

Title: Extrapolation of complex electromagnetic permittivity function using least squares approach.

The complex electromagnetic permittivity of a material is an analytic function  $\epsilon(\omega)$  in the upper half plane of the complex  $\omega$ -plane. It satisfies certain conditions that come from physics. The experimentalists usually know  $\epsilon(\omega)$  for  $\omega$  in some finite interval on the real axis. The problem is to reconstruct  $\epsilon(\omega)$  from the experimental data. The problem turns out to be ill-posed. We give a definitive analytical and numerical treatment for this problem. We also propose a numerical reconstruction algorithm that is based on the least squares approach and introduces several “natural” regularization techniques. We also, for the first time, discuss the error analysis rigorously.