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Strong tunable coupling between a charge qubit and a phase qubit[1] AURELIEN FAY, EMILE HOSKINSON, FLORENT LECOCQ, LAURENT LEVY, Institut Neel, CNRS-UJF, FRANK HEKKING, LPMMC, CNRS-UJF, WIEBKE GUICHARD, OLIVIER BUISSON, Institut Neel, CNRS-UJF —

We have studied the quantum dynamics of a superconducting circuit based on a dc-SQUID coupled to a highly asymmetric Cooper pair transistor (ACPT). The dc-SQUID is a phase qubit controlled by a bias current and magnetic field. The ACPT is a charge qubit controlled by a bias current, magnetic flux and gate voltage. We have measured by microwave spectroscopy the lowest quantum levels of the coupled circuit as function of applied flux, bias current and gate voltage. Quantum state measurements of the phase and charge qubit are achieved by a nanosecond flux pulse applied to the dc-SQUID. Our circuit enables the independent manipulation of each qubit as well as the entanglement of the quantum states of the two circuits. We observe avoided level crossings between the two qubits when they are put in resonance. The coupling strength is measured over a large frequency range and varies from 100MHz to 1.3GHz. We succeed to realize a tunable coupling between the charge and the phase qubit. The measured tunable coupling strength is well explained by a combination of a capacitive and a Josephson coupling between the two qubits.

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