

Master 2020

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**Realisation of a Small Satellite Receiver Front-End Software
Defined Radios.**

ABSTRACT - Masterthesis

Interest and activities in the small satellite are growing exponentially and are becoming a way to conduct more affordable science and technical missions. Although the targets of these missions are becoming more ambitious, it is still difficult to increase the number of communication windows, to support multiple signals and to increase data rates through reliable inter satellite ground connections to the Earth. Also, there are many other things which leads to further regulatory issues. Present communication systems as well as radio signal processing IP cores are not able to overcome these problems completely. One approach to overcome these issues is to deploy satellites by utilizing a Software Defined Radio (SDR). SDR is a crucial aspect for the implementation of various software that allows a communication system flexible and multifunctional without changing any piece of hardware or functionality.

This thesis work examines the design of small satellite system by using Software Defined Radio. In the first part of thesis work the simulation of complete transceiver system will be carried out, the simulation will be started from the existed transmitter concept designed in the former master thesis. Then modulation and demodulation will be performed by using few popular modulation techniques alongside setting the suitable instrument arrangement, that is capable of transmitting a reference signal and analysing the demodulated signal. PlutoSDR (AD9363) hardware will be chosen since the German Aerospace Center (DLR) has already carried out few radiation tests with the similar SDR hardware (AD9361). Then the PlutoSDR will be tested for observing the performance of SDR hardware for further system implementation. Later, PlutoSDR hardware will be employed along with GNU Radio framework in order to develop a system which is capable of transmitting and receiving the real data in the form of image, text or bits over the air. Finally, by using two PlutoSDRs one at the transmitter side and another at the receiver side test will be carried out to make sure the designed system is capable of transmitting and receiving real data over the air and can be implemented into the small satellite missions.