PROJECT OVERVIEW: Charge Stability and Density of States Fluctuations Modeling in a Single Atom Transistor

I — INTRODUCTION

- Charge stability diagram/Coulomb diamond key device metric of single atom transistor
- Can we model the atomistic effects in the single atom transistor's Coulomb diamond?

II — METHODOLOGY

- Rate-equation formalism
- Atomistic modeling (density of states, single phosphorus dopant energy states)

III — RESULTS

- DOS fluctuations in leads major reason for observed "streaks" in experimental Coulomb diamond
- Asymmetric lead-to-channel coupling and inelastic scattering affect Coulomb diamond's shape / streak profile
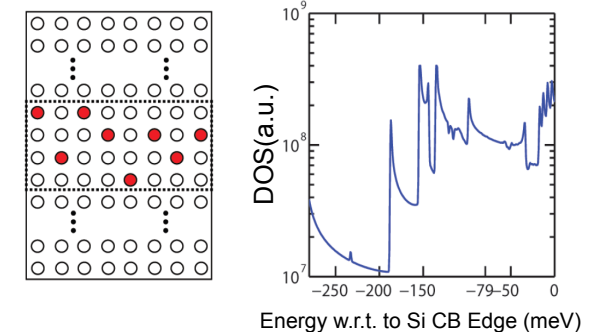- Manuscript in preparation (Tan, et. al.)

1 Theoretical vs experimental Coulomb diamond
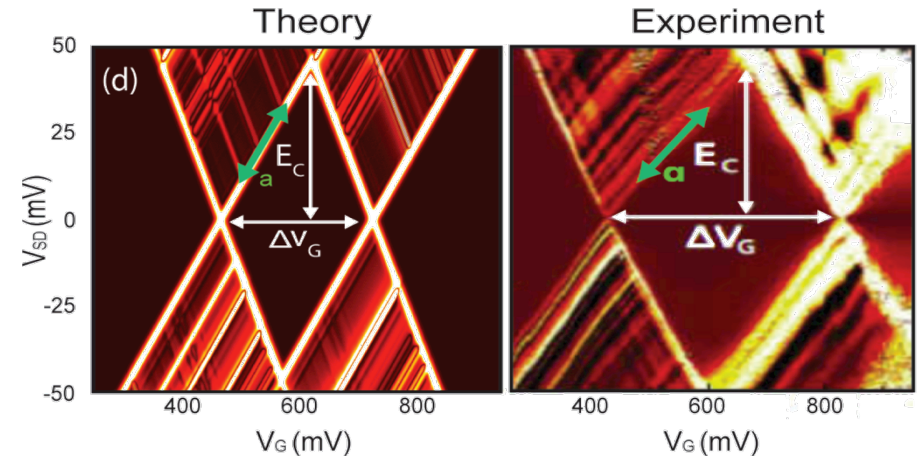
2 STM image
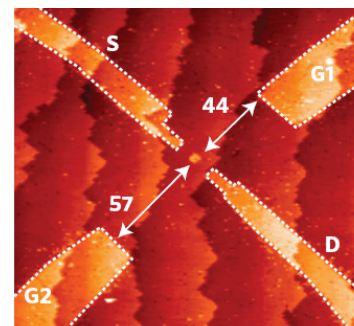
3 Lead dopant / DOS profile

1) Comparison of theoretical Coulomb diamond with experiment 2) STM image of single atom transistor with gates G1/G2 and S/D leads 3) Sample atomistic S/D lead dopant profile with calculated DOS (NEMO)

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