![Fachhochschule Lippe und Höxter University of Applied Sciences]

Department of Electrical and Information Engineering

Master Thesis
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Performance Investigation of Chirp Spread Spectrum Systems for Industrial Applications

Abstract

Chirp spread spectrum (CSS) is a new modulation technique introduced by Nanotron Technologies. The standard IEEE 802.15.4a incorporated it as an alternative physical layer (PHY) to IEEE 802.15.4 recently. The industrial applications of chirp spread spectrum (CSS) systems are studied in this thesis. A Matlab/Simulink simulation was developed to investigate chirp spread spectrum systems. For real time investigation of different communication parameters a measurement setup was designed. The measurement setup includes two locally designed boards with nanoNET TRX transceiver and HCS12 microcontroller soldered on each of these, one used as the master and the other as the slave station. ImageCraft C is used to develop software for both master and the slave station. A series of tests was conducted in the presence of different interferers like FSK, FHSS, WLAN, microwave oven and Zigbee in different lab and factory environments to measure *bit error rate* (BER), *jitter*, *packet delay* (PD) and *packet loss rate* (PLR). The report presents theoretical background of CSS and explains how the CSS Matlab model works. A comparative analysis of results obtained from tests is also presented. Results of real time tests are not only compared with each other but also with the simulated results. The overall performance of CSS is also compared with other commonly used technologies in industrial applications. The document comments on the performance of CSS and its effectiveness in industrial systems.

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