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Reflectionless quantum transport and fundamental ballistic-resistance steps in microscopic constrictions

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A quantization of the resistance of microscopic constrictions in a two-dimensional electron gas [B. J. van Wees *et al.*, Phys. Rev. Lett. **60**, 848 (1988); D. A. Wharam *et al.*, J. Phys. **21**, L209 (1988)] arises if the constriction has a sufficiently smooth shape: $\pi^2 (2R/d)^{1/2} > 1$, where d and R are the diameter and radius of curvature of the constriction. The shape of the steps is shown to be related to the geometry of the constriction.

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