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CNOT gates with weakly coupled qubits: Dependence of fidelity on form of interaction JOYDIP GHOSH, MICHAEL GELLER, University of Georgia, Athens — An approach to the construction of a CNOT quantum logic gate for a 4-dimensional coupled-qubit model with weak but otherwise arbitrary coupling has been given recently (e-print arXiv0906.5209). How does the resulting fidelity depend on the form of qubit-qubit coupling? We calculate intrinsic fidelity curves (fidelity vs. total gate time) for a variety of qubit-qubit interactions, including the commonly occurring isotropic Heisenberg and XY models, as well as randomly generated ones. For interactions not too close to that of the Ising model, we find that the fidelity curves do not significantly depend on the form of the interaction, and we provide the fidelity curve for the non-Ising-like cases and a criterion for determining its applicability.

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