Published in: *Advanced Properties and Processes in Optoelectronic Materials and Systems (APROPOS 18): book of abstracts.* Center for Physical Sciences and Technology, Vilnius, Lithuania, 2022, p. 91. ISBN 978-609-96355-0-7.
https://www.ftmc.lt/uploads/APROPOS18/APROPOS18_abstract_book_ISBN%20978-609-96355-0-7.pdf

S3-P4

270-320 GHz Low Barrier Schottky Diode Mixer

Javier Martinez[1], Diego Moro[1] and Oleg Cojocari[1]

[1]ACST GmbH, Josef-Bautz Strasse 15, 63457 Hanau, Germany.
Email: javier.martinez-gil@acst.de

We report the fabrication of a sub-harmonic Mixer at 270-320 GHz, featuring discrete anti-parallel low barrier Schottky diode. The mixer presents a typical Noise Figure of 16 dB in the middle of the band and lower than 18dB all over the band. The reduction in local oscillator (LO) input power requirements is as low as 170 µW for optimal operation conditions. The mixer noise performance remains low when additional LO input power of 500 µW is applied. Both the mixer and the diodes have been fully designed and fabricated at ACST GmbH.

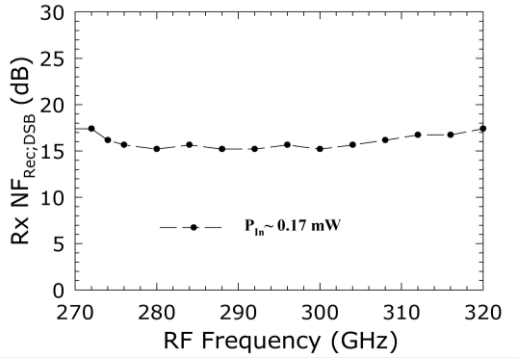

Fig. 1 DSB Noise Figure of the receiver with a constant LO input power of 0.17 mW.

The state of the art of SHM at 300GHz presents LO powers between 1-4mW [1,2] thus, we present a SHM which only requires 170 µW of LO power, keeping its main features using 10 times less power. This reduction of LO power requirements in the receiver has a direct impact in the total DC power consumption of the LO source. This also opens the possibility to offer simpler and more compact receivers in the THz range.

The designed and fabricated 270-320 GHz SHM requires LO power levels comparable to SIS and HEB technologies [3], but it can operate at room temperatures and performs noise levels acceptable for a wide range of applications.

The double side band (DSB) Noise Figure of the tested receiver is illustrated in Fig. 1. It has been obtained using the Y-factor measurements [4]. The receiver DSB NF includes a WR-3.4 horn antenna, the low barrier mixer and a ~ 2 dB NF LNA in the 2-18 GHz bandwidth. The Y-factor was measured using a power sensor head in the 5 MHz to 50 GHz. The NF of this receiver remains constant and flat in all the band, being the typical 16 dB with a minimum of 15dB and maximum of 18 dB.

REFERENCES

[1] Bertrand Thomas, "Low-Noise Fixed-Tuned 300–360-GHz Sub-Harmonic Mixer Using Planar Schottky Diodes", IEEE Microwave and Wireless Components Letters, Dec. 2005.
[2] Cheng Guo, "A 290–310 GHz Single Sideband Mixer With Integrated Waveguide Filters", IEEE Transactions on Terahertz Science and Technology, Jul. 2018.
[3] Shoichi Shiba, “Temperature Dependence of HEB Mixer Performance”, 19th International Symposium on Space Terahertz Technology, April 2008.
[4] Shunyou Qin, “Uncertain analysis of antenna noise temperature measurement using Y-factor method”, 11th International Symposium on Antennas, Propagation and EM Theory, Oct. 2016.

DOI: 10.17185/duepublico/78066
URN: urn:nbn:de:hbz:465-20230403-095322-6

Martinez, J., Moro, D., & Cojocari, O. (2022). 220-330 GHz Low Barrier Schottky Diode Mixer. In: *Advanced Properties and Processes in Optoelectronic Materials and Systems (APROPOS 18): book of abstracts.* Center for Physical Sciences and Technology, Vilnius, Lithuania, p. 91. ISBN 978-609-96355-0-7.