

Chez Pierre

Presents ...

Monday, April 22, 2013

12:00pm

MIT Room 4-331



Rui-Rui Du
Rice University

“Creating Majorana Fermions on the Edge of InAs/GaSb Quantum Wells”

In the quest of Majorana fermions in solid state, proximity coupled 1D quantum wires ("Majorana wires") represent a promising system. The requirements for materials quality, however, are rather stringent: among the least of them the wires must be pure and uniform enough, such that the occupied number of modes will be the same over at least several micrometers length. We demonstrate here, by research of Rice group and collaborators, that in inverted InAs/GaSb semiconductor quantum wells these requirements can be readily met by creating and gate tuning the helical edge states. Single mode, spin polarized edges with coherent length over 5 micrometers are routinely observed at liquid helium temperature. This recent materials breakthrough, together with the fact that highly transparent interfaces can be formed between InAs/GaAs and metallic superconductors, opens a well-controlled way of creating and manipulating Majoranas in solid state.

Ref. Knez, Du, and Sullivan, Phys. Rev. Lett. 107, 136603 (2011); 109, 186603 (2012)