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Research Work*
Bachelor's Thesis*

to be assigned

ILH
RF-group

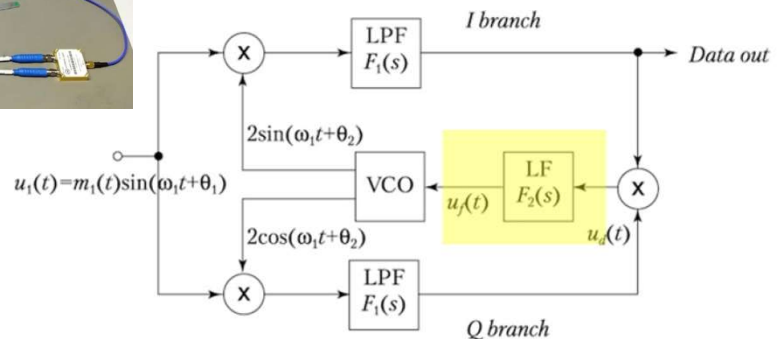
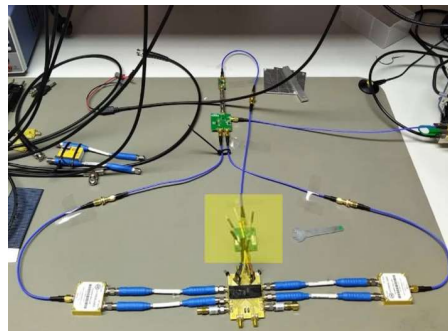
Controllable Loop Filter for a Wideband PLL

Motivation:

Analog carrier recovery for synchronization of the receiver to the transmitter allow extremely high data rates at high carrier frequencies, while being faster, drawing less energy and feature compact size compared to digital synchronization.

For an existing wideband Phase Locked Loop (PLL) as part of a carrier recovery, an external, controllable loop filter (LF) must be designed.

With this the PLL will be capable of locking to the carrier of an E-band (ca. 75GHz) link and recover QPSK modulated data, while combining both a large locking range and accurate tracking.



Source: Roland Best, Costas Loops, 2018
<https://doi.org/10.1007/978-3-319-72008-1>

Goals:

- Development of a controllable LF as a mixed signal system (analog signal processing via operational amplifiers, digital control of the filter parameters)
- Evaluation of correlation between filter parameters and locking behavior (lock range, pull in range, stability etc.) of the PLL / carrier recovery.
- Verification of the latter with a functioning prototype of the analog PLL and the LF.

Language: German/English

Tasks:

- Evaluation of required specs for a LF (bandwidth, propagation delay, tracking, controllability etc.)
- Design and simulation of a mixed signal LF
- Design and layout of a prototype PCB
- Design of a rudimentary interface for digital control (e.g. COM port and command line)
- Design of a testbench and debugging of interface

*the workload will be adjusted accordingly

