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Development of an integrated Schottky based heterodyne THz receiver at 300 GHz using power combining approach.

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The aim of this research is to develop a heterodyne THz receiver using a sub-harmonic Schottky mixer pumped by a photonic local oscillator for detection above 300 GHz.

The photonic local oscillator (LO) pumping the mixer will be based on Uni-travelling carrier (UTC) photodiodes (>75 GHz). The photodiode output will then be doubled using a frequency multiplier to generate the LO signal for the sub-harmonic mixer. To produce a suitable amount of LO power while overcoming the frequency multiplier losses, power combining will be implemented to the UTC photodiodes outputs. The mixer for down-conversion will use the Schottky barrier diode, which offers excellent sensitivity for THz detection at room temperature with wide Intermediate Frequency (IF) Bandwidth.

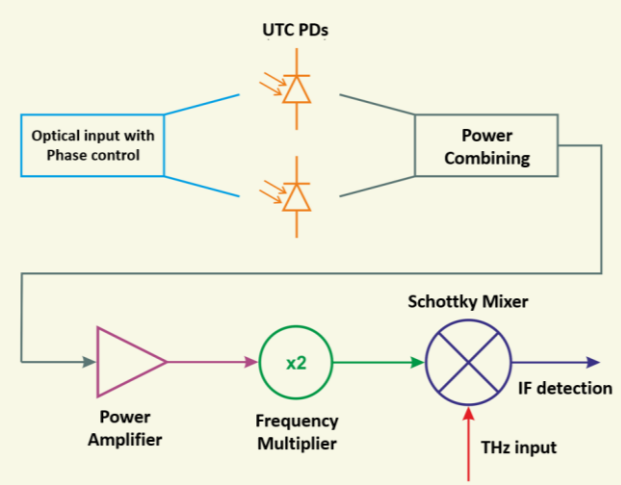

Fig. 1 Schematic of the Integrated heterodyne THz receiver (>300 GHz)

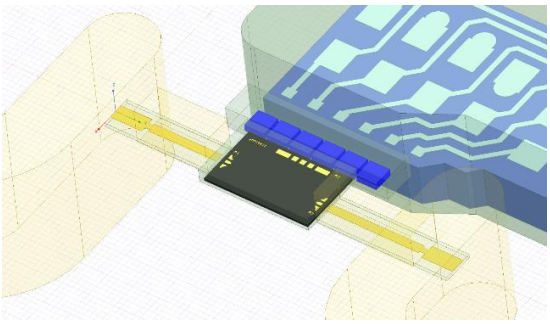

Fig. 2 WR10 Waveguide to micro-strip transition for MMIC Power Amplifier in the receiver block.

The components of the receiver viz. power combined UTC photodiodes, frequency multiplier, Schottky mixer, bias unit, etc. will be incorporated into a single device block using hybrid integration. Such integration would improve the overall performance of the receiver through optimization of interconnection, amplification, etc. and miniaturize the device, making it suitable for several applications.

The project objectives are to study the receiver performance characteristics improvement due to the photonic local oscillator approach in contrast to the conventional electronic sources, and the benefits of integration in the receiver device.

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