Non-Uniform Absorption of Terahertz Radiation in Superconducting Hot-Electron Bolometer Mixers

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***Abstract*—We present an improved hot-spot model for superconducting hot-electron bolometer (HEB) mixers that takes into account the non-uniform absorption of terahertz radiation on the superconducting HEB microbridge. Given the fact that terahertz radiation is absorbed indeed in the region of a superconducting microbridge with its energy gap, which is in connection with the local electron temperature, lower than the photon energy of the incoming radiation, we assume that the absorption of the incoming radiation on a superconducting HEB microbridge is proportional to the local surface resistance, which can be computed in terms of the Mattis-Bardeen theory. With this improved hot-spot model, we found that LO (Local Oscillator)-pumped current-voltage and LO-pumped resistance-temperature characteristics of superconducting HEB mixers below the gap frequency can be precisely modeled.**