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TITULO: **Two-component Bose-Einstein condensates for quantum information**

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ABSTRACT

Quantum computation using qubits made of two component Bose-Einstein condensates (BECs) is analyzed. We construct a general framework for quantum algorithms to be executed using the collective states of the BECs. The use of BECs allows for an increase of energy scales via bosonic enhancement, resulting in two qubit gate operations that can be performed at a time reduced by a factor of N, where N is the number of bosons per qubit. 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.