

# *Determining Cracks by Boundary Measurements*

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EDITOR'S NOTE. The paper below was submitted in January, 1989. When the paper was accepted, the staff of the first author supplied our production staff with the T<sub>E</sub>X source file; however, the file supplied to us corresponded to a preliminary draft. It appeared in the previous issue of this Journal (38 (1989), 497–525). Because that version substantially differs from the paper in its final form, the editors are republishing the correct version in full. The authors and the Journal regret this mishap.

**0. Introduction.** A practically and theoretically very interesting inverse problem concerns the determination of an unknown internal conductivity profile from boundary measurements of voltage potentials and corresponding current fluxes. Most of the theoretical work connected with this problem has been based on the assumption that one has available information about all possible voltage potentials and their corresponding current fluxes. With such complete information it is known that an isotropic conductor is uniquely determined under appropriate smoothness conditions, cf. [6-11]. When some structural information is already known about the conductivity profile then it is conceivable that one can determine characteristic features by making only a finite number of boundary measurements. One such situation where a single measurement suffices has recently been studied in [4]. The physical situation there corresponds to finitely many small inclusions of zero or infinite conductivity imbedded in a known reference conductor. The results assert that it is possible to gain information about the location of the inhomogeneities, their relative sizes and their orientations. In this paper we consider the practically very important case of a curve,  $\sigma$ , of zero or infinite conductivity located inside a 2-dimensional medium with a known reference conductivity. We prove that the presence of  $\sigma$  and its actual shape and location may be determined from exactly two boundary mea-