

Fast adaptive frequency sweep for the calculation of scattering parameters in the frequency domain

BSc-thesis, MSc-thesis or project/internship work
Electrical engineering / Computational engineering /
Accelerator physics / Mathematics



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1. Context

The Finite element method (FEM) in the frequency domain is one of the most powerful methods for the solution of high frequency electromagnetic field problems for resonators, filters, attenuators, etc. In many practical applications, however, the frequency response of the system over a broad frequency band is required. Fast Frequency Sweeping (FFS) is a class of methods used for the estimation of broadband S-parameters based on evaluation of a minimum amount of frequency points. Modern FFS methods include Reduced Basis Methods, Thiele based interpolation, Asymptotic Waveform Evaluation and Vector Fitting. Each of these methods have advantages and disadvantages depending on the specific characteristics of the frequency response of the system.

2. Task

In this work, a novel FFS approach based on the Adaptive Rational Barycentric Representation will be developed and its performance will be compared with existing reduced basis methods. All methods will be implemented in an existing FEM simulation framework in the frequency domain and it will be further validated for practical applications.

3. Prerequisites

Strong background in Maxwell's equations, basis knowledge of FEM, some experience with programming in C/C++, interest in electromagnetic field simulation.

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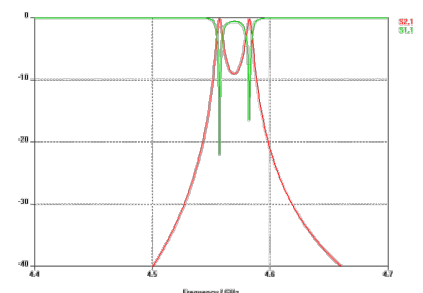
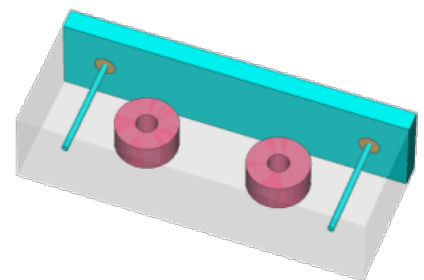


Fig. 1: Scattering parameters of a dielectric 2-Port Filter (simulation with CST Microwave Studio)