1137-35-265 **Matti Lassas**, **Gunther Uhlmann** and **Yiran Wang*** (wangy257@math.washington.edu).

Determination of vacuum space-times from the Einstein-Maxwell equations.

We study inverse problems for the Einstein-Maxwell equations in general relativity. We prove that it is possible to generate gravitational waves from the nonlinear interactions of electromagnetic waves. By sending electromagnetic waves from a neighborhood of a freely falling observer and taking measurements of the gravitational perturbations in the same neighborhood, one can determine the vacuum space-time structure up to diffeomorphisms in the largest region where these waves can travel to from the observer and return. (Received February 05, 2018)