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Using quantum mechanics to synthesize electronic devices PETRA SCHMIDT, STEPHAN HAAS, Department of Physics and Astronomy, University of Southern California, Los Angeles , ANTHONY LEVI, Department of Electrical Engineering and Department of Physics and Astronomy, University of Southern California, Los Angeles — Adaptive quantum design [1] has been used to explore the possibility of creating new classes of electronic semiconductor devices. We show how non-equilibrium electron transmission through a synthesized conduction band potential profile can be used to obtain a desired current - voltage characteristic. We illustrate our methodology by designing a two-terminal linear resistive element in which current is limited by quantum mechanical transmission through a potential profile and power is dissipated non-locally in the electrodes. As electronic devices scale to dimensions in which the physics of operation is dominated by quantum mechanical effects, classical designs fail to deliver the desired functionality. Our device synthesis approach is a way to realize device functionality that may not otherwise be achieved. [1] Y.Chen, R.Yu, W.Li, O.Nohadani, S.Haas, A.F.J. Levi, Journal of Applied Physics, Vol.94, No.9, p6065, 2003

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