

# Ro-vibrational Quantum Logics in a Molecule Using Strong-Field Alignment

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**Abstract.** We discuss an approach to quantum control based on preliminary adiabatic tuning of the field-free Hamiltonian by a strong laser field to optimize it for the desired transitions. As an illustration, we describe single-qubit, two-qubit, and some qudit logical gates within rotational and vibrational states of a diatomic molecule. Gate operations utilize resonant Raman transitions, and the prior adjustment of the Hamiltonian is done by a strong nonresonant aligning field.