



**Appunti di Fisica '17
&
Dottorato di Ricerca in Fisica**

**14 giugno ore 15:00
Sala seminari, CNR-IPCF**

**Hyperbolic metamaterials:
Ultra-anisotropic materials for nano-biophotonics**

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Hyperbolic metamaterials (HMM) are non-magnetic anisotropic nanostructures that can support highly confined wave-vector modes in addition to surface plasmon modes within the structure due to hyperbolic dispersion. This class of materials feature hyperbolic (or indefinite) dispersion because one of their principal components has the opposite sign to the other two. Their properties include the strong enhancement of spontaneous emission, diverging density of states, negative refraction, enhanced superlensing effects and extreme sensitivity for sensing applications. Such metamaterials represent the ultra-anisotropic limit of traditional uniaxial crystals, having dielectric properties in one direction ($\epsilon > 0$) but metallic properties in the other ($\epsilon < 0$) and supporting high-wavevector propagating waves (bulk plasmon modes) due to hyperbolic dispersion. The design, fabrication and characterization of grating-coupled HMMs in a wide wavelength range, from visible to near infrared will be presented. I will also discuss current and potential applications of HMMs in nanophotonics and bio-medical research.

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