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Multiplexing Readout of a Qubit Array via a Single Transmission Line MARKUS JERGER, STEFANO POLETTO, ALEXANDER LUKASHENKO, ALEXEY V. USTINOV, Physikalisches Institut, Karlsruhe Institute of Technology and DFG-Center for Functional Nanostructures (CFN), D-76128 Karlsruhe, Germany, PASCAL MACHA, UWE HÜBNER, EVGENI IL'ICHEV, Institute of Photonic Technology, PO Box 100239, D-07702 Jena, Germany — A resonant circuit coupled to a qubit displays a shift of its resonance frequency depending on the quantum state of the qubit. The qubit state can be thus measured by probing the resonator near its resonance frequency. By coupling every qubit to its individual resonator of distinct frequency, one can read out the state of an array of many qubits through a single microwave line coupled to all resonators. Moreover, this readout can be performed simultaneously by using a multi-tone microwave pulse with frequency-division multiplexing. We will present measurements on an ensemble of 7 superconducting flux qubits located on one chip and each coupled to an individual transmission-line resonator. We performed spectroscopy of all qubits and determined their parameters in a single measurement run. Our latest experiments on simultaneous preparation and readout of the 7-qubit array will be presented.

Markus Jerger
Physikalisches Institut, Karlsruhe Institute of Technology,
D-76128 Karlsruhe, Germany

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