Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Robust signatures in the current-voltage characteristics of DNA molecules oriented between two graphene nanoribbon electrodes CARLOS PAEZ, Instituto de Fisica Gleb Wataghin, Universidade Estadual de Campinas, Brazil, PETER SCHULZ, Faculdade de Ciências Aplicadas, Universidade Estadual de Campinas, Brazil, RUDOLF ROEMER, NEIL WILSON, Department of Physics, University of Warwick, United Kingdom — In this work we numerically calculate the electric current through three kinds of DNA sequences (telomeric, λ-DNA, and p53-DNA) described by different heuristic models. A bias voltage is applied between two zig-zag edged graphene contacts attached to the DNA segments, while a gate terminal modulates the conductance of the molecule. The calculation of current is performed by integrating the transmission function (calculated using the lattice Green's function) over the range of energies allowed by the chemical potentials. We show that a telomeric DNA sequence, when treated as a quantum wire in the fully coherent low-temperature regime, works as an excellent semiconductor. Clear steps are apparent in the current-voltage curves of telomeric sequences and are present independent of lengths and sequence initialisation at the contacts. The current-voltage curves suggest the existence of stepped structures independent of length and sequencing initialisation at the contacts. We also find that the molecule-electrode coupling can drastically influence the magnitude of the current. The difference between telomeric DNA and other DNA, such as λ-DNA and DNA for the tumour suppressor p53, is particularly visible in the length dependence of the current.

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Date submitted: 29 Nov 2012 Electronic form version 1.4