Towards Coherent Control of Two-Dimensional Electrons on Helium with Microwaves

SPEAKER: Jiabao Chen, Okinawa Institute of Science and Technology Graduate University

Time: 3:00-4:00 pm, Wednesday, November 27, 2019
Venue: Room 312, Pudong Campus, 1555 Century Avenue

Abstract:
Electrons trapped on the surface of liquid helium form a clean two-dimensional electron system. The quantized bound states of the electron orbital motion perpendicular to the liquid surface (the Rydberg states) are formed due to its own image charge in the liquid. We use these electrons to make a highly controllable quantum system to study many-electron dynamics and develop methods for quantum information processing.

In this talk, I will talk about our recent experimental results and theoretical analysis in this direction. We achieved strong coupling between the cyclotron motion of the electrons and microwaves in a Fabry-Perot cavity. We also demonstrated phenomena reminiscent of those studied in AMO experiments, such as sideband transitions, avoided crossings, Lamb shift, etc. by applying a B-field which is tilted with respect to the surface of liquid helium and performing the Stark spectroscopy of electron's energy levels.

Biography:
Jiabao Chen received his B.Sc. degree in Life Science from Nanjing University, China, in 2013, and a Ph.D. degree in physics from the Okinawa Institute of Science and Technology Graduate University (OIST), Japan, in Sep 2019. He studies two-dimensional electrons on helium, quantum optics, quantum information, and open-source software developments for scientific computation.