Abstracts

Characteristics of broadband InP millimeter-wave amplifiers for radiometry

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The performance of InP HEMT (High-Electron Mobility Transistor) amplifiers is characterized in a direct detection 3.8 mm receiver over a temperature range of 50 to 300 K. The effects of low frequency noise up-conversion are observed in the total power response. The measured spectrum of gain fluctuations at room temperature is characterized by /spl delta/g/sub n//sup 2/(f)/spl sime/(1 Hz/f)/sup /spl alpha///spl delta/g/sub 0//sup 2/, with an index /spl alpha//spl sime/0.9 and /spl delta/g/sub 0//sup 2//spl sime/6/spl times/10/sup -9/Hz/sup -1/ per device used in the amplification chain. When the devices are cooled to 50 K, /spl delta/g/sub 0//sup 2/ increases by a factor of /spl sime/5. The measured receiver sensitivity is 3 mK Hz/sup -1/2/ at an ambient temperature of 300 K and 0.8 mK Hz/sup -1/2/ at 50 K. The measured sensitivity at room temperature is the best reported for a HEMT direct detection receiver in the 3 mm atmospheric window. At 50 K the observed receiver sensitivity is competitive with the performance of sub-Kelvin bolometric detectors or SIS junctions used for direct detection.

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