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Pi electron plasmon modes by the method of tight binding in an array of armchair single-walled carbon nanotubes. M. E. MARKES, University of Nebraska-Kearney, P. F. WILLIAMS, University of Nebraska-Lincoln — P. R. Wallace introduced the method of tight binding in the study of graphene sheets about 50 years ago [1]. More recently, it has been possible to explain the relationship between the semiconductor/metallic behavior and carbon nanotube chirality by applying periodic axial boundary conditions to Wallace's band model [2]. Several years ago one of us (P. F. Williams [3]) developed a self-consistent dielectric response model for arrays of one-dimensional metal filaments using a tight-binding approximation. At the time this model was found useful in a study of the single-particle excitations and plasmon dispersion curves of tetrathiofulvalene-tetracyanoquinodimethane (TTF-TCNQ). This paper is a report of work in progress to extend the Williams-Bloch model to arrays of single-walled carbon nanotubes modeled using the Wallace tight-binding model and axial periodic boundary conditions. The collective excitations are characterized by a frequency and wavelength dependent dielectric function obtained using a self-consistent field in the random phase approximation. The zeros of this function yield the plasmon modes. [1] P. R. Wallace, Phys. Rev., vol. 71, 1947. [2] R. Saito et. al., Appl. Phys. Lett., vol. 60, 1992. [3] P. F. Williams and A. N. Bloch, Phys. Rev. B, vol. 10, 1974.

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