Abstract Submitted
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Accuracy of gates in a quantum computer based on vibrational eigenstates DMITRI BABIKOV, Marquette University, Chemistry Department, Milwaukee, WI — A model is developed to study the properties of a quantum computer that uses vibrational eigenstates of molecules to implement the quantum information bits and optimally shaped femto-second laser pulses to apply the quantum logic gates. Particular emphasis of this study is on understanding how the different factors, such as properties of the molecule and of the pulse, can be used to affect the accuracy of quantum gates in such a qubit. Optimal control theory and numerical time-propagation of vibrational wavepackets are employed to obtain the shaped pulses for the gates NOT and Hadamart transform. The effects of the anharmonicity parameter of the molecule, the target time of the pulse and of the penalty function are investigated. Influence of all these parameters on the accuracy of qubit transformations is observed and explained. It is shown that when all these parameters are carefully chosen the accuracy of quantum gates reaches 0.999 .

Dmitri Babikov
Marquette University, Chemistry Department, Milwaukee, WI

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