



IBS Center for Molecular Spectroscopy and Dynamics

Seminar

■ **SPEAKER**

Dr. Kyoung-Duck Park (Department of Physics, Pohang University of Science and Technology)

■ **TITLE**

Tip-enhanced cavity-spectroscopy

■ **ABSTRACT**

Structure, functions, dynamics, and interactions are the basic properties to systematically understand physical systems existing in nature. In particular, there have been many scientific adventures to understand light-matter interactions, yet in the classical regime at the microscale due to the diffraction-limited optical resolution. Recently, plasmonic nano-cavity enables to induce light-matter interactions and tip-enhanced nano-spectroscopy enables to probe them at the nanoscale [1-3]. However, these two approaches have developed independently with their own weaknesses so far. In this talk, I provide a novel concept of “tip-enhanced cavity-spectroscopy (TECS)” overcoming the limitations of previous approaches to induce, probe, and dynamically control ultrastrong light-matter interactions in the quantum tunneling regime [4, 5]. Furthermore, I provide several new directions of nano-spectroscopy and -imaging, which have not been thought in the near-field optics community before. First, we exploit extremely high tip-pressure (\sim GPa scale) to directly modify the lattice structure and electronic properties of materials [6, 7]. Second, we dynamically control the near-field polarization by adopting adaptive optics technique to near-field optics [8]. Third, we develop conductive TECS to modify electrical properties of materials by directly flowing an electric current through the cavity junction. In addition, in the last part of this talk, I present specific research directions of our group in the fields of cavity quantum optics, plexciton condensate, quantum molecular physics, and quantum nonlinear optics, which can be enabled through the TECS approach.

■ **DATE AND VENUE**

January 10, 2023 (Tuesday, 11:00 - 12:00)
Seminar Room A (116)

■ **LANGUAGE**

Korean

■ **INVITED BY**

Dr. Kwang Jin Lee