

Abstract Submitted  
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**Nearest Neighbor Hopping conduction observed with ionic liquid induced silicon surface states**<sup>1</sup> JJ NELSON, K. V. REICH, M. SAMMON, B. I. SHKLOVSKII, A. M. GOLDMAN, University of Minnesota — A two-dimensional hole gas can be created on the surface of a bulk Si wafer by using an ionic liquid in an electric double layer transistor configuration (EDLT). EDLTs are useful in observing metal to insulator and superconductor to insulator transitions due to record high carrier densities of  $10^{15} \text{ cm}^{-2}$  that can be achieved. In some cases the high carrier densities are due in part to oxidation of the sample surface. With an EDLT configuration we have observed a 2D insulator-to metal transition with low mobility Si at the highest reported critical carrier density. [J. Nelson and A. M. Goldman Phys. Rev. B 91, 241304(R) (2015)] The experiment reported here is designed to promote electrostatic carrier induction over electrochemical reactions and is focused on carrier densities near  $10^{11} \text{ cm}^{-2}$ . At such a low densities we observe nearest neighbor hopping conduction on the surface of Si.[J. Nelson et al., Phys. Rev. B 92, 085424 (2015)] This observation suggests that the ionic liquid covering the surface should be treated as a series of discrete charges that can act as a platform to better understand EDLT physics at higher carrier densities.

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