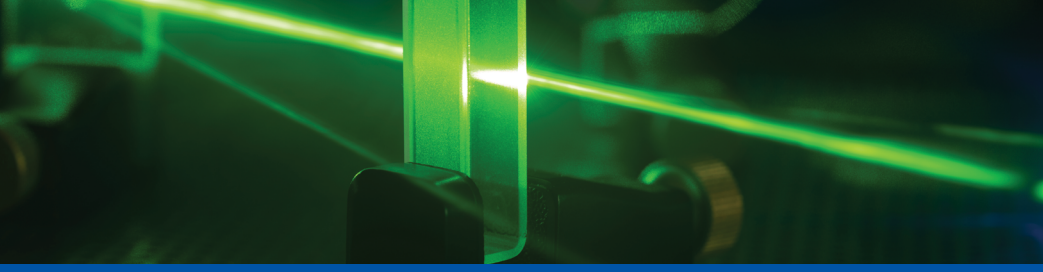


ADVANCED SCIENCE RESEARCH CENTER

PHOTONICS INITIATIVE

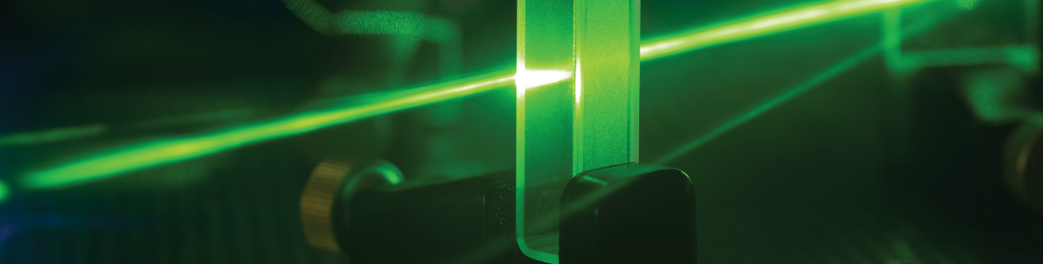
asrc.gc.cuny.edu/photonics

Mission

To serve as a world-recognized center for photonics/electromagnetics/wave physics research, making an impact from the fundamental understanding of light-matter interactions to applications in the next generation of computing, sensing, and communications technology.

Initiative Overview

The technology of generating and using light and other radiant energy forms, photonics is best known for fiber-optic communications, but its potential in a wide range of fields of applied science is vast: from diagnosing cancer without a biopsy to detecting bioterrorism. Researchers also use photonics to explore areas such as plant photosynthesis to advance basic scientific knowledge.



Initiative Overview (cont.)

Photonics was chosen as an ASRC flagship initiative because it has become a strength for CUNY—an area that has been expanded over the last several years through the University's "cluster hiring" initiative in the sciences—and because it offers unusual potential for collaboration across disciplines. Photonics research encompasses biology; medicine; physics; technology fields such as computer display and lighting; and the futuristic fields of quantum information processing and quantum encryption in which data reside on single photons, which are to light what electrons are to electricity.

Laboratories

Alù Laboratory

Professor Andrea Alù and his team's research interests span a broad range of technical areas, including nano-optics and photonics, microwave, THz, infrared, optical and acoustic metamaterials and metasurfaces, plasmonics, nonlinearities and nonreciprocity, cloaking and scattering control, applied electromagnetics and acoustics, and optical nanocircuits and nanoantennas. Alù and his team have achieved acclaim for introducing breakthrough discoveries in metamaterial technology. Applications of the laboratory's research include the creation of new nanodevices, cloaking and camouflaging, magnet-free nonreciprocal devices, giant nonlinearities at the nanoscale, energy harvesting, and biomedical sensing.

Grosso Laboratory

Professor Gabriele Grosso and his research team study the optical properties of 2D materials (matter consisting of a single layer of atoms) in order to enable the development of quantum information-processing systems and optoelectronic devices. Their research aims are to design quantum materials directly at the atomic level and to control light-matter interactions at the nanoscale. Understanding these interactions is crucial to designing high-performance, scalable photonic platforms that play a key role in emerging quantum technologies.

Sfeir Laboratory

Professor Matthew Sfeir's lab focuses on enabling next-generation photonic technologies for light-harvesting, light-detection, and light-emitting devices, primarily for energy and sensing applications. Sfeir's group excels in using ultrafast laser techniques as a high-throughput platform for identifying macromolecular and nanoscale materials with unique electronic and spin dynamics. They are developing tools for measuring the dynamics of light-matter interactions across the electromagnetic spectrum, from the UV to the microwave.