Noise Measurements in Hot-Electron Titanium Nanobolometers

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Abstract — We are presenting experimental results on the electrical noise in small titanium hot-electron nanobolometers with the critical temperature above 300 mK. The noise data demonstrate good agreement with the conventional bolometer theory prediction. The noise is dominated by the thermal energy fluctuations (phonon noise) when the operating temperature is set just a few mK below the superconducting transition. The corresponding noise equivalent power (NEP) is about $3\times10\text{-}18$ W/Hz$^{1/2}$ for the smallest measured device. An additional factor of 2-3 reduction of NEP is feasible if the device length and thickness are further reduced. Such a combination of the low NEP and the relatively high operating temperature is attractive for submillimeter low-background applications and has not been achieved with other types of bolometers.

Index Terms — bolometers, superconducting device noise, submillimeter wave detectors, superconducting radiation detectors.

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