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Transport Properties of Two-Dimensional Electron Gases in Antiparallel Magnetic-Electric Barrier Structures

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Abstract: We study theoretically transport properties of two-dimensional electron gases through antiparallel magnetic-electric barrier structures. Two kinds of magnetic barrier configurations are employed: one is that the strength of the double δ-function in opposite directions is equal and the other is that the strength is unequal. Similarities and differences of electronic transports are presented. It is found that the transmission and the conductance depend strongly on the shape of the magnetic barrier and the height of the electric barrier. The results indicate that this system does not possess any spin filtering and spin polarization and electron gases can realize perfect resonant tunneling and wave-vector filtering properties. Moreover, the strength of the effect of the inhomogeneous magnetic field on the transport properties is discussed.

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Key words: magnetic-electric barrier, resonant tunneling, wave-vector filtering, transmission, conductance

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