

ARC Centres of Excellence Program

ARC Centre of Excellence for Quantum Computer Technology

Interim Director: Professor R G Clark

Collaborating Institutions:

- The University of New South Wales
- The University of Queensland
- The University of Melbourne
- Macquarie University
- Griffith University
- The University of Sydney
- Australian Defence Force Academy
- Defence Science and Technology Organisation
- Los Alamos National Laboratory
- Ohio State University
- LPS University of Maryland
- Hewlett-Packard Laboratories

Development of a quantum computer is one of the century's major challenges in science and engineering. The international race to construct such a computer is of the highest technological calibre. Australia is currently placed amongst the front-runners through its groundbreaking research in quantum computing theory and in world-leading capacity to manipulate the atomic building blocks of a quantum computer. The existing ARC Special Research Centre for Quantum Computer Technology has played a pivotal role in positioning Australian research in the highly competitive field. The new Centre of Excellence will build on this success to enhance Australia's momentum in this race, by building stronger research teams of theoreticians and experimentalists working on coordinated projects towards the common goal.

The Centre's main technological thrust is a form of quantum computer based on the quantum control of individual atoms precisely situated in a silicon crystal. Key milestones already reached in this program include the ability to register the implanted atoms one by one, the capacity to fabricate atomic-scale arrays, and the demonstration of architectures for reading and controlling the quantum states. The roadmap past these milestones towards the goal of a quantum computer has been drawn up in detail by the Centre's key researchers, often with alternative paths if one is found to be blocked. The Centre will also undertake theoretical and experimental research on a complementary form of quantum computing, based on optical methods.

The potential economic and social benefits of quantum computing are of strategic importance. The Centre maintains a close relationship with government and industry, regarding in particular the commercialisation opportunities. The Centre plays a leading role in training gifted Australian researchers, engineers and technologists in the methods and innovation cultures of the modern photonics, electronics and nanotechnology industries. It also acts as a magnet to expatriate researchers, and to attract some of the world's best scientists to Australia.

