

AUFGABE DER BACHELORARBEIT

im Studiengang „International Studies in Engineering“

für: Zhijie CAI

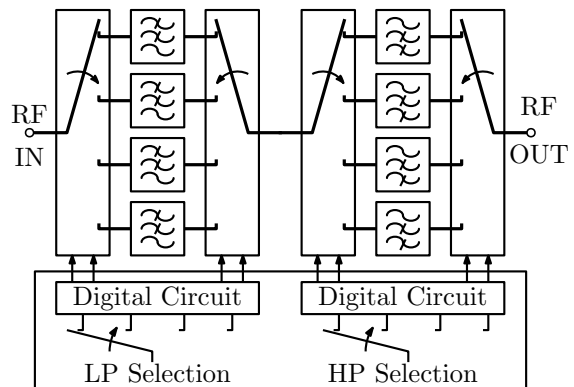
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Thema: Development of a Programmable Preselector Filter for Software Defined Radios

One advantage of software defined radios (*SDRs*) compared to conventional radios is their ability to receive signals modulated in various ways in a wide frequency range (e.g. 24 – 1850 MHz for the *RTL-SDR*). To that end, the RF hardware implemented in an SDR is designed to be very wideband. However, a couple of problems arise from that. Among others, so-called *blocking* effects can occur when a weak signal shall be received in the presence of a (strong) disturbing signal. Disturbing signals frequently occur due to radio and TV broadcasting transmitters, nearby WLAN transmitters or mobile phone base stations, as well as switching electronics.

One way to improve the sensitivity of SDRs is the addition of a tunable preselector filter between the antenna and the receiver front end. This filter must be designed such that the desired signal is in its passband and the disturbing signals are in its stopbands. One practical realization is depicted in the adjacent figure.

In this Bachelor thesis such a programmable filter shall be developed. For this purpose, passive lowpass and highpass filters shall be designed and constructed using discrete components and microstrip lines. Switching between the filters shall be performed using integrated RF multiplexers. The control of the multiplexer ICs shall be done with two single-pole four-throw rotary switches and digital circuits.



The task entails the following steps:

- creating a time and work plan,
- specification of the filters in terms of their passband and stopband behavior,
- design of the filters with due regard to the specifications of available components,
- design of a digital control circuit for the multiplexer ICs,
- design of a PCB layout in EAGLE and assembling the circuits after production at the in-house PCB workshop,
- measurement of the switchable filters and testing of their control,
- documentation of the work,
- final presentation of the work, and
- submitting a digital copy of documentation and presentation in PDF format.

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