Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

**Plasmon Waveguides: Balancing Propagation, Localization, and Loss below the Diffraction Limit** JENNIFER DIONNE, Caltech, LUKE SWEATLOCK, Caltech, HARRY ATWATER, Caltech, ALBERT POLMAN, FOM Institute - AMOLF — On subwavelength scales, photon-matter interactions are limited by diffraction. Circumventing this diffraction limit is now a principle focus of integrated nanophotonics. Here, we present studies of surface plasmon (SP) waveguides exhibiting both long-range propagation and spatial confinement of light with lateral dimensions of less than 10 percent of the free-space wavelength. Attention is given to characterizing the dispersion relations, mode profiles, wavelength dependent propagation, and energy density decay in metallodielectric waveguides comprised of silicon dioxide/Ag/silicon dioxide and Ag/silicon dioxide/Ag structures with waveguide thicknesses ranging from 12nm-50nm. Numerical dispersion analysis indicates the presence of three distinct SP branches, including the existence of modes in the plasmon bandgap. For bound modes in Ag waveguides, near-IR propagation lengths exceed centimeter scales only at the expense of confinement. However, enhanced propagation is observed at shorter wavelengths despite notable field localization in the metal. Likewise, for silicon dioxide SP waveguides, propagation lengths exceed tens of microns with fields confined to within 30 nanometers of the structure. Applications of both short and long-wavelength plasmons to photonic waveguiding will be discussed, and utilization of such results for integrated plasmonic applications will be explored.

Jennifer Dionne
Caltech

Date submitted: 27 Nov 2004 Electronic form version 1.4