Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Left-handed Metamaterials in actively pumped Host Medium and Plasmonic Nanolaser ANDREY SARYCHEV, Ethertronics Inc., GENNADY TARTAKOVSKY, Lockheed Martin Inc — We consider plasmonic nanoantennas immersed in active host medium. Specifically shaped metal nanoantennas can exhibit strong magnetic properties in the optical spectral range due to the excitation of the Magnetic Plasmon Resonance. A case when a metamaterial comprising such nanoantennas can demonstrate both "left-handiness" and negative permeability in the optical range is considered. We show that high losses predicted for optical "left-handed" metamaterials can be compensated in the gain medium. We have derived condition under which nanoantennas filled with highly efficient gain medium can demonstrate low absorption or even gain sufficient for lasing. The host medium should have initial gain greater than 10^3 cm^{-1}. We propose plasmonic nanolaser, where the metal nanoantenna operates like a resonator. The size of the proposed plasmonic laser is much smaller than the wavelength. Therefore, it can serve as a very compact source of EM radiation.

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Date submitted: 03 Dec 2006 Electronic form version 1.4