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Fachgebiet Hochfrequenztechnik

H F T

Fachbereich Ingenieurwissenschaften
Abteilung Elektrotechnik und Informationstechnik

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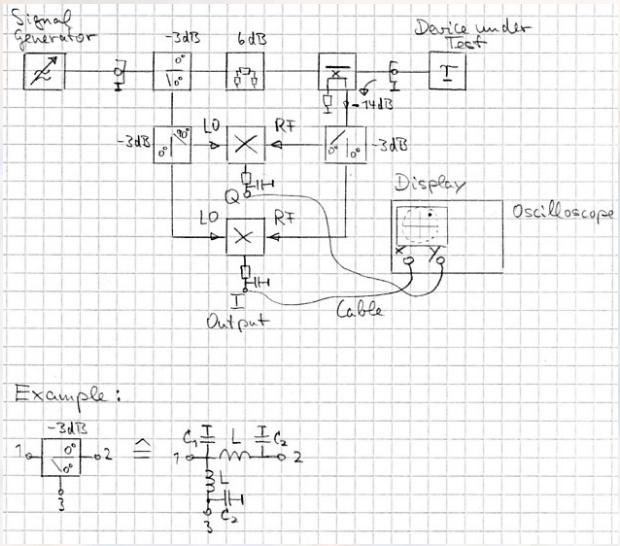
Project

Task: 6 MHz Vector Reflectometer Circuit

Description of Project:

The task of the project is to realize an analog reflectometer which can be used in one of the MRFT lab experiments for demonstration of the complex reflection coefficient. A reflectometer is an instrument which measures the reflected wave amplitude on a transmission line and displays the complex reflection coefficient. Our design uses an external RF signal generator as signal source and a digital oscilloscope as the display.

The circuit to be realized contains the directional coupler for the separation of the forward- and backward running waves as well as frequency mixers used to convert the RF signal into dc voltages for real and imaginary axes (I/Q) as well as auxiliary circuits for phase shifting and power splitting. The circuit is to be built in PCB-technology using discrete R-, L-, C- components plus the commercially available mixer circuits. The design frequency of the reflectometer circuit is 6MHz.



Task description:

For the realization of the reflectometer circuit:

- The auxiliary components of directional coupler, 0°-power splitter, 90°-divider hybrid and attenuator are to be designed and realized using discrete R-, L-, and C- components (the design of one of the circuits has been demonstrated in an earlier project and may be used as a guide line)
- A PCB- layout has to be generated using the EAGLE software (production of the PCB is done in our electronics workshop)
- The circuit has to be assembled and tested
- The circuit has to be combined with the external signal generator and oscilloscope and the reflecto-meter functionality is to be tested,
- and the accuracy of measurements is to be evaluated using calibration terminations and comparison with standard laboratory Vector Network Analyzer measurements.
- If necessary, circuit modifications may be tried out in order to improve accuracy w.r.t. instrument errors of zero-offset, I/Q-unbalance and directivity.