



Gregor Dengler

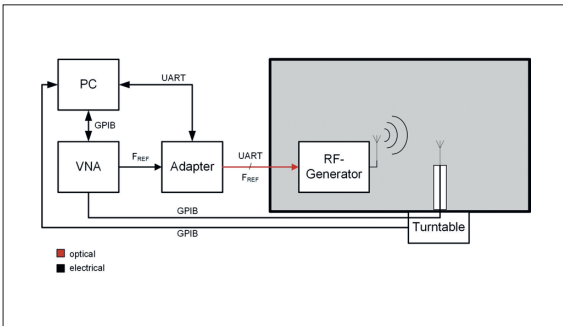


Tobias Vogel

Graduate Candidates	Gregor Dengler, Tobias Vogel
Examiner	Prof. Dr. Heinz Mathis
Co-Examiner	Stefan Hänggi, Armatusse, Bern, BE
Subject Area	Mobilkommunikation

## Miniature RF generator

### Development of a miniature RF generator for antenna measurements

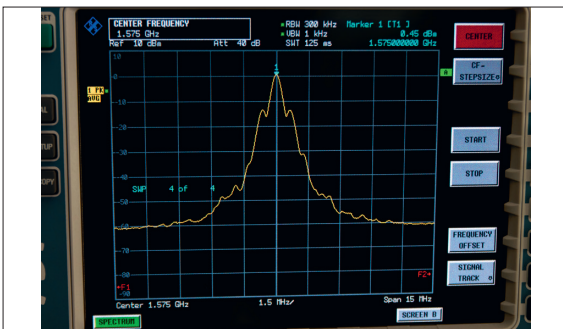


Blockdiagram of the measurement circuit

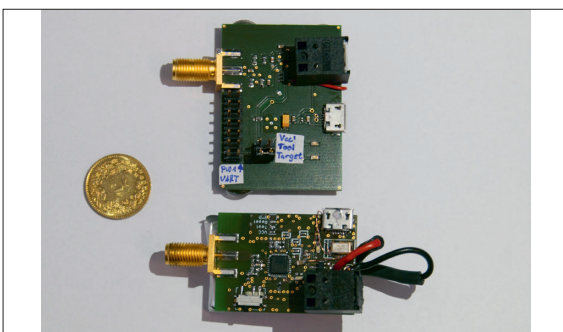
**Task:** Reflections are a known problem in the measurement of radio frequency (RF) signals. For measurements of RF signals, anechoic chambers, which reduce the reflections to a minimum by using wave-absorbing material, are used. In an earlier thesis from 2013, a receiver with an optical connector was created to eliminate reflections of the coaxial cable leading into the anechoic chamber. In this thesis, its counterpart – the transmitter – was developed. The task was to build an RF transmitter with an output power of 0 dBm, within the frequency range from 1 GHz to 3 GHz, and which allows the measurement of the amplitude and phase of a signal. The reference signal for the generator is carried into the anechoic chamber by an optical cable.

**Objective:** The main challenge of this thesis was to make the device as small as possible, while allowing measurements of up to 2 hours. The device should be flexible to allow for further additions and improvements. The whole measurement circuit should be controlled and configured using computer software.

**Result:** The reference frequency is transformed to an optical signal on the RF adapter and leads via a Toslink cable into the anechoic chamber, to the RF generator. With a phase-locked loop (PLL) and a voltage-controlled oscillator (VCO) the reference will be changed to the radiated frequency, which can be programmed to 300MHz up to 3 000MHz. For wireless operation the built-in quartz is used as the reference frequency. The radiation power depends on which reference is used and varies with the change of temperature from -1 dBm to 2 dBm.



RF-generator output of 1,575 GHz



Hardware PCB (top: RF-adapter / bottom: RF-generator)