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Electron Confinement in Cylindrical Potential Well[1] A. S. BALTENKOV, Institute of Ion-Plasma and Laser Technologies, Uzbekistan, A. Z. MSEZANE, Clark Atlanta University — We show that studying the solutions of the wave equation for an electron confined in a cylindrical potential well offers the possibility to analyze the confinement behavior of an electron executing one- or two-dimensional motion in the remaining three-dimensional space within the framework of the same mathematical model of the potential well. Some low-lying electronic states with different symmetries are considered and the corresponding wave functions are calculated. The behavior of their nodes and their peak positions with respect to the parameters of the cylindrical well is analyzed. Additionally, the momentum distributions of electrons in these states are calculated. The limiting cases of the ratio of the cylinder length H to its radius R_0 are considered; when H significantly exceeds R_0 and when R_0 is much greater than H. The possible application of the results obtained here for the description of the general features in the behavior of electrons in nanowires with metallic type of conductivity (or nanotubes) and ultrathin epitaxial films (or graphene sheets) are discussed. Possible experiments are suggested as well where the quantum confinement can be manifested.

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Zineb Felfli
Clark Atlanta University

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