Inverse Problems in General Relativity: the Einstein-Maxwell Equations

Yiran Wang

Department of Mathematics, University of Washington, USA

Email: wangy257@math.washington.edu

We study the inverse problem of determining space-time structures using gravitational waves and electromagnetic waves. In particular, we consider the Einstein-Maxwell equations with electromagnetic sources and prove the unique determination of the Vacuum space-time structures. With proper gauge choices, the Einstein-Maxwell equations can be reduced to a quasilinear hyperbolic system. The solution of the problem is based on the understanding of the nonlinear interaction of gravitational and electromagnetic waves, especially from the microlocal point of view as interactions of singularities. This is a joint work with M. Lassas and G. Uhlmann.