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Title:

On thermo-acoustic and photo-acoustic imaging of small absorbers

Abstract:

This work is dedicated to the study of the photo-acoustic and thermo-acoustic tomography techniques. They are multi-wave imaging techniques based on the photoacoustic effect that was discovered in 1880 by Alexander Graham Bell. The inverse problem we are concerned in is the problem of recovering small absorbers in a bounded domain $\Omega \subset R^3$. We provide a direct reconstruction method based on the algebraic algorithm that was developed first by A. EL Badia and T. Ha-Doung in 2000, without following the quantitative photo-acoustic tomography approach (qPAT). This algorithm allows us to reconstruct the number of the absorbers and their locations from a single Cauchy data, in addition to some information on optical parameters such as the conductivity and the absorption coefficient that can serve as an important diagnostic information in detecting tumors. The main difference between PAT and TAT is in the type of optical pulse used. In PAT, a high frequency radiation is delivered into the biological tissue to be imaged, while in TAT low frequency radiations are used, which makes some differences in the physical and mathematical setting of the problem.