Point measurements for a Neumann-to-Dirichlet map and the Calderón problem in the plane

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This work considers properties of the Neumann-to-Dirichlet map for the conductivity equation under the assumption that the conductivity is identically one close to the boundary of the examined smooth, bounded and simply connected domain. It is demonstrated that the so-called bisweep data, i.e., the (relative) potential differences between two boundary points when delta currents of opposite signs are applied at the very same points, uniquely determine the whole Neumann-to-Dirichlet map. In two dimensions, the bisweep data extend as a holomorphic function of two variables to some (interior) neighborhood of the product boundary. It follows that the whole Neumann-to-Dirichlet map is characterized by the derivatives of the bisweep data at an arbitrary point. On the diagonal of the product boundary, these derivatives can be given with the help of the derivatives of the (relative) boundary potentials at some fixed point caused by the distributional current densities supported at the same point, and thus such point measurements uniquely define the Neumann-to-Dirichlet map. This observation also leads to a new, truly local uniqueness result for the so-called Calder\'on inverse conductivity problem.

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