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**Interqubit coupling mediated by a high-excitation-energy quantum object** SAHEL ASHHAB, ANTTI NISKANEN, KHALIL HARRABI, YASUNOBU NAKAMURA, THOMAS PICOT, PIETER DE GROOT, KEES HARMANS, HANS MOOIJ, FRANCO NORI — We consider a system composed of two qubits and a high-excitation-energy quantum object used to mediate coupling between the qubits. After reproducing well-known results concerning the leading term in the mediated coupling, we obtain an expression for the residual coupling between the qubits in the off state. We also analyze the entanglement between the three objects, i.e. the two qubits and the coupler, in the eigenstates of the total Hamiltonian. Although we focus on the application of our results to the recently realized parametric-coupling scheme with two qubits, we also discuss extensions of our results to harmonic-oscillator couplers, couplers that are near resonance with the qubits and multi-qubit systems. In particular, we find that certain errors that are absent for a two-qubit system arise when dealing with multi-qubit systems.

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