

Analysis of topological derivative applied to the identification of penetrable objects

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This work investigates the mathematical justification of qualitative inverse scattering based on the concept of topological derivative (TD), with both the unknown scatterer and the background medium allowed to be anisotropic. We assume a scalar wave propagation setting, with frequency-domain near-field data. Our results include a justification of the classical sign heuristics associated with TD-based identification, which is valid for unknown scatterers of finite size within a "moderate scatterer" limitation (expressed in terms of the norm of a volume integral operator), and the verification of spatial decay of the TD away from the unknown object. We present illustrative numerical examples. This is a joint work with Fioralba Cakoni (Rutgers University, USA).