ACST
Technology Solutions
for Terahertz Electronics

A European Training Network
TERA OPTICS

220-330 GHz Mixer

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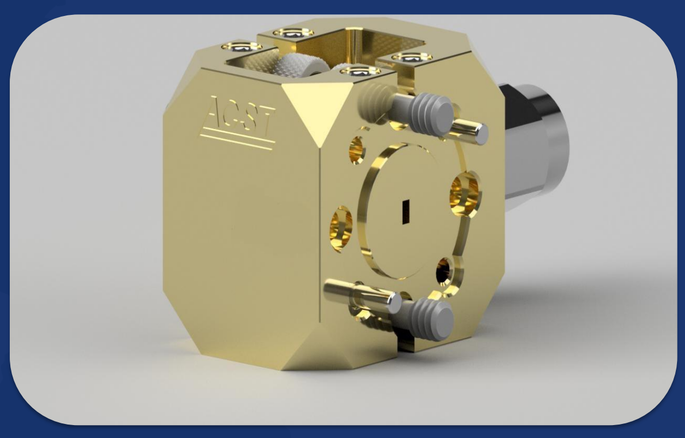
Introduction

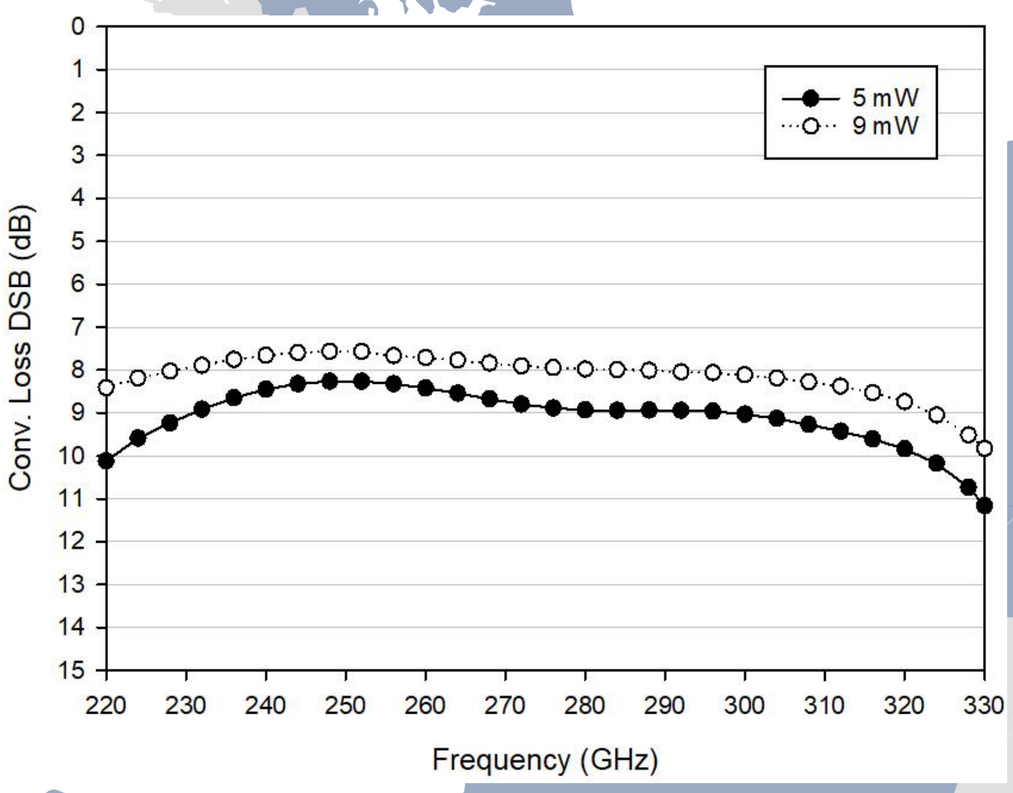
Sub-harmonic Mixers (SHM) based on Schottky diodes can operate either at low frequencies and beyond 2 THz, feature which makes them suitable for a wide range of applications. SHM are crucial components in heterodyne receivers, being their role to mix the received THz radiation with a THz reference signal provided by a Local Oscilator (LO), and down convert it into an intermediate signal able to be handled by commercial tools or amplifiers. Due to the development of the technology, the frequency and bandwidth of many applications is increasing, leading the research of a robust, reliable and high-performance broadband mixers.



In this poster we present the Conversion Loss and the Noise Figure of the designed and simulated mixer when the LO input power varies from 9 to 5 mW.

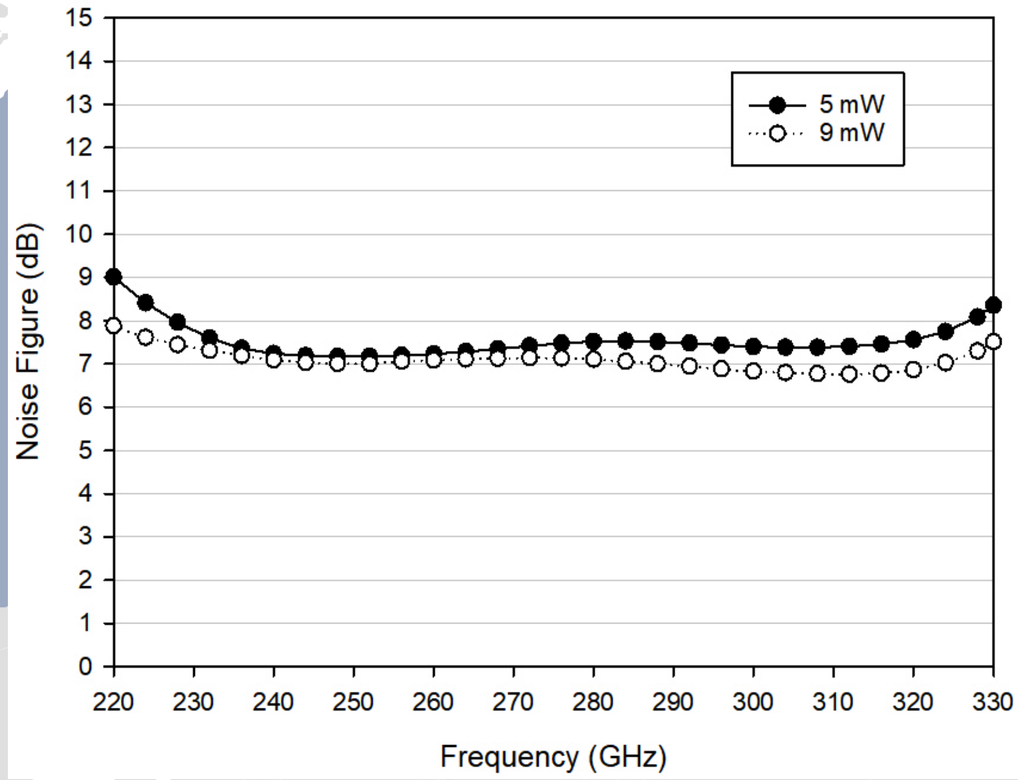
Conversion Loss

ADS has been used to calculate the ideal performance of a pair of Schottky diodes, as well as the performance of the mixer. Non linear simulations gave an optimum LO power of 9 mW, but the figure below illustrates how reducing the power by 4 mW the performance is reduced by 1-1.5dB, and how the mixer still has great values all over the band, demonstrating the flexibility of the design in terms of LO powers.



Noise Figure

When reducing the LO power, the Noise Figure does not increase uniformly all over the band. An interesting phenomena is happening; at lower and higher frequencies the NF has increased considerably more than at central frequencies, meaning the lower the power the lower the bandwidth. If we continue reducing the LO power, the bandwidth continue decreasing until becomes completely narrowband, centred in 270 GHz.



Conclusions and future work

A high performance full-band Mixer has been designed at ACST. In this poster it is shown the impact of lower the LO power in both, Conversion Loss and Noise Figure, demonstrating the high flexibility of the design while changing the LO power in 2.5dB.

The State-of-the-Art of SHMs at 300GHz presents maximum bandwidths of 70 GHz, featuring Conversion Loss between 6 and 10 dB using 3-4mW of LO power. We show the performance of a full-band W3.4 Mixer, highlighting Conversion Efficiencies between 8.5 and 11 dB with 5 mW and 7.5 and 9.7 dB with 9 mW, values comparable with the State-of-the-Art but with almost twice the bandwidth.

The mixer is not manufactured yet, but after its fabrication, experimental results will be compared with simulated values.

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