Characterizing a Resonator Bolometer Array

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Rebecca Wernis

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Abstract

High-background applications such as climate monitoring, biology and security applications demand a large dynamic range. Under such conditions ultra-high sensitivity is not required. The resonator bolometer is a novel detector which is well-suited for these conditions. This device takes advantage of the high-density frequency multiplexing capabilities of superconducting microresonators while allowing for the use of high-Tc superconductors in fabrication, which enables a modest (1-4 K) operating temperature and larger dynamic range than is possible with conventional microresonators. The moderate operating temperature and intrinsic multiplexability of this device reduce cost and allow for large pixel counts, making the resonator bolometer especially suitable for the aforementioned applications. A single pixel consists of a superconducting microresonator whose light-absorbing area is placed on a thermally isolated island. Here we present experimental results and theoretical calculations for a prototype resonator bolometer array. Intrinsic device noise and noise equivalent power (NEP) under both dark and illuminated conditions are presented. Under dark conditions the device sensitivity is limited by the thermal noise fluctuations from the bolometer legs. Under the experimental illuminated conditions the device was photon noise limited.

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