Signal Theory
Diploma work in matching of antenna elements

The problem concerns the estimation, of the impedance of antenna elements, by means of measurement in conjunction with modelling. The modelling is necessary since the antenna element is located inside a network, at least behind a transmission block. It is possible to express the issue as an inverse scattering problem but the approach to solution is very practical. The tooling for this problem is a so called vector network analyzer (VNA) equipped with a time domain option and simulation software such as Agilent's ADS. The VNA provides an out-put signal that either is a low pass filtered or band pass filtered step response or impulse response. These options give some possibility to measure the first, counted from the input port, change of impedance along a cable. The interpretation of the signal is however, more problematic when an intermediate transmission block contributes with a filtering function i.e. in this perspective a narrowband non-constant transfer function. At this point simulation can aid since often very good models of the transfer function can be built of the intervening building blocks

Goals and Tasks

1. Through special measurements and the application of the chirped Z-transform or similar, interpret the out-put of the VNA ("reverse engineering of the VNA frequency to time domain transform").
2. Use ADS to model typical and actual transmission blocks. Either measurements or simulations of circuit models or full 3-D models can be used to generate transfer data (S-parameters).
3. The goal is to build together transform data and model data in Matlab such that a sensitivity analysis of the impedance deviation, from target, of the antenna element can be achieved. This application constitutes a soft ware tool in laboratory environment.
4. Discuss differences and possibilities resulting from the choice between impulse and step transform and between band pass and low pass filter settings of the VNA and in the Matlab application. Measurement error in the impedance level will be dependent on the settings and this need to be discussed in order to obtain an optimal choice in each situation of measurement. The result can be an application having several choices and a guide whose advice depends on the transfer function of the intervening circuitry.

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