

TERAHERTZ TECHNOLOGY

SIMULATION OF A TERAHERTZ BAND WIRELESS TELECOMMUNICATION SYSTEM BASED ON THE USE OF IR-UWB SIGNALS

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A simulation model of a terahertz pulsed ultra-wideband communication line with a detailed description of its main components is presented. The results of the study of the essence of the change in the temporal shape (i.e., distortion) of the IR-UWB signal of a picoseconds duration at its transmission via an idealized model in the THz band (from 110 to 170 GHz) with known parameters are given. For this purpose, simulation was carried out of a terahertz pulse radio communication system of the "point-to-point" type. If necessary, on the basis of the obtained research results, it is possible to formulate the requirements for the parameters of a THz radio link that will be designed, which provide an acceptable level of distortion. The Visual System Simulator software AWR Microwave Office ver.12 by National Instruments, which has a convenient interface and the necessary functionality for conducting low frequency/high frequency/superhigh frequency studies at the circuit diagram and system engineering levels, was chosen as the simulation environment. An idealized simulation model of a THz radio link is built on the basis of the parameters and block diagram of the layout of the experimental model of the THz transceiver developed by the authors [1-9,17-19]. The results of the study on the transmission of a UWB signal of picoseconds duration through an idealized radio channel model of the terahertz channel from 110 to 140 GHz show that the main type of distortion of the temporal pulse shape is its expansion from the initial duration of 140 ps to 250 ps, which is primarily due to the limitation of the bandwidth in the low pass filter and bandpass filters of the transmitting and receiving paths.

KEY WORDS: terahertz frequency band, radio relay communication lines, pulsed ultra-wideband signals, transmitter, block diagram of a simplex radio communication system, simulation model