

Adaptive Current Tomography and Eigenvalues

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Abstract

Adaptive current tomography (ACT) systems apply patterns of currents to the surface of a body, measure the resulting patterns of voltages, and reconstruct an approximation to the conductivity inside the body. Thus we measure an approximation to a Neumann to Dirichlet map of the boundary values of Maxwell's equations. We explain how the design of the ACT systems we have built have been influenced by the spectral properties of these maps. We describe in detail how the spectral properties of this measured Neumann to Dirichlet map can be used to determine the patterns of currents to apply in order to detect the smallest inhomogeneities that the measurement precision of the system allows. Mathematical and experimental examples will be given to illustrate the adaptive process for determining these patterns without having to know in advance the internal conductivity distribution.