

Abstract Submitted  
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**Effective  $\cos n\varphi$  Josephson element**<sup>1</sup> W.C. SMITH, A. KOU, U. VOOL, L. FRUNZIO, M.H. DEVORET, Department of Applied Physics, Yale University — Using superinductances, one can realize circuit elements with tunneling energies proportional to  $\cos n\varphi$ , with  $\varphi$  being the phase across the element and  $n$  being a positive integer. In these elements, Cooper pairs are only able to tunnel in multiples of  $n$ , resulting in an  $n$ -fold degenerate ground state manifold that can encode a qubit. Such a qubit is expected to be insensitive to most relevant noise sources [1,2]. We present the experimental realization of a qubit based on the  $\cos 2\varphi$  element and show preliminary measurements of its energy levels.

[1] P. Brooks et al. Phys. Rev. A 87, 052306 (2013).

[2] M.T. Bell et al. Phys. Rev. Lett. 112, 167001 (2014).

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