Research Group of Sensor System Electronics

Prof. Dr.-Ing. Andreas Bahr

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Hiwi Position or Master Thesis under the theme:

"A digital quadrature demodulation read-out system for magnetic field sensor"

Introduction

The signals emitted from humans in form of magnetic stray fields are of very low amplitude (amplitudes on the order from 0.1 to 100 pT depending on the area of the body) and the frequencies of interest range from DC to below 1 kHz, which is typically the ELF (extremely low frequency) to VLF (very low frequency) frequency regime.

A cantilevered mesoscopic ME structure is electrically excited in a mechanical resonance lying in the medium wave regime, at typically from 510 kHz to 530 kHz exhibiting a mechanical quality factor of about 1000.

The limit of detection (LOD [T/√Hz]) is typically measured by an Instrument on the lab with low noise, where an analog implementation as proof of concept to minimize the equipment required for measurements were presented. The idea of this project is exploring a digital approach of the demodulation for these sensors.

Main goals:

1. Present a method to justify the effect of applying square signal or sinusoidal signal for the mechanical frequency of the sensor to measure the LOD (T/√Hz).
2. Develop an architecture as proof of concept for the digital demodulation sensor based on the architecture as proof of concept of the analog demodulation sensor in the laboratory.
3. Model the system on FPGA to verify the functionality with real sensors and define the parameters required to design a board.
4. Design a PCB able to do the digital quadrature modulation and get experimental results.
5. Combine the theorical research with hands-on experience.

Requirements:
1. Hands-on experience.
2. First experience in FPGA programming.

Supervisor

Ing. Johan Arbustini, M. Sc.