The Center for
Light Matter Interaction
Tel Aviv University

LMI Seminar:

How electromagnetic waves interact with structures with complex symmetries

Dr. Yarden Mazor
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Wednesday July 3th, 2024
13:00-14:00

Light refreshments and drinks will be served at 12:30

Auditorium 011, Engineering Classroom Building, Faculty of Engineering, Tel-Aviv University

Abstract: The symmetries a certain system possesses are crucial in determining how electromagnetic waves interact with it – most importantly, how it guides or scatters waves.
In this talk, I will explore these properties in two families of structures.

- Surface waves have been vastly explored throughout the last decade. They exist in many systems, such as patterned metallic sheets (structures dating back to the late 19th century), plasmonic systems, metasurfaces, and 2D materials. These systems are usually explored in a planar setup. However, interesting phenomena take place when these are incorporated into a cylindrical geometry. Waves can be guided along the “tube”, with intriguing properties of the field distribution and dispersion. Strong anisotropy can result in asymmetric field distributions, high confinement, and angular momentum selectivity. Adding a bias static magnetic field results in nonreciprocal propagation and tunable routing properties.
- Knots are intriguing mathematical objects – closed curves with nontrivial characteristics. When conducting wires are given a knot shape, they have already been shown to have unique scattering and radiation properties. Arranging these into a 2D knotted metasurface and carefully adjusting the knot features and geometry, one can achieve various electromagnetic wavefront manipulations, ranging from near-optimal polarization rotation to anomalous refraction. We will discuss the physical mechanisms that allow for this optimal performance and how electromagnetic knots can be implemented practically.

Bio : Yarden Mazor received his B.Sc. (summa cum laude) in biomedical engineering from the Technion in 2010 and his Ph.D. in electrical engineering from Tel-Aviv University in 2017, under the supervision of Prof. Ben Z. Steinberg. His Ph.D. research focused on nonreciprocal wave propagation in 1D and 2D plasmonic particle arrays. In 2017, he joined the group of Prof. Andrea Alù at the University of Texas at Austin as a Postdoctoral fellow, focusing on space-time modulated metamaterials, and guided surface waves on metasurfaces. In 2020, he joined the physical electronic department at Tel-Aviv University in Israel, where he is currently a senior lecturer (assistant professor). His research areas include wave physics, wave interaction with space-time modulated systems, analytical methods for probing inhomogeneous media through impedance measurements, and metasurfaces. He has won the TAU rector’s award for best lecturer in engineering, and several honors for student papers.