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On Electron Mobility in a Rectangular Quantum Wire due to Alloy Disorder

Guseyn Behbudoglu IBRAGIMOV

Institute of Physics, Azerbaijan National Academy of Sciences, Javid av.33,
370143, Baku-AZERBAIJAN

e-mail: guseyn@physics.ab.az and guseyn\g@mail.ru

 [Keywords](#)
 [Authors](#)



phys@tubitak.gov.tr

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Abstract: Analytic expressions are derived to describe the electron mobility and relaxation rate in the rectangular quantum wire experiencing scattering due to alloy disorder. The dependence of electron mobility on the temperature and transverse dimension is numerically evaluated and it is found that the mobility increases continuously with temperature, because there is no new intersubband scattering with increase in temperature. It is shown that the alternating increase/decrease in the mobility---depending on the transverse dimension of the quantum wire---occurs due to intersubband scattering. It is found that the mobility in a quantum wire is significantly greater than mobility in a quantum well.

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