

Secondment Report Form

| | |
|--------------------------|---|
| Secondee | Gonzalo Expósito Domínguez |
| Host Organization | Id: |
| | Name: Institute of Mobile and Satellite communications Technology IMST |
| Research Topic(s) | EBG metamaterials and active antennas |
| | |
| | |

ACTIVITIES DURING THE SECONDMENT

During this stay at IMST, I have carried out a training process in EMPIRE XCell. This software is developed in the company and it is a powerful and a useful tool for antenna and RF circuit design. I made full tutorials, use the different functionalities and carried out examples of a wide variety of antennas and RF circuits.

The first task of my stay was to develop a 2x4 antenna with circular polarization, this antenna should maintain high gain performance and a good axial ratio. This first task was easy to design, but it was a perfect example in order to see the whole process. In this project, IMST took the responsibility of the design process, the construction, assembling and measurement processes.

As long as IMST have big projects such as KASANOVA, they have all type of tasks. In another project, I was programming a motor with a high level language. The purpose of this task was to be able to move the motor to obtain the desired steer direction. This motor is used as a positioner of a Ka band antenna. This antenna is pointed in three different states.

- 1- With a GPS and a compass, the position and the steering direction are calculated mathematically.
- 2- With a DBS receiver, by comparing SNR the antenna is reoriented with a unit control.
- 3- Finally, thanks to the electronic steering unit in the antenna, the link is perfectly matched between the antenna and the satellite.

For this same project, but in another different thing, a feeding distribution network is designed. This uniform corporate network is made in waveguide technology for 64 horn antennas. Problems such as roughness of the process of the construction, assembling the different pieces and measurement are addressed.

Besides, one orthomode transducer has to be designed. This transition converts one fundamental mode in the waveguide into two orthogonal modes, and one of them with 90° phase shift. The aim of this device is to get circular polarization.

The design of high definition radars is another project currently ongoing at IMST. The aim of the project, in which IMST GmbH and SMARTMICRO GmbH are working, is to build a high definition radar able to distinguish between different objects in the same timing and speed gates by using Multiple Input Multiple Output (MIMO) systems. By using steerable arrays in Reception and Transmission antennas, the system can switch radiation patterns of both antennas and process the

data to determine accurately the azimuth and elevation of each object. As it was previously mentioned, this radar system works in the automotive frequency band at 24 GHz. At these frequencies the wavelength is small and therefore the reduced size of the antennas and systems allow to integrate it easily in terminal devices. In order to handle the high transmitting power and reduce the losses in the system, waveguide transmission lines and horn antennas would be desirable, however due to the cost and the impossibility of chip integration those can not be used. The whole system will be developed with microstrip technique which allows to integrate the phase shifters close to each radiating element.

These phase shifters have only two states because the radar system does not need high resolution between beams, but they must have low insertion losses. A first prototype was built and measured with good results. However for the next step of the project, a new version of the phase shifter will be constructed. This new version will include a combination of switching topologies in order to increase the isolation of the system and the insertion losses. This new configuration will try to make symmetric the on and the off states, in order to have the same power level in all the radiating elements.

MAIN RESULTS OF THE STAY

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

| | |
|---|---|
| Number of Publications: _1__ | Other(s): |
| | (1)__Revision of EBG metamaterials and active antennas_____ |
| Number of Documents/ Reports: _____ | (2)_____ |
| | _____ |
| Number of Case Studies & Demonstrators: _____ | (3)_____ |
| | _____ |

* Attach all relevant documentation that specifies your results

FORECAST ACTIVITIES

The Ph.D. student will stay until June 30th in IMST collaborating in private and public projects, some of his work towards new phase shift concepts will be useful for his thesis.

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 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input checked="" type="checkbox"/> |
| The research topics were relevant to my work. | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input checked="" type="checkbox"/> |
| I benefited from being part of a wider research culture. | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input checked="" type="checkbox"/> |

HOST ORGANIZATION

| | | | | |
|---|----------------------------|----------------------------|----------------------------|---------------------------------------|
| I am satisfied with the quality and quantity of supervision I received. | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input checked="" type="checkbox"/> |
| I had access to adequate resources to support my research.. | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input checked="" type="checkbox"/> |

SECONDMENT PROGRAM

| | | | | |
|--|----------------------------|----------------------------|----------------------------|---------------------------------------|
| I would recommend this secondment programme to others. | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input checked="" type="checkbox"/> |
| I believe the skills I have learned will help me to improve my job/research. | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input checked="" type="checkbox"/> |
| I would apply to another programme similar to CARE. | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input checked="" type="checkbox"/> |
| In general, how would you classify the CARE Secondment Programme? | 1 <input type="checkbox"/> | 2 <input type="checkbox"/> | 3 <input type="checkbox"/> | 4 <input checked="" type="checkbox"/> |

Other questions/comments to be potentially considered: _____

SIGNATURES

Candidate Gonzalo Expósito Domínguez

Date: 31/03/2012
(year/month/day)

Signature



Return the form to CARE Secondment Office