



PHYSICS AND ASTRONOMY SPECIAL COLLOQUIA

Dr. Ajay Ram Srimath Kandada

Center for Nanoscience and Technology,
Istituto Italiano di Tecnologia

“On the nature of exciton-bath interactions in two-dimensional lead halide perovskites”

Abstract

"Excitonic interactions in 2D semiconductors garner considerable attention, both due to their relevance in quantum opto-electronics and to the richness of their physics. Quantum-well like derivatives of organic-inorganic perovskites are emerging material systems where strongly bound two-dimensional excitons have been observed even at room temperature.¹ These hybrid semiconductors feature complex lattice dynamics due to the ‘softness’ arising from non-covalent bonds between molecular moieties and the inorganic network and due to the ionic character of the crystal.² I will discuss the profound and unique consequences of such dynamic structural complexity on the fundamental character of primary photo-excitations. I will present evidences of polaronic effects³ and multi-body correlations,² both of which are strongly affected by the lattice dynamics, based on various ultrafast optical spectroscopies".

- (1) Neutzner, S.; Thouin, F.; Cortecchia, D.; Petrozza, A.; Silva, C.; Kandada, A. R. S. Exciton-Polaron Spectral Structures in Two Dimensional Hybrid Lead-Halide Perovskites. *Phys. Rev. Mater.* **2018**, *2*, 064605.
- (2) Thouin, F.; Neutzner, S.; Cortecchia, D.; Dragomir, V. A.; Soci, C.; Salim, T.; Lam, Y. M.; Leonelli, R.; Petrozza, A.; Kandada, A. R. S.; et al. Stable Biexcitons in Two-Dimensional Metal-Halide Perovskites with Strong Dynamic Lattice Disorder. *Phys. Rev. Mater.* **2018**, *2*, 034001.
- (3) Thouin, F.; Chávez, D. A. V.; Quarti, C.; Cortecchia, D.; Bargigia, I.; Beljonne, D.; Petrozza, A.; Silva, C.; Kandada, A. R. S. Phonon Coherences Reveal the Polaronic Character of Excitons in Two-Dimensional Lead-Halide Perovskites. *Nat. Mater.* **2019**, DOI: 10.1038/s41563-018-0262-7.

Wednesday, February 13, 2019

3:00 p.m.

Elliott Building – Room 230