FUSION 2011 Tutorial Workshop  
Multistatic Exploration – Introduction to Modern Passive Radar and Multistatic Tracking & Data Fusion  

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Abstract: Advanced distributed signal and data fusion for passive radar systems, where DVB TV or GSM mobile phone base stations are used as sources for illuminating targets, for example, is a topic of increasing interest. Even in remote regions of the world, transmitters of electromagnetic radiation become potential radar transmitter stations enabling covert surveillance for air, sea, and ground scenarios. Analogous considerations are valid for sub-sea surveillance. Illustrated by examples and experimental results, principles of passive radar as well as advanced multistatic tracking and de-ghosting techniques will be discussed.

Objectives:
1. Example: Passive Radar with GSM Base Stations  
2. Introduction to Target Tracking and Data Fusion  
3. Multistatic Tracking with DAB/DVB Passive Radar  
4. Tracking Aspects for Bistatic GMTI Applications

Target Audience: Postgraduate/PhD students and system engineers in industry, scientific staff in research labs. Basic knowledge in mathematics and statistics is necessary.

Outline:
A particularly exciting topic of recent research is advanced distributed signal and data fusion for passive radar systems, where radio, TV, or mobile phone base stations are used as sources for illuminating targets of interest. Even in remote regions of the world, each transmitter of electromagnetic radiation becomes a potential radar transmitter station, which enables air surveillance by passively receiving reflections of noncooperatively emitted signals of opportunity. In this way, the reconnaissance process remains covert and is not revealed by actively transmitting radiation. Analogous considerations are valid for sub-sea surveillance.

Digital Audio/Video Broadcasting (DAB/DVB-T) is already available in a large area of Europe. The advantage of using these signals for passive air surveillance is the disposability of a large range of illuminators sending an easily decodeable digital broadcast signal. In the considered multi-static scenario, one observer provides bistatic Time Difference of Arrival (TDoA) and Doppler measurements. The main task for target tracking is to handle ghosts that arise due to problems of association between illuminators, targets and measurements.

Another practically relevant type of illuminators is given by GSM mobile phone base stations. The potential of using GSM passive radar is illustrated by experimental results of an experimental system at Fraunhofer FKIE.

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**Course Materials:** A written manuscript and the presentation slides will be made available on an accompanying CD.

**Brief Biography of Instructor:**
- 1962 born in Nuremberg, Bavaria, Germany, study of physics and mathematics at Aachen Technical University (RWTH), Germany
- Since 1990 Research Scientist at the German Defence Research Establishment FGAN, now called Fraunhofer Defence and Security.
- Since 2002 Lecturer for Target Tracking and Sensor Data Fusion at Bonn University
- Since 2002 Head of Department Sensor Data and Information Fusion at FGAN-FKIE
- Since 2003 Editing services for IEEE T-AES
- Since 2007 Member of the Board of Directors of the International Society of Information Fusion (ISIF), re-elected for 2010-2012.
- 2008 Executive Chair of the 11th International Conference on Information Fusion, June 30 – July 3, 2008, Cologne, Germany (together with Peter Willett)
- 2009 Habilitation at The Faculty of Mathematics and Natural Sciences of the University of Bonn University, Germany.
- 2011 Fellow, IEEE