Secondment Report Form

Secondee	Marija Agatonović
Host Organization	Id: KIT
	Name: Institut für Hochfrequenztechnik und Elektronik (IHE)
Research Topic(s)	2D DOA estimation using artificial neural networks
	(MIMO, smart and signal processing antennas)

ACTIVITIES DURING THE SECONDMENT

Activities during the research stay at IHE included measurements in the anechoic chamber and development of new algorithms to train the ANNs (Artificial Neural Networks) employed in 2D DOA (Direction of Arrival) estimation.
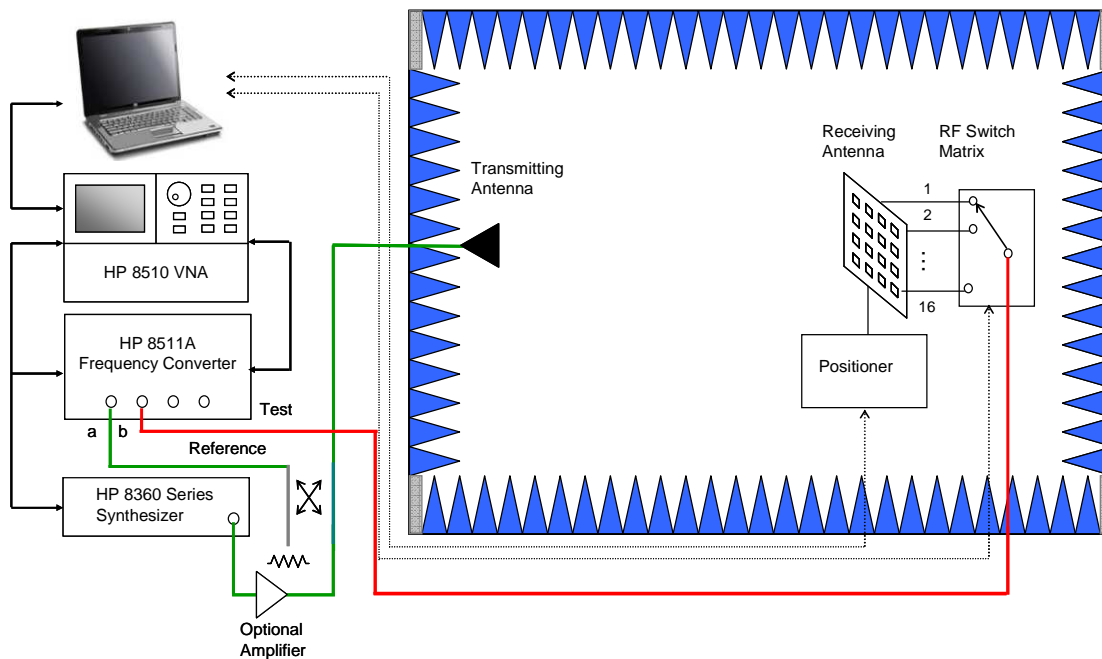

Fig. 1 Measurement setup

Several changes in the IHE anechoic chamber have been done in order to perform DOA measurements. The following activities were conducted:

1. Introduction to measurement equipment and software in the chamber, measurement of reference horn antennas.
2. RF switch matrix testing and programming.
3. Upgrading the existing software to accommodate the specific measurement.
4. Introduction to new simulation software CST Studio Suite.

5. Design of two 4×4 antenna arrays.
6. Ordering of components (cables, SMA connectors, substrates, etc.)
7. Measurement of manufactured antennas.
8. Development of new algorithms for ANNs (RBF NN – *Radial Basis Function Neural Networks*) training and their application to DOA estimation using rectangular antenna array at the receiving site (MATLAB simulations). Special attention is devoted to unsupervised learning method used to identify centers and standards deviations of Gaussian functions of neurons in the RBF NN hidden layer. A type of modified *K-means clustering algorithm* is developed to identify and eliminate inactive neurons in order to improve the reliability of the hidden layer and therefore, complete neural network training process.
9. Measurements in the anechoic chamber including scenarios with one and two transmitting antennas.
10. Post-processing of measured results.
11. Application of 2D MUSIC algorithm to measured results.
11. Development and testing of empirical neural network models.
12. Development of hybrid empirical-theoretical model (in progress).

MAIN RESULTS OF THE STAY

Other(s):

Number of Publications: ___1 in progress___   (1)___At the moment, 2 papers are under___
                                                     ___review_____

Number of Documents/ Reports: _____   (2)_____
                                                     _____

Number of Case Studies & Demonstrators: _____   (3)_____
                                                     _____

* Attach all relevant documentation that specifies your results

FORECAST ACTIVITIES

In cooperation with the researcher Leen Sit from IHE, investigation on application of ANNs in DOA estimation of MIMO-OFDM radar signal.

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**	**4** ☑
The research topics were relevant to my work.	**1**	**2**	**3**	**4** ☑
I benefited from being part of a wider research culture.	**1**	**2**	**3**	**4** ☑

HOST ORGANIZATION

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

SECONDMENT PROGRAM

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

Other questions/comments to be potentially considered: _____
_____
_____
_____
_____
_____
_____

SIGNATURES

Candidate   Marija Agatonović   **Date**:   2012/04/26

(year/month/day)

Signature _____ *Marija Agatonović* _____