Microwave Kinetic Inductance Detectors

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For

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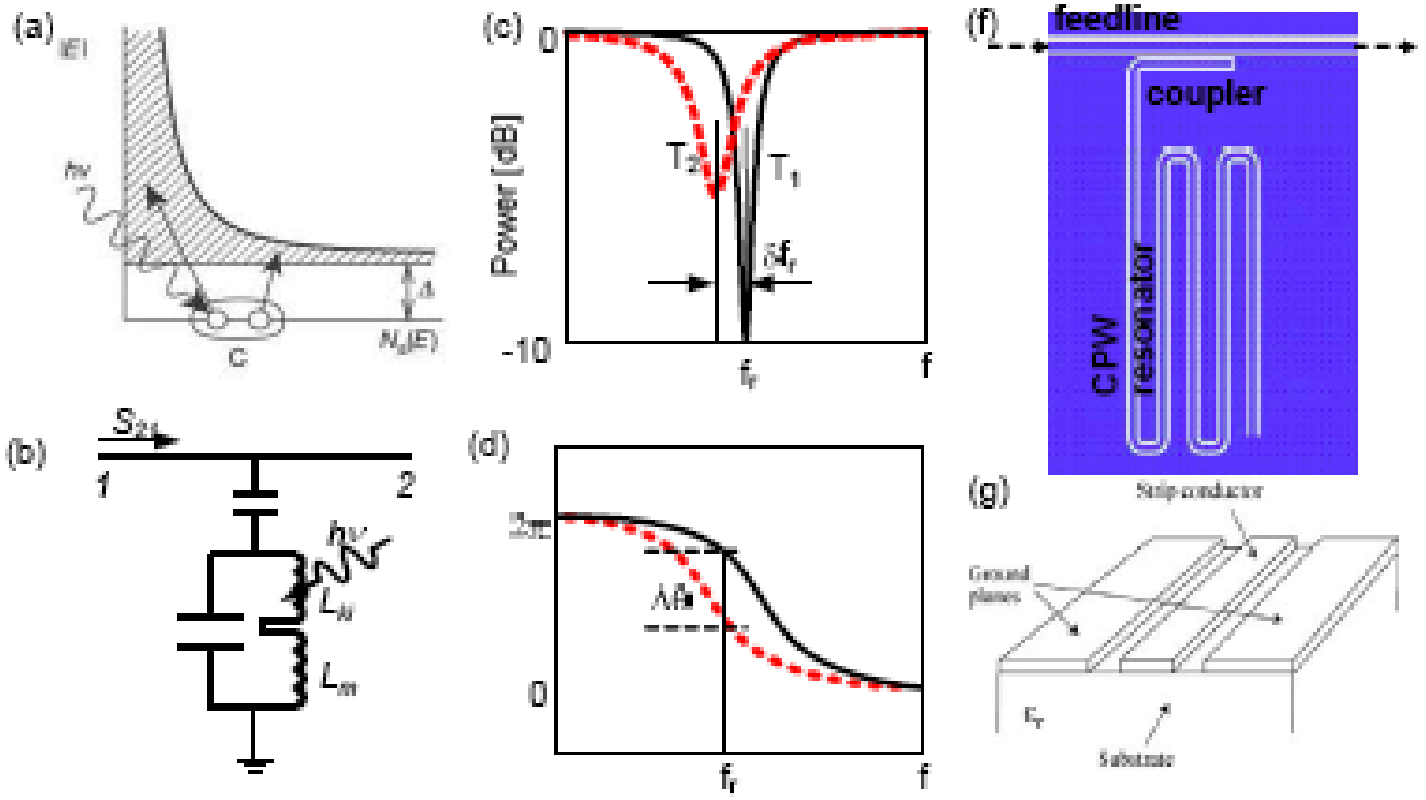

- Photons create quasiparticle excitations
- Quasiparticle number sensed by change in kinetic inductance

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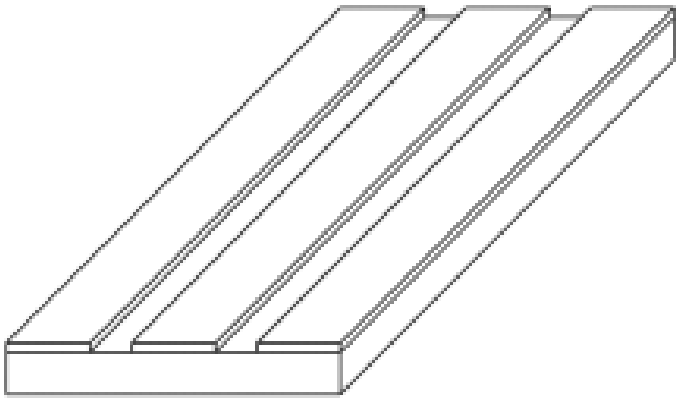
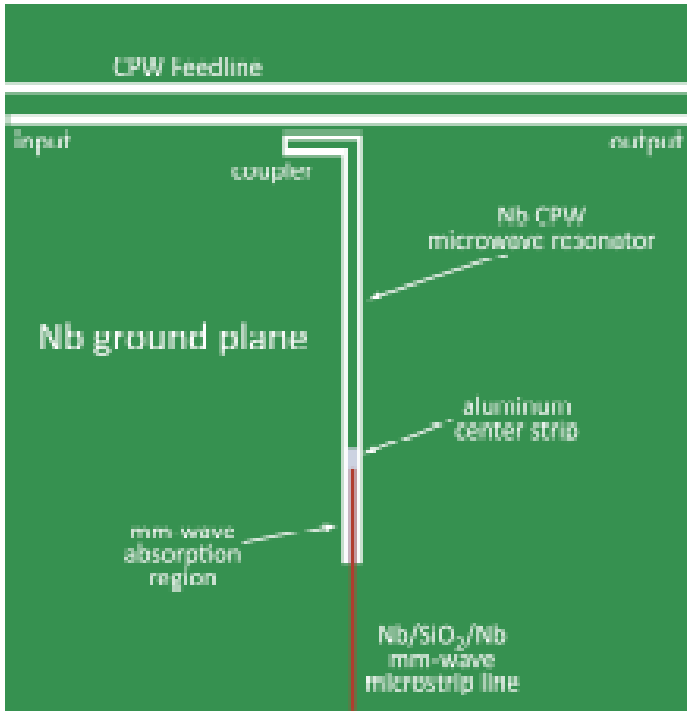


Basic CPW



Basic MKID Configuration

MKIDs are simple to fabricate, and are “drop in” replacements for TES detectors coupled to microstrip circuits.

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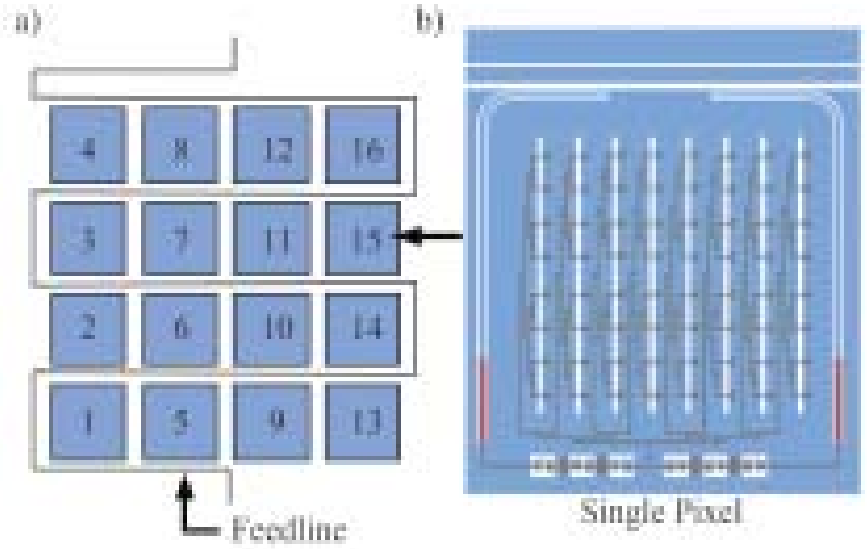

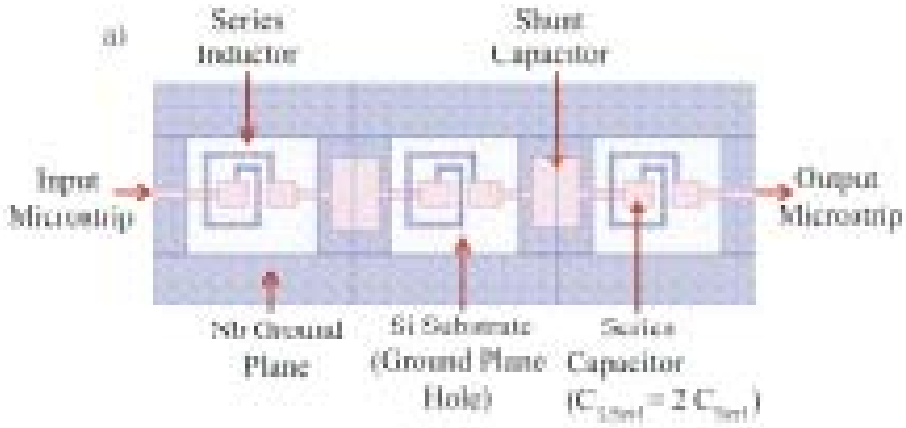

Design of array with two-color pixels used in CSO demonstration

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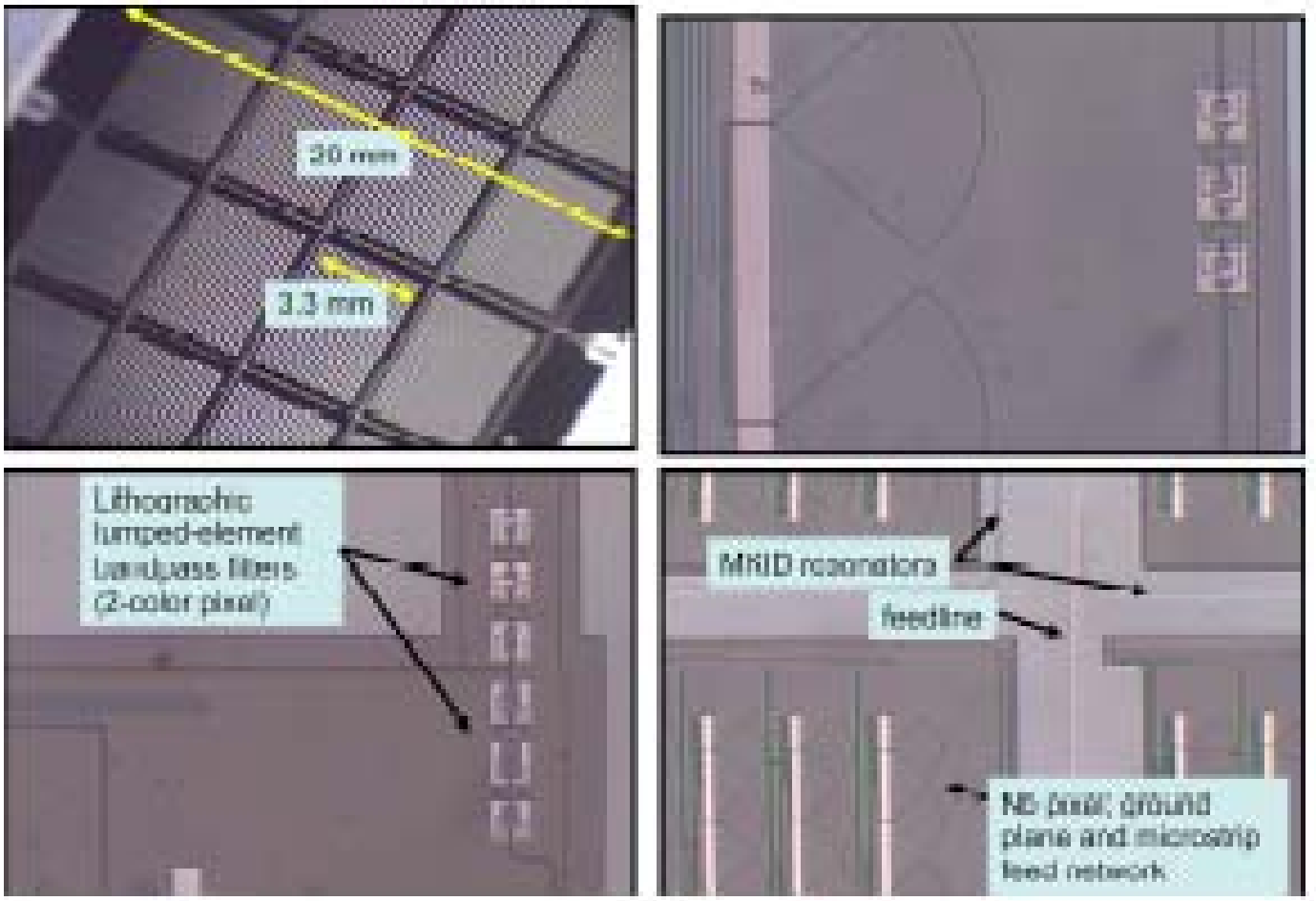

Micrographs of CSO Array

Advantages

- Relatively Low System Cost
  - Simple, robust fabrication process
  - No additional cryo multiplexer required
  - Large multiplexing factors (>1000) possible
  - Drop-in replacement for microstrip-coupled TES

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Disadvantages

- Low maturity level
  - 5 years behind TES development
- Sensitivity lower than ideal bolometer by Sqrt[2]
  - Generation and recombination noise (fundamental)
  - Amplitude readout with present amps results in noise ~2 x BLIP
- Readout electronics for 1000 element arrays not yet complete
  - Expected in 2010

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State of Development and Prospects

- ~TRL 4 following CSO demonstration
- Required development
  - Warm electronics
  - Phase noise
    - Materials, fab processes, design
  - Amplifier performance