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Base sequence dependence and backbone-induced effects on charge transport through DNA YONG JOE, SUN LEE, ERIC HEDIN, Ball State Univeristy — We investigate quantum mechanical electron transmission along the long axis of the DNA molecule using a tight-binding model. Specifically, we use two different DNA models to study the charge transfer efficiency of synthetic ds-DNA. First, the generic form of a simple one-conduction channel model, called the fishbone model, is used. The sugar-phosphate backbone and the coupling amplitude between each site of the base and the backbone are incorporated into an energy-dependent on-site potential in the main DNA site. Here, individual sites represent a base-pair formed by either AT (TA) or GC (CG) pairs coupled via hydrogen bonds. Second, we employ a two-dimensional three-chain model where the backbone on-site energy, the coupling amplitude between the bases and the backbone, and a possible hopping of charge carriers between the successive backbone sites are used as key parameters. The overall transmission and the current-voltage characteristics are calculated to determine the influence of mismatch (impurity) effects in the DNA sequence. Finally, we discuss the transmission gap as a function of coupling between the bases and between the bases and the backbone. *One of the authors (E.R.H) is partially supported by a grant from the Center for Energy Research, Education, and Service (CERES) at Ball State University.

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