Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

High Density Germanium Nanowire Assemblies: Contact Challenges, Electrical Characterization and Photoconductivity Dynamics
BRIAN DALY, University College Cork, BORIS POLYAKOV, DONATS ERTS, University of Latvia, MICHAEL MORRIS, JUSTIN HOLMES, University College Cork — The conductivity and photoconductivity properties of vertically aligned germanium nanowires, within anodised aluminium oxide (AAO) templates have been characterized by C-AFM and macro-contact measurements. Contact resistance between the nanowires and metal macro-contacts was minimized by polishing and gradual etching of the AAO surface, to expose the nanowires, prior to deposition of the contacts. Conductivity data from C-AFM and macro-contact measurements were found to be comparable suggesting that both methods are inherently suitable for evaluating the electrical transport properties of encapsulated nanowires within a matrix. Photoconductivity measurements indicate a photocurrent/dark current ratio of up to 40% in the Ge nanowire matrix during illumination with an Ar laser between 457 – 514 nm. These results are significant as the ability to make good ohmic contacts to nanowires, within well defined arrays, is key for the future 'bottom-up' fabrication of multi-layered device architectures for future electronic and optoelectronic devices.

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Date submitted: 17 Nov 2005 Electronic form version 1.4