Grover quantum algorithm implementation using a single molecular magnet

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Among all existing qubits, spin based devices are very attractive since they reveal electrical read-out and coherent manipulation. Beyond this, the more isolated a system is, the longer its quantum behavior remains, making of the nuclear spin a serious candidate for exhibiting long coherence time and consequently high numbers of quantum operation. In this context I will present the electrical read-out and manipulation of a single nuclear spin 3/2 carried by a single molecular magnet[1]. Ramsey and Hahn-echo measurements reveal coherence times of the order of 0.3ms. These measurements demonstrate that a nuclear spin embedded in the molecular magnet transistor is a four quantum states system that can be fully controlled. Theoretical proposal demonstrated that Grover algorithm could be implemented using a 3/2 spin[2]. I will then present the experimental implementation of this algorithm applied to a single nuclear spin.

[1]S. Thiele et al., *Science* **2014**
[2]M.N. Leuenberger et al., *PRB* **2003**