

Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Simulating quantum field theories with superconducting circuits¹ ANTONIO MEZZACAPO, GUILLERMO ROMERO, LAURA GARCÍA-ÁLVAREZ, JORGE CASANOVA, LUCAS LAMATA, ENRIQUE SOLANO², Department of Physical Chemistry, University of the Basque Country UPV/EHU, Apartado 644, E-48080 Bilbao, Spain — In this contribution, we present the quantum simulation of fermionic field modes interacting via a continuum of bosonic modes with superconducting circuits. Unlike many quantum technologies, superconducting circuits offer naturally the continuum of bosonic modes by means of one-dimensional transmission lines. In particular, we consider a simplified version of 1+1 quantum electrodynamics (QED), which may describe Yukawa interactions, and the coupling of fermions to the Higgs field. Our proof-of-principle proposal is designed within the state-of-the-art circuit QED technology, where fermionic fields are encoded in superconducting flux qubits, in a scalable approach that may lead to a full-fledged quantum simulation of quantum field theories.

¹The author acknowledge support from Spanish MINECO FIS2012-36673-C03-02; UPV/EHU UFI 11/55; Basque Government IT472-10; SOLID, CCQED, PROMISCE, and SCALEQIT European projects

²IKERBASQUE, Basque Foundation for Science, Alameda Urquijo 36, 48011 Bilbao, Spain

Guillermo Romero
University of the Basque Country UPV/EHU

Date submitted: 15 Nov 2013

Electronic form version 1.4