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# **Two component Bose-Einstein condensates for quantum information**

***Presented by:***

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## **Abstract**

Quantum computation using qubits made of two component Bose-Einstein condensates (BECs) is analyzed. Recently coherent control of two component BECs have been achieved in atom chips, as well as the strong coupling of BECs to cavities. Currently these systems are not generally considered for quantum computation due to the large number of bosons in the system, making the system effectively classical. Here we show that quantum effects such as entanglement can survive in such systems, and that universal quantum computation should be possible with such systems. We construct a general framework for quantum algorithms to be executed using the collective states of the BECs. We illustrate the scheme by an application to quantum algorithms such as Grover's algorithm, and discuss possible experimental implementations. Decoherence effects are analyzed under both general conditions and for the experimental implementation proposed.

*Light refreshments will be served.*