EDISON

Electromagnetic Design of
flexIble SensOrs

FNP Team-Tech

Report 8. Scattering From a Cylindrical Object of Arbitrary Cross Section With the Use of Finite Element Method

BSc. Malgorzata Warecka
February 20, 2018

European Funds Smart Growth

FNP Foundation for Polish Science

European Union
European Regional Development Fund

This work was supported by project EDISOn - Electromagnetic Design of flexIbleSensOrs, *The „EDISOn" project is carried out within the TEAM-TECH programme of the Foundation for Polish Science co-financed by the European Union under the European Regional Development Fund.*

Revision	Date	Author(s)	Description
1.0	20.02.2018	M. Warecka	created
1.0	20.02.2018	P. Kowalczyk	checked

1 Introduction

The aim of the report is to present results of hybrid method that combine finite element method and mode matching method for scattering problem with cylindrical object of arbitrary cross section. The method was described in a previous report. In this report two shapes of cross sections will be presented: rectangular and elliptical cylinder.

2 Rectangular cylinder

The analyzed cylinder with rectangular cross section has dimensions λ x 0.25λ (see Fig.1). The structure is placed in the center of Cartesian coordinate system. The scattering characteristics for different size of domain (radius of surface where Z matrix is determined) are presented in Fig. 2. Maximum error is defined as a maximum of absolute difference between a scattering characteristic obtained with FEM and field matching method [1]. The results for different radius of numerical domain are presented in Fig. 3.

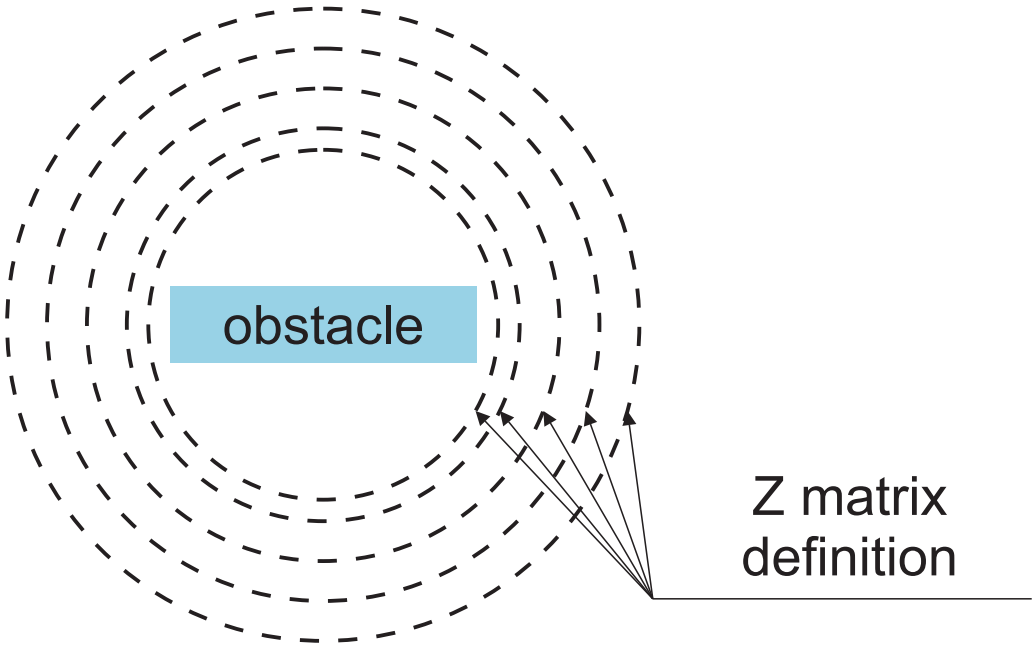

Figure 1: Computational domain for rectangular cylinder

3 Elliptical cylinder

The analyzed cylinder with elliptical cross section has dimensions λ x 0.5λ (semi-major/minor axis) - see Fig.4. The structure is placed in the center of Cartesian coordinate system. The scattering characteristics for different size of domain are collected in Fig. 5. The maximum error for different radius of numerical domain are presented in Fig. 6.

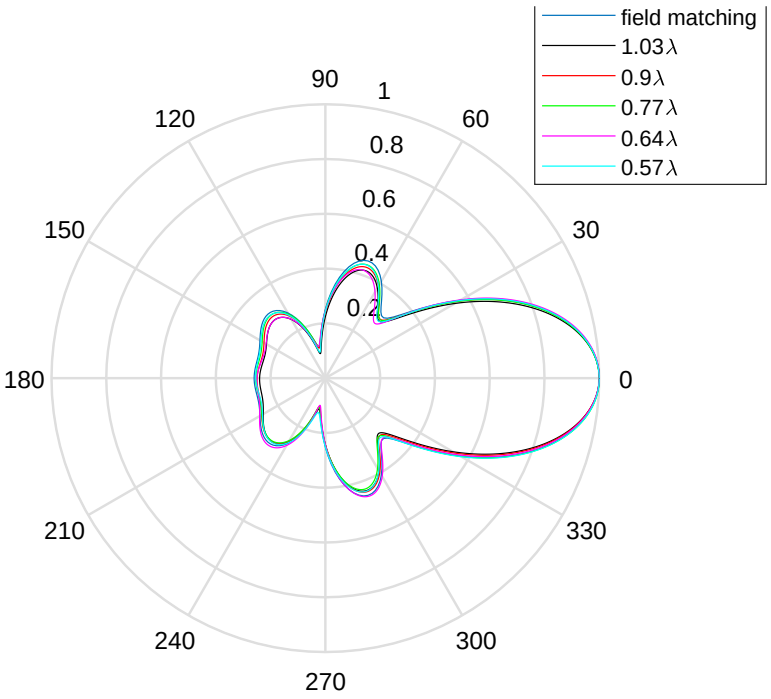

Figure 2: The scattering characteristics of rectangular cylinder different value of numerical domain radius

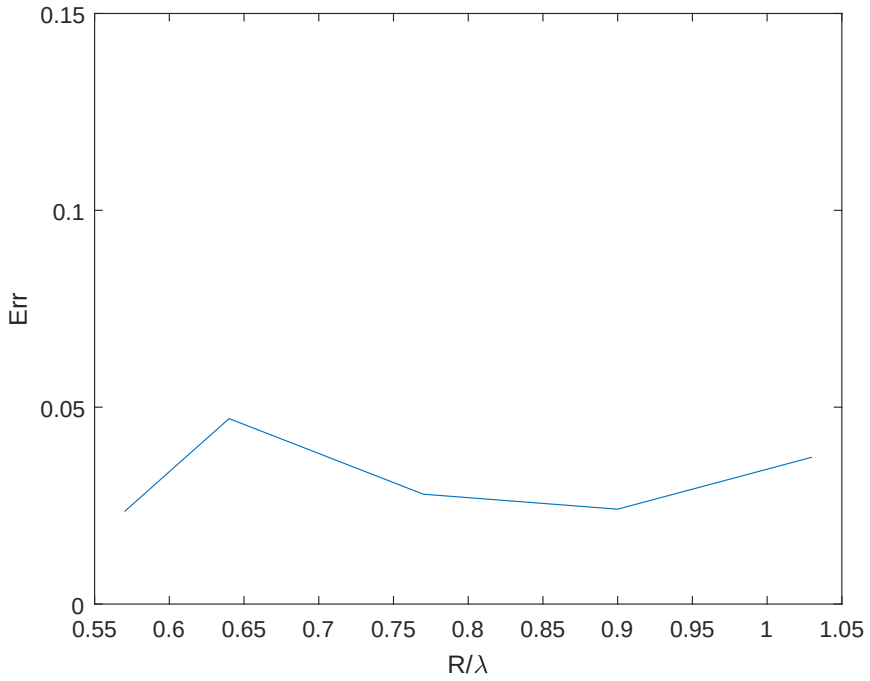

Figure 3: Values of maximum error for different value of radius

References

[1] R. Lech, P. Kowalczyk and A. Kusiek, "Scattering From a Cylindrical Object of Arbitrary Cross Section With the Use of Field Matching Method," in IEEE Transactions on Antennas and Propagation, vol. 64, no. 11, pp. 4883-4887, Nov. 2016.

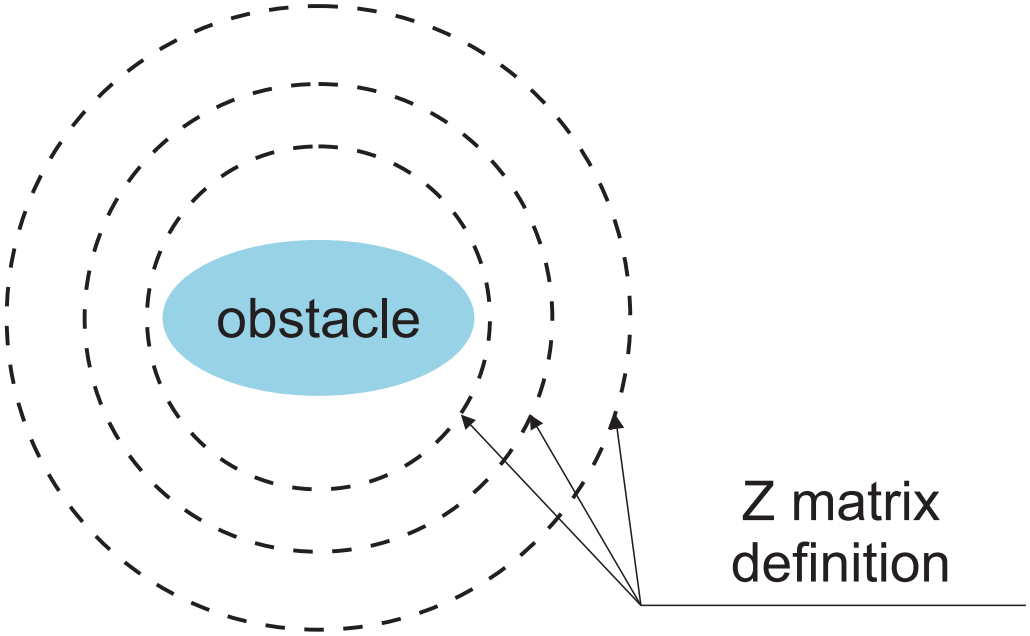

Figure 4: Computational domain for elliptical cylinder

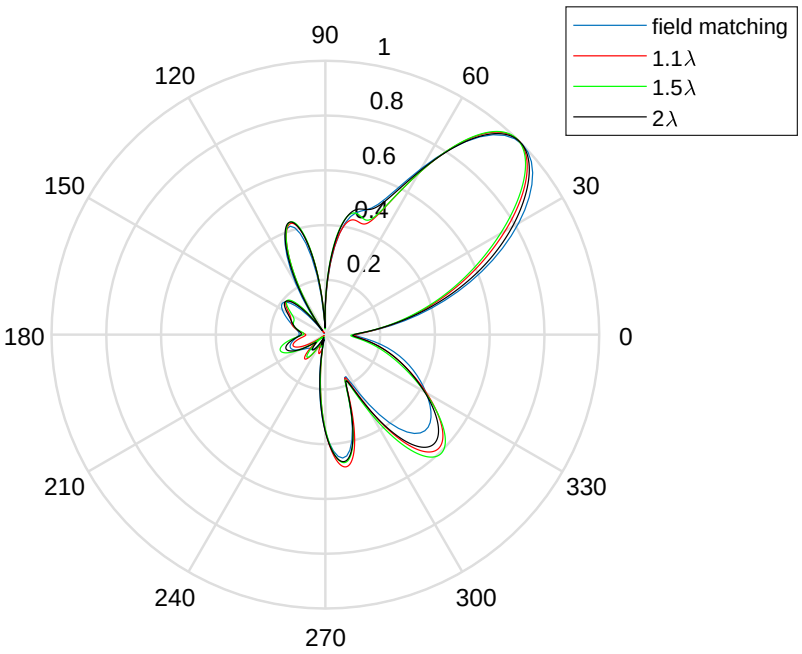

Figure 5: The scattering characteristics of elliptical cylinder for different value of numerical domain radius

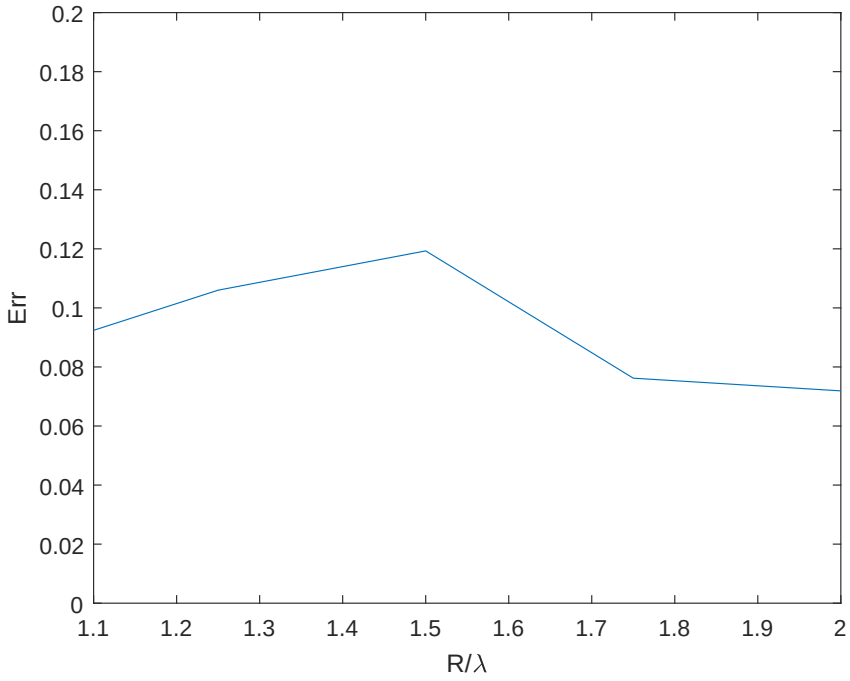

Figure 6: Values of maximum error for different value of radius