

LONG-FORM PROGRAMME

JQC Symposium & MACRO

Multicomponent Atomic Condensates and ROTational Dynamics

Held at Newcastle University on 13th-16th September, 2016



Joint Quantum Centre (JQC) Durham–Newcastle
An Inter-University Research Centre dedicated to aspects of quantum science and technology





Map of Newcastle University, Central Station, Hotels & Quayside



Campus Map:(17) Herschel Building, (21) Barbara Strang Teaching Centre

Welcome to MACRO: Multicomponent Atomic Condensates and Rotational Dynamics

We welcome participants to this four-day joint multicomponent atomic condensates and rotational dynamics (MACRO) conference and JQC symposium hosted in the business & technology heart of the north-east of England; Newcastle upon Tyne. The conference will focus on primarily recent experimental & theoretical developments in multicomponent, spinor and rotating ultra-cold atomic gases, while also exploring broader themes. Focus topics will include ring-trapped BECs and associated topological phases; dynamics of multicomponent, spinor and polariton condensates; and the applications of these topics to emergent applications including precision measurement and atomtronics.

MACRO

The JQC MACRO conference will formally run from the morning of Wednesday the 14th to the afternoon of Friday the 16th of September (with a reception held on Tuesday evening), with lab-tours taking place in the Durham University physics department on the afternoon of Friday the 16th. This includes the annual JQC colloquium (Thu 15th) and a conference dinner at the picturesque BALTIC River Terrace.

Symposium

The Joint Quantum Centre Symposium 2016 will be held in Newcastle University on the afternoon of Tuesday 13th September 2016. It showcases cutting-edge research in Atomic and Molecular Physics taking place at the JQC and beyond. This is the fourth annual symposium after the JQC Launch event (2013), the Quantum Technologies Symposium (2014), and JQC Symposium (2015).

JQC Colloquium The JQC Colloquium is an annual high-profile event alternating between Durham and Newcastle. This year's Colloquium will be delivered on Thursday 15th of September by Prof. Jean Dalibard (Collège de France). Previous Colloquia have been hosted by Sandy Fetter (Stanford, 2013), Bill Phillips (NIST, 2014), and Jabez McClelland (NIST, 2015)

Venues

JQC Symposium (Tue 13): Herschel Building Ground Floor [Lecture Theatre 3 and Concourse]

MACRO Reception (Tue 13, 19.30): Herschel Building Ground Floor Concourse

MACRO Talks/Meals (Wed 14 – Fri 16): Barbara Strang Teaching Centre [Room 1.46 (Talks, 2nd floor) and B32 (coffee/meals/posters)]

JQC Colloquium (Thu 18.30): Herschel Building Ground Floor, Lecture Theatre 3

Registration

Tue 13 (from 11.00): Herschel Building Ground Floor Concourse

Wed 14 (from 08.30): Barbara Strang Teaching Centre, Room 1.46 (2nd floor)

Poster size

A0 portrait.

Conference Organisers

Simon Cornish (JQC Durham), Simon Gardiner (JQC Durham) & Nick Proukakis (JQC Newcastle)

Local Organising Committee

John Helm (JQC Durham) & Kean Loon Lee (JQC Newcastle)

This conference is funded by EPSRC grant EP/K030558/1 and the Newcastle University Conference Fund. Additional support is provided by IOP QQQ Group, NJP and the Newcastle–Gateshead Initiative.

Tuesday 13th September: JQC Symposium

Welcome Brunch 11:00-12:30, Room: Herschel Concourse

Session 1 12:30-14:30, Herschel LT3, Chair: Ifan Hughes (JQC Durham)

- 12:30 Clive Emary, JQC, Newcastle University, UK [Plenary]
Feedback Control in Quantum Transport
- 13:10 Nicholas Chancellor, JQC, Durham University
Experimental Freezing of mid-Evolution Fluctuations with a Programmable Annealer
- 13:30 Jacob Dunningham, University of Sussex, UK
Recent advances in sensing beyond the quantum limit
- 13:50 Simon Haine, University of Sussex, UK
Mean-Field Dynamics and Fisher Information in Matter Wave Interferometry
- 14:10 Beatriz Olmos, University of Nottingham, UK
Non-trivial topological phases in dissipative systems with dipolar exchange interactions

Coffee 14:30-15:00, Herschel Concourse

Session 2 15:00-17:00, Herschel LT3, Chair: Matt Jones (JQC Durham)

- 15:00 Charles S. Adams, JQC, Durham University, UK [Plenary]
Non-contact interactions between photons
- 15:40 Niamh Keegan, JQC, Durham University, UK
Rydberg spectroscopy and dressing using narrow linewidth transitions in strontium
- 16:00 Tomasz Karpiuk, Uniwersytet w Białymstoku, Poland
Condensate losses and oscillations induced by Rydberg atoms
- 16:20 Robert Nyman, Imperial College London, UK [Plenary]
Photon Bose-Einstein condensates: near-equilibrium photon fluids

Coffee 17:00-17:30, Herschel Concourse

Session 3 17:30-19:30, Herschel LT3, Chair: Andrew Baggageley (JQC Newcastle)

- 17:30 Dmitry V. Skryabin, University of Bath, UK
Soliton and topological physics with microcavity polaritons
- 17:50 Kyle Ballantine, SUPA, University of St. Andrews, St. Andrews, UK
Meissner effect for an artificial gauge field in multimode cavity QED
- 18:10 Lewis McArd, JQC, Durham University, UK
A Travelling Wave Zeeman Decelerator
- 18:30 Luca Galantucci, JQC, Newcastle University, UK
Quantum Turbulence in Superfluid Helium channel flows
- 18:50 Boris A. Malomed, Tel Aviv University, Israel [Plenary]
Stable two-dimensional solitons in spin-orbit-coupled Bose-Einstein condensates and optical waveguides

MACRO Reception/Symposium Dinner 19:30-22:00, Herschel Concourse

Wednesday 14th September: MACRO Conference

MACRO Welcome 09:00-09:05, Room: Barbara Strang Teaching Center BST1.46

Turbulence 09:05-10:50, Room: BST1.46, Chair: Nick Proukakis (JQC Newcastle)

09:05 Carlo F. Barenghi, JQC, Newcastle University, UK [Keynote]
Turbulence in a quenched homogeneous Bose gas

09:45 Vanderlei S. Bagnato, Universidade de São Paulo, Brazil [Keynote]
Quantum turbulence in BEC: overview and new perspectives

10:25 Thomas Gasenzer, Ruprecht-Karls-Universität, Germany
Turbulence, universal dynamics, and non-thermal fixed points

Coffee 10:50-11:20 Room: B32

Quenched Dynamics 11:20-13:15, Room: BST1.46, Chair: Piotr Deuar (IFPAN)

11:20 Franco Dalfovo, Università di Trento, Italy
Formation and dynamics of vortices in a quenched Bose-Einstein condensate

11:45 Giovanni Barontini, MUARC, University of Birmingham, UK
Phase and Temperature Quenches in Bose-Einstein Condensates

12:10 Nir Navon, Cavendish Laboratory, University of Cambridge, UK
From collective excitations to turbulence in a uniform quantum gas

12:35 Thomas P. Billam, JQC, Newcastle University, UK
From quantum vortex dynamics to classical turbulence

13:00 Axel Pelster, OPTIMAS, Technical University of Kaiserslautern, Germany
Tuning the Quantum Phase Transition of Bosons in Optical Lattices

Lunch 13:15-14:30, Room: B32

Spinor BEC 14:30-16:20, Room: BST1.46, Chair: Natalia Berloff (DAMTP/Skoltech)

14:30 Masahito Ueda, University of Tokyo, Japan [Keynote]
Topological quantum phenomena in spinor Bose-Einstein condensates

15:10 Ashton S. Bradley, University of Otago, New Zealand
Open systems theory for spinor and low-dimensional Bose-Einstein condensates

15:35 Fang Fang, University of California, USA
Spin excitations in a ferromagnetic spinor BEC

15:50 Tom Bienaimé, Università di Trento, Italy
Polarizability and spin-dipole oscillation in spinor condensates

16:05 Tomasz Świsłocki, Warsaw University Of Life Sciences - SGGW, Poland
Non-adiabatic quantum phase transition in a trapped spinor condensate

Coffee 16:20-16:50, Room: B32

Bose–Bose/Bose–Fermi Mixtures 16:50-18:50, Room: BST1.46, Chair: Francesco Minardi (LENS)

16:50 Frédéric Chevy, ENS, France
Bose-Fermi dual superfluids

17:15 Jan Arlt, Aarhus Universitet, Denmark.
Observation of the Bose polaron in multicomponent BEC

17:40 Kean Loon Lee, JQC, Newcastle University, UK
Phase separation and dynamics of two-component Bose-Einstein condensates

- 18:05 Xiaoke Li, University of Nottingham, UK
Coherent Heteronuclear Spin Dynamics in an Ultracold Spinor Mixture
- 18:20 Pierrick Cheiney, ICFO, Barcelona, Spain
Liquid droplets in a two-components Bose gas
- 18:35 Zhigang Wu, Aarhus University, Denmark
Induced interactions in a Fermi-Bose mixture in mixed dimensions

Conference Dinnar at BALTIC 19:30

Thursday 15th September: MACRO Conference

Ring Traps 09:00-10:55, Room: BST1.46, Chair: Simon Cornish (JQC Durham)

- 09:00 Halina Rubinsztein-Dunlop, University of Queensland, Australia [Keynote]
Configuring ^{87}Rb BECs at the microscale and their dynamics
- 09:40 Stephen Eckel, JQI, NIST, USA
Cold-atom circuits: exploring superfluid transport
- 10:05 Muntsa Guilleumas, Universitat de Barcelona, Spain
Coherent quantum phase slip in a two-component bosonic ring
- 10:30 Mark Edwards, JQI, Georgia Southern University, USA
Finite-temperature energy landscapes in rotating ring BECs

Coffee 10:55-11:25, Room: B32

Rotational Dynamics 11:25-13:20, Room: BST1.46, Chair: Jacques Tempere (Antwerpen)

- 11:25 Veronica Ahufinger, Universitat Autònoma de Barcelona, Spain
Geometrically induced complex tunnelings for ultracold atoms in ring potentials
- 11:50 John L. Helm, JQC, Durham University, UK
Spin-orbit coupled interferometry in spinor BECs
- 12:15 Patrik Öhberg, SUPA, Heriot-Watt University, UK
Rotating Bose-Einstein condensates and synthetic gauge potentials
- 12:40 Ana Rakonjac, JQC, Durham University, UK
Towards precision sensing of atom-surface interactions and rotation using Bose-Einstein condensates
- 13:05 Angela White, Okinawa Institute of Science and Technology Graduate University, Japan.
Emergence of classical rotation in superfluid Bose-Einstein condensates

Lunch 13:20-14:30, Room: B32

Dynamics & Reduced Dimensionality 14:30-16:10, Room: BST1.46, Chair: Axel Görlitz (Düsseldorf)

- 14:30 Christoph Weiss, JQC, Durham University, UK
Generating mesoscopic quantum superpositions in two-component BECs
- 14:55 Fabian Maucher, SPOCK/JQC, Durham University, UK
Two examples of self-organization facilitated by vortices
- 15:20 Peter Krüger, MUARC, University of Nottingham, UK
Cold Bose gases with tuneable dimensionality
- 15:45 Aidan S. Arnold, University of Strathclyde, UK
Talbot-enhanced measurement of condensate interference

Coffee 16:10-16:40, Room: B32

NJP Session & Call for Papers 16:40-17:00, Room: BST1.46

- 16:40 Ben Sheard, NJP Associate Editor
Getting published: peer review, open access, author benefits
- 16:55 *Discussion / Call for Papers*

Dipolar BEC 17:00-18:10, Room: BST1.46, Chair: Lauro Tomio (ITA, Brazil)

- 17:00 Nick Parker, JQC, Newcastle University, UK
Vortices and dark solitons in quantum ferrofluids

17:25 Arnaldo Gammal, Universidade de São Paulo, Brazil

Rotating dipolar Bose-Einstein condensate and structure generations

17:40 Robert E. Zillich, Johannes Kepler University, Austria

Dipole-Coupled Multilayers as a Multi-Component Bose Gas: Correlations, Excitations, and Quenches

17:55 Danny Baillie, University of Otago, New Zealand

Self-bound dipolar droplet: a localized matter-wave in free space

JQC Colloquium 18:30-19:30, Room: Herschel LT3, Chair: Charles Adams (JQC Durham) [tbc]

Jean Dalibard, Collège de France, Paris, France

The 2D Bose gas, in and out of equilibrium

MACRO Poster Session/Buffer Dinner 19:30, Room: B32

Friday 16th September: MACRO Conference

Quantum Gases/Fluids 09:00-11:00, Room: BST1.46, Chair: Axel Pelster (Kaiserslautern)

- 09:00 [Natalia Berloff](#), DAMTP, UK / Skolkovo, Russian Federation [Keynote]
Quantum simulators on polariton graphs
- 09:40 [Marzena Szymańska](#), UCL, London, UK
Driving across Universalities with a Dissipative Condensate
- 10:05 [Milorad V. Milošević](#), Universiteit Antwerpen, Belgium
Emergent phenomena in multiband/multigap superconductivity
- 10:30 [Jacques Tempere](#), Universiteit Antwerpen, Belgium
Vortices in rotating multiband Fermi superfluids
- 10:45 [Hayder Salman](#), University of East Anglia, UK
Long-range Ordering of Topological Excitations in a Two-Dimensional Superfluid Far From Equilibrium

Coffee 11:00-11:20, Room: B32

Hot Topics 11:20-12:35, Room: BST1.46, Chair: Simon Gardiner (JQC Durham)

- 11:20 [John D. Close](#), ANU, Australia
A quantum sensor: simultaneous precision gravimetry and magnetic gradiometry with a Bose-Einstein condensate
- 11:35 [Barry M Garraway](#), University of Sussex, UK
Non-adiabatic losses from RF-dressed cold atom traps
- 11:50 [Cameron J. E. Straatsma](#), JILA, University of Colorado, USA
Collapse and revival of the monopole mode of a degenerate Bose gas in an isotropic harmonic trap
- 12:05 [Alessia Burchianti](#), LENS, Italy
Josephson effect and dissipative dynamics in fermionic superfluids
- 12:20 [Christoph Eigen](#), Cavendish Laboratory, University of Cambridge, UK
Weak Collapse of a Box-Trapped Bose-Einstein Condensate

Lunch 12:35 onwards, Room: B32

Bus Departure to Durham 13:05

Lab tours/Cathedral visit 13:45-17:00

Staged Departure 14:30-17:00

Posters Thursday 15th, 19:30, Room: B32

- Kyle Ballantine, SUPA, University of St. Andrews, UK
Meissner effect for an artificial gauge field in multimode cavity QED
- Robert Bettles, JQC, University of Durham, UK
Cooperativity in lattice monolayers of driven interacting dipoles
- Yuriy Bidasyuk, Braunschweig, Germany
Stable Hopf solitons in rotating Bose-Einstein condensates
- Thomas Bland, JQC, Newcastle University, UK
Dark Solitons in Dipolar Bose-Einstein Condensates
- Hannes Busche, JQC, University of Durham, UK
Interactions between photons in spatially separate media
- Arijit Chakraborty, Indore, India
Comparative study of numerical techniques for rotating ultra-cold atomic gases
- Andre Cidrim, University of São Paulo, Brazil
Controlled polarization of two-dimensional quantum turbulence in atomic Bose-Einstein Condensates
- Paolo Comaron, JQC, Newcastle University, UK
Algebraic order and quench dynamics in exciton-polariton condensates
- James Cooling, University of Sussex, UK
A quantum-enhanced atomic gyroscope with tunable sensitivity
- Piotr Deuar, IFPAN, Poland
The Wigner SGPE: a stable c-field theory that includes quantum fluctuations
- Matthew Edmonds, JQC, Newcastle University, UK
Probing the Stability and Collisions of Dipolar Matter-Wave Bright Solitons
- Sandeep Gautam, Sao Paulo State University, Brazil
Analytic models for density of a ground-state spinor condensate
- Krzysztof Gawryluk, University of Bialystok, Poland
Thermal solitons in a quasi-1D Bose gas as revealed by studying static structure factor
- Philip Gregory, JQC, University of Durham, UK
Controlling the Rotational and Hyperfine State of Ultracold ^{87}Rb ^{133}Cs Molecules
- Paul Griffin, University of Strathclyde, UK
Matterwave interferometric measurement of the condensate mean field
- Alexander Guttridge, JQC, University of Durham UK
Towards a Quantum Degenerate Mixture of Cs and Yb
- Victoria Henderson, University of Strathclyde, UK
Fresnel Holography for Atomic Waveguides and Miniaturised Rotation Sensing
- Jeremy Hutson, JQC, University of Durham, UK
Creating Feshbach Resonances for Ultracold Molecule Formation with Radiofrequency Fields
- James Keaveney, JQC, University of Durham, UK
A single-mode external cavity diode laser using an intra-cavity atomic Faraday filter
- Viv Kendon, JQC, University of Durham, UK
Adiabatic and quantum walk searching
- Fabrizio Larcher, JQC/INO-CNR, Newcastle/Trento
Critical Dynamics in Quenched 2D Atomic Gases
- Ruth Le Sueur, JQC, University of Durham, UK
Dude, where's my bound state?

- Jay Man , Cambridge, UK
Hydrodynamics in an interacting Bose gas
- Marius Meyer , University of Oslo, Norway
Low-energy states in the lowest Landau level for rotating two-component Bose gases
- Axel Pelster , OPTIMAS, Kaiserslautern, Germany
Cloud Shape of Dipolar Fermi Gases
- Nick Proukakis , JQC, Newcastle University, UK
Ring Trap Dynamics
- Apichayaporn Ratkata , JQC, University of Durham, UK
Towards quantum simulation using fermionic KCs ultracold molecules
- Em Rickinson , JQC, Newcastle University, UK
Diffusion of Quantum Vortices
- Sara Rosi , INO-CNR and LENS, Italy
Noise-correlation spectroscopy across superfluid-Mott insulator transition: separating $G1$ and $G2$
- Cameron J. E. Straatsma , JILA, University of Colorado, USA
Collapse and revival of the monopole mode of a degenerate Bose gas in an isotropic harmonic trap
- Lauro Tomio , Inst. Tech. Aeronautica, Brazil
Miscibility in anisotropic trapped dipolar condensates
- Patrik Turzak , Cambridge, UK
Collective Oscillations of a Box-Trapped Bose Gas
- Chris Wade , JQC, University of Durham, UK
Real-time Terahertz Imaging and Cooperatively Enhanced Terahertz Detection using a Hot Rydberg Vapour
- Oliver Wales , JQC, University of Durham, UK
Towards precision sensing of atom-surface interactions and rotation using Bose-Einstein condensates
- Daniel Whiting , JQC, University of Durham, UK
Heralded single photons from a hot atomic vapour in a strong magnetic field
- Klejdja Xhani , JQC, Newcastle University, UK
Decay of Macroscopic Quantum Self-Trapping due to Vortex Ring Generation and Thermal Fluctuations