Nanometer Scale Optics of Objects and Devices (Ramot)

code: 12-2011-230

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The NanoPhotonics Laboratory

The NanoPhotonics Laboratory research is focused on the optics of nanometer scale objects and devices. In particular, the research involves nano-photonic components for telecommunication and sensing, Bragg and Photonic Crystals (PhC) based waveguides and resonators, slow light, optical polymers, nonlinear optics and secure communication.

Offered Industrial Services:

- Optical chip design and simulations
- Spectral characterization of photonic structures

Current Research Topics

Nano-Rectennas - Rectennas (rectifying antenna) are devices used to convert electromagnetic energy into DC electrical power. It has been theoretically shown that similar devices, scaled down to nanodimensions, could be used to convert light into electricity at much greater efficiencies, larger bandwidth and lower cost than with solar cells.

Secure Key Distribution - Very long lasers made of optical fibers offer a promising route to highly secure communications, though not as secure as quantum key distribution, yet providing faster communication over long distances. This method is also feasible with existing hardware.

Circular Bragg and photonic crystal Resonators - Circular resonators, based on Bragg reflection enables the realization of nano-cavities with ultra-small modal volume, large Free Spectral Range (FSR) while retaining low bending losses or high Quality factor

Slow Light propagation in photonic structures - Slow light propagation is more advantageous for applications such as nonlinear optics at low powers, optical delay-lines and memories, high-power amplifiers and low-threshold lasers. Slow light is enabled by employing a highly depressive photonic structure such as CROW, which is a waveguide consisting of a periodic array of isolated resonators, weakly coupled to one another.

Polymer Optics - Polymeric materials are an attractive choice for future photonic systems. They have low optical losses and material dispersion, large electro-optic coefficient, are simple to manipulate and to cast, using a wide variety of fabrication methods including soft-lithography techniques. All these pave the way to all-polymer integrated optical circuits that include on-chip sources, processors and detectors.

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