

A Schottky Diode Frequency Multiplier Chain at 380 GHz for a gyro-TWA Application

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In this paper, we report on the design of a Schottky diode doubler chain to generate 10 mW over 360-395 GHz to drive a gyrotron travelling wave amplifier (gyro-TWA). This chain consists of two frequency doublers; the first stage is required to handle an input power of 200 mW at W-band. The doubler chain could potentially act as a source to drive subsequent frequency multipliers to produce output power at terahertz (THz) frequencies; this is highly attractive to meet the increasing demand on the local oscillator (LO) systems of THz heterodyne receivers.

The circuit topology of both doublers is based on a balanced configuration [1]. The physical and geometrical parameters of the diodes in both doublers were optimized to ensure reasonable conversion efficiency and sufficient output power at each stage. For the first stage, the diode chip with 6 anodes was designed to be soldered onto a 50 μm thick aluminum nitride (AlN) substrate, which provides better heat spreading than quartz due to its higher thermal conductivity. As shown in Fig.2, with an input of 200 mW the first stage doubler can produce around 50 mW of power to drive the second stage. The second doubler is an integrated structure on 12 μm thick GaAs with two diodes in an anti-series configuration. The fabrication is currently on-going and the measurements results will be presented at the conference.

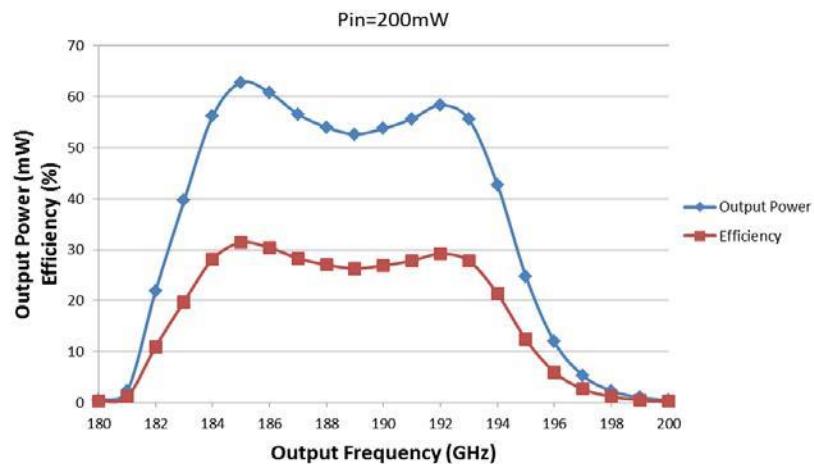


Fig.1 Predicted performance of the first stage doubler.

This work is carried out at the STFC-Rutherford Appleton Laboratory and is supported by the Engineering and Physical Sciences Research Council (EPSRC), UK.

References

1. N. Erickson, "High efficiency submillimeter frequency multipliers," in IEEE MTT-S Int. Microwave Symp. Dig., 1990, pp. 1301–1304.