**Device Fabrication: Designs and Techniques**

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**Shadow Mask Evaporation**

1. Spin resist
2. Pattern in SEM
3. Develop resist
4. Double-angle evaporation on "shadow mask"
5. Lift-off

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**Quantronium with JBA Readout**

**Quantronium schematic:**
- Quantronium qubit
- JBA non-linear resonator
- Gate
- Charge port
- Readout

**Capacitor structure:**
- Optical image of quantronium
- Capacitor structure

**Mask design and evaporation:**
- SEM image of resist design
- SEM image after evaporation

**Cavity Bifurcation Amplifier**

**Resonator fabrication:**
1. Define areas to be etched with photolithography
2. Etch in RIE: CF$_4$ etches Nb and O$_2$ eats resist
3. O$_2$ content determines Nb slope
4. Shadow mask evaporation for junction

**Advantages:**
- Ease of fabrication
- Less stray elements
- Engineerable frequency and Q
- Ideal for multiplexing

**SEM image of sloped edge (c.f. Joe Schreier)**

**Optical image of 2Ghz resonator**

**SEMs image ofJsloped edge (c.f. Joe Schreier)**

**Coupled Qubits:**

**Alternate Fabrication Technique: Multilayer “window” junctions**

**Ongoing and Future Fabrication Projects**

**Evaporated Aluminum Oxide Capacitors:**

**Coupling Capacitor**

**Phase and amplitude of output signal gives state of qubit**