ELEDIA Research Center
ELEDIA@UniTN - University of Trento
Via Sommarive 5, 38123 Trento, ITALY
E-mail: andrea.massa@eledia.org
Web: www.eledia.org/eledia-unitn

SEMINAR

Two Instances of Microwave Inverse Problem: Antenna Diagnostic and Phase Retrieval

Speaker: **Dr. Benjamin Fuchs**
(University of Rennes 1, France)
Date: 17 March 2017 @ 12:00 AM
Location: Room Garda – Polo Scientifico F. Ferrari – Povo
Note: The seminar will be held in English
Contact: Prof. Paolo Rocca (paolo.rocca@unitn.it)

Microwave inverse problems have recently drawn a lot of attention because of their potential benefits for individuals, public authorities and industries. The exploitation of electromagnetic field data as a sensing tool has indeed a number of relevant applications including antenna diagnostics, biomedical imaging, humanitarian demining, archeological prospection to name just a few. In this talk, two examples of microwave inverse problem are addressed.
Antenna diagnostic is the detection of failures that prevent the antenna from achieving its ideal performance. This step is crucial in many applications ranging from the manufacturing and testing stages of antennas to the maintenance of base transceiver stations by mobile network operators. Diagnostics methods based on the acquisition of the radiated field are attractive because they are non invasive and well suited to the diagnostic of antennas on site. By properly exploiting the a priori knowledge of the antenna under test, a compressive sensing based approach is proposed to locate the antenna failures from much less measurements than conventional techniques. Experimental results will be shown.
Phase retrieval is the problem of recovering a complex signal from the magnitude of linear measurements. This problem is of important practical interest in microwaves, where an accurate acquisition of the phase is difficult as the frequency goes up. To solve this notoriously challenging mathematical problem, a procedure combining convex relaxation optimization and a simple interferometric technique is described. Numerical examples will be shown to illustrate the efficiency and robustness to noise of the proposed approach.

- **About the Speaker**

Benjamin Fuchs received the M.Sc. and electrical engineering degrees in 2004 from the National Institute of Applied Science of Rennes, France, and the Ph.D. degree in signal processing and telecommunications and the "Habilitation à Diriger des Recherches" from the University of Rennes 1, France, in 2007 and 2016, respectively. He was during his Ph.D. a visiting scholar at the University of Colorado at Boulder, USA.
In 2009, he joined the Institute of Electronics and Telecommunications of Rennes (IETR) as a researcher at the Centre National de la Recherche Scientifique (CNRS). He has spent three years (2008 as postdoctoral research fellow and 2011-2012 on leave from CNRS) at the Swiss Federal Institute of Technology of Lausanne (EPFL), Switzerland.
His current research interests revolve around synthesis and inverse problems in electromagnetics for antenna design and microwave imaging. More specifically, he is working on array synthesis, antenna diagnostic, electromagnetic field interpolation and phase retrieval.