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High-speed terahertz communication in the W and J bands

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Recent years have witnessed a growing interest in the terahertz and sub-terahertz frequency ranges, driven by the increasing demand for higher data rates and reliable wireless connectivity beyond the capabilities of optical, infrared and millimeter wave technologies. This spectral region offers wide available bandwidth while preserving more favorable propagation characteristics than optical systems [1, 2].

Despite significant attenuation due to atmospheric water vapor, transmission windows can be identified in which links spanning several kilometers are feasible [3]. In particular, the W (75–110 GHz) and J (220–330 GHz) bands are highly promising due to a well-balanced combination of wavelength, beam divergence, manageable atmospheric attenuation, and the availability of efficient sources and detectors.

In this paper, we report recent progress in high-speed terahertz communication links developed at the Military University of Technology. Targeting specific application niches that benefit from highly directive communication with reduced detectability and increased resistance to eavesdropping and jamming, we investigate several types of THz data links differing in transmission range, data rate, modulation format, and system complexity. Measurements were conducted over various distances, data rates, and attenuation conditions. Error-free communication was achieved over distances up to 750 m between the transmitter and receiver, with data rates reaching 1.5 Gbit/s.



Fig. 1 Outdoor measurement setup for the longrange W-band

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