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High-Fidelity Measurements of Long-Lived Flux Qubits DAVID HOVER, MIT Lincoln Laboratory, CHRIS MACKLIN, KEVIN O'BRIEN, University California Berkeley, ADAM SEARS, JONILYN YODER, TED GUDMUNDSEN, JAMIE KERMAN, VLADIMIR BOLKHOVSKY, SERGEY TOLPYGO, GEORGE FITCH, TERRY WEIR, MIT Lincoln Laboratory, ARCHANA KAMAL, SIMON GUSTAVSSON, FEI YAN, Research Laboratory of Electronics, MIT, JEFF BIRENBAUM, IRFAN SIDDIQI, University California Berkeley, TERRY ORLANDO, Research Laboratory of Electronics, MIT, JOHN CLARKE, University California Berkeley, WILL OLIVER, MIT Lincoln Laboratory;Research Laboratory of Electronics, MIT — We report on high-fidelity dispersive measurements of a long-lived flux qubit using a Josephson superconducting traveling wave parametric amplifier (JTWPA). A capacitively shunted flux qubit that incorporates high-Q MBE aluminum will have longer relaxation and dephasing times when compared to a conventional flux qubit, while also maintaining the large anharmonicity necessary for complex gate operations. The JTWPA relies on a Josephson junction embedded transmission line to deliver broadband, nonreciprocal gain with large dynamic range. This research was funded in part by the Office of the Director of National Intelligence (ODNI), Intelligence Advanced Research Projects Activity (IARPA); and by the Assistant Secretary of Defense for Research & Engineering under Air Force Contract number FA8721-05-C-0002. All statements of fact, opinion or conclusions contained herein are those of the authors and should not be construed as representing the official views or policies of

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