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את\ה מוזמן\ת להרצאה סמינריונית במחלקת הנדסת מכונות ומכטרוניקה

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ב-zoom

Topological effects in plasmonic metasurfaces

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Abstract

Topological insulators (TIs) are electronic materials that have a bulk band gap but have protected (even in the presence of disorder) conducting states on their edge or surface[1,2]. They provide unprecedented platform for quantum computation among other applications. During the past decade, the concepts of topological physics have been introduced into other fields, including photonic systems and efficient light confinement, guiding and localization have been achieved by using photonic crystal (PhC) optical systems with topological states[3,4]. Furthermore, surface plasmon (SP) polaritons are 2D surface waves confining electromagnetic energy to subwavelength regions in the vicinity of a metal-dielectric interface[5,6]. The SP's properties can be manipulated by causing them to interact with properly designed nanoscale metasurfaces and as these can by fabricated at great ease today, SPs play a vital role in nano-optics[6,7].

In the talk we present simple metasurfaces with different topologies supporting plasmonic edge states at the boundary between them. Preliminary experiments and numerical simulations show the achieved mode localization in line defects and point singularities. Line singularities are shown to support dark and bright modes. Point singularities show strong localization of light which can be further modified by the varying topological order of the structure.

We believe that our approach along with the experimental ability and the simplicity of the geometric design together with easy fabrication provide an important platform for the realization of topologically protected boundary plasmonic states. Such simple means of robust waveguiding and localization of light can play a vital role in the development of

nano-photonic devices. In view of the scientific and practical interest of our findings we believe that further research in this field may pave the way to a novel nanophotonic circuitry based on topology.

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About the Lecturer

Dr Yuri Gorodetski is a faculty member with conjoint position in Mechanical engineering and Mechatronics department and Electrical engineering and Electronics department. He earned all his academic degrees from the Technion. His graduate research performed under supervision of prof. E. Hasman became a breakthough in the area of plasmonics and introduced the peculiar phenomenon of a plasmonic spin-orbit interaction. Then he spent three years in a post-doc fellowship in University of Strasbourg under the supervision of prof. T.W. Ebbesen, the leading specialist in the world of plasmonics. Currently Dr Gorodetski is a head of the nanophotonics laboratory in the University. His research work focuses on nanophotonics and plasmonic meta-materials, singular optics and plasmonic spin-orbit interaction.