Abstract Submitted
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Frequency tunable non-degenerate Josephson amplifier for qubit readout[1] FLAVIUS SCHACKERT, MICHAEL HATRIDGE, KATRINA SLIWA, BALEEGH ABDO, LUIGI FRUNZIO, MICHEL DEVORET, Yale University, Dept. of Applied Physics — We have developed a new ultra low noise microwave amplifier based on the Josephson parametric converter (JPC), which overcomes a practical weakness of devices of previous generations: having sufficient frequency tunability to easily match the qubit readout frequency. The JPC consists of two superconducting microwave resonators that are coupled to each other through a ring of four Josephson junctions, threaded by a magnetic flux and providing the non-linearity for the amplification process. The non-linearity is of the trilinear form involving the minimal number of modes, and allows ideal non-degenerate parametric amplification at the quantum limit of noise. In our new tunable version, the junctions responsible for amplification are shunted by a cross of four larger junctions, which for our purpose can be regarded as linear inductors, as in the work of Roch et al.[1]. The JPC has now a unique bias point at any applied flux and is tunable over more than half a gigahertz. We are currently using this amplifier in conjunction with a quantum non-demolition measurement of a transmon qubit and have observed quantum jumps with fidelity larger than 90%. [1] N. Roch, E. Flurin, F. Nguyen, P. Morfin, P. Campagne-Ibarcq, M. H. Devoret, and B. Huard, in preparation.

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