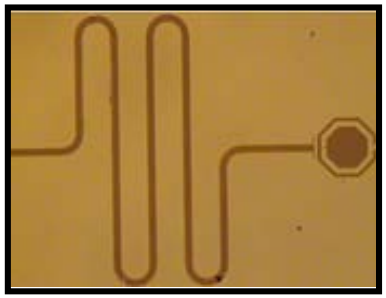
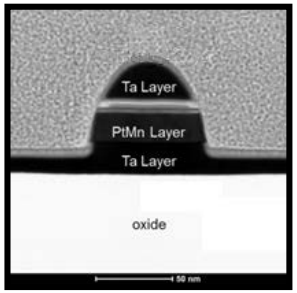
Introduction

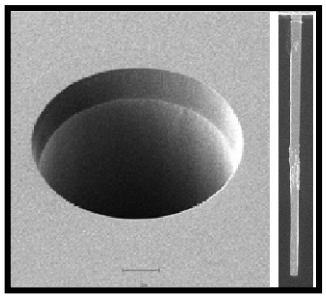
- SEMATECH is a research collaboration engaged with global partners to accelerate the development of materials and processes for a broad range of novel device technologies
- Long history of leading-edge collaborative research
- Unique 300mm fabrication line at Albany, NY through a partnership with the College of Nanoscale Science and Engineering (CNSE)
    - Combines flexibility for research and discipline to establish device baselines
    - Cutting-edge process equipment from Applied Materials, Tokyo Electron, Lam Research and others supporting dielectric and metal deposition, EPI, doping, etc.
    - Advanced patterning center with E-beam, EUV micro-exposure tool, EUV full-field, 193immersion, MUV and a full suite of etch tools
    - State of the art metrology and characterization



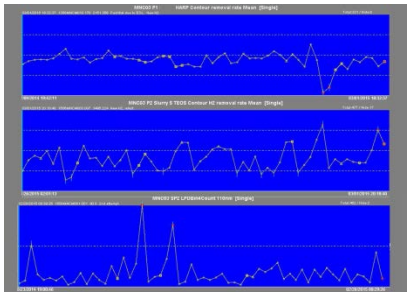
TiN resonator /capacitor fabricated at Albany



Magnetic Tunnel Junction



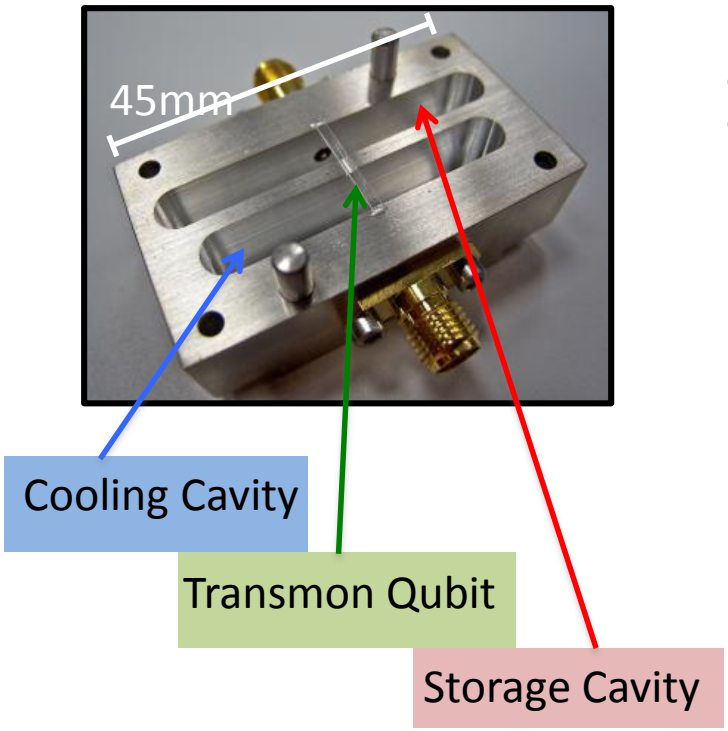
TSV (pre & post metal fill) for 3D integration

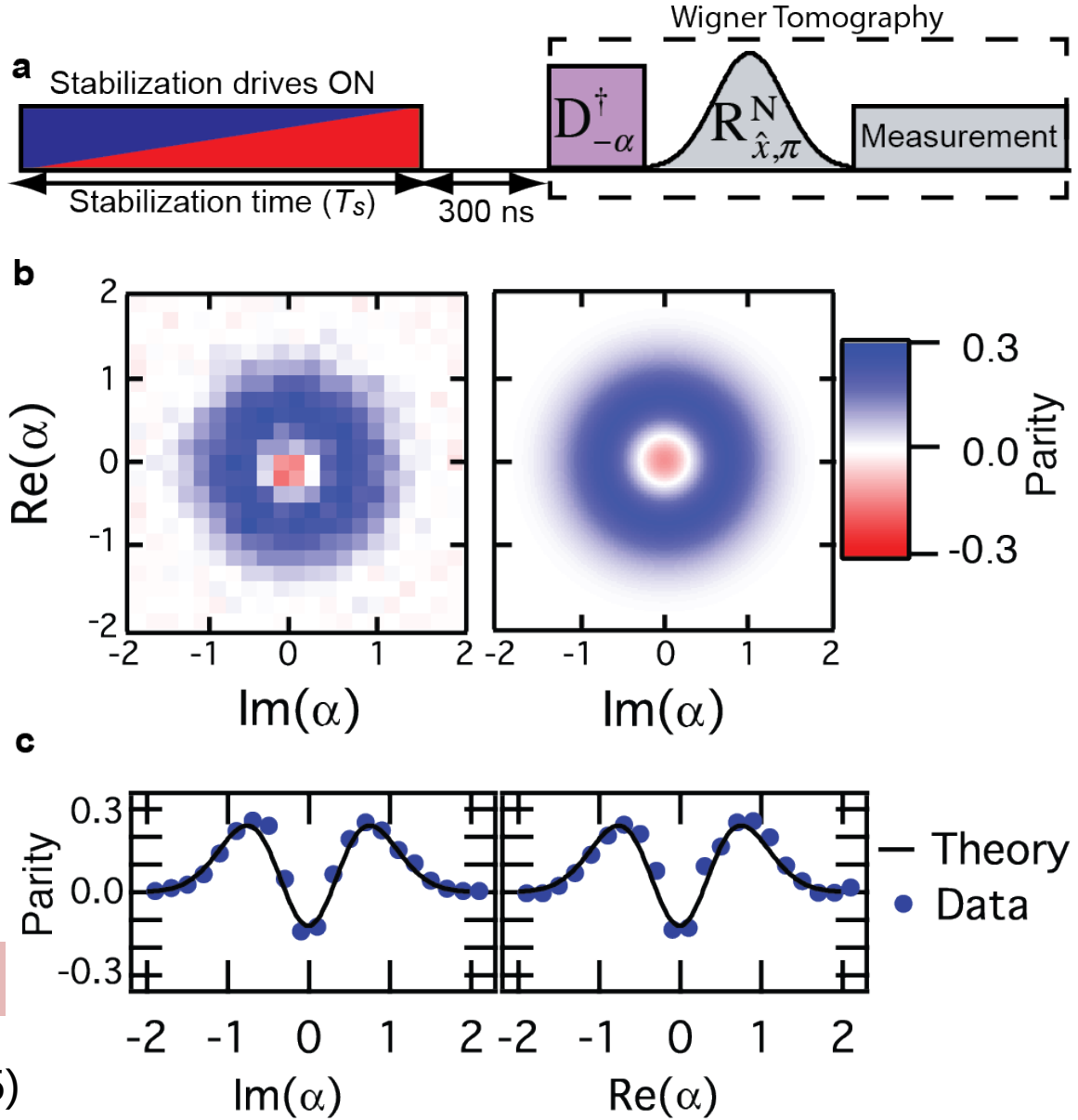


SPC Charts utilized widely to ensure process stability

Quantum Measurements

Created steady state non-equilibrium quantum states of a cavity





Holland, arXiv:1504.03382 (2015)

SEMATECH Goals

Advance quantum information technology by:

- Leveraging state of the art semiconductor process tools
  - Fabrication process flows to yield tight distribution of qubit performance within wafer and from wafer to wafer
  - Statistical validation of process improvements designed to improve coherence
  - Novel designs for transmon qubit fabrication that utilize advanced CMOS manufacturing techniques
- Developing and implementing experimentally-tested protocols to preserve multi-qubit quantum states in the presence of decoherence

Collaboration

- Can offer collaborators:
  - Advanced fabrication and materials characterization
  - Experimental Physicist: Eric T. Holland
    - Yale (Schoelkopf) graduate - June 2015
    - Background in coherent control of SC circuits (transmons/cavities)
  - Experts in device fabrication
    - C. Hobbs, D. Veksler, R. Lee, P. Kearney, X. Zhou et al
- Looking from Collaborators:
  - Test facilities for resonators/qubits
  - Cross-pollination of ideas for novel stabilization codes

Contact Information

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