Abstract Submitted
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Tuning Superconductivity in Two Dimensions with a Novel Metal-Graphene Hybrid Material[1] BRIAN KESSLER, CAGLAR GIRIT, ALEX ZETTL, University of California - Berkeley, VINCENT BOUCHIAT, Neel Institute, CNRS - Grenoble — Using typical experimental techniques, such as chemical doping, it is difficult to isolate the effects of carrier density from disorder on a two-dimensional superconducting transition. To circumvent this problem, we have produced graphene sheets covered with a non-percolating network of nanoscale tin clusters. This network of disordered metal clusters efficiently dopes the graphene substrate and induces long-range superconducting correlations by injecting Cooper pairs into the graphene sheet. This allows us to study the superconducting transition at fixed disorder and variable carrier concentration by tuning the density of carriers via the field effect. We find that despite structural inhomogeneity on mesoscopic length scales (10-100 nm), this hybrid material behaves electronically as a homogenous dirty superconductor exhibiting separate amplitude and phase-ordering transitions. We identify a gate-voltage dependent transition of the Berezinskii-Kosterlitz-Thouless type and extract a vortex-antivortex dielectric constant higher than observed in similar systems. arXiv:0907.3661

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