Physics
AT QUEENS COLLEGE

Colloquium Notice

Dimitrios Sounas

The University of Texas at Austin

Nonreciprocal photonics without magnetic biasing

Reciprocity is a fundamental principle in optics, requiring that the response of a structure is symmetric when source and observation points are interchanged. It is of major significance for the analysis, design and operation of optical systems, but at the same time it poses fundamental limitations on the ways we handle and process optical signals. Nonreciprocal devices, which break this symmetry, have become fundamental in photonic systems for protection of lasers, the separation of signals propagating in opposite directions and the design of photonic topological insulators. Yet, to date they require magnetic materials, making them bulky, costly and unsuitable for integration. This is in stark contrast with most photonic devices, including sources, modulators, switches, waveguides, interconnects and antennas, which may be realized at the nanoscale. In this talk I will show how it is possible to address this problem and design magnetless nonreciprocal devices by using time modulation and nonlinear effects. I will discuss how time modulation allows to impart an effective momentum to a structure and break reciprocity. I will show how this approach can be implemented at different frequency bands, spanning from microwaves to optics. Then, I will present how we can completely remove the requirement of an external bias and realize all-passive nonreciprocal devices by introducing nonlinearities in asymmetric structures. I will discuss fundamental limitations of these devices, stemming from time-reversal symmetry, and show how they can be overcome. I will conclude my talk by providing an outlook for future opportunities of this rapidly advancing research field.

Monday
April 9, 2018
Starts at 12:15 PM
Physics Conference Room, SB B326