Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

**Quasiparticle parity lifetime of bound states in a hybrid superconductor-semiconductor quantum dot**[1] ANDREW HIGGINBOTHAM, University of Copenhagen, Harvard University, SVEN ALBRECHT, GEDIMINAS KIRSANSKAS, University of Copenhagen, WILLY CHANG, University of Copenhagen, Harvard University, FERDINAND KUEMMETH, PETER KROGSTRUP, THOMAS JESPERSEN, JESPER NYGÅRD, KARSTEN FLENSBERG, CHARLES MARCUS, University of Copenhagen — We measure quasiparticle transport in an InAs nanowire that is half-covered with epitaxial superconducting aluminum, thenlocally gated to form a quantum dot. We observe negative differential conductance at finite source-drain bias, and temperature dependent even-odd alternations in the Coulomb blockade peak spacings at zero bias. These observations can be understood in terms of a mid-gap semiconductor discrete state and a continuum of BCS quasiparticle states. Comparing with simple models, we bound the discrete state's parity lifetime and the quasiparticle temperature. These results indicate that parity fluctuations are slow, and imply Majorana qubit poisoning times on the order of a millisecond. Additional results indicate that the bound states move to zero energy in a magnetic field, qualitatively consistent with expectations for Majorana fermions in a finite system.

[1]Research supported by Microsoft Station Q, Danish National Research Foundation, Villum Foundation, Lundbeck Foundation, and the European Commission.

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Date submitted: 14 Nov 2014 Electronic form version 1.4