Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Comparison of Active and Passive Approaches for Controlling the Near-Field Optical Path of Guided-Light Wave[1] DANHONG HUANG, US Air Force Research Lab, MICHELLE EASTER, Hunter College of the City University of New York, DAVID WELLEMS, HENRY MOZER, US Air Force Research Lab, ALEXEI MARADUDIN, University of California-Irvine, GODFREY GUMBS, Hunter College of the City University of New York, DAVE CARDIMONA, US Air Force Research Lab — Both active and passive approaches are proposed and compared for controlling the optical path of p-polarized light wave guided through a surface-patterned metallic structure with sub-wavelength features. For active control, the dynamical role of photo-excited electrons in a slit-embedded atomic system with field-induced transparency (FIT) is demonstrated for modulating transmitted-light intensity in the near-field region. Additionally, the strong coupling between the optical transitions within slit-embedded FIT atoms and the surface-plasmon modes in a metallic slit array is found. For passive control, on the other hand, a geometrical effect is demonstrated for focused transmitted light passing through a Gaussian-shaped metallic lens embedded with an array of slits. This geometrical effect is further accompanied by a swing of the light-focusing pattern in the near-field region as the incident angle is increased, as well as by the reduction of an anomalous light refraction due to higher-order diffraction modes at longer wavelengths and larger incident angles.

[1]This research was supported by the Air Force Office of Scientific Research (AFOSR)

Danhong Huang
US Air Force Research Lab

Date submitted: 08 Nov 2012 Electronic form version 1.4