

2. Abstract

For my thesis project I chose the title Wireless Data Architecture in IoT Systems, within which I will focus on LoRa communication. The reason for choosing this topic is that wireless communications, IoT and M2M technologies are becoming more widespread and available today. These have become more and more affordable over the last year, as technology has advanced. In my work I outline Industry 4.0, IoT technology, then as the title of my topic demonstrates, the LoRa communication. The main guideline will be a detailed presentation of this communication, which will show the block diagram of the RF module, the functions of the parameters encountered during the communication, the analysis of the applied signals and a system-level analysis. Before doing so, the various transmitter and receiver architectures are analysed. After that, a LoRa module and its transmitting and receiving architecture are presented. I present their advantages, disadvantages, block diagrams and their explanations. Communication is shown, sending a data packet, evaluating parameters during transmission and the components that are needed during transmission and reception. In addition, I discuss the parameters needed to reach the LoRa communication range and the applicability of this technology.

In addition, implementation of Matlab-based simulator including a channel model will be described. Its main task will be to demodulate the signals received during LoRa communication. Since the LoRa Modem supports both FSK and LoRa modulation, I place particular emphasis on FSK modulation. I will mention the coherent and non-coherent receiver characteristics, which is an important feature of the receiver. After demodulating, I determine the bit-error-ratio (BER) based on the recovered bit stream at the receive side and the a priori known transmitted bit sequence as a function of the signal-to-noise ratio (SNR), i.e., I plot the BER curve.

Due to the epidemiological situation, I was unable to do my last task as laboratory conditions and device access were not available to me. The task is to examine a multipath signal, similarly to the previous one, only here the target is to mix 3 signals, where several parameters and characteristics can modify the measurements and calculations.