Acoustically Modulated Electromagnetic Inverse Source Problems

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Abstract: The inverse source problem for the Maxwell equations is of fundamental interest and considerable practical importance, with applications ranging from geophysics to biomedical imaging. The problem is usually stated in the following form: determine the electric current density from boundary measurements of the electric and magnetic fields. It is well known that this problem is underdetermined and does not admit a unique solution. In this work we propose an alternative approach to the electromagnetic inverse source problem. In this approach the electric current density as well as the conductivity, electric permittivity and magnetic permeability are spatially modulated by an acoustic wave. In this manner, we find that it is possible to uniquely recover the current density from boundary measurements of the fields with Lipschitz stability. Numerical simulations are used to illustrate the results.