

Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Ensembles of plasmonic nanoparticles at optical frequencies for negative index media A.M. BRATKOVSKY, E. PONIZOVSKAYA, Hewlett-Packard Laboratories, Palo Alto — Metamaterials in a form of an array of metallic nanoparticles support collective plasmonic excitations that are believed to be responsible for various unusual phenomena, like surface enhanced Raman scattering (SERS). The array is analogous to a dual structure for a metal film with periodic array of holes, which can provide an extraordinary transmission. We have investigated the electromagnetic response of ordered films of metallic nanoparticles. In particular, we looked at various cubic, close-packed, and columnar structures. This included the nanoparticle realization of G.Eleftheriades' structure that was speculated by N.Engheta et al. to produce negative index medium (NIM). It appears that open- and close-packed arrays behave similarly: there are plasmon resonances and high transmission of certain wavelength that is considerably larger than the separation between the particles, yet **no negative index behavior**, unlike in e.g. "fishnet" metal-dielectric heterostructures that are NIM[1]. We discuss a realization of "transparent metal" metamaterial with emphasis on "channeling" of radiation in columnar structures. [1] W. Wu et al., cond-mat/0610352, to appear in Appl. Phys. A, Special Issue on Negative Index Metamaterials.

A.M. Bratkovsky
Hewlett-Packard Laboratories, Palo Alto

Date submitted: 05 Dec 2006

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