

Massachusetts Institute of Technology
Department of Physics

Condensed Matter Theory Seminar

“Surface Plasmons as Fundamental Wave Phenomena”

Itai Epstein, Tel Aviv University

Abstract: The field of plasmonics deals with near-field, evanescent, surface light waves that propagate at the boundary between a metal and a dielectric material. The most exciting phenomenon in this field is the ability to significantly manipulate the properties of electromagnetic radiation using nanometric size metal structures, having high potential for fundamental discoveries and novel nanotechnology applications. In this work I study plasmons as a fundamental wave phenomena; on one hand, plasmons exhibit very unique properties, which do not exist in conventional optical waves, such as the ability to confine light over dimensions much smaller than its wavelength. On the other hand, they are solutions of the wave equation, and therefore they are expected to obey all the fundamental rules governing wave phenomena. My research focuses on the interplay between these two approaches, combining the unique properties of plasmons with fundamental aspects of wave phenomena, and exhibiting unusual properties. Among these are the prediction and experimental demonstration of self-accelerating caustic plasmon beams that can compensate losses [1, 2], the derivation and observation of a plasmonic modified Bragg law of diffraction [3, 4], spatial and spectral plasmonic holography in the near-field [5] and plasmonic nonlinear frequency conversion. These experimental demonstrations can pave the way to new and exciting applications in nano-photonics.

[1] I. Epstein and A. Arie, PRL. 112, 023903 (2014).

[2] A. Libster *, I. Epstein* and A. Arie, PRL 113, 123902 (2014).

[3] I. Epstein, I. Dolev, D. Bar-Lev, and A. Arie, PRB 86, 205122 (2012).

[4] I. Dolev, I. Epstein, and A. Arie, PRL 109, 203903 (2012).

[5] I. Epstein and A. Arie, JOSA B 31, 1642–1647 (2014).

5:00pm
Tuesday, February 17, 2015
Duboc Seminar Room (4-331)