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Qubits structure as an enhancement factor of coherence in a one-way quantum computer
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Abstract

Present day´s efforts for building up an operative quantum computer soon will take shape. One of the main challenges to this task is to implement qubit coherence in a practical way. We make emphasis on the structure of the nuclear qubits in a one-way quantum computer as a source of coherence enhancement. The form factor, accounting for the nuclear qubit structure of the model, is the magnetogyric ratio γ (more commonly called the gyromagnetic ratio). We collect experimental values for γ and calculate the respective times of coherence T h , for a number of materials. A parametrization is also given for γ , in terms of the atomic number, whose agreement with the experiment is very good. We also calculate, accurately enough, bounds to the corrections to T h due to spurious dipolar coupling between nuclei because this has not been done in the past. Such corrections are negligible for nearby planes whereas for remote planes they might be of considerable size. It is concluded that the nuclei states last longer than their electronic counterpart. However, this stability of nuclei qubits limits the speed at which the computer can carry out instructions and process the information.

Keywords

Qubit, structure, form factors, dipolar coupling, spurious, decoherence time.