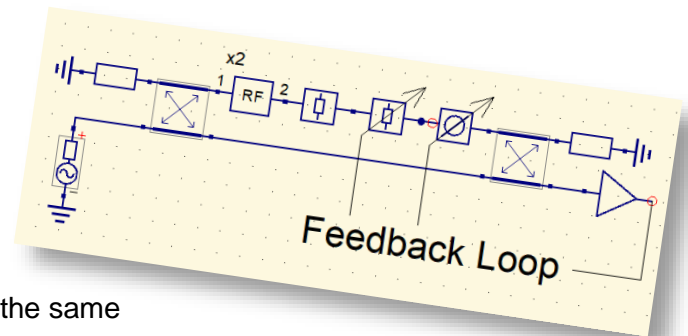


# Bachelors/Master thesis

## Removing harmonics by active cancellation and feedback

### Motivation

Electronic communication devices can transmit and receive at multiple frequencies at the same time. This can lead to disturbances, for example 800 MHz couples into 2400 MHz due to harmonic distortion. In general, we call this challenge “co-existence”.



Distortions can be caused by semiconductor junctions, and by bad mechanical contacts. For the characterization of such distortions, we need signal sources that are practically free of their own harmonic distortions at power levels of a few watt. Without further “tricks”, no source can fulfill this. The traditional solution is low pass the amplified signal. But such systems cannot be broadband due to the fixed filter characteristics. For different frequencies, separate filters need to be used.

Active harmonic cancellation is an interesting, and un-explored approach to yield a broad band solution.

### Research topic

Goal: Building an active harmonic cancellation system, investigating the limits of the methodology. The basic principle is that the 2<sup>nd</sup> and 3<sup>rd</sup> harmonic of a signal is measured, and a cancellation signal is added and adjusted in phase and magnitude to cancel the harmonics. This will work well, if the phase and magnitude of the cancellation signal is kept stable with respect to the wanted signal. A control loop will guide the cancellation signal to reduce the 2<sup>nd</sup> and 3<sup>rd</sup> harmonic to the lowest level this method can achieve.

**You will learn** about **RF components** such as **phase shifters, attenuators, precision RF measurements** and **programming the detection and feedback loop**. The design is novel and certainly will lead to a publication at a scientific conference and/or journal such as the IEEE Transactions on EMC

### Organizational matters

- Start: as soon as possible
- Workplace: at the institute

### Contact/Supervision

IFE: David Pommerenke - [david.pommerenke@tugraz.at](mailto:david.pommerenke@tugraz.at)

IFE: Leonhard Petzel – PhD student - [leonhard.petzel@tugraz.at](mailto:leonhard.petzel@tugraz.at)