Seminar (1h)

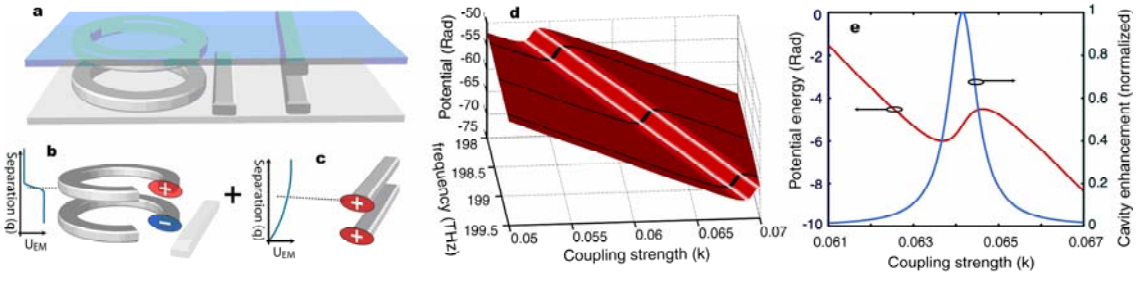
Integrisana nano-fotonika, opto-elektronika i opto-mehanika: od filtara za telekomunikacije do nanomašina na pogon svetlosnih sila

Integrated nanophotonics, optoelectronics and optomechanics: from telecom-grade wavelength routers to light-powered nanomachines

Nanophotonic circuits based on high index contrast (e.g. silicon or SiN) support strong confinement (SC) of light in wavelength-scale waveguides and resonators with long photon lifetimes and strong light-matter interaction. They raise the prospect of dense photonic integration on a chip, and of new device concepts with superior performance. Nanophotonics has potential to revolutionize current technology in communication, computation and energy conversion, e.g. by harnessing large optical bandwidth, high energy-efficiency circuits, and all-optical feedback control. The challenge to widespread assimilation of SC nanophotonics into mainstream technology is their enormous sensitivity, and limited scalability and complexity.

In this talk, I first describe SC nanophotonic devices based on solutions to the atomic-scale ultrasensitivity and scalability challenges. Microring-resonator-based nanophotonic circuits with telecom-grade performance are demonstrated leading to chip-scale tunable optical add-drop multiplexers, a key enabling component for ultrahigh-bandwidth agile optical networks and interconnects. I also discuss a number of new device concepts including: dispersionless wavelength switches, polarization transparency, loop-coupled cavities, and low-loss open-system Bloch waves.

In the second part of the talk, I will introduce recently proposed light-powered nanomachines and all-optical self-adaptive optomechanical circuits that rely on the interplay of resonantly-enhanced optical forces and the manipulation of optical resonances by mechanical degrees of freedom in nanophotonic structures. This new class of devices facilitates resonantly tailored optomechanical potentials, enabling picometer-precision positional control of nanomechanical structures and all-optically self-aligning microcavities that track the wavelength of an incident laser. These concepts lay the foundation for a fundamentally new class of nanophotonic devices with unique capabilities and numerous applications.



Biografija

Miloš Popović rodjen je u Zaječaru, Srbiji, 1977. godine. Završio je redovne studije iz elektrotehnike na Queen's univerzitetu, u Kanadi, 1999. godine, a magistrirao 2002. i doktorirao 2007. na Masačusetskom Institutu za Tehnologiju (MIT-u) u Kembridžu, država Masačusets, SAD, sa tezom na temu visoko-konfiniranih optičkih integrisanih kola. Trenutno je post-doktorski istraživač u grupi za optiku i kvantnu elektroniku na MIT-u, gde predvodi istraživačke projekte na teme optičkih „add-drop" multipleksera realizovanih u nanofotonici, optičkih prekidača, i optomehaničkih uređaja na pogon „optičkih" sila. Jedna ujedinjujuća tema njegovog rada su mikroprsten (microring) rezonatori.

Miloš je zainteresovan za teoriju i projektovanje linearnih i nelinearnih integrisanih optičkih uređaja; optičke sile u nanofotonskim strukturama i optičku feedback kontrolu, integrisanje optičkih uredjaja i elektronike; nanofotonici za sisteme za litografiju bez maske/šablona; uređaje za efikasnu konverziju energije.

Autor je oko 60 referentovanih radova i 13 prijava za patente na temu integrisane optike. Član je američkog društva za optiku (Optical Society of America) i instituta za elektronske inženjere (IEEE).

Više informacija o Miloševom istraživanju, uključujući elektronske verzije izdatih radova, je dostupno na web stranici: http://www.mit.edu/~milos