SCATTERED MULTI-STATIC ARRAY IMAGING AND EIGENVALUE PROBLEMS

Wagner B. Muniz

Federal University of Santa Catarina (UFSC), Brazil

Resumo/Abstract:
Inverse scattering problems have many applications such as radar and sonar imaging, ultrasound, seismics and non-destructive testing. We consider time-harmonic (fixed frequency) scattering problems in the resonance region where the aim is to image a scattering object from its multi-static data, that is, when many sources illuminate the object and their corresponding array data measurements are available. The resonance region is such that the object is neither small nor large when compared to the incident wavelength, precluding for instance the use of standard linearization algorithms such as Born approximation or geometrical optics.

We will discuss elements of inverse scattering theory and operators which are the starting point of a class of inversion algorithms denoted by qualitative methods. The behavior of these operators naturally leads to an eigenvalue problem for the scattering object, and in the case of a penetrable inhomogeneity this leads to a quadratic eigenvalue problem (the now popular transmission eigenvalues), bearing some connections to invisibility cloaking. In most situations qualitative methods would try to avoid these eigenfrequencies. Here we will present some results, numerical examples and new features of inversion algorithms when an eigenfrequency of the object is used.