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Tunneling spectroscopy of a 2D-2D tunnel junction: Towards a local spectroscopic probe of 2D electron systems MATTHEW PELLICCIONE, ADAM SCIAMBI, DAVID GOLDHABER-GORDON, Stanford University, SETH BANK[1], ARTHUR GOSSARD, University of California, Santa Barbara, JOHN RENO, MICHAEL LILLY, Sandia National Laboratory — We present measurements on GaAs/AlGaAs bilayer two-dimensional electron systems (2DES) that exhibit inelastic tunneling between the 2D electron layers. Due to a relatively large interlayer separation, scattering allows for tunneling events between states of different energy and momentum, which are not observed in similar systems with a small interlayer separation. This behavior can be used to measure spectroscopic information about the 2DES that is obscured when tunneling events conserve energy and momentum exclusively. We study the bulk behavior of this system in the integer quantum Hall regime on samples from different sources, and provide a model to explain the observed tunneling dynamics. We also discuss the prospect of using this system as a virtual scanning tunneling microscope (VSTM), where a scanning probe is used to locally induce tunneling between the 2D electron layers.

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