Nanoscale conductivity mapping using four-point probe

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In four-point measurements, the limited resolution caused by geometrical convolution effects, have so far prevented the method from being used to investigate systems with nanoscale features such as grain boundaries. We present a method to enhance the spatial resolution as well as the accuracy in four-point-probe measurements of 2D and quasi-2D systems by a factor of 50 compared with raw data. By measuring the resistivity on a dense grid around the target area, a convoluted resistivity map is obtained. The real conductance sheet is simulated using a grid of discrete resistances, which is optimized by means of a standard optimization algorithm, until the simulated voltage-to-current ratios converges with the convoluted measurement map. We obtain results in agreement with resistivity maps measured on conductive polymer films and sillicon surface states. In combination with a newly developed scanning four-point probe with electrode spacing of 1.1 μm the resolution is of the order of 100 nm. Apart from four-point measurements, the microcantilever chip technology is used for several other applications, such as for assembling conducting nanotube bridges and nanomanipulation of silicon nanowires. Recent results of this work will be presented.