Short-range scattering in quantum dots

In a project funded by NSFC, Professor Li Guodong and colleagues at the National Center for Nanoscience and Technology in Beijing made a new breakthrough in understanding the way electrons travel around quantum dots. This might lead to promising new fabrication methods of novel quantum devices, as they reported in *Journal of Applied Physics*, published by the American Institute of Physics in October 2010.

According to their report, Professor Li and his research team carried out an experiment using self-assembled quantum dots and a two-dimensional electron gas, and then fit the data to a model to find out the type of scattering exhibited.

To study these effects, they placed an AlGaAs/GaAs two-dimensional electron gas (2DEG) near embedded GaSb/GaAs type-II quantum dots at a temperature of 4.2 K.

"The type-II GaSb quantum dots only confine the holes and not the electrons," says coauthor Chao Jiang, "so they are free to interact with the 2DEG."

Measurements at various voltages in the coupled system showed that the scattering mechanism is short-range, an idea verified by a simple model with a constant scattering potential.

"For the first time, we have clarified that the mechanism of electron scattering in this type of quantum dot system is short-range," says Chao. "The result is particularly significant for the future designing of very efficient quantum-dot-based devices."

The title of the article published on the *Journal of Applied Physics* is "Short Range Scattering Mechanism of Type-II GaSb/GaAs Quantum Dots on the Transport Properties of Two-dimensional Electron Gas", co-authored by Chao Jiang, Guodong Li, Hong Yin (National Center for Nanoscience and Technology, China), Qinsheng Zhu (Chinese Academy of Science) and Hiroyuki Sakaki (Toyota Technological Institute).