Stability for the Multi-Frequency Inverse Medium Problem

Gang Bao

Department of Mathematics, Zhejiang University, China

Email: baog@zju.edu.cn

This talk is concerned with the inverse medium scattering problem, which is to determine the refractive index of a medium from boundary measurements of the scattered waves for a given incidence field. For fixed frequency, the problem is known to be severely ill-posed. Several numerical results show that in the case of multiple frequencies, in contrast with the single frequency case, the ill-posedness decreases dramatically when the frequency band increases and covers the resonance region of the medium. However, little is known about the stability for the inverse problem or the convergence issues for the numerical methods.

In the one-dimensional case, our recent stability estimates will be presented for the inverse medium problem when the frequency takes value in a bounded interval. It is shown that the ill-posedness of the inverse medium problem decreases as the width of the frequency interval becomes larger. More precisely, under certain regularity assumptions on the refractive index, the estimates indicate that the power in H\"older stability is an increasing function of the largest value in the frequency band. Finally, a Lipschitz stability estimate is obtained for the observable part of the medium function defined through a truncated Trace formula. This is joint work with Faouzi Triki.