

Meeting: 1003, Atlanta, Georgia, SS 5A, AMS Special Session on Radon Transform and Inverse Problems, I

1003-78-949 **Mark A. Anastasio*** (anastasio@iit.edu), Illinois Institute of Technology, Department of Biomedical Engineering, 10 W. 32nd St, E1-116, Chicago, IL 60616, and **Daxin Shi, Thomas Deffieux** and **Yin Huang**. *Exploitation of Symmetries and Rotational Invariances in Acoustic and Optical Diffraction Tomography.*

Diffraction tomography (DT) is a linearized inverse scattering method for reconstructing the internal structure of weakly scattering objects. In this work, we consider the reconstruction problems of intensity DT (I-DT) and variable density acoustic DT (ADT). I-DT seeks to reconstruct the refractive index distribution of an object from knowledge of only the transmitted wavefield intensities. A-DT seeks to reconstruct separately the density and compressibility variations of an object. These imaging modalities are based on distinct physical processes and differ from conventional DT in that they generally require twice the amount of measurement data to be acquired for image reconstruction. In this work, these reconstruction problems are studied in a unified framework in which data symmetries are identified and exploited by use of rotational invariance properties of the imaging operators. Our analysis produces novel inversion formulae that are algebraic in nature and do not require the explicit computation of multidimensional convolution operations. The inversion formula are implemented numerically and investigated by use of simulation studies. (Received October 01, 2004)