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Electronic characterization of 1-D defects using scanning gate spectroscopy STEVEN R. HUNT, Department of Physics and Astronomy, Univ. of California at Irvine, Irvine, CA 92697-4576, BRAD L. CORSO, PHILIP G. COLLINS — Scanning gate microscopy (SGM) is a technique particularly useful for characterizing transport in electronic devices. We have extended the SGM technique into a spectroscopy by measuring the entire bias dependence of conductance at every position on a surface. Much as in current imaging tunneling spectroscopy (CITS), the resulting data set is a multidimensional, detailed map of the electronic behavior of a surface. We apply this scanning gate spectroscopy (SGS) technique to scattering in one-dimensional, carbon nanotube circuits. Transport in one-dimensional systems depends critically on inhomogeneities, including isolated point defects. The SGS technique enables straightforward investigation of low-dimensional transport physics at such sites. In our experiments, metallic single-walled carbon nanotubes are investigated before and after the electrochemical introduction of a point defect, in order to clearly establish the contribution of different defect types. SGS directly images the energy dependence of a defect's scattering, providing a way to distinguish between different defect chemistries and quantitatively model its energy levels and transmission. This research is partly supported by the NSF (DMR-0801271).

Steven R. Hunt
Department of Physics and Astronomy,
Univ. of California at Irvine, Irvine, CA 92697-4576

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