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Effects of disorder on performance of 2DEG hot-electron mixer RAHUL RAMASWAMY, KAI WANG, ANDREI SERGEEV, GOTTFRIED STRASSER, VLADIMIR MITIN, University at Buffalo, MATTHEW BELL, ALEKSANDR VEREVKIN, Rutgers University — The hot electron bolometer is a detector of choice to be integrated with quantum cascade laser (QCL) to constitute as a mixer. This pair is a promising candidate for a sensitive terahertz mixer operating at liquid nitrogen temperatures. To get effective coupling to the electromagnetic radiation and to avoid significant kinetic inductance at THz frequencies we use low mobility specially fabricated 2DEG structures. The disorder was introduced by low energy electron irradiation onto the sample by electron beam lithography process. We also reduced the spacer thickness in the AlGaAs/GaAs heterostructures to increase ionized impurity scattering. Our fabricated bolometer micro bridges are 150 μm wide and vary in length from 3 to 20 μm . We investigate electron heating in these devices at THz frequencies and determine basic kinetic and transport parameters, such as electron-phonon relaxation time, electron heat capacity and bandwidths achievable in such mixers.

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