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Terahertz mixing in AlGaAs/GaAs 2DEG hot-electron microbolometers at liquid nitrogen temperatures[1] KAI WANG, RAHUL RAMASWAMY, MATTHEW BELL, ANDREI SERGEEV, ALEKSANDR VEREVKIN, GOTTFRIED STRASSER, VLADIMIR MITIN, University at Buffalo, DAROLD WOBSCHALL, Esensors Inc. — We investigate THz mixing based on electron heating of two-dimensional electron gas (2DEG) in semiconductor mirobolometers. The 2DEG microbolometers were fabricated from AlGaAs/GaAs heterostructures and have dimensions of 3 - 20μm between the Ohmic contacts and 50m in width. Significant efforts were made to get low Ohmic contact resistance for effective coupling to the THz antenna and to the intermediate frequency amplifier. We investigate mixing at subTHz and THz frequencies. In the sub-THz range, a W-band Gunn diode operating at 82 GHz was used as a local oscillator. In the THz range we employ a Quantum Cascade Laser (QCL). The QCL is positioned in close proximity at different locations to optimize electromagnetic coupling. Experiments at sub-THz and THz frequencies give consistent data, which provide evidence that electron-heating is the major mechanism of mixing. Mixing experiments allow us to evaluate the mixer gain bandwidth and conversion loss. The results show that a heterodyne receiver, which combines AlGaAs/GaAs 2DEG hot- electron mixer with a QCL as the local oscillator, has great prospects for THz sensing with high spectral resolution and wide spectral bandwidth.

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