Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Ultra-strong coupling regime of cavity QED with flux qubits
JEROME BOURASSA, ALEXANDRE BLAIS, Universite de Sherbrooke — With improved dephasing rate and coupling strength, the transmon qubit has recently been used to reach the strong coupling regime of cavity QED [1,2]. With the transmon however, these improvements are done at the expense of lower anharmonicity compared to the Cooper-pair box. Here we present an alternative approach where a flux qubit is coupled to the transmission line. As was recently shown experimentally [1], very strong coupling can be obtained by directly connecting the qubit loop to the center conductor of the resonator whose local inductance is tuned to maximize the coupling. We will discuss how this system can be used to study the breakdown of the rotating-wave approximation and how the Λ-configuration of the energy levels of the flux qubit can be exploited.

[1] J. Koch et al, Phys. Rev. A, 2007, 76, 042319 (2007)
[2] J. A. Schreier et al, PRB 77, 180502 (2008)
[3] A. A. Abdumalikov, et al., PRB 78, 180502 (2008)

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Date submitted: 14 Jan 2009 Electronic form version 1.4