



Design of a transition-edge-sensor-based thermal stabilization stage

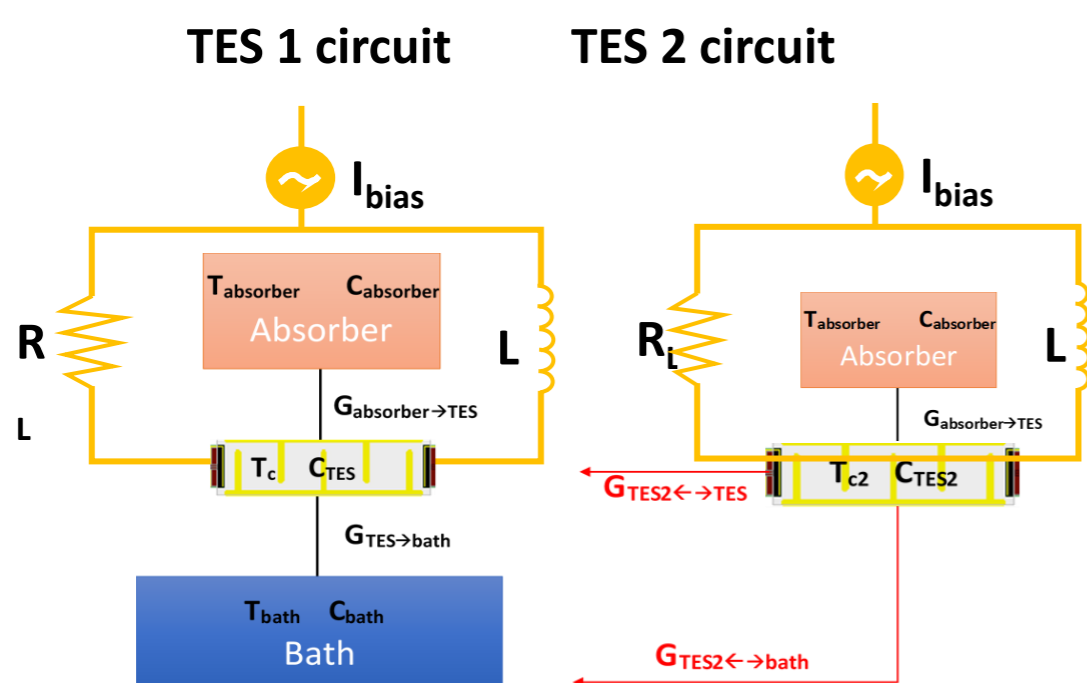
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Abstract

- We designed, modelled, fabricated, and began testing prototypes of a novel dual-TES circuit design: in addition to the usual single-TES bolometer design, we have added a metalized, leg-isolated membrane which houses a second TES and serves as a thermal stabilization stage that can be lithographically integrated with other devices
- Our goal was to examine whether noise reduction in the second stage can reduce thermal fluctuations (e.g. 1/f noise) in the other components by providing a more stable base temperature
- We present fabrication results on the dual-Tc design and testing of the simultaneous biasing of a two-stage, two-TES device. We explore varied heat capacity of the thermally stabilized stage in the single pixel design, and present other designs to evaluate the use of a second stage for multiple pixel arrangements.

Background

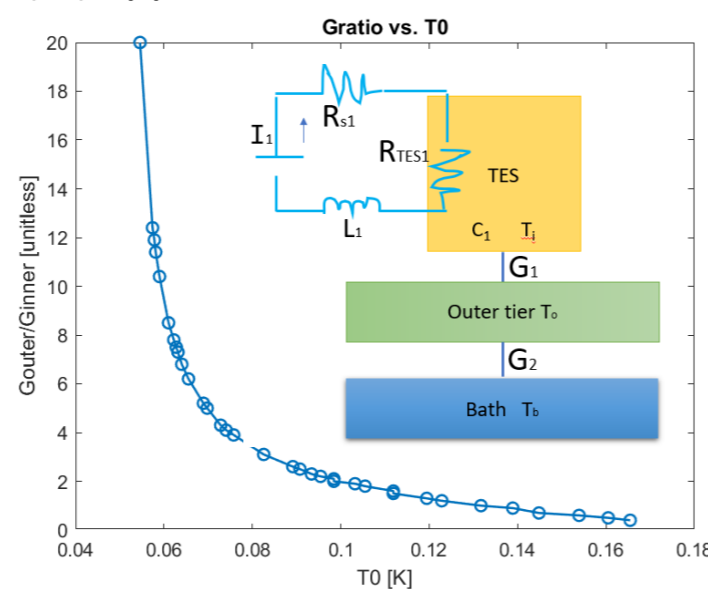
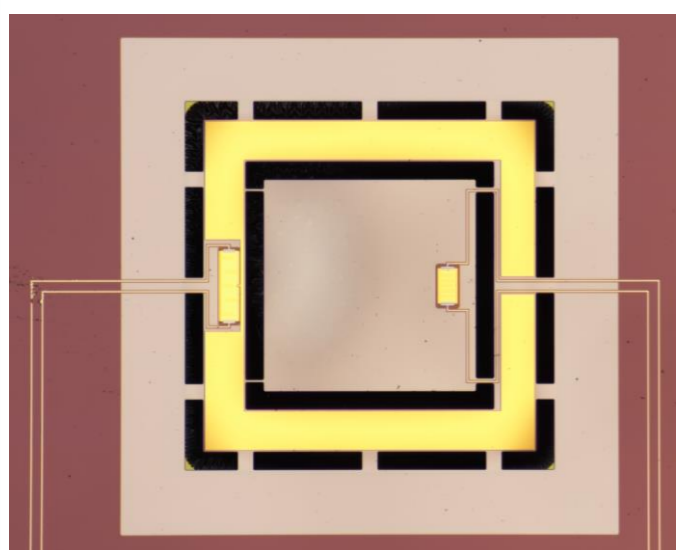
Electrothermal feedback in a TES circuit can be used to suppress thermal fluctuations in the TES and regions in close thermal contact



Integrated electrical and thermal diagram of a two-TES system

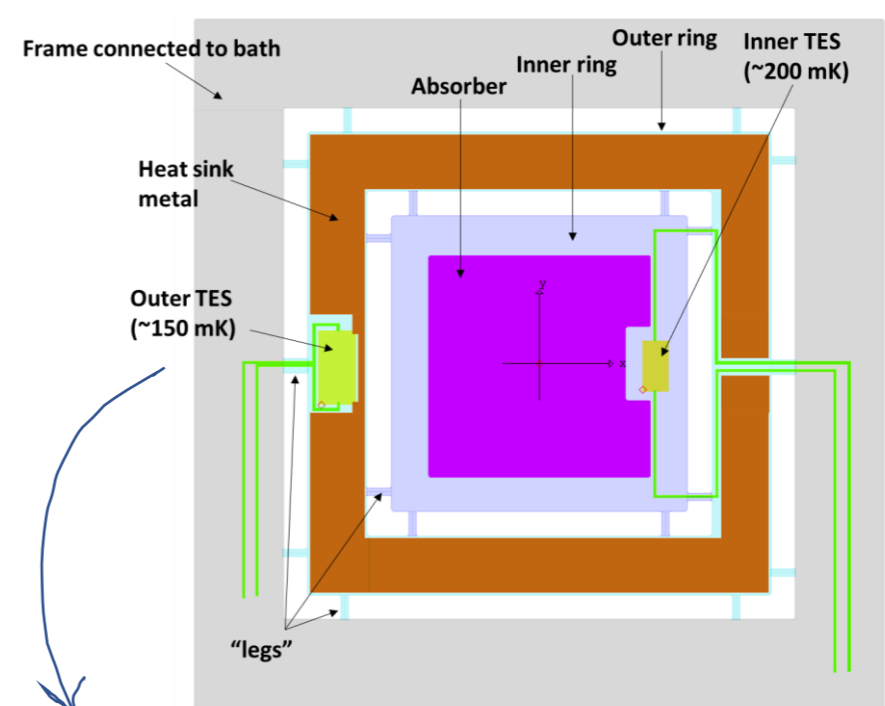
Objective

Develop a model to determine stability criteria for a dual-TES device that is thermally and electrically stable. Apply approach towards the fabrication and testing of superconductive films for the development of detectors used for x-ray or infrared (IR) applications.

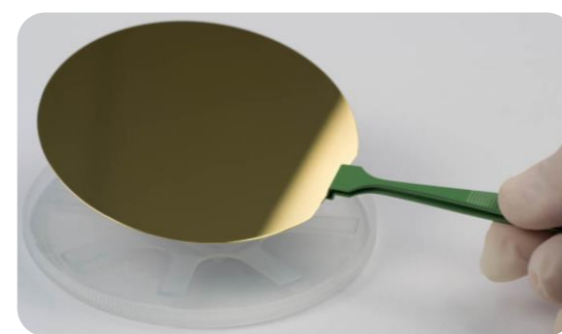


Methodology

Modeling/Design



Fabrication



Testing



- Develop a model to determine stability criteria for a dual-TES device and design test prototypes that vary critical parameters (e.g. heat capacity and thermal conductance, time constants)
- Fabricate prototypes using traditional lithographic techniques
- Test prototypes