Abstracts

An InP HEMT W-band amplifier with monolithically integrated HBT bias regulation

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This paper presents the results of the first W-band InP-based high electron mobility transistor-heterojunction bipolar transistor (HEMT-HBT) monolithic microwave integrated circuit (MMIC). The InP-based HBT and HEMT devices are monolithically integrated using selective molecular beam epitaxy (MBE). The amplifier demonstrates the highest frequency performance MMIC so far obtained with this technology. A single-stage HBT op amp current regulator is integrated with a single-stage HEMT amplifier in order to regulate and self-bias the MEMT device over process, temperature, and age variations. The HBT regulates the HEMT bias to within 3% of the bias current while consuming only a small fraction of the total dc power. The HEMT W-band amplifier achieves a radio frequency (RF) gain of 8.25 and 5.9 dB at 77 and 94 GHz, respectively. A minimum noise figure of 4.2 dB was also recorded at 93.5 GHz. The RF performance achieved from the HEMT amplifier using the InP-based HEMT-HBT integrated technology is comparable to that of InP-based single-technology HEMT performance.

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