



# PhD Projects at ACQAO

## EXPERIMENTAL

### About ACQAO

The Australian Centre for Quantum-Atom Optics (ACQAO) was formed in 2003 as one of the recently established Australian Research Council Centres of Excellence. It involves collaboration between the Australian National University in Canberra, the University of Queensland in Brisbane, and the Swinburne University of Technology in Melbourne.

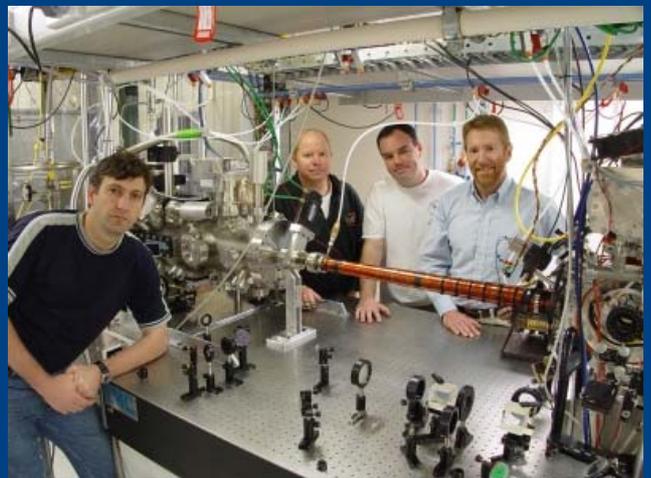
The aim of ACQAO is to carry out strategic fundamental research, which combines the ideas of quantum optics, such as squeezing and entanglement, and the techniques of atom optics, such as Bose-Einstein condensation and atom lasers.

## METASTABLE HELIUM BEC

The 2001 Nobel prize in physics was awarded for the first demonstrations of Bose-Einstein condensation (BEC). These landmark experiments in physics realised a new state of matter in which the de Broglie wavelengths of ultracold atoms overlap to form a coherent, macroscopic quantum fluid with a single collective phase. It is this collective quantum mechanical phase that delineates a *condensate* atom from a normal *thermal* atom, indeed it is this phase that gives a condensate its remarkable properties.

In this experimental program we propose measuring the development of relative phase between two BEC's. This challenging project is made possible by using a BEC comprising atoms in an excited state. On striking a detector, these atoms release electrons which can be detected with very high efficiency, allowing single atom detection. This unique property of a He\* BEC makes it the ideal candidate to probe the quantum mysteries of a BEC.

This project is part of the Australian Centre of Excellence for Quantum Atom Optics (ACQAO) and is well funded. Our team comprises a number of highly motivated staff members and students as well as excellent technicians. We also have close ties to theoretical physicists at the ANU and UQ nodes of ACQAO. We have a number of ongoing collaborations with groups in the Netherlands and France, and there exists the opportunity to visit these laboratories. Furthermore, ACQAO runs annual workshops which encourage interaction between students and staff across different universities.



### Supervisor

Dr Andrew Truscott <[andrew.truscott@anu.edu.au](mailto:andrew.truscott@anu.edu.au)>

### Scholarships and further information

For further details about the research project and information about PhD scholarships please contact Dr Andrew Truscott or visit the webpage of the ANU IAS Node of ACQAO: [http://www.rsphysse.anu.edu.au/ampl/he\\_bec/](http://www.rsphysse.anu.edu.au/ampl/he_bec/)