SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

ULTRASOUND SENSING USING MICROTOROID OPTICAL RESONATOR

PhD Preliminary Research Examination

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Abstract: The interaction between light and sound has been subject of interest for decades. Recently, along with the vast improvement in optics and photonics, the optical sensing of ultrasound has attracted a lot of attention. Many optical components, ranging from optical fibers to different types of optical resonators such as fiber gratings, etalons and Whispering Gallery Mode (WGM) resonators, have been utilized to detect acoustic waves by using the refractive index change (acousto-optics effect) and/or the geometry change of the medium in the presence of the acoustic waves.

WGM resonators are great candidates for highly sensitive sensors due to their ultra-high quality factor that results in a very steep slope in their spectra. Different from piezoelectric sensors in which noise increases with reduction in size, WGM resonators can be fabricated in micron scale without showing increase in detection noise. We propose to use the on-chip microtoroid resonators side-coupled to a tapered fiber as miniature sensors for ultrasensitive ultrasound sensing. In a waveguide coupled WGM resonator structure, the strain induced by the ultrasonic field deforms the waveguide, coupling region and the resonator and also modulates the resonator refractive index. As a result, the resonant frequency shifts. Therefore, by locking the wavelength at the steep edge of the resonance, one can detect the modulation of the transmitted light. In addition, changing the material of the resonator is also an option to increase the sensitivity. Currently the microtoroids are made of silica. We plan to replace silica with specific polymers, such as PMMA or PS, which are subject to more changes in refractive index upon interaction with acoustic wave.

DATE:	Friday, February 15, 2013
TIME:	1:30 p.m.
PLACE:	Green Hall, Room 0120

Thesis advisor:
Dr. Lan Yang

This seminar is in partial fulfillment
of the Doctor of Philosophy degree

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