



“Metamaterials, metasurfaces and plasmonic devices to efficiently control the electromagnetic waves”

EECS Fall 2014 Seminar Series & IEEE AP/MTT Technical meeting

DATE/TIME/LOCATION: Tuesday, Oct. 28th, 2014/ (5:00pm-6:00pm) / HEC-101

SPEAKER: Dr. Christos Argyropoulos, University of Nebraska-Lincoln, USA

ABSTRACT:

Metamaterials, metasurfaces and plasmonic devices can be used to manipulate, control and tailor the electromagnetic radiation in unprecedented ways. They are artificially constructed structures able to exhibit novel functionalities not available in materials provided by nature. Their properties can lead to the design of exciting structures, such as invisible cloaks and ultrathin energy concentrators. However, these novel devices often suffer from intrinsic physical limitations, such as extremely narrowband operation, high losses, weak optical nonlinear response, low tunability and poor reconfigurable operation. In my talk, I will propose several ways to overcome these inherent limitations, based on the introduction of tunable, active and nonlinear media. The large field enhancement in the vicinity of individual and collections of plasmonic nanoparticles and inside metamaterial gratings ensures a significant boosting of nonlinear optical effects, which can lead to ultrathin optical frequency mixers, tunable optical sensors and filters, all-optical switches and nano-memories. I will also present a new ultrathin nonlinear metasurface reflector, or meta-mirror, with giant nonlinear response, a million times stronger compared to traditional nonlinear materials. Finally, I will discuss recent theoretical and experimental advances towards demonstrating large enhancement of spontaneous emission rates of molecules and quantum dots embedded in plasmonic patch nanoantennas. The experimental demonstration of Purcell factors $\sim 1,000$ will be reported, while maintaining high quantum efficiency and directional emission.

BIOGRAPHY:



Christos Argyropoulos received the Diploma of Electrical and Computer Engineering from the Aristotle University of Thessaloniki, Greece (2006). He holds a M.Sc. degree in Communication Engineering from the Microwaves and Communication Systems group of the University of Manchester, UK (2007) and a Ph.D. degree in Electronic Engineering from the Antennas and Electromagnetics Group of the Queen Mary, University of London, UK (2010). After completion of his PhD studies (2011), he accepted a Postdoctoral Fellowship position in the University of Texas at Austin, USA. Next (2013), he worked as a Postdoctoral Associate in the Center for Metamaterials and

Integrated Plasmonics at Pratt School of Engineering, Duke University, USA. Currently, he is an Assistant Professor at University of Nebraska-Lincoln, Department of Electrical Engineering, where he established the metamaterials and integrated nanophotonics lab.

He has published over 100 technical papers in highly ranked journals and refereed conference proceedings, including 5 book chapters. His main research interests include computational electromagnetics, numerical and analytical modeling of metamaterials and their applications, novel antenna design, transformation optics, linear and nonlinear plasmonics, active metamaterials, thermal emission from plasmonic structures, graphene nanophotonics, new energy harvesting devices and acoustic metamaterials. He has received several travel and research awards, such as Junior Researcher Award of the 2013 Raj Mittra Travel Grant, EPSRC Research Scholarship, Royal Academy of Engineering international travel grant and twice the Marie Curie Actions Grant to attend the European School of Antennas. He is a member of IEEE, IEEE Antennas and Propagation Society, Optical Society of America, SPIE, American Physical Society and the Technical Chamber of Greece.

LOCATION: University of Central Florida
HEC 101

Organizer: Prof. Raj Mittra & Kalyan Karnati
(407)749-2725, kalyan@knights.ucf.edu