Multi-frequency Electrical Impedance Tomography for Anomaly Detection and Imaging

Habib Zribi†

†Department of Biomedical Engineering, Kyung Hee University, Korea

Multi-frequency electrical impedance tomography (EIT) systems can be used for both frequency-difference imaging and anomaly detection. We formulate the forward problem as a pair of partial differential equations coupled through conductivity σ and permittivity ϵ distributions: $\nabla \cdot (\sigma \nabla v) - \nabla \cdot (\omega \epsilon \nabla h) = 0$ and $\nabla \cdot (\omega \epsilon \nabla v) + \nabla \cdot (\sigma \nabla h) = 0$ with appropriate boundary conditions where v and h are real and imaginary parts of a complex voltage $U = v + ih$. Here, we note that both σ and ϵ affect v and h. We describe a mathematical analysis of the coupled equations for anomaly detection and frequency-difference imaging. Explaining algorithms for anomaly detection and imaging, we present experimental results using conductivity phantoms.