Abstract Submitted
for the TSF06 Meeting of
The American Physical Society

Extended Electron States in DNA Molecules KEMAL BAGCI, University of North Texas Physics Department — An important class of disordered 1D conductor is the DNA macromolecules. A DNA strand is a random sequence of four nucleotides (guanine G, adenine A, cytosine C, and thymine T). For a conduction electron the sequence of nucleotides is mapped into the sequence of sites with on-site energies, $\varepsilon_A = 8.24$ eV, $\varepsilon_T = 9.14$ eV, $\varepsilon_C = 8.87$ eV, and $\varepsilon_G = 7.75$ eV. Due to the overlapping of the electron orbitals, there is hopping transport between the neighboring sites. The hopping constant is about $t \leq 1$eV. Since the potential profile fluctuates randomly, the electron diffusion along the chain is limited by localization length $l(E)$. However, the long-range correlations may give rise to a continuum of extended states. These states may provide long-distance transport. Here we report the results of our analytical study of the localization length of DNA. We have generalized the analytical result in Ref.[1] to two channel systems. The method is based on the generalized result, where $l(E)$ is related to the binary correlation function of the nucleotide sequence. We calculated localization for DNAs, which exhibit long-range and oscillatory correlations, those that may possess the mobility edge.. Our study shows that the structure of the correlations in some of the human DNA's favors formation of the sharp mobility edges in the energy spectrum. [1] F.M. Izrailev, A.A. Krokhin, Phys. Rev. Lett. **82,** 4062 (1999).

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Date submitted: 19 Sep 2006 Electronic form version 1.4