Bachelor Thesis

Comparison and Design of Nonlinear Equalizers for THz Communications in Offline Digital Signal Processing

Karlsruhe Institute of Technology

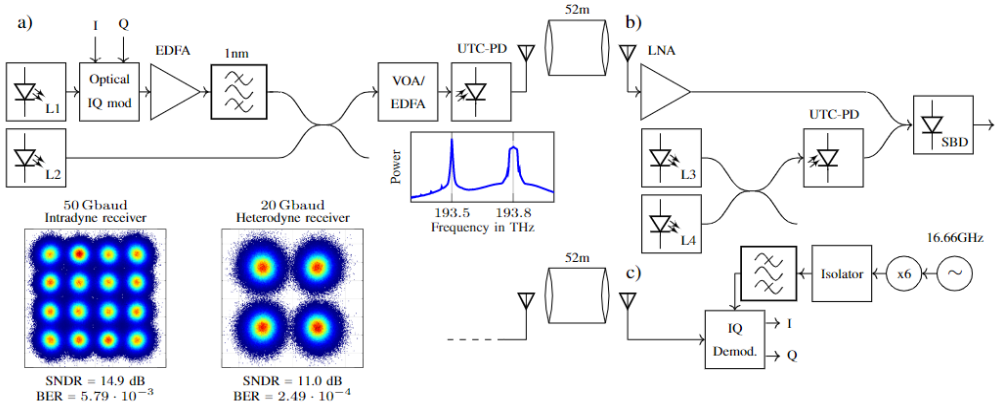
Over the past few years, the demand for higher data rate wireless communications for personal and industrial applications has increased. To meet this demand, the upcoming 6th generation standard considers frequencies in the range of 250-320GHz to provide bandwidth up to 70GHz. The vision is to achieve data rates of up to 250 Gbit/s per direction and polarization. In order to achieve these high rates, the optoelectronic and electronic component impairments and nonlinearities, as well as the channel impulse response have to be equalized in digital signal processing (DSP). The goal of this thesis is to investigate the performance differences between linear and nonlinear equalizers for THz applications. Besides studying existing equalizers, the target is to implement the most promising ones in MATLAB for offline DSP and evaluating the performance on measurements.

Tasks:

- Research and implementation of (non-)linear equalizers in MATLAB for offline DSP
- Evaluate the performance of the equalizers based on an experimental setup.

Requirements:

- Experience in MATLAB
- Knowledge in optical/electrical communications



Structure of the optoelectronic THz transceiver. The photonic transmitter in a). It consists of two lasers L1 and L2, an optoelectronic IQ modulator, an erbium-doped fiber amplifier (EDFA), a 3dB coupler, a variable optical attenuator (VOA) and a uni-traveling carrier photodiode (UTC). The photonic single-ended heterodyne receiver in b) consists of two lasers L3 and L4, an optical and an electrical 3 dB coupler as well as a UTC, a Schottky barrier diode and a low noise amplifier (LNA). The intradyne receiver in c) consists of an integrated MMIC demodulator and LNA, an electrical 16.66GHz oscillator, a x6 frequency extender, an isolator, and a bandpass filter. The inset spectrum in d) shows the optical power spectrum in front of the UTC.

Interested? For more information contact:

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