Renormalized Couplings and the Insulator and Metallic Behavior of Double-Stranded DNA\textsuperscript{1} EFTA YUDIARSAH, SERGIO E. ULLOA, Ohio University — Electronic transport in double-stranded DNA is studied using a ladder model in a tight-binding Hamiltonian, with realistic on-site energies \cite{Roche} and hopping constants \cite{Voityuk}. The effect of DNA molecules coupling to leads is studied on periodic poly (dG)-poly(dC) sequences with an embedded TGGGGT defect group. The differential conductance features diminish gradually and vanish at small coupling. The influence of counter-ions, local fields, and interaction with phonons can renormalize the hopping constants; we study the role of increasing intra-strand hopping on \textlambda-phage DNA sequences. Increasing coupling results in the electronic transport of \textlambda-sequences to change from insulator to metallic. Differential conductance $dI/dV$ at low bias is vanishingly small for bare hopping constants found in the literature \cite{Voityuk}, and increases rapidly if they are enhanced by more than 5 times. Even at large uniform intra-chain coupling (1 eV), $dI/dV$ drops drastically at low bias for sequences longer than 300 base pairs. Electron-phonon interactions are also considered. The diagonal (local) interaction results in polaronic effects while the non-diagonal terms yield phonon-assisted hopping. \cite{Roche,Voityuk}

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\textsuperscript{1}S. Roche, Phys. Rev. Lett. 91, 108101 (2003).