Seminar on

Development of A THz Scanning Imaging System

by

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Abstract

To minimize tissue trauma before and during surgery, we have been pursuing the development of novel technologies to create a fully integrated 2D scanning imaging system for endoscopy and optical coherence tomography; this interest in minimizing trauma has continued in our more recent research into the use of the Terahertz (THz) bandwidth for non-destructive tissue biopsy.

For non-destructive biopsies, our team is currently developing a portable THz beam steering device utilizing gradient structures, EO polymer and metamaterials. Traditionally, the systems used in these applications steer electromagnetic (EM) waves in free space, resulting in bulky systems with a maximum spatial resolution defined by the Abbe diffraction limit. Our proposed THz imaging system integrates our advancements in Electro Optic (EO) components and tunable fishnet metamaterials (TFMM) into a compact beam steering device that guides the THz beam through a raster scan of the area of interest to acquire a THz image. The proposed TFMM beam steering device utilizes a tunable resonant frequency of TFMM with negative refractive index to achieve maximal beam steering angles (field of view) and confinement with subwavelength beam sizes as a means to minimize the system size and increase the spatial resolution beyond the Abbe limit.

In addition to our stated applications, these technologies can be applied far more broadly, with potential benefits in cancer screening, food and pharmaceutical inspection, and low-energy dental imaging and many other bio and biochemical sensing. In this talk, theory, application and demonstration of image acquisition and beam steering for all three techniques will be presented.

Biography

Wei-Chih Wang is currently a Research Associate Professor in the Department of Mechanical Engineering and an Adjunct Research Associate Professor in the Department of Electrical Engineering at the University of Washington. He graduated from University of Washington with a degree in electrical engineering in 1996. He later received a postdoctoral fellowship for a DARPA funded piezoelectric MEMS project under Dr. Eun Sok Kim at the University of Hawaii in 1996 and 1997. He has authored or co-authored over 135 technical publications, holds 8 patents and over 200 disclosures. His research interests are in the area of developing polymer based micro sensors and actuators for industrial and biomedical applications. More recently, his work has expanded to THz, IR and visible band 3-D metamaterials, and electromagnetic and electro-active polymer material study. He is currently a Senior member of SPIE, a member of IEEE and Eta Kappa Nu. He is also an associate editor and a member of the editorial board for the International Journal of Optomechatronics and the Sensors & Transducers Journal and serve in the program committees for SPIE Smart Structures and Materials + Nondestructive Evaluation and Health Monitoring and International Symposium on Optomechatronics Technologies since 2003 and 2009.

Date : 17 September, 2014 (Wednesday)
Time : 11:00 am – 12:00 noon
Venue : Room 15-202, meeting room of State Key Laboratory of Millimeter Waves, 15/F, Academic 3, City University of Hong Kong

***** ALL ARE WELCOME *****

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