

Abstract Submitted
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Nanocircuit Elements, Left-Handed Nano-Transmission-Lines and Layered Metamaterials at Optical Frequencies NADER ENGHETA, ANDREA ALU, ALESSANDRO SALANDRINO, University of Pennsylvania — It is known that for certain noble metals such as Ag, Au, the optical wave interaction with such metallic nanostructures involves surface plasmonic resonances. We present theories for synthesizing nanocircuit elements in the optical domain using such plasmonic and non-plasmonic nanoparticles. Three basic circuit elements, i.e., nano-inductors, nano-capacitors, and nano-resistors, are envisioned in terms of small nanostructures with different material properties. Coupled nanocircuits and parallel and series combinations are also discussed, which may provide road maps for the synthesis of more complex nanocircuits in the IR and visible bands. When these nanoparticles are arranged to form series nano-capacitors and shunt nano-inductors, a left-handed nano-transmission line may be resulted in which guided waves possess negative refractive index at optical frequencies. Such structures may be envisioned as plasmonic and non-plasmonic thin layers, exhibiting forward and backward-wave propagation properties in the optical domain and offering a mechanism for sub-wavelength- resolution, beyond-diffraction-limit imaging that can lead to potentials for nanoscale lithography and high-capacity data storage.

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