Abstract Submitted
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Lateral Charge Transport in Atomically Clean, Ultra-thin Crystalline-Silicon Sheets[1] WEIWEI HU, SHELLEY SCOTT, R.B. JACOBSON, DONALD SAVAGE, MARK ERIKSSON, MAX LAGALLY, University of Wisconsin — In very thin, atomically clean crystalline-Si sheets ("nanomembranes"), the electrical conductance is controlled by the surface. Conductance can occur either through surface transfer doping or directly in the clean-surface electronic bands. The thinner the sheet, the larger should be the contribution of the surface. We have earlier reported [1] conductance measurements on nanomembranes as thin as 77nm, and have shown that not only is the surface antibonding (π^*) band used to enhance "bulk" conduction in the membrane [2], but also the charges are additionally mobile in this band, providing a significant contribution to the overall conductance. We extend these measurements to thinner nanomembranes, between 64nm and 35nm thick, using a back-gated van der Pauw technique in ultra-high vacuum. The sheet conductance is measured after a high-temperature flash to obtain a high-quality Si(2×1) reconstructed surface, and with H adsorbed on the surface. The maximum sheet resistance for a 64nm sample with H deposited in situ is higher than 24 GΩ.

[1] W. Peng, et al., Nature Commun., under review.
[2] Zhang, P. P. et al., Nature 439, 703-706 (2006).

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