High Power Amplifier Modules from 110 to 200GHz

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Terahertz multiplier-based local-oscillator chains offer the highest spectral purity but, because of low efficiencies of the multipliers, require large DC powers to support the millimeter-wave amplifiers that drive them. In addition, the engineering challenge of aligning multiple stages of narrow-band varactor multipliers makes high-power broad-bandwidth sources difficult. Moving the power-amplifier to a higher frequency in the chain can alleviate these issues.

Utilizing Teledyne's InP HBT MMICs process we have developed a high-power amplifier module operating from 115-130GHz [1]. This device produces over 180mW with only 1mW input power and consumes 3.5W of DC power. In conjunction with low-power, broad-band multipliers, this amplifier can replace the first stages of high-power varactor multipliers. This amplifier-based system would consume a quarter of the DC power while still providing 19% bandwidth. In addition to this 115-140 GHz device, other amplifier modules are being developed at 155-180 GHz and 180-210GHz which will be presented at the conference.

For higher-power applications, power-combined modules are also under development. These use a hybrid-coupler corporate combiner architecture to combine four MMICs into a single package. Measurements of a 4-way power combined 130GHz amplifier will be shown at the conference.

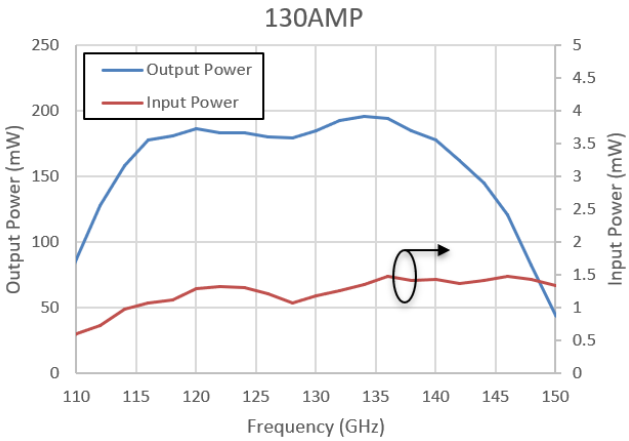

Fig. 1. Measured data from the packaged 115-140 GHz InP HBT MMIC. DC power consumption is 3.5W.

REFERENCES

[1] Z. Griffith, M. Urteaga and P. Rowell, "A 140-GHz 0.25-W PA and a 55-135 GHz 115-135 mW PA, High-Gain, Broadband Power Amplifier MMICs in 250-nm InP HBT," *2019 IEEE MTT-S International Microwave Symposium (IMS)*, Boston, MA, USA, 2019, pp. 1245-1248.

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