

Internship proposal 2009-2010

Laboratory : Applied Electromagnetic Lab University “Roma Tre”	
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Design of super-lensing and hyper-lensing devices based on metamaterials

Scientific project:
The student will start the research activity gaining some skills about the definition and the concepts of super-lensing and hyper-lensing. A super-lens is an optical device capable to focalize on the focal plane the sub-wavelength details of an object carried by evanescent waves. Beating the diffraction limit of conventional optical lenses, the superlens leads to higher resolutions. A hyper-lens is an optical device capable of transforming evanescent waves into propagating waves. In this way, the super-resolution of the super-lens can be brought to the far-field optics, dramatically increasing the resolution of optical microscopes. Super-lenses and hyper-lenses have been made possible through the employment of metamaterials, artificial engineered materials with unusual properties that cannot be found in natural materials.
The core of this scientific project will consist in the design of super-lensing and hyper-lensing devices working in the visible regime. The first step will be the design of the suitable metamaterials to be used for the proposed application. The second step will be the implementation of the super-lens/hyper-lens device(s). The third step will be the characterization of the device(s) in terms of robustness to the possible losses affecting the metamaterials.
The Applied Electromagnetic Lab is member of the Virtual Institute on Advanced Electromagnetic Materials and Metamaterials (www.metamorphose-vi.org) and is involved in several national and international research projects in the field of metamaterials. The student(s) working on this project will interact with the members of the Virtual Institute and participate in the research projects.

Techniques in use :
Theoretical analysis and numerical simulations

Applicant skills :
Electromagnetic field theory, electrodynamics of complex and dispersive materials.

Granted internship: yes
C'nano IdF laboratory (France only):
Possibility for a thesis: yes, financial support possible after selection according to national rules.
Amount of the grant: approximately 13640 €/year (previdential contribution shall be deducted).