Zhaowei Liu, Professor
Dept of Electrical & Computer Engineering (ECE)
Materials Science and Engineering Program (MSE)
Center for Memory Recording Research (CMRR)

University of California, San Diego (UCSD)

Super-resolution imaging enabled by metamaterials

Metamaterial assisted illumination nanoscopy (MAIN) has recently been proven to be a promising approach for linear super-resolution microscopy with up to a >7-fold improvement in imaging resolution. Further resolution enhancement is possible in principle, however, has not yet been demonstrated due to the lack of high-quality ultrathin layered hyperbolic metamaterials (HMMs) used in the MAIN. In this talk, I will present our most recent result of MAIN by using a low-loss composite HMM consisting of high-quality bilayers of Al-doped Ag and MgO with a nominal thickness of 2.5 nm. With this state-of-the-art optical hyperbolic metamaterial, we demonstrated MAIN with a 14-fold imaging resolution improvement. Similar idea can be extended to scattering imaging with greatly improved resolution. The MAIN represents a simple super-resolution imaging approach that offers distinct benefits such as low illumination power, high photostability, low cost, and a broad spectrum of selectable probes (or label-free), making it ideal for dynamic imaging of life science samples.

Capsule Bio:

Zhaowei Liu is a Professor in the ECE Department at UCSD. He received his BS and MS from Physics in Nanjing University in 1998 and 2001 respectively. He obtained his PhD in MAE from UCLA in 2006, and was subsequently a postdoctoral researcher in ME at UC Berkeley. In 2008 he joined the faculty at UCSD. His previous work was selected as top 100 science stories of 2007 by Discovery Magazine, and top 10 scientific discoveries of 2008 by Time Magazine. His current research interest covers a broad spectrum of fields, including of nanophotonics, imaging and sensing, bio-photonics, nonlinear optics, metamaterials, plasmonics, energy, light sources and detectors, and micro/nanofabrication. He is a recipient of the 2010 Society of Manufacturing Engineers (SME) Outstanding Young Manufacturing Engineer Award, the UCSD 2010 Hellman Faculty Fellowship Award, the 2013 ONR Young Investigator Award, and the 2013 DARPA Young Faculty Award. He is also the invited participant for the Frontiers of Science 2010 by National Academy of Science and the Frontiers of Engineering 2014 by National Academy of Engineering. He has been elevated to OPTICA (previous OSA) Fellow in 2016.