

Title: Imaging small polarizable scatterers with polarization data

This a common work with P. Bardsley (Cirrus Logic) and F. Guevara Vasquez (University of Utah)

Abstract: We present a method for imaging small scatterers in a homogeneous medium from polarization measurements of the electric field at an array. The electric field comes from illuminating the scatterers with a point source with known location and polarization. We view this problem as a generalized phase retrieval problem with data being the coherency matrix or Stokes parameters of the electric field at the array. We introduce a simple preprocessing of the coherency matrix data that partially recovers the ideal data where all the components of the electric field are known for different source dipole moments. We prove that the images obtained using an electromagnetic version of Kirchhoff migration applied to the partial data are, for high frequencies, asymptotically identical to the images obtained from ideal data. We analyze the image resolution and show that polarizability tensor components in an appropriate basis can be recovered from the Kirchhoff images, which are tensor fields. A time domain interpretation of this imaging problem is provided and numerical experiments are used to illustrate the theory.