Abstract Submitted
for the DAMOP08 Meeting of
The American Physical Society

Sorting Category: 4.4 (T)

Collective excitation of surface plasmons by a linear dipole array JÉRÉMIE CHOQUETTE, KARL-PETER MARZLIN, BARRY SANDERS, Institute for Quantum Information Sciences, University of Calgary — Surface plasmons are electromagnetically induced charge-density waves that appear at the interface between dielectrics and a thin metal film and can enhance optical field intensities by two to three orders of magnitude. Optical dipoles placed near the metal interface have their radiative properties significantly affected by the presence of surface plasmon modes. The spontaneous emission rate is heavily modified and an optical emitter can decay both radiatively and into a surface plasmon. We consider a linear (pencil-like) arrangement of N dipoles in vacuum near a metal film on the surface of a prism. In free space this arrangement would predominantly emit radiation along the axis of this pencil with an intensity that increases like N^2. We show that this gain persists in the presence of the metal film and an additional enhancement of the intensity can be achieved by the narrow characteristic of the radiation field emitted by the induced surface plasmon modes. This effect is rather insensitive to the alignment of the pencil due to the evanescent nature of surface plasmon fields.

Jeremie Choquette
jchoquette@qis.ucalgary.ca
Institute for Quantum Information Sciences, University of Calgary

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Date submitted: 01 Feb 2008 Electronic form version 1.4