UNIVERSITÄT
DUISBURG
ESSEN

Fachgebiet Hochfrequenztechnik

H F T

Fachbereich Ingenieurwissenschaften
Abteilung Elektrotechnik und Informationstechnik
Institut für Nachrichten- und Kommunikationstechnik

Prof. Dr.-Ing. K. Solbach
Prof. Dr.-Ing. A. Beyer

Studienarbeit / Bachelorarbeit

Aufgabe der Bachelorarbeit

im Studienprogramm

International Studies in Engineering (ISE)

für: Herrn Sherwood **Amankwah**

gestellt von: Prof. Dr.-Ing. K. Solbach

Fakultät für Ingenieurwissenschaften - Hochfrequenztechnik

Thema: **Local Oscillator for Zero-IF Direct Conversion Receiver**

In project of a zero-IF direct conversion receiver for the short-wave frequency range, a local oscillator is required to pump the RF mixer. The project description is given in a paper by Rick Campbell, originally in QST August 1992 and translated to German in CQ-DL 10-2004 to 12-2004. The paper describes a conventional LC-oscillator with varactor tuning and special components to reduce frequency drift from the start. The paper also gives a hint that a digital solution in the form of a Digital Direct Synthesis (DDS) circuit also is available to the radio amateur.

Task

The thesis task is to build and test the LC-oscillator for the 7 MHz-band and to compare the RF properties of this oscillator with the properties of an inexpensive DDS circuit available at the laboratory.

In particular, the task is to:

- Give a short description of the two types of oscillator circuits and explain the principles of operation for both
- Lay-out a printed circuit board for the LC-oscillator
- Assemble the complete circuit and test for functionality
- Determine the tuning characteristic of frequency versus varactor voltage
- Make measurements of frequency stability, i.e. drift over time and temperature, supply voltage pulling, noise and harmonic spectrum
- Repeat above measurements of frequency stability using the DDS circuit
- Compare the performance of the two oscillator circuits and determine critical features

Finally, the thesis results have to be presented in a technical talk.