Abstract Submitted
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Elementary electronic excitations in quantum wires made up of vertically stacked quantum dots M.S. KUSHWAHA, Rice University — We investigate the elementary electronic excitations in quantum wires made up of vertically stacked (self-assembled) InAs/GaAs quantum dots. The length scales (of a few nm) involved in the experimental setups prompt us to consider an infinitely periodic system of two-dimensionally confined (InAs) quantum dot layers separated by GaAs spacers. The resultant quantum wire is characterized by the Bloch functions and the Hermite functions. We make use of the Bohm-Pines' RPA in order to derive a general nonlocal, dynamic dielectric function. The theoretical framework is then specified to work within a two-subband model that enables us to scrutinize the single-particle as well as collective responses of the system. We also size up the importance of studying the inverse dielectric function in relation with the quantum transport phenomena. It is remarkable to notice how the variation in the barrier- and well-widths can allow us to tailor the excitation spectrum in the desired energy range. Given the foreseen applications in the single-electron devices and in the quantum computation, it is quite tempting to explore the electronic, optical, and transport phenomena in such systems.[1]

[1]M.S. Kushwaha, J. Chem. Phys. **135**, 124704 (2011).

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