1086-35-163 **Adrian I Nachman*** (nachman@math.toronto.edu), Dept.of Mathematics and, Dept. of Electrical and Computer Engineering, University of Toronto, Toronto, Ontario M5S 2E4, Canada.
Inverse Problems with Minimal Interior Measurements.

Imaging electric conductivity of tissue is both desirable and challenging. The classical Electric Impedance Tomography Problem seeks to determine the conductivity from measurements of voltages and currents at the boundary; it has spurred deep and far-reaching mathematical developments. The ill-posedness of the problem is now well understood, and places severe limitations on the resolution that can be achieved.

Recent research on Hybrid Inverse Problems seeks to overcome such limitations in classical inverse boundary value problems by coupling two physical modalities to obtain new interior data. We will discuss one such approach: imaging conductivity from interior current density data obtainable using MRI in a novel way. We only require knowledge of the magnitude of one current for a given voltage on the boundary. We show that the corresponding equipotential surfaces are area minimizing in a conformal metric determined by the given data. Using geometric measure theory and convex analysis techniques, we prove identifiability and give convergent reconstruction algorithms. We'll present theoretical, numerical and experimental results from joint work with Robert Jerrard, Michael Joy, Weijing Ma, Tim DeMonte, Amir Moradifam, Alexandru Tamasan and Alexandre Timonov). (Received September 25, 2012)