12-qubits reached in quantum information quest

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In the drive to understand and harness quantum effects as they relate to information processing, scientists in Waterloo and Massachusetts have benchmarked quantum control methods on a 12-Qubit system. Their research was performed on the largest quantum information processor to date.

Theorists and experimentalists at the Institute for Quantum Computing and (IQC) and Perimeter Institute for Theoretical Physics (PI) in Waterloo, along with MIT, Cambridge, have presented an operational control method in quantum information processing extending up to 12 qubits. The team's research is available in *Physical Review Letters* (PRL 96, 170501 week ending 5 May, 2006) and describes the approaches, accuracy and scalability. Despite decoherence, the researchers reached a 12-coherence state and decoded it using liquid state nuclear magnetic resonance quantum information processors.

Raymond Laflamme, Executive Director at the Institute for Quantum Computing and Long Term Researcher at Perimeter Institute says - "…our experiment shows a high level of quantum control over the largest quantum register to date. It is an important step in implementing quantum information processing on larger and larger devices. This is an important milestone towards harnessing the quantum world."

The team's findings set a new algorithmic benchmark in a global effort to exploit quantum properties in order to support entirely new modes of information processing – such as quantum computers with an ability to

solve certain types of incredibly complex problems that no modern day computer can approach. The basic principles behind today's computers and other information processing devices (known as "classical" systems) were developed in the 1930s. However, today's theories governing the calculation, storage and transmission of information are at a crossroads. As wires and logic gates become ever smaller, quirky quantum phenomena in the tiny world of atoms take over and impede the efficient flow of information. Select groups of international theorists and experimentalists - including those who are clustering in Waterloo, Ontario - are trying to understand and harness the phenomena and, with this latest research, have set a new standard by controlling a 12-Qubit system.

Source: Perimeter Institute for Theoretical Physics