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Graphene as a platform to study 2D electronic transitions VINCENT BOUCHIAT, Neel Institute, CNRS-Grenoble, BRIAN KESSLER, CAGLAR GIRIT, ALEX ZETTL, Physics Dept. UC Berkeley — The easily accessible 2D electron gas in graphene provides an ideal platform on which to tune, via application of an electrostatic gate, the coupling between electronically ordered dopants deposited on its surface. To demonstrate this concept, we have measured arrays of superconducting clusters deposited on Graphene capable to induce via the proximity effect a gate-tunable superconducting transition. Using a simple fabrication procedure based on metal layer dewetting, doped graphene sheets can be decorated with a non percolating network on nanoscale tin clusters. This hybrid material displays a two-step superconducting transition. The higher transition step is gate independent and corresponds to the transition of the tin clusters to the superconducting state. The lower transition step towards a real zero resistance state exhibiting a well developped supercurrent, is strongly gate-tunable and is quantitatively described by Berezinskii-Kosterlitz-Thouless 2D vortex unbinding. Our simple self-assembly method and tunable coupling can readily be extended to other electronic order parameters such as ferro/antiferromagnetism, charge/spin density waves using similar decoration techniques. [1] B. M. Kessler, C.O. Girit, A. Zettl, and V. Bouchiat, Tunable Superconducting Phase Transition in Metal-Decorated Graphene Sheets submitted to PRL, arXiv:0907.3661

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