

Abstract Submitted
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Tuning Charge and Correlation Effects for a Single Molecule on a Graphene Device HSIN-ZON TSAI, UCB Physics, SEBASTIAN WICKENBURG, UCB Physics and LBNL MSD, JIONG LU, UCB Physics, NUS Chemistry, NUS GRC, JOHANNES LISCHNER, UCB Physics, LBNL MSD, ARASH A. OMRANI, ALEXANDER RISS, CHRISTOPH KARRASCH, HAN SAE JUNG, RAMIN KHAJEH, DILLON WONG, UCB Physics, KENJI WATANABE, TAKASHI TANIGUCHI, NIMS Japan, ALEX ZETTL, UCB Physics, LBNL MSD, and Kavli ENSI, STEVEN G. LOUIE, UCB Physics and LBNL MSD, MICHAEL F. CROMMIE, UCB Physics, LBNL MSD, and Kavli ENSI — Controlling electronic devices down to the single molecule level is a grand challenge of nanotechnology. Single-molecules have been integrated into devices capable of tuning electronic response, but a drawback for these systems is that their microscopic structure remains unknown due to inability to image molecules in the junction region. Here we present a combined STM and nc-AFM study demonstrating gate-tunable control of the charge state of individual F4TCNQ molecules at the surface of a graphene field effect transistor. This is different from previous studies in that the Fermi level of the substrate was continuously tuned across the molecular orbital energy level. Using STS we have determined the resulting energy level evolution of the LUMO, its associated vibronic modes, and the graphene Dirac point (ED). We show that the energy difference between ED and the LUMO increases as EF is moved away from ED due to electron-electron interactions that renormalize the molecular quasiparticle energy. This is attributed to gate-tunable image-charge screening in graphene and corroborated by ab initio calculations.

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