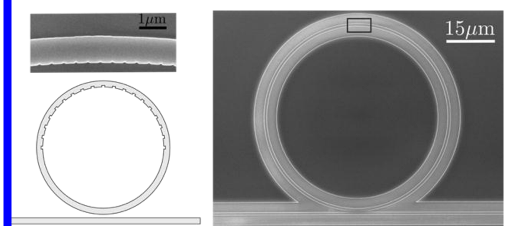
NANOHOUR

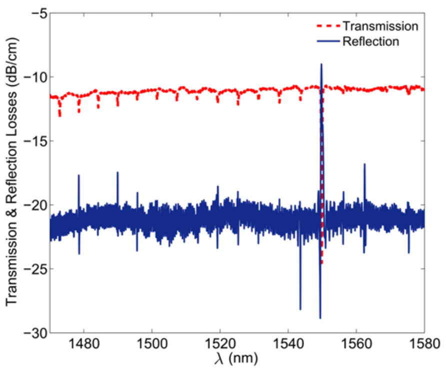
Wednesday, November 2, 2011 3:00 pm
Beckman Institute - Room 3269

Reflective microring resonators: Compact narrow-band reflectors for photonic integrated circuits

Amir Arbabi, Electrical and Computer Engineering

Graduate Student with Professor Lynford Goddard





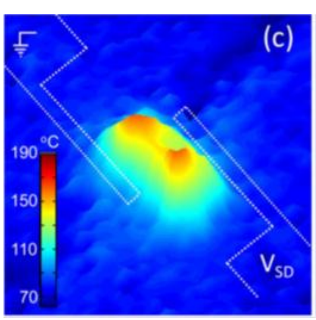
The distributed Bragg reflector (DBR) spurred the realization of numerous optoelectronic devices including the vertical cavity surface emitting laser, narrow linewidth lasers, and fiber Bragg gratings. Microring resonators are the basic building blocks in various photonic applications, serving as filters, switches, delay lines, and modulators. An ideal microring resonator supports two degenerate counter propagating resonance modes which are uncoupled. However, due to large field enhancement in a high Q ring, even a small perturbation can create strong coupling between the two modes.

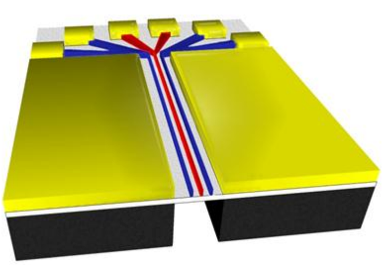
In this talk, I will present a small footprint narrowband on-chip mirror made by integration of a DBR inside a microring resonator. The DBR covers half of the ring's circumference and couples microring modes only at one resonance wavelength. Design, fabrication, and characterization of the proposed device will be presented. A single reflection peak with maximum power reflectivity of 92.3% and full width at half maximum of 0.4 nm is demonstrated. The device has potential application as an in-line mirror for low-threshold, narrow linewidth single mode laser diodes.

Power Dissipation and Thermal Transport in Carbon Nanotube Films

David Estrada, Electrical and Computer Engineering

Graduate Student with Professor Eric Pop





Single-wall carbon nanotubes (CNTs) are 1-dimensional cylinders of sp2 bonded carbon atoms. Due to high reported values of carrier mobility and thermal conductivity, on the order of 10^3 – 10^4 $cm^2V^{-1}s^{-1}$ and 10^3 $Wm^{-1}K^{-1}$, CNTs are promising materials for energy efficient nanoelectronics. However, such intrinsic properties are greatly affected (1 – 3 orders of magnitude reduction) by defects such as CNT junctions and external influences such as substrate interactions. Therefore, understanding power dissipation in such non-ideal scenarios is critical to engineering high quality devices.

In this talk I will discuss the use of infrared (IR) microscopy to study power dissipation in CNT thin-film transistors (TFTs). I show power dissipation is non-uniform resulting in the formation of distinct hot spots, a sign of percolative transport in these devices. Moreover, using electrical breakdown thermometry I estimate the thermal resistance of a single CNT junction as 4.4×10^{11} KW^{-1}. Finally, I will introduce our group's efforts in modeling breakdown in CNT TFTs, and the development of a suspended differential electrical thermometry platform to measure the thermal conductivity of CNT networks, arrays, and crossbars.

Coffee and cookies will be served

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