

20 Gbit/s 306 GHz link enabled by Yagi-Uda antenna

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We report on the use of a Yagi-Uda antenna on polymer substrate used in a 306 GHz - 20 Gbit/s real-time data link for indoor applications. The Yagi-Uda antenna is described and the validation of the THz link is obtained in amplitude modulation mode and using QAM-16 signals (32 Gbit/s).

The Yagi-Uda antenna used in the THz link is fabricated on a cyclic olefin copolymer (COC). This antenna consists of a coplanar waveguide (CPW) fed Yagi-Uda antenna employing 20 directors. The CPW ground planes act as reflectors. The circuit lies on a 110- μ m-thick commercially available COC 6013 membrane. The design achieves a directivity higher than 15 dBi [1].

To enable validation of the THz link using the Yagi-Uda antenna, a dual-frequency laser system is amplitude modulated using a Mach-Zehnder modulator (MZM), followed by an erbium-doped fiber amplifier (EDFA). This optically modulated signal is then injected in an untravelling carrier photodiode (UTC-PD) feeding a to a 300 GHz CPW probe (Cascade Infinity type [2]). The signal is radiated in free-space by the Yagi-Uda antenna (figure 1), without any external lenses to collimate the signal. The THz link is 0.2 m, and the receiver (associated with a 25 mm lens) is composed of combination of amplifiers and Schottky-barrier diode (Zero-bias Detector, ZBD). Additional amplifiers used after ZBD are required to feed the bit error rate tester, and the BER measurement is done in real-time. The figure 1 is showing the real-time obtained BER performance, highlighting the performance of the Yagi-Uda antenna. The first curve (stars) is the performance obtained with the UTC-PD feeding the receiver directly, and square one is the performance of the whole data-link.

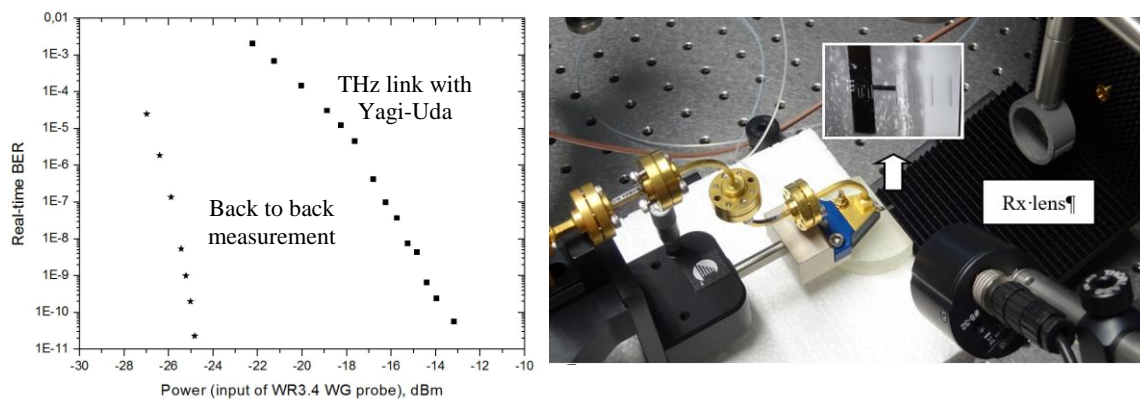


Figure 1. Left: Realtime measured bit error rate (BER) of the Yagi-Uda 306 GHz link (20 Gbit/s). Right: view of the experimental setup of the THz link.

References

- [1] Fabio Pavanello, Guillaume Ducournau, Emilien Peytavit, Sylvie Lepilliet, Jean-François Lampin, *High-gain Yagi-Uda antenna on cyclic olefin copolymer substrate for 300 GHz applications*, IEEE Antennas Wirel. Propag. Lett., 13 (2014), doi: 10.1109/LAWP.2014.2322628.
- [2] <https://www.formfactor.com/product/probes/infinity/infinity-waveguide-probe/>, accessed October 10th, 2020.