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Gate-Sensing the Potential Landscape of a GaAs Two-Dimensional Electron Gas XANTHE CROOT, ALICE MAHONEY, SEBASTIAN PAUKA, JAMES COLLESS, DAVID REILLY, School of Physics, University of Sydney. Engineered Quantum Systems, ARC Centre of Excellence., JOHN WATSON, SAEED FALLAHI, Department of Physics and Birck Nanotechnology Center, Purdue University, GEOFF GARDNER, School of Materials Engineering and Birck Nanotechnology Center, Purdue University, MICHAEL MANFRA, Department of Physics, School of Materials Engineering and Birck Nanotechnology Center, Purdue University, HONG LU, ARTHUR GOSSARD, Materials Department, University of California, Santa Barbara — In situ dispersive gate sensors hold potential as a means of enabling the scalable readout of quantum dot arrays. Sensitive to quantum capacitance, dispersive sensors have been used to detect inter- and intra-dot transitions in GaAs double quantum dots [1], and can distinguish the spin states of singlet triplet qubits [2]. In addition, the gate-sensing technique is likely of value in probing the physics of Majorana zero modes in nanowire devices [3]. Beyond the readout signatures associated with charge and spin configurations of qubits, gate-sensing is sensitive to trapped charge in the potential landscape. Here, we report gate-sensing signals arising from tunnelling of electrons between puddles of trapped charge in a GaAs 2DEG. We examine these signals in a family of different devices with varying mobilities, and as a function of temperature and bias. Implications for qubit readout using the gate-sensing technique are discussed. [1] Colless, J. et al. PRL 110, 046805 (2013), [2] House, M.G. et al, Nat. Comms. 6, 8848 (2015), [3] Karzig, T. et al, arXiv:1610.05289v2 (2016)

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