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Efficient Qubit Readout Using Josephson Photomultipliers E.J. PRITCHETT[1], L.C.G. GOVIA, Saarland University, C. XU, M.G. VAVILOV, University of Wisconsin, B.L.T. PLOURDE, Syracuse University, R. MCDERMOTT, University of Wisconsin, F.K. WILHELM, Saarland University — A Josephson photomultplier (JPM) – a current-biased Josephson junction operated near its critical bias – can absorb and detect weak microwave signals with high sensitivity (PRL 107, 217401 (2011)). When strongly coupled to a high-Q transmission line "cavity," the JPM can detect single microwave photons with large bandwidth and with near unit efficiency (PRB 86, 174506 (2012)). The switching of a JPM into its voltage state acts on the adjacent cavity via the backaction of photon subtraction (PRA 86, 032311 (2012)). While a destructive measurement of the microwave cavity, this switching can perform a binary non-demolition measurement of a quantum system coupled to the cavity. We present a protocol by which the presence and subsequent detection of a cavity photon by a JPM conveys information about the state of a superconducting qubit without destroying it, thus performing a quantum non-demolition measurement of the qubit's state. Multi-qubit generalizations of this protocol are discussed.

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