PAP Seminar Announcement

Dark mode meta surfaces and applications
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Host: Asst. Prof. Ranjan Singh

Abstract

The concept of dark states, initially introduced in atomic physics, was borrowed and intensively developed during the last decades in the fields of photonics, plasmonics and metamaterials. The interest to the concept of dark states was driven mainly by the ability to obtain sharp spectral features with steep intensity variation, which are highly desirable for sensing applications. Despite the great variety of studied designs, most of them are based on the same principle. It consists in associating a superradiant element bearing an electric dipolar momentum and acting as a radiative or bright mode, with a subradiant element bearing an electric quadripolar or magnetic dipolar momentum and playing the role of the dark (or trapped) mode. The mode hybridization induced by a strong coupling between bright and dark elements leads to the opening of a narrow electromagnetically induced transparency (EIT) window inside the absorption band.

However the last theoretical advances lead to revisit this commonly shared interpretation. In particular it was evidenced that no dark mode excitation is necessary for the excitation of Fano resonances. They can be described by the interference of bright modes only. In our recent studies we bring further evidence for direct dark mode excitation that is neither relying on hybridization mechanism nor interference effects, and is thus distinctly different from EIT. We experimentally investigated the concept of dark modes and EIT metamaterials in the microwave and optical domains and demonstrate its implementation for both the case of free space and guided wave light propagation configurations.

Short Biography

Dr. Anatole Lupu is a tenured CNRS scientist with twenty-five years research activity in optoelectronics performed both in academic and industrial labs. He joined the Institute of Fundamental Electronics in 2003. He is the head of the Photonic Crystals and Metamaterials Group’s. His current research interests are dealing with the theoretical and experimental studies in the areas of metamaterials, nanophotonics, plasmonics and PT-symmetric devices. Before joining IEF he was with “Corning Incorporated”, which is one of the world’s leading innovators in materials science. He conducted research on low noise figure semiconductor optical amplifiers (SOA). Previous research activities at CNET/France Telecom (1995-1999) dealt with the realisation of InP/InGaAsP demultiplexers for Fiber To The Home applications. He published, in total, circa 100 research papers and holds 5 patents.