Center for Molecular Spectroscopy and Dynamics, IBS-Korea University

IBS Center for Molecular Spectroscopy and Dynamics

COLLOQUIUM

■ SPEAKER

Dr. Moonseok Kim (Department of Physics, Korea University)

■ TITLE

Biomechanical imaging and photomedicine

■ ABSTRACT

The mechanical properties of biological tissues are closely related to their functional abilities, which makes them valuable biomarkers for diagnostics and treatment monitoring. For example, the stiffening of tissues often represents an early warning sign for disease, as in the cases of breast or prostate cancer.

As an imaging technique for mechanical properties, Brillouin microscopy has drawn special interest. It is capable of interrogating the intracellular and extracellular mechanical properties in 3D with no need for contact and labeling. Brillouin microscopy relies on light scattering from spontaneous acoustic phonons in tissues to provide biomechanical information. By measuring the optical frequency shift of the scattered light, Brillouin measurements probe the local spontaneous pressure waves in the medium, from which we determine the high frequency longitudinal modulus. In the past few decades, multi-pass Fabry-Perot interferometer has been used for Brillouin microscopy due to its high spectral resolution and extinction ratio. However, Brillouin microscopy has not been suitable for biomedical applications because of the slow data acquisition of the multi-pass Fabry-Perot interferometer.

To solve this issue, a non-scanning Brillouin spectrometer using a virtually-imaged phased array (VIPA) etalon was demonstrated. Due to the low insertion loss of the VIPA, the data acquisition time is significantly reduced. The high extinction can be achieved by cross-axis cascade approach of the two-stage VIPA spectrometer. Owing to the advantage of the VIPA spectrometer, Brillouin microscopy has been developed to measure the elastic modulus of the human cornea, intracellular mechanical variation. Nevertheless, Brillouin microscopy is currently available in only nearly transparent tissues and mechanical imaging deep in scattering tissues remains still a challenge since the intensity of the

probe and collection beams are exponentially attenuated. As a prospective application to overcome the limitation, advanced 3D biomechanical imaging is discussed, which is highly promising for non-contact, label-free, and 3D interrogation of the intracellular and extracellular mechanical properties.

- DATE AND VENUE

  January 18, 2017 (Wednesday, 5:00-6:00 p.m.)
  Seminar room 116, KU R&D Center

- Language

  Korean