

Novel Electromagnetic Wave Front Manipulation through Antenna and Material Engineering

Li-Jun Jiang
University of Hong Kong

While antenna and material engineering have been applied in every corner of modern electronics, it is becoming increasingly interesting to develop novel radiation structures based on fundamental physics. In this talk, we will discuss some of our new designs rooted in basic electromagnetic wave propagation and polarization manipulations. We will focus on three types of new structures: (1) The magneto-electric antenna, which employs both electric field and magnetic field of electromagnetic waves. Our effort uses composite right/left-handed and leaky wave structures to implement beam scanning and low profile planar structures. (2) Orbital angular momentum generation, which can generate the phase structured beam in the microwave frequency domain. We provide solutions that have high efficiency or easy integration. (3) Nonlinear Yagi-Uda antenna, which employs the second harmonic generation of nonlinear plasmonic effects from nano particles to implement spatial beam separation depending on the frequency. Theoretical motivations, numerical analysis methods, and relevant implementations will be discussed in detail.