Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Spin-resolved Andreev levels and parity crossings in hybrid superconductor-semiconductor nanowires RAMON AGUADO, Consejo Superior de Investigaciones Cientificas, CSIC, Spain, EDUARDO LEE, SPSMS, CEA-INAC/UJF-Grenoble, France, XIAOCHENG JIANG, Harvard University, Department of Chemistry and Chemical Biology, MANUEL HOUZET, SPSMS, CEA-INAC/UJF-Grenoble, France, CHARLES LIEBER, Harvard University, Department of Chemistry and Chemical Biology, SILVANO DE FRANCESCHI, SPSMS, CEA-INAC/UJF-Grenoble, France — I will present measurements and theory of the Zeeman effect on the Andreev levels of a semiconductor quantum dot, based on an InAs nanowire, with large electron g-factors strongly coupled to a conventional superconductor with large critical field. This material combination allows spin degeneracy to be lifted without destroying superconductivity. When the system is in a spin singlet state, a spin-split Andreev level crossing the Fermi energy results in a quantum phase transition to a spin-polarized state, implying a change in the fermionic parity of the system. This crossing manifests itself as a finite-field, zero-bias conductance anomaly [1] whose properties resemble those expected for Majorana modes in a topological superconductor [2-3]. While this resemblance is understood without evoking topological superconductivity, the observed parity transitions could be regarded as precursors of Majorana modes in the long-wire limit [4].

[1] E. J. H. Lee, X. Jiang, M. Houzet, R.Aguado, C. M. Lieber, and S. De Franceschi, Nature Nanotechnology, in press (2013).
[2] V. Mourik, et al, Science 336, 1003-1007 (2012).
[3] A. Das, et al. Nature Phys. 8, 887-895 (2012).
[4] T. D. Stanescu, et al, Phys. Rev. B 87, 094518 (2013).

Ramon Aguado
Consejo Superior de Investigaciones Cientificas, CSIC, Spain

Date submitted: 15 Nov 2013 Electronic form version 1.4