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## **AMAC-UK Award**

### **Report on the research visit to the University of Manchester: Models and inverse methods for near field electromagnetic sensors**

With the help from AMAC-UK award I have visited a Sensing Imaging and Signal Processing research group led by prof. Anthony Peyton at the University of Manchester, School of Electrical and Electronic Engineering. The visit was scheduled from 23<sup>rd</sup> to 25<sup>th</sup> April 2019. The purpose of this visit was to learn about current research activities in Manchester in the field of electromagnetic sensing, to get hands on experience with state-of-the-art laboratory equipment for measurement of electromagnetic sensor characteristics, to present objectives and activities of my PhD project and to get expert feedback on planned research steps.

On the first day of visit prof. Peyton has shown me the group's laboratory facilities and introduced me to his team with whom I arranged the individual meetings. Next, we discussed the topics and challenges of my PhD thesis. We talked about different sensor modalities including inductive and capacitive high frequency methods. He gave me useful advice regarding sensor geometries, primary electromagnetic field coupling and electronic design concepts. He pointed out some of the potential issues I might face during study and gave me useful literature. We also discussed ongoing projects in Manchester and Zagreb. Later that day I had a meeting with the team which is working on combining advanced methods for metal detection and ground penetrating radar (GPR) for humanitarian demining. I learned about their current research in the field of electronic design for metal detector and antenna design for ground penetrating radar. I presented them some of my designs for electronic instrumentation and gained valuable feedback on how to improve them.

On the second day I conducted an experiment with their measurement setup for high frequency inductive method. The purpose of the experiment was to measure response of the

soil at the medium to high frequencies with the goal to determine soil electrical properties. Most of the existing research is focused on measuring either electrical conductivity at the low frequencies or electrical permittivity at the high frequencies. One of the goals of my PhD thesis is to simultaneously measure both electrical properties. Those measurements would give us valuable information which could be used in precision agriculture or humanitarian demining. This experiment would be good indicator to see if we can observe changes in samples with different electrical parameters. I tested samples which included water, salty water which is more conductive, dry and wet soil. Because the measurement setup in the Zagreb laboratory is still under development, this was a good chance to get preliminary measurement which could be used as a reference. I also got a chance to use state-of-the-art equipment in Manchester laboratory.

On the third day I attended team meeting for SEMIS project funded by Find a Better Way charity where I got insight in current progress of the project. Also, I presented goals of my PhD thesis and our project Models and inverse methods for near field electromagnetic sensors (MIMES) funded by Croatian science foundation.

I would like to thank AMAC-UK for award and giving me the opportunity to visit University of Manchester which will certainly help me in my future PhD research.

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