ICFO



ICFO Colloquium | Tunable Active Metasurfaces for Dynamic Wavefront Control

HARRY ATWATER

June 05, 2026
10:00 to 11:00
ICFO Auditorium

PROFILE

Harry Atwater is the Otis Booth Leadership Chair of the Division of Engineering and Applied Science, and the Howard Hughes Professor of Applied Physics and Materials Science at the California Institute of Technology. Atwater's scientific effort focuses on nanophotoni light-matter interactions. His work spans fundamental nanophotonic phenomena a d applications, including active wavefront shaping of light using metasurfaces, optic l propulsion of lightsails, quantum and 2D nanophotonics as well as solar energy conversio , on earth and in spac
. Atwater was an early pioneer in nanophotonics and plasmonics and gave a name to the fie d of plasmonics in 2001. Currently Atwater directs the Liquid Sunlight Alliance (LiSA)

a Department of Energy Hub program for solar fuels, and is a PI of the Caltech Space So ar Power Project. He was also the founding Editor in Chief of the journal ACS Photonic . Atwater is a Member of the US National Academy of Engineering, a Fellow of APS, MRS SPIE and Optica, a Web of Science Highly Cited Researcher from 2014-2024, and is recipi nt of numerous awards, including the 2021 von Hippel Award of the Materials Research Society

ABSTRACT

Active metasurfaces that enable dynamic modulation of reflection and transmission amplitude, phase, and polarization, using resonantly excited materials combined with electro-optic and nonlinear active media, are powerful design elements for wavefront control. We report on the design and realization of space-time metasurfaces, and nanostructured high quality factor dielectric active metasurfaces that enable both phase and amplitude modulation. They employ electro-optic active media with incorporated driving electrodes that introduce local refractive index modifications in the active medium that couple to high Q factor resonant modes, in an externally applied electric field. We also discuss new directions for phase modulation in all-optical active metasurfaces based on very low optical power nonlinearities enabled by opto-mechanical metastructures. We compare the achievable nonlinearities to those in other nonlinear media and discuss applications in imaging and computation

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Hosted by: Javier Garcia de Abajo