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Sensitivity of charge transport measurements to local inhomogeneities DANIEL KOON, St. Lawrence University, FEI WANG, DIRCH HJORTH PETERSEN, OLE HANSEN, Department of Micro- and Nanotechnology, Technical University of Denmark — We derive analytic expressions for the sensitivity of resistive and Hall measurements to local variations in a specimen's material properties in the combined linear limit of both small magnetic fields and small perturbations, presenting exact, algebraic expressions both for four-point probe measurements on an infinite plane and for symmetric, circular van der Pauw discs. We then generalize the results to obtain corrections to the sensitivities both for finite magnetic fields and for finite perturbations. Calculated functions match published results and computer simulations, and provide an intuitive, visual explanation for experimental misassignment of carrier type in n-type ZnO and agree with published experimental results for holes in a uniform material. These results simplify calculation and plotting of the sensitivities on an $N \times N$ grid from a problem of order N^5 to one of order N^3 in the arbitrary case and of order N^2 in the handful of cases that can be solved exactly, putting a powerful tool for inhomogeneity analysis in the hands of the researcher: calculation of the sensitivities requires little more than the solution of Laplace's equation on the specimen geometry.

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