Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Parametric Amplification of Quantum Signals with a Josephson Ring Modulator NICOLAS BERGEAL, FLAVIUS SCHAKERT, MICHAEL METCALFE, VLADIMIR MANUCHARYAN, RAJAMANI VIJAYARAGHAVAN, MARKUS BRINK, MICHEL DEVORET, Yale University Applied Physics — Quantum Mechanics puts a limit on how small the degradation of information passing through a phase preserving amplifier can be. It is known theoretically that the minimum noise added by the amplifier to the signal amounts at least to half a photon at the signal frequency. Is it possible to construct a practical amplifier working at microwave frequencies that would reach this quantum limit? We have developed a new device aiming at answering this question, which is of practical importance for the readout of solid state qubits, and more generally, for the measurement of very weak signals in various areas of science. The device is based on a ring of four Josephson junctions which connects two microwave resonators corresponding to the signal and idler modes. It can be operated both as an amplifier and a frequency converter. Theoretical aspects and experimental results will be presented.

Nicolas Bergeal
Yale University

Date submitted: 03 Jan 2008 Electronic form version 1.4