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FOR IMMEDIATE RELEASE

Taking a Spin Around The Block

WATERLOO, ON, May 4th, 2009 – Large-scale quantum computing will require the manipulation of quantum states of a physical system with well-behaved internal degrees of freedom. The internal quantum 'spin' states of single electrons confined to tiny potential wells (known as quantum dots) provide one such physical system.

Although the spin states of single electrons are long-lived, they are notoriously difficult to prepare and read out. One way to achieve preparation and readout is to use a physical process known as the 'Pauli Spin Blockade', in which a current flows freely or is 'blocked' depending on the internal spin states of electrons. Because the internal spin states have a finite lifetime, this method for preparation and readout is, however, imperfect.

New research at the Institute for Quantum Computing (IQC) involving graduate student Farzad Qassemi, postdoctoral fellow Dr. Bill Coish and Prof. Frank K. Wilhelm published in Physical Review Letters reveals the mechanisms behind blocking and unblocking of current due to microscopic spin states. This work opens the door to new methods of rapidly preparing and reading out quantum bits stored in electron spins and provides important intuition needed to understand experiments on strongly correlated states of matter.

Reference:
F. Qassemi, W. A. Coish, and F. K. Wilhelm,
Stationary and Transient Leakage Current in the Pauli Spin Blockade
Phys. Rev. Lett. 102, 176806 (2009)

About IQC:

Founded in 2002, the mission of the Institute for Quantum Computing (IQC) is to aggressively explore and advance the application of quantum mechanical systems to a vast array of relevant information processing techniques.

A part of the University of Waterloo, IQC creates a truly unique environment that fosters cutting-edge research and collaboration between researchers in the areas of computer, engineering, mathematical and physical sciences.

At the time of this release, IQC has 18 faculty members, 20 postdoctoral fellows and over 73 students and research assistants, as well as a support staff of 10.

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To find out more about the Institute for Quantum Computing, please visit www.iqc.ca

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