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Elena Cherkaev* (elena@math.utah.edu), University of Utah, Department of Mathematics, 155 South 1400 East, JWB 233, Salt Lake City, UT 84112. *Inverse homogenization: Reconstruction of the microstructure of a heterogeneous medium.*

Inverse homogenization is a problem of deriving information about the microstructure of a composite medium from homogenized or effective measurements. The scale of the structure is assumed to be much smaller than the wavelength of the applied acoustic or electromagnetic signal. The approach is based on the analytic Stieltjes representation of the effective tensor, which relates the n -point correlation functions of the microstructure to the moments of the spectral measure. The problem of reconstruction of the spectral function from effective measurements in an interval of frequency, has a unique solution, however the problem is extremely ill-posed. Several stabilization techniques are discussed such as quadratically constrained minimization, regularization using nonnegativity constraint, and reconstruction in the class of functions of bounded variation. The reconstructed spectral function is used for estimation of geometric parameters of the structure as well as for evaluation of coupled effective properties of the same medium. (Received September 20, 2005)