Search for Conduction Electron Spin Resonance in Single-Wall Carbon Nanotubes

Jason R. Ball[1], Agus Subagyo[2], Kazuhisa Sueoka[2], Rui-Rui Du[1], Junichiro Kono[1]
[1]Department of Physics and Astronomy, Rice University
[2]Graduate School of Information Science and Technology, Hokkaido University
jason.r.ball@rice.edu

One of the key components of Tomonaga-Luttinger Liquid (TLL) theory in carbon nanotubes (CNTs) is the separation of the electron spin and charge into quasi-particles known as 'spinons' and 'holons.' This unusual phenomenon, called *spin-charge separation*, has not been clearly observed to date despite many experimental attempts using different methods. Here, we are using the method of electron spin resonance (ESR) to search for spin-charge separation, which is expected to manifest itself in unusual Zeeman splitting. More specifically, the ESR line is predicted to split into both spinon and holon peaks, making ESR an excellent tool for probing the spin-charge separation of SWCNTs. ESR has never been measured on a single nanotube, and it is the goal of this project to develop a suspended, single-nanotube FET that will be measured with a precision probe. These experiments will require high quality, gated samples, which will be developed in the nanoelectronics laboratory of Dr. Kazuhisa Sueoka at Hokkaido University. This presentation will cover the methods used to develop these suspended SWCNT-FETs, which will be fabricated using wet etching techniques. The results and relevant characterization data of each method will be presented, as well as their planned applications in ESR measurements, to be performed at Rice University.