

Seminar on

Engineering Superoscillatory EM Waves

by

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Abstract

The quest to obtain ultimate control of an electromagnetic (EM) waveform has fascinated and challenged scientists and engineers for ages. Imaging, medical therapy and lithography can all benefit greatly from a technology which brings EM waves into ultra-sharp focus. The physics of diffraction seem to disallow an EM wave to focus, in the far-field, to a focal width below half its wavelength. However, this has recently been proven possible using superoscillatory EM waves.

A superoscillation is a waveform which oscillates, across a finite duration, faster than the frequency components that make up the wave. For example, when properly designed, a time domain function with 1Hz bandwidth can oscillate at 10Hz across a predefined time interval of interest. In this talk, I will show how superoscillation waves can be engineered to construct super-resolution focusing and imaging devices. First I will elucidate a somewhat surprising relationship between superoscillation and superdirectivity – a technique used by antenna engineers to design very narrow beams. This relationship enables one to design superoscillation functions using established antenna design techniques. After establishing the design methodology, I shall demonstrate how superoscillation can be used to design devices which perform sub-wavelength microwave focusing, optical super-resolution microscopy, radar imaging and medical imaging and/or therapy.

Biography

Alex M. H. Wong was born in Hong Kong and immigrated to Canada at a young age. He obtained his bachelor's degree in Engineering Science (B.A.Sc. 2006), and his master (M.A.Sc. 2009) and doctoral (Ph.D. 2014) degrees in Electrical Engineering, all at the University of Toronto in Toronto, Canada. He is currently a post-doctoral fellow within the Eleftheriades group in electromagnetics, at the University of Toronto, advancing multiple projects on superoscillation, “smart train” radar, and RF, infrared and optical metasurfaces. His has wide ranging research interest in the fields for electromagnetics and optics, which specifically include RF and microwave systems, superoscillations, super-resolution imaging, metasurfaces, near-field antennas. He is a member of the IEEE Antennas and Propagation Society and the IEEE Microwave Theory and Techniques Society.

Date : 10 April, 2015 (Friday)

Time : 11:00 am – 12:00 noon

Venue : Room 15-202, 15/F, 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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