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The effect of split gate dimensions on the electrostatic potential and 0.7 anomaly within one-dimensional quantum wires on a modulation doped GaAs/AlGaAs heterostructure L. W. SMITH*, H. AL-TAIE, A. A. J. LESAGE, K. J. THOMAS, F. SFIGAKIS, P. SEE, J. P. GRIFFITHS, I. FARRER, G. A. C. JONES, D. A. RITCHIE, M. J. KELLY, C. G. SMITH, University of Cambridge, Cavendish Laboratory — We use a multiplexing scheme to measure the conductance properties of 95 split gates of 7 different gate dimensions fabricated on a GaAs/AlGaAs chip, in a single cool down [1]. The number of devices for which conductance is accurately quantized reduces as the gate length increases. However, even the devices for which conductance is accurately quantized in units of $2e^2/h$ show no correlation between the length of electrostatic potential barrier in the channel and the gate length, using a saddle point model to estimate the barrier length. Further, the strength of coupling between the gates and the 1D channel does not increase with gate length beyond 0.7 μm. The background electrostatic profile appears as significant as the gate dimension in determining device behavior. We find a clear correlation between the curvature of the electrostatic barrier along the channel and the strength of the "0.7 anomaly" which identifies the electrostatic length of the channel as the principal factor governing the conductance of the 0.7 anomaly.
* Present address: Wisconsin Institute for Quantum Information, University of Wisconsin-Madison, Madison, WI.
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Luke Smith
Univ of Wisconsin-Madison

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