

Full frequency duplex link in the 300 GHz band

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Abstract—We present here a demonstration of THz transmission system enabling a full frequency duplex link in the 300 GHz band. This system is coupling a super-heterodyne architecture, E-band modems and duplexing system at 300 GHz.

Keywords — THz, wireless millimetre/sub-mm technologies.

I. INTRODUCTION

Terahertz (THz) transmissions systems are getting more and more attention for the 6th generation of cellular wireless communications requiring very high data-rate backhaul. Many system approaches are considered ahead of these future backhails, but almost all demonstrations rely on unidirectional links. We propose here the validation of a full duplex system and demonstrate a full-duplex link on a single antenna pair.

II. LINK ARCHITECTURE AND PERFORMANCE

The link architecture is based on a super heterodyne approach which is able to up-convert traditional backhauling frequencies (< 100 GHz) up to the THz

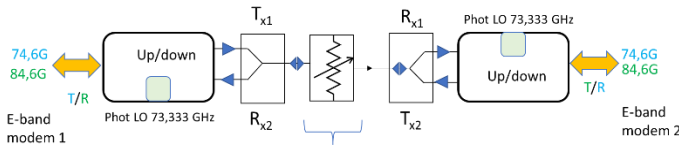


Figure 1: System architecture: two E-band modems with 10 GHz frequency spacing (74.6 and 84.6 GHz) are up/down converted into the 300 GHz band (295 and 305 GHz). The local oscillators are in this case achieved using a photomixing approach to avoid spurious tones in the LO signal at 73.333 GHz.

range and thus enabling channel aggregation. It was first demonstrated in [1], then it was shown that this approach enabled to meet the new IEEE 802.15.3d THz communication standard [2]. Targeting real implementation of THz backhails in super heterodyne architecture, it is relevant to make the system compatible to a single antenna pair to simplify the alignment constraints for the expected outdoor use cases. This can be achieved with a duplexing system as shown in the figure 1. In this figure, a set of two up/converters are used to reach the 300 GHz band, where $f_{\text{THz}} = 3 \cdot f_{\text{LO}} + f_{\text{IF}}$, with $f_{\text{LO}} = 73.333$ GHz, and $f_{\text{IF}} = 74.6$ GHz or 84.6 GHz. The THz link was then successfully tested in an outdoor configuration with a pair of two Cassegrain antennas (62 dBi) over a 645 m distance, with a QAM-32 performance.



Fig. 2. Outdoor validation of the duplexed link over a 645 m distance.

Reference:

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