Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Enhanced nonlinear optical processes with film-coupled plasmonic nanoantennas CHRISTOS ARGYROPOULOS, CRISTIAN CIRACI, DAVID SMITH, Duke University, DUKE UNIVERSITY TEAM — Interesting nonlinear optical effects require extremely high pump intensities to be triggered, which makes their practical realization impossible. However, the extreme confinement and enhancement of the fields inside plasmonic waveguides and nanocavities is expected to boost these effects and make them accessible with much lower input intensities and within nanosized structures. We will present colloidally synthesized plasmonic nanoantennas strongly coupled to metallic films, which can lead to the exploitation of nonlinear processes at low power levels and in highly integrated formats. These plasmonic systems hold great promise for enhancing and controlling different nonlinear optical processes. Their robust and sensitive scattering response can be easily controlled by their geometrical and material parameters. Strong local field enhancement can be generated at the gap region between the nanoantennas and the metallic film, where cavity-like plasmonic modes are excited in highly subwavelength regions. In particular, we will show that boosted third-order nonlinear optical processes can be obtained by loading Kerr nonlinear optical materials inside the nanogap of the proposed nanoantennas. Strong optical bistability and giant all-optical scattering switching behavior will be presented. The proposed nonlinear plasmonic designs can lead to new integrated nanophotonic devices, such as efficient, low-power and ultrafast all-optical memories, logic-gates and scattering nanoswitches.

Christos Argyropoulos
Duke University

Date submitted: 10 Jan 2014 Electronic form version 1.4