Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Engineering Majorana modes in MBE grown III-V semiconductor heterostructures PEDRAM ROUSHAN, PETER O'MALLEY, YU CHEN, BROOKS CAMPBELL, Department of Physics, UCSB, BORZOYEH SHOJAEI, JAVAD SHABANI, BRIAN SCHULTZ, CHRIS PALMSTROM, Materials department, UCSB, JOHN MARTINIS, Department of Physics, UCSB — Several theoretical proposals for realizing Majorana fermions in condensed matter systems have created much excitement and are being intensely followed by experimental groups. A common feature of all these proposals is the large size of the parameter space. We are pursuing a proposal based on coupling a semiconductor nanowire with strong spin-orbit coupling to an s-wave superconductor. Considering only the energy landscape, the size of the induced quasiparticle gap depends on the spin-orbit coupling, Zeeman energy, mobility, coupling between the two materials, and the s-wave superconducting gap. We find that Majorana modes can only be realized through carefully engineered materials. We explore this parameter space and discuss the feasibility of realizing Majorana modes based on measured parameters in our MBE grown semiconductor heterostructures.

Pedram Roushan
Department of Physics, UCSB

Date submitted: 19 Dec 2012 Electronic form version 1.4