

Abstract Submitted  
for the MAR13 Meeting of  
The American Physical Society

**Extracting Past-Future Vacuum Correlations Using Circuit QED**<sup>1</sup> BORJA PEROPADRE<sup>2</sup>, Instituto de Física Fundamental, CSIC, CARLOS SABIN<sup>3</sup>, School of Mathematical Sciences, The University of Nottingham, MARCO DEL REY, Instituto de Física Fundamental, CSIC, EDUARDO MARTIN-MARTINEZ<sup>4</sup>, Institute for Quantum Computing, Dept. Applied Math., University of Waterloo & Perimeter Institute — In this work we propose a realistic circuit QED experiment to test the extraction of past-future vacuum entanglement to a pair of superconducting qubits. A qubit P –for past– interacts with a quantum field along an open transmission line for an interval  $T_{on}$  and then, after a time-lapse  $T_{off}$  of no interaction, a second qubit F –for future– starts interacting for a time  $T_{on}$  in a symmetric fashion. After this protocol, past-future quantum correlations will have transferred to the qubits, even if the qubits do not coexist at the same time. We show that this experiment can be realized with current technology and discuss its utility as a possible implementation of a quantum memory.

<sup>1</sup>Spanish MICINN Projects No. FIS2011-29287 and No. FIS2009-10061 and CAM research consortium QUITEMAD Grant No. S2009-ESP-1594.

<sup>2</sup>Calle Serrano 113-B, 28006 Madrid, Spain

<sup>3</sup>University Park, Nottingham NG7 2RD, United Kingdom

<sup>4</sup>200 University Av W, Waterloo, Ontario, N2L 3G1, Canada

Borja Peropadre  
Instituto de Física Fundamental, CSIC

Date submitted: 08 Nov 2012

Electronic form version 1.4