Secondment Report Form

Secondee	Przemysław Gorski
Host Organization	Id: KUL
	Name: Katholieke Universiteit Leuven Electrical Engineering ESAT/TELEMIC
Research Topic(s)	Antenna interactions and coupling
	New materials, metamaterials, EBG structures
	Electromagnetic simulation

ACTIVITIES DURING THE SECONDMENT

<Brief description of the main activities developed during the stay, and how they contributed to achieve your work plan goals (max. 3 pages)>

1. Introduction and comments

Work was focused on verification of theoretical and numerical analysis of mutual coupling (between two antennas separated by metematerial wall- G structure) by comparison results from CST Microwave Studio and MAGMAS developed by Katholike University of Leuven. Secondee notice difference in mutual coupling between numerical analysis (CST microwave studio) and measurements. The minimum of mutual coupling in measurements with metamterial wall is shifted about 10% above compare with simulation in frequency domain also the level is higher for about 4-8 dB. Secondee verified numerical analysis using code that is made by group of Guy Vandenbosch on Belgium Katholike University of Leuven.

First two weeks secondee learned new program for numerical analysis - MAGMAS witch use methods of moments to solve numerical problems. In next week secondee tried implement structure of two antennas with integrated 19 “G” structure (metamaterial wall) that was analyzed in CST previously. Time calculation of such structure in MAGMAS was extensive (20 frequency points - 20-40 h). Therefore the structure was simplified and the time calculation decreased to 10 h for 20 frequency points.

2. Structure

Analyzed structure consist of to two patch (30,2x30,2 mm) and 19 spirals (G structures) was analyzed in MAGMAS and CST Microwave Studio. Figure 1 shows dimensions of one elements of G structure.

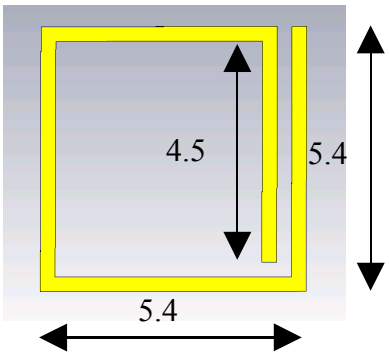

Fig 1. One elements of G structure

Figure 2 shows complete structure (2 patches and 19 G shapes).

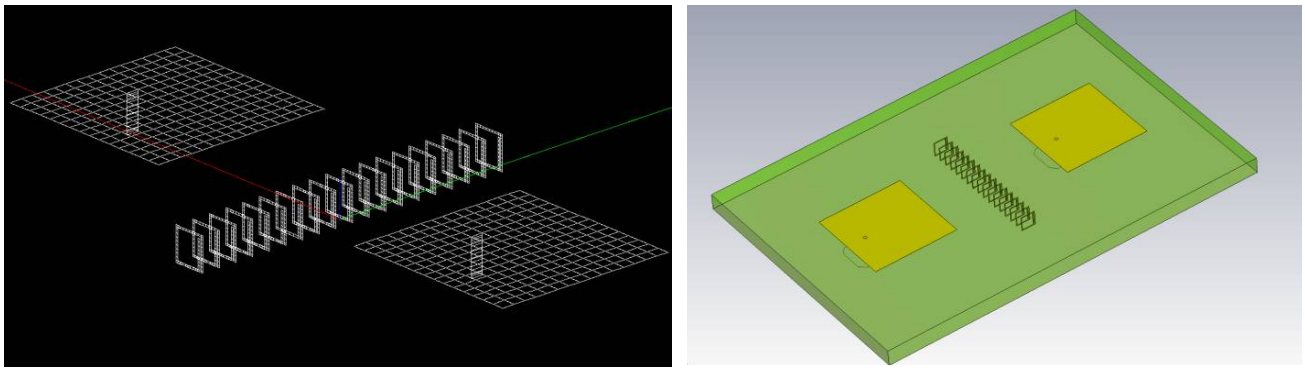

Fig 2. Analyzed structure in MAGMAS and CST Microwave Studio consist of 2 patch and 19 G shapes.

Tabela 1 shows difference in structure that was analyzed in CST and MAGMAS. Differences in structure are only in feed and size of substrate and ground.

	Parameters of antenna and G	MAGMAS	CST
1	Patch size	30.2x30.2 mm	30.2x30.2 mm
2	Material- patch	PEC	PEC
3	Number of patch	2	2
4	Substrate - permittivity	ε_r=2.3	ε_r=2.3
5	Feed	Active wall	Waveguide port –SMA connector
6	Substrate thickness	6.125 mm	6.125 mm
7	Substrate - number of layer	6	1
8	Substrate and ground	Inf.	100x146mm
9	Number of G structure	19	19
10	Material – G	PEC	PEC

3. Results

Structure presented in previous paragraph was analyzed in CST and MAGMAS. For showing the effect of G structure results was compared with structure that does not possess G shapes - Figure 3.

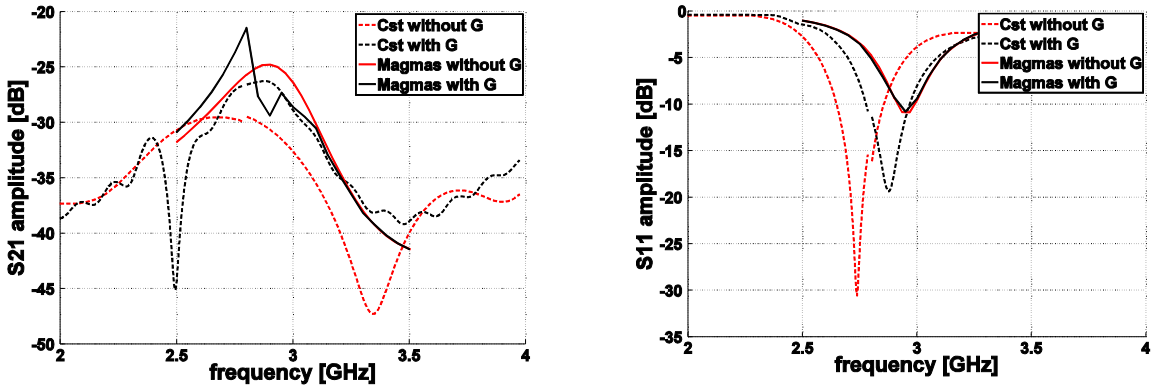

Fig. 3. S parameters of antenna consist of two patches with and without G shapes – CST and Magmas numerical analyzes.

S11 results are the same for analyzes made in MAGMAS with G and without G structures. For CST case when G shapes are inserted the best match is shifted for about 100 MHz and the match is better. S21 parameters for both types of analyzed (FTDT and method of moments) show the effect of G structure but the effect is shifted in frequency for about 400 MHz between then.

4. Conclusion

MAGMAS give similar results compared with CST but results are shifted in frequency. I got similar phenomena when I compare measurements results and numerical results given by CST. The resonance frequency of measured was 220 MHz above results given from CST Microwave Studio. The MAGMAS results seem to be more stable and more accurate but it take more time to get this results.

MAIN RESULTS OF THE STAY

< List of the publications co-written (or in progress)>

Number of Publications: 1

Number of Documents/ Reports: ____

Number of Case Studies & Demonstrators: _____

Other(s):
(1) results will be parts of PhD dissertation
(2)_____
(3)_____

* Attach all relevant documentation that specifies your results

FORECAST ACTIVITIES

<Are there any envisaged activities following this secondment project, new collaborations, co directed PhD, etc>

The host organization and secondee plan collaborate in topic such as metamaterials and PBG.

In order to improve CARE's secondment program, please fill this short questionnaire. Use the space at the end to expand your answers, if needed. Our aim is to improve the general experience for secondees in future.

Disagree ➢ ➢ Agree

GENERAL

My objectives were achieved.	**1** ☐	**2** ☐	**3 x**	**4** ☐
The research topics were relevant to my work.	**1** ☐	**2 x**	**3** ☐	**4** ☐
I benefited from being part of a wider research culture.	**1** ☐	**2** ☐	**3** ☐	**4 x**

HOST ORGANIZATION

I am satisfied with the quality and quantity of supervision I received.	**1** ☐	**2** ☐	**3** ☐	**4 x**
I had access to adequate resources to support my research..	**1** ☐	**2** ☐	**3** ☐	**4 x**

SECONDMENT PROGRAM

I would recommend this secondment programme to others.	**1** ☐	**2** ☐	**3** ☐	**4 x**
I believe the skills I have learned will help me to improve my job/research.	**1** ☐	**2** ☐	**3 x**	**4** ☐
I would apply to another programme similar to CARE.	**1** ☐	**2** ☐	**3 x**	**4** ☐
In general, how would you classify the CARE Secondment Programme?	**1** ☐	**2** ☐	**3** ☐	**4 x**

Other questions/comments to be potentially considered: _____

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SIGNATURES

Candidate **Date**: (2011/05/10)

Przemysław Górski

Signature _____