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On the transfer matrix method and WKB approximation for systems with spatial-dependent effective mass CHUN-FENG HUANG, National Measurement Laboratory, Center for Measurement Standards, Industrial Technology Research Institute, Hsinchu 200, Taiwan, R. O. C., S.D. CHAO, Institute of Applied Mechanics, National Taiwan University, Taipei, Taiwan, R. O. C., D.R. HANG, Department of Materials Science and Optoelectronic Engineering, National Sun Yat-sen University, Kaohsiung 804, Taiwan, R. O. C., Y.C. LEE, Institute of Materials Science and Engineering, National Sun Yat-sen University, Kaohsiung 804, Taiwan, R. O. C. — A set of coupled differential equations is derived by considering the continuous limit of the transfer matrix method, which is a numerical approach for the one-dimensional structures such as the semiconductor heterostructures. By decoupling such a set of equations, an extension to the Wentzel-Kramers-Brillouin (WKB) method is obtained to incorporate effects due to the spatial-dependent effective mass. For a traveling wave, the decoupling is to ignore the reflection resulting from the variations of both the potential and effective mass. By considering a solvable fully-quantized system, it is shown that the extended WKB method provides good approximation for the states with the high eigenenergies.

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