Abstracts

Cooled Schottky Varactor Frequency Multipliers at Submillimeter Wavelengths

J.T. Louhi, A.V. Raisanen and N.R. Erickson. "Cooled Schottky Varactor Frequency Multipliers at Submillimeter Wavelengths." 1993 Transactions on Microwave Theory and Techniques 41.4 (Apr. 1993 [T-MTT]): 565-571.

The efficiency of a Schottky varactor frequency multiplier at submillimeter wavelengths can be increased by cooling the diode. The main reason for better efficiency is the increased mobility of the free carriers. Because of that the series resistance decreases and the efficiency can be expected to increase as much as a few dB at low input power levels. At high output frequencies and at high power levels the efficiency of the multiplication is decreased by the current saturation, because the junction capacitance cannot be pumped effectively. When the diode is cooled the maximum current of the diode increases and much more output power can be expected. There are also slight changes in the I-V characteristic and in the diode junction capacitance, but they have a negligible effect on the efficiency of the multiplier. The theoretical maximum output power at near 1 THz is calculated to increase by about 10 dB from 50 µW to 500 µW, when the multiplier chain is cooled to 77 K. However, cooling to 77 K is not necessary, because considerable improvement in the efficiency may be achieved by cooling to 150 K, readily available in space by passive cooling.

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