EDISON

Electromagnetic Design of
flexIble SensOrs

FNP Team-Tech

SAPOR + eigenvectors

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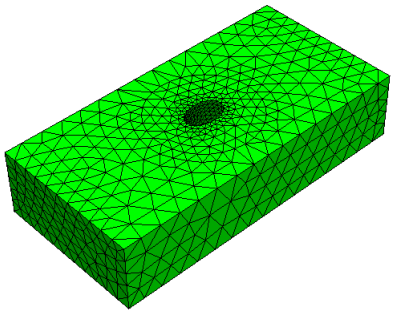
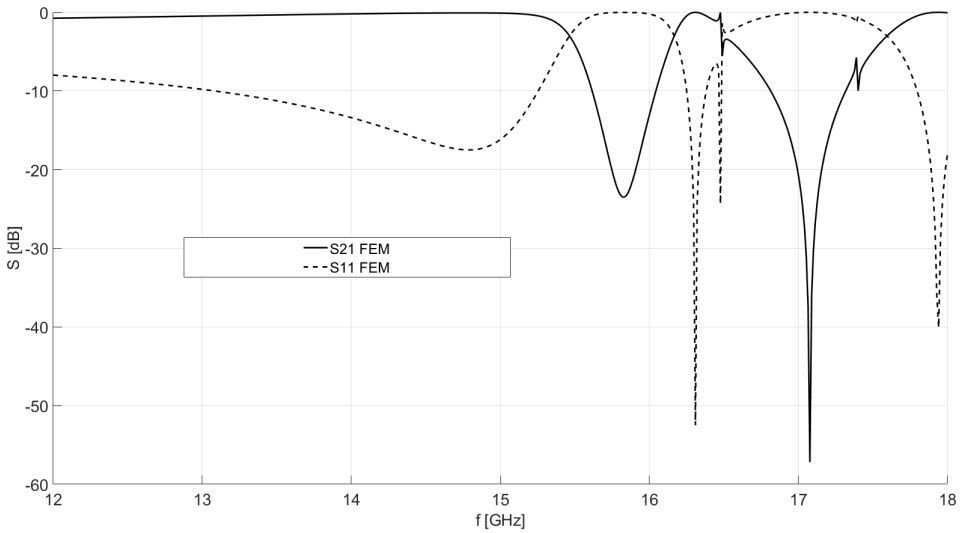
1 Introduction

The geometry and S-characteristics of the test structure:





The aim of the numerical tests is to construct the projection basis Q composed of the eigenvectors from the analyzed freq. band and the subsequent block moments computed in the middle freq. point. If the T-orthogonalization of the is preserved (where T is a FEM mass matrix), the reduced-order model:

$$\begin{aligned}(\Gamma_r + s^2 C_r) E_r(s) &= s B_r I, \\ U &= B_r^T E_r(s),\end{aligned} \tag{1}$$

has a useful property, which allows to decouple it into the two separate reduced models:

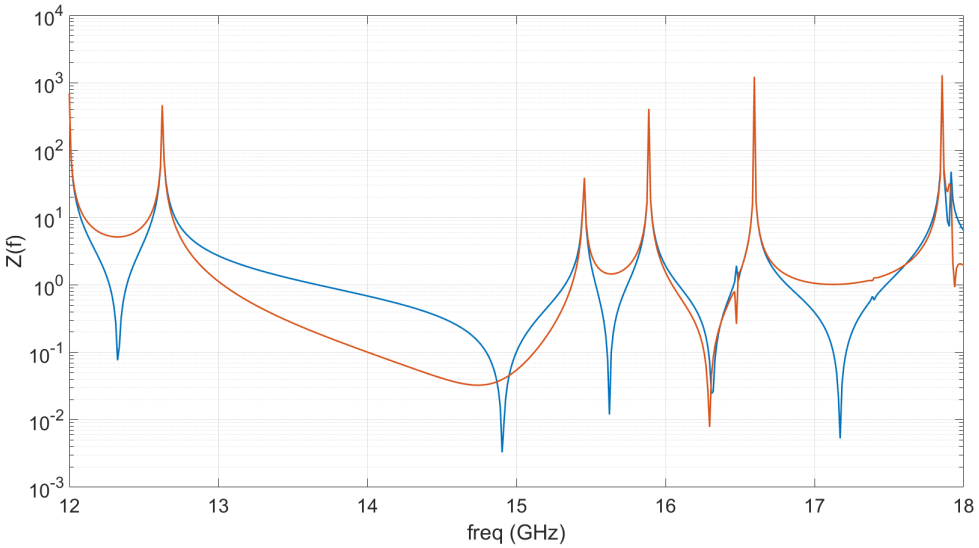
$$\left(\begin{bmatrix} \Gamma_r^I & 0 \\ 0 & \Gamma_r^{II} \end{bmatrix} + s^2 \begin{bmatrix} C_r^I & 0 \\ 0 & C_r^{II} \end{bmatrix} \right) \begin{bmatrix} E_r(s)^I \\ E_r(s)^{II} \end{bmatrix} = s \begin{bmatrix} B_r(s)^I \\ B_r(s)^{II} \end{bmatrix} I,$$

where I denotes the part of the ROM associated with the eigenvectors, whereas II with the block moments, and the projection basis has the form: $Q = [Q^I \quad Q^{II}]$.

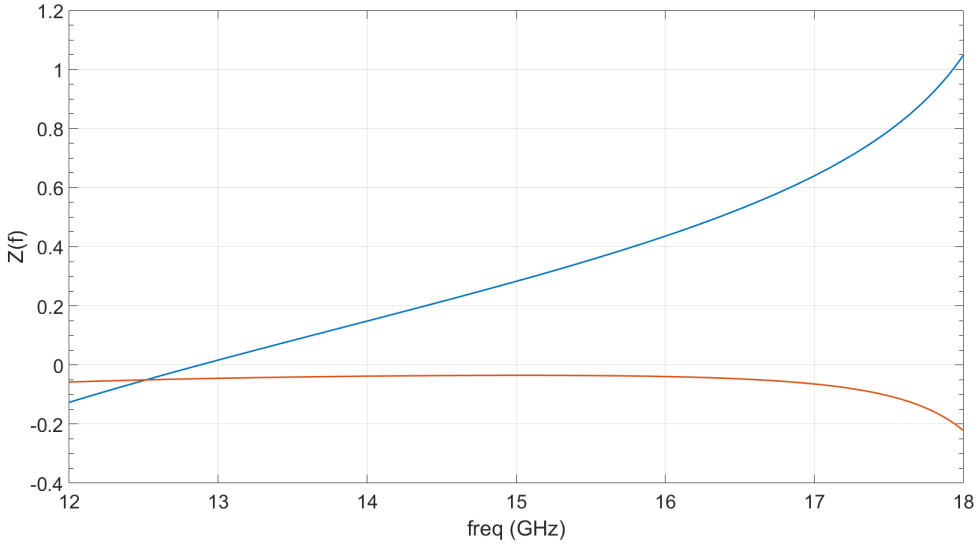
2 Numerical Tests

In the numerical tests we assume that Q^I contains the eigenvectors associated with all the eigenvalues (the poles of the structure) from the freq. band of interest (12-18 GHz) - in the test case: 17 vectors. In the following test cases we enrich the projection basis with the increasing number of the block moments.

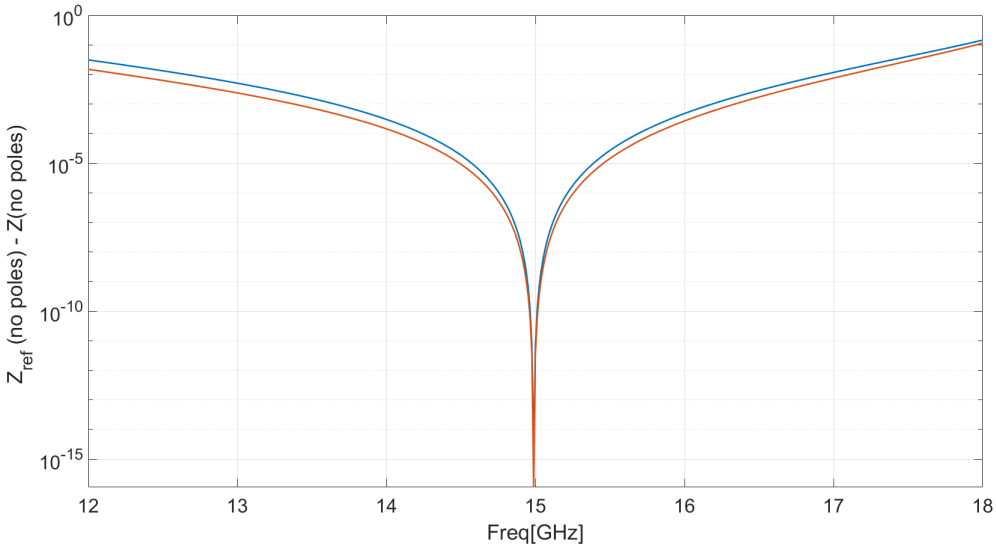
Firstly, lets look at the plots of Z-parameters for the ROM constructed using only the Q^I part of the projection basis:

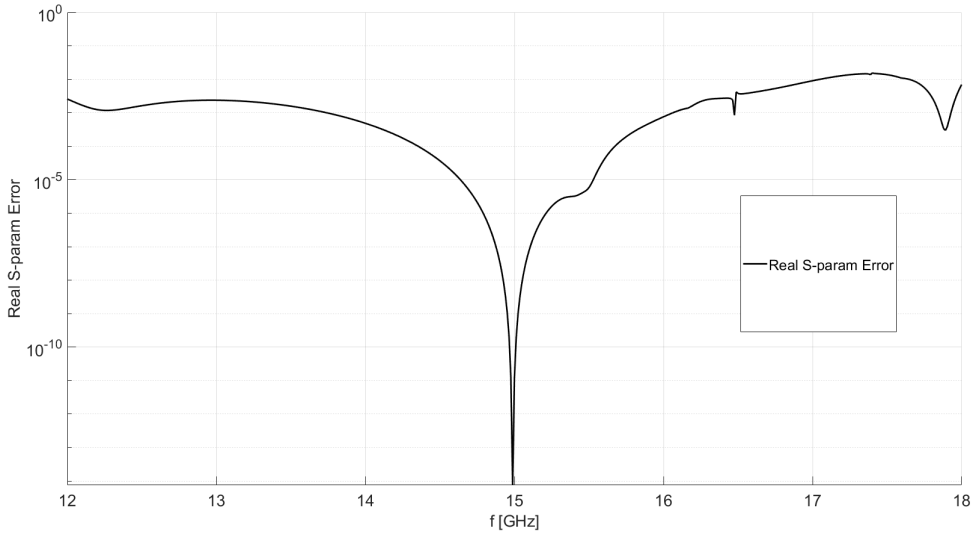


Next, lets look at the plots of Z-parameters for the ROM constructed using only the Q^{II} part of the projection basis, for 30 block moments. It is expected that small number of block moments is sufficient to approximate the following Z function:

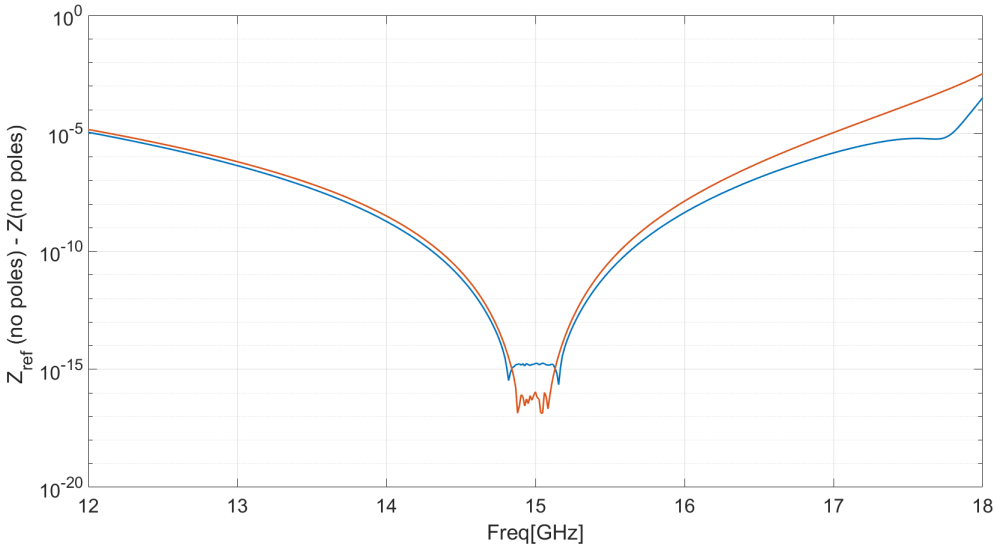


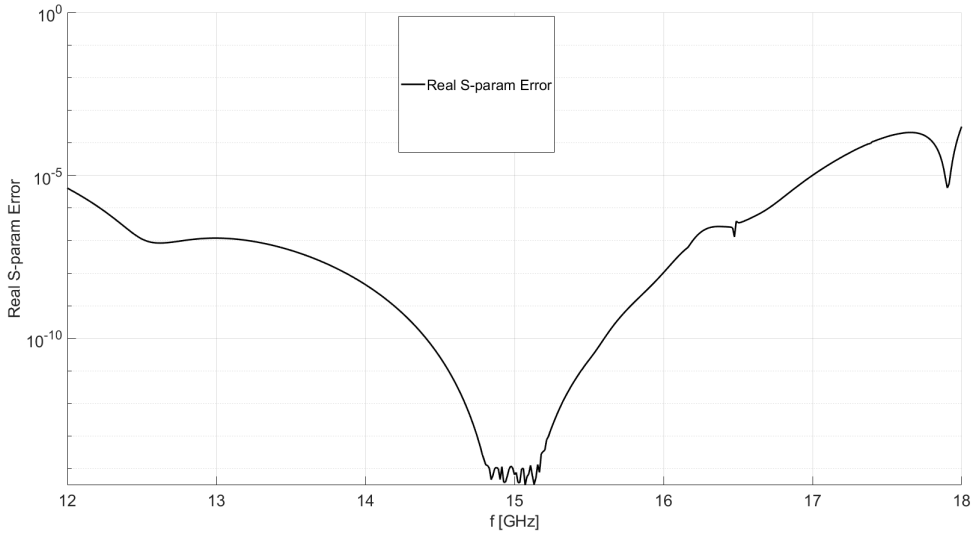
- results for the projection basis composed of all the eigenvectors and 2 block moments (4 vectors). The whole projection basis contains **21 vectors** (17 + 4).



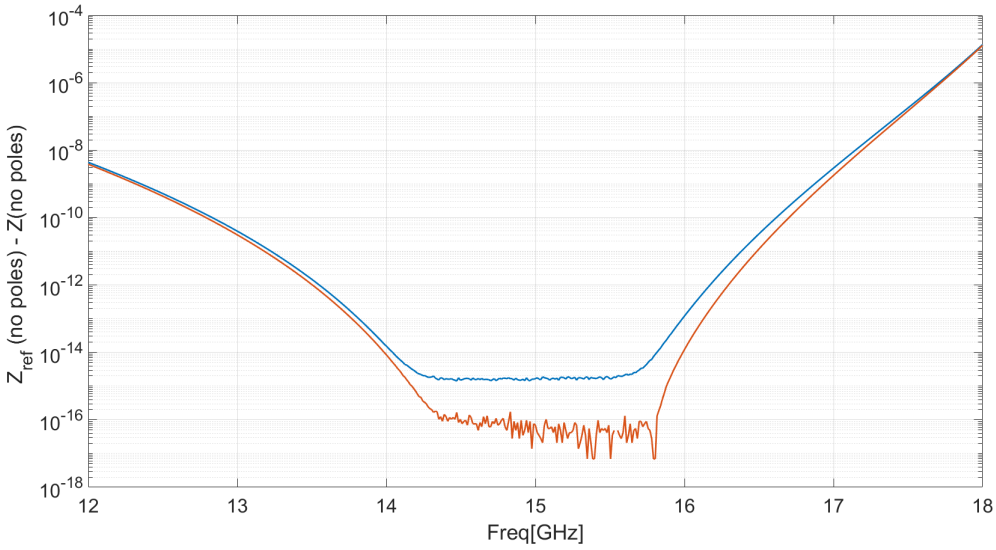


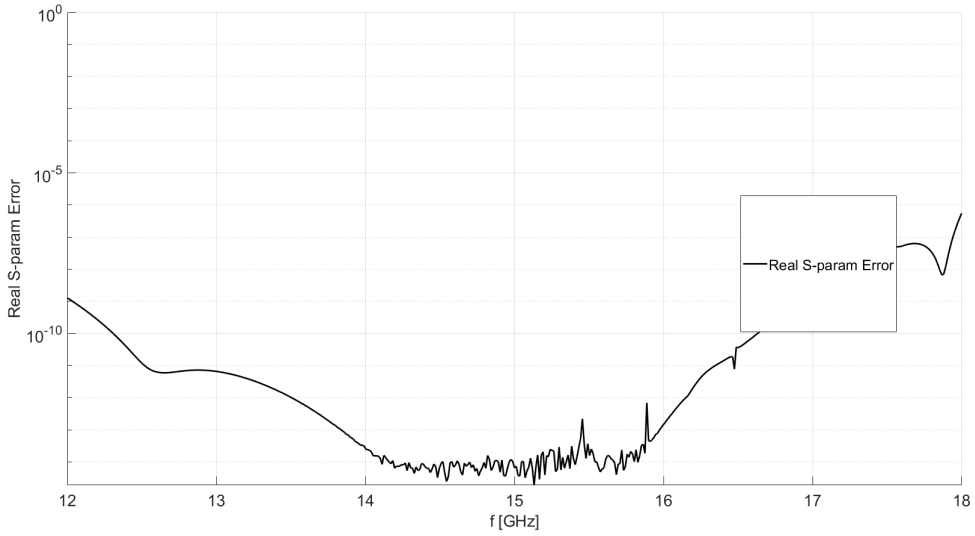
- for the projection basis composed of all the eigenvectors and 4 block moments (8 vectors). The whole projection basis contains **25 vectors** (17 + 8).



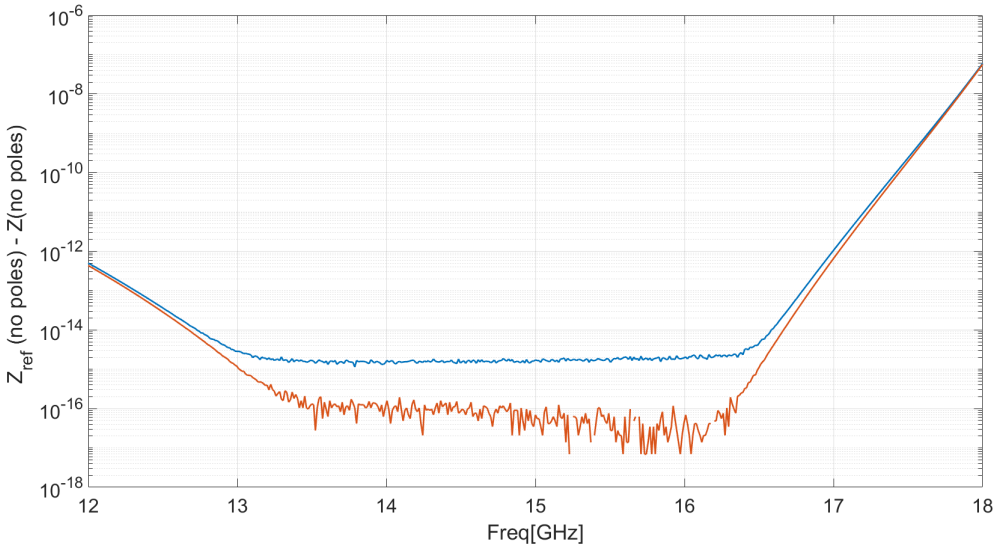


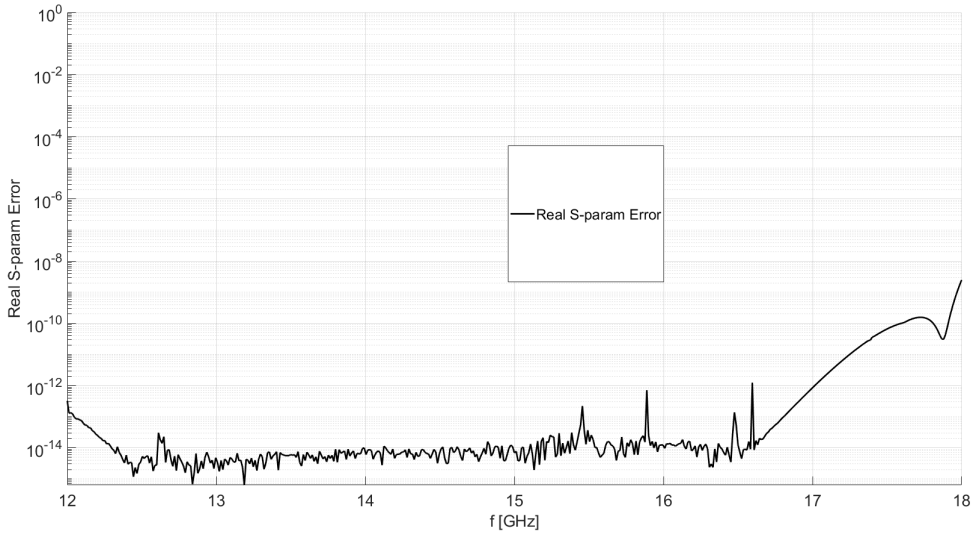
- for the projection basis composed of all the eigenvectors and 6 block moments (12 vectors). The whole projection basis contains **29 vectors** (17 + 12).



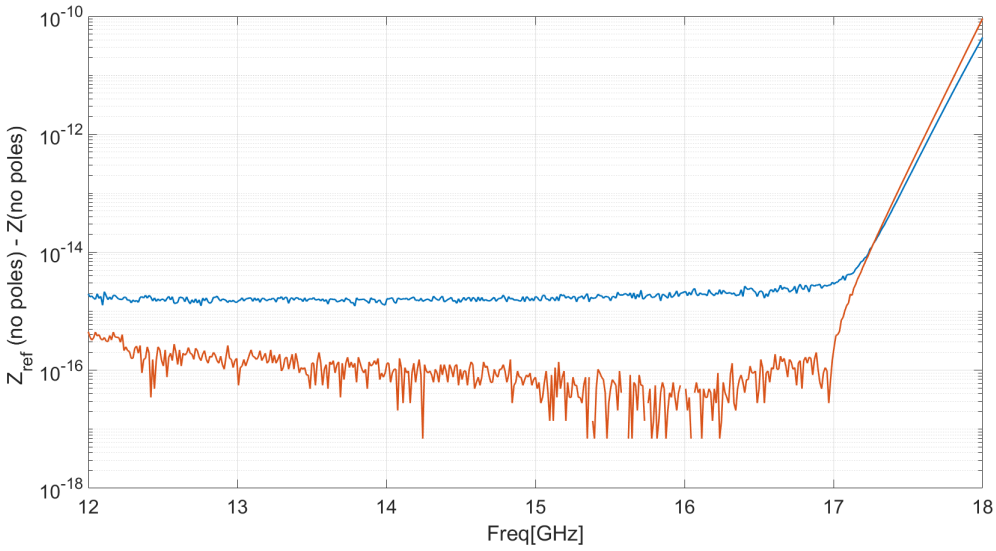


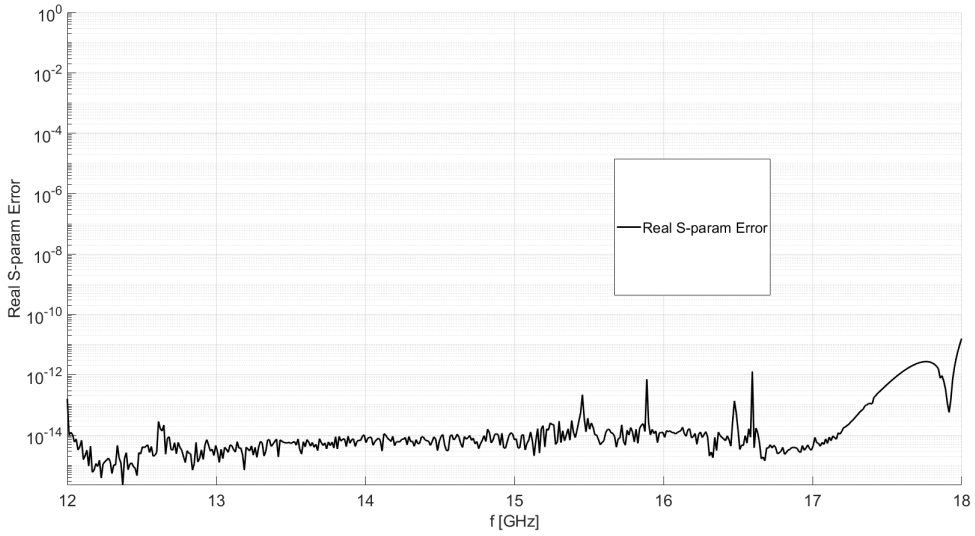
- for the projection basis composed of all the eigenvectors and 8 block moments (16 vectors). The whole projection basis contains **33 vectors** (17 + 16).





- for the projection basis composed of all the eigenvectors and 10 block moments (20 vectors). The whole projection basis contains **37 vectors** (17 + 20).





- for the projection basis composed of all the eigenvectors and 12 block moments (24 vectors). The whole projection basis contains **41 vectors** (17 + 24).