New Frontiers in Plasmonics:  
Embedded Eigenstates and Topological Effects  

Francesco Monticone  
Cornell University, School of Electrical and Computer Engineering, Ithaca, NY, 14853,  
e-mail: francesco.monticone@cornell.edu

The field of plasmonics, or metal optics, has enabled great advances in our ability to control electromagnetic fields  
at the subwavelength scale, and in realizing anomalous and extreme electromagnetic effects, including, for  
instance, transparency and invisibility, sub-diffractive resonances and light guiding, as well as enhanced  
absorption, nonlinearities, and quantum effects.

In this talk, we will present our recent efforts on two particularly exciting research directions in the field of  
plasmonics: (i) Extreme light confinement and trapping based on the concept of *embedded eigenstates*, or bound  
states in the continuum, in open plasmonic cavities and waveguides. In this context, we will discuss our recent  
work on unveiling the properties of these non-radiating eigenmodes, which exist in engineered open resonant  
structures based on plasmonic layers operating in their epsilon-near-zero regime (F. Monticone, et al., “Trapping  
Light in Plain Sight: Embedded Photonic Eigenstates in Zero-Index Metamaterials”, in press, 2018). (ii)  
*Topologically-protected leaky surface plasmons* on magnetized plasmonic structures. We will discuss the  
possibility of controlling the radiation, scattering, and guiding properties of plasmonic-based photonic topological  
insulators, with the goal to provide seamless bridging between free-space propagating waves and one-way  
topological surface waves on complex bodies (A. Hassani and F. Monticone, “Topologically-Protected One-Way  
time permits, we will also highlight some surprising connections between embedded eigenstates and topological  
properties.

We believe that these findings may open new intriguing scenarios in the field of plasmonics, and may stimulate  
 further theoretical studies and experimental efforts in this exciting area of science and technology.