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Calibration of a Microfabricated Phonon Spectrometer JARED HERTZBERG, OBAFEMI OTELAJA, RICHARD ROBINSON, Cornell University, Department of Materials Science and Engineering — Non-thermal distributions of phonons may be locally excited and detected in silicon micro- and nanostructures by decay of quasiparticles injected into an adjacent superconducting tunnel junction [1]. Using this technique, narrow frequency bands of phonons may be isolated and applied to investigate phonon transport through nanostructures at sub-kelvin temperatures [2]. In our prototype phonon spectrometer we have demonstrated spatial resolution below 1 micron and frequency resolution of 10 GHz. We describe ways to control the spatial resolution, frequency resolution, frequency range, dynamic range and signal-to-noise ratio in this technique, by using different superconducting materials in the tunnel junctions and by inserting absorber materials into the phonon transmission path. This work is supported by DOE (DE-SC0001086).

[1] H. Kinder. Phys. Rev. Lett. 28, 1564 (1972)
[2] J. B. Hertzberg et al, Rev. Sci. Inst. 82, 104905 (2011).

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