sensor. He also coordinates the EPSRC Cross Disciplinary Technology programme GG-TOP, which spans across the disciplines of Physics, Civil and Electrical Engineering and Archaeology. The aim of this programme is the development of a complete portfolio of gravity gradient sensing technology – from the sensor to the 3D visualization. The focus is on applications in underground mapping from urban areas (infrastructure detection) to rural areas (archaeological artefacts).

He is PI on an EPSRC grant to realize a cold atom quantum simulator, targeting disorder phenomena such as Anderson localization and Bose glasses.

He further participates in the European project Space Optical Clock-II and the QUANTUS (quantum gases in microgravity) project funded by the German Space Agency.

He is the UK representative for the ESA m-class mission candidate STE-QUEST and serves on the ESA science team for this mission.

His work has been disseminated through both invited and peer-reviewed presentations at international conferences and through high-impact publications with over 56 publications in total. His work has been cited over 2000 times and he has an h-index of 21. His publications include one Science, one Nature Physics, 16 Physical Review Letters and one Report on Progress in Physics.

Qualifications

- Habilitation in Physics, University of Hamburg, 2006
- PhD in Physics, University of Hannover, 1999
- Diploma in Physics, University of Hannover, 1995

Biography

Kai Bongs obtained his PhD from the University of Hannover in 1999 on creating a Bose-Einstein condensate and developing and testing atom optical techniques for its manipulation. He supplemented this work by realising the dark solitons in Bose-Einstein condensates in a one year postdoc in the same group. He then studied to atom interferometry during a postdoctoral stay at Yale University from 2000-2002, where he initiated a programme to develop a mobile gravity gradient sensor as well as an electron guide in the group of Mark Kasevich. In 2002 he became a member of the group of Prof. Sengstock at Hamburg University, where he led the atom optics division. During his habilitation work carried out in this group his research focus shifted back to quantum gases, in particular to quantum gas mixtures, both Fermi-Bose mixtures and Spin mixtures.

In 2007 he was appointed to his current position at the University of Birmingham, where he leads a research programme encompassing both quantum simulation as well as ultraprecise sensors with ultracold atoms.

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Teaching

- Y2 Modern Optics
- Y3 Images and Communications
- Y4 Images and Communications
- Y4 Project Supervision
- MPAGS Images and Communications

Postgraduate supervision

- Supervision of research PhDs in cold atom physics

Research

RESEARCH THEMES

- Quantum Simulation
- Atom Interferometry
- Optical Clocks
- Quantum Gas Mixtures
- Bose Einstein Condensation
- Laser Cooling

RESEARCH ACTIVITY

- Simulating disorder in 2D using cold atoms
- Realising a mobile optical clock apparatus
- Building a gravity gradient sensor and exploring its applications
- Building a portable gravity sensor
- Realising ultracold heteronuclear molecules
- Realising Fermi-Bose mixtures in optical lattices
- Studying Spinor Bose Einstein Condensates
- Studying soliton excitations in condensates
- Characterising atom optical elements

Other activities

- Member, Science Team, STE-QUEST ESA m-class mission
- Main scientific organiser for the session H06 of the COMMITTEE ON SPACE RESEARCH scientific assembly COSPAR 2012, to be held from July 13th to 18th 2012 in Mysore, India
- Scientific organiser of the "Quantum Interfaces" symposium at CMMP2011, 13.12.-15.12.2011 in Manchester
- Member of Institute of Physics and German Physical Society

Publications

T. v. Zoest, N. Gaaloul, Y. Singh, H. Ahlers, W. Herr, S. T. Seidel, W. Ertmer, E. Rasel, M. Eckart, E. Kajari, S. Arnold, G. Nandi, W. P. Schleich, R. Walser, A. Vogel, K. Sengstock, K. Bongs, W. Lewoczko-Adamczyk, M. Schiemangk, T. Schuldt, A. Peters, T. Könemann, H. Müntinga, C. Lämmerzahl, H. Dittus, T. Steinmetz, T. W. Hänsch, J. Reichel;

"Bose-Einstein Condensation in Microgravity",

Science, 328, 5985 (2010).

C. Becker, S. Stellmer, P. Soltan-Panahi, S. Dörscher, M. Baumert, E.-M. Richter, J. Kronjäger, K. Bongs and K. Sengstock;

"Oscillations and interactions of dark and dark-bright solitons in BEC",

Nature Physics 4, 496 (2008).

C. Ospelkaus, S. Ospelkaus, L. Humbert, P. Ernst, K. Sengstock and K. Bongs,

"Ultracold heteronuclear molecules in a 3d optical lattice",

Phys. Rev. Lett. 97, 120402 (2006).

S. Ospelkaus, C. Ospelkaus, O. Wille, M. Succo, P. Ernst, K. Sengstock, and K. Bongs;

"Localization of Bosonic Atoms by Fermionic Impurities in a Three-Dimensional Optical Lattice",

Phys. Rev. Lett. 96, 180403 (2006).

H. Schmaljohann, M. Erhard, J. Kronjäger, M. Kottke, S. van Staa, J.J. Arit, K. Bongs and K. Sengstock;

"Dynamics of F=2 Spinor Bose-Einstein Condensates"

Phys. Rev. Lett. 92, 040402 (2004).

S. Burger, K. Bongs, S. Dettmer, W. Ertmer, K. Sengstock, A. Sanpera, G. V. Shlyapnikov, and M. Lewenstein;

"Dark Solitons in Bose-Einstein Condensates",

Phys. Rev. Lett., 83, 5198 (1999).

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