

Physics Colloquium Oral Presentations

Michigan Technological University

Thursday March 19, 2015

3:30-5:00

Fisher Hall 139

Efficient computation of spontaneous emission dynamics in photonic structures

M.H. Teimourpour

Advisor: Ramy El-Ganainy*

Abstract: We present a real space formulation of spontaneous emission process that can capture all the physics in both Markovian and non-Markovian regimes. Starting from first principles, we map the unitary evolution of a dressed two-level quantum emitter onto the problem of electromagnetic radiation from a self-interacting harmonic oscillator. Our formalism leads to an efficient computational scheme of spontaneous emission dynamics using finite difference time domain method without the need for calculating the photonic eigenmodes of the surrounding environment. We illustrate the versatility of our scheme by considering several different examples.

Phosphorene Oxide: Stability and electronic properties of a novel 2D material

Gaoxue Wang

Advisor: Ravindra Pandey

Abstract: Phosphorene, the monolayer form of the (black) phosphorus, was recently exfoliated from its bulk counterpart. Phosphorene has a direct band gap and high charge mobility which are fascinating for electronic devices. Phosphorene oxide, by analogy to graphene oxide, is expected to have novel chemical and electronic properties. In this talk, I will present our results on phosphorene oxide including its formation by the oxygen adsorption on the bare phosphorene, its stability and electronic properties.

The Superluminal Pair Events in Sweeping Laser Beams: Theory and Experiment

Qi Zhong

Advisor: Robert Nemirow

Abstract: A laser beam, in a single sweep, can cast a pair of light spots on scattering surfaces, instead of one light spot, which might be thought intuitively. These light spots move with superluminal (faster-than-light) speeds across scattering surfaces, an attribute that does not violate special relativity. The movement of the pair of light spots on infinite planes and finite spheres will be demonstrated. An attempt to create superluminal sweeping beams in the laboratory will then be described that involves a prism tube with rubidium vapor applied to deflect the laser beam with resonant frequencies.