Duration: 09:00h to 13:00h **Room Domizia**

WF1 (EuMC)
EMI Challenges in Future Complex Multi-Functional (Digital) Systems

Organisers:
David Thomas, The University of Nottingham, UK
Peter Russer, Technische Universität München, Germany
Ioan E. Lager, Delft University of Technology, The Netherlands

Abstract:
The growth of Internet-enabled smart infrastructures underpinning virtually every sector of economic and social life requires complex, high performance and highly integrated miniature electronic systems. The electromagnetic interference will increase with the anticipated increase of clock speeds, frequency of operation and circuit density. Immunity levels will also decrease due to lower supply voltages and lower signal power levels. Traditionally, the potential EMI sources were assessed in the frequency domain assuming static emissions. This is not valid for multifunctional devices with many operating modes. New approaches that fully account for time dependence and uncertainty are needed. The workshop will present some state-of-the-art, unconventional methods and instruments in the realm of EMI prediction and assessment and will speculate on the challenges lying ahead and the feasible manners to approach them.

Programme

09:00h - 09:40h	***The Characterisation and Propagation of Stochastic Fields from Printed Circuit Boards*** D. Thomas, The University of Nottingham, UK
09:40h - 10:20h	***Pulsed-Field Electromagnetic Immunity in a Complex Digital Environment*** A.T. de Hoop, Delft University of Technology, The Netherlands I.E. Lager, Delft University of Technology, The Netherlands
10:20h - 10:40h	***Conclusions – Open Forum***
10:40h - 11:20h	***Coffee Break***
11:20h - 12:00h	***Parametric Identification of Stochastic EMI Sources Based on Near-Field Measurements*** Y. Kuznetsov, Moscow Aviation Institute, Russia A. Baev, Moscow Aviation Institute, Russia A. Gorbunova, Moscow Aviation Institute, Russia
12:00h - 12:40h	***Near-Field Measurement and Modelling of Stochastic Fields in EMI"*** J.A. Russer, Technische Universität München, Germany P. Russer, Technische Universität München, Germany T. Asenov, University of Nis, Serbia
12:40h - 13:00h	***Conclusions – Open Forum***

Duration: 09:00h to 18:20h **Room Euphemia**

WF2 (EuRAD)
Photonics for RADAR Systems

Organisers:
Antonella Bogoni, CNIT-Photonic Networks National Laboratory, Italy

Abstract
This workshop aims at highlighting the issues of the current radar technologies and the role that photonics can play in radar systems in overcoming these issues and enabling a novel paradigm of multifunctional and software defined radars. The workshop wants to represent a significant overview of the state of the art of photonic-based radar subsystems and available technologies for optical devices in radar applications. Moreover, the workshop wants to envisage the future development of microwave photonics in the radar industrial perspective.
The final goal of the workshop is to support the synergy between the players developing the new generation radar systems as the device suppliers, the system vendors, the final users and the involved authorities, both in the military and in the civil environments.

Programme

09:00h - 09:20h	***Workshop Introduction*** Antonella Bogoni, CNIT, Italy
09:20h - 09:50h	***The Navy Case Study: From Shipboard Requirements to Technological Challenges*** Andrea Manco, CSSN (Naval Support and Test Center), Italy
09:50h - 10:40h	***RF Signal Generation Based on Photonics*** Janping Yao, Ottawa University, Canada
10:40h - 11:20h	***Coffee Break***
11:20h - 12:10h	***General Purpose Integrated Microwave Photonic Processors*** Josè Capmany, The Universidad Politecnica de Valencia, Spain
12:10h - 13:00h	***Photonic True Time Delays for Beamforming and Signal Processing*** Daniel Dolfi, Thales Research & Technology, France
13:00h - 14:20h	***Lunch***
14:20h - 15:10h	***Integrated Microwave Photonics for Radar Systems*** David Marpaung, CUDOS, IPOS, School of Physics, University of Sydney, Australia
15:10h - 16:00h	***Photonic Applications on EW Solutions*** Alessandro Albertoni, Elettronica, Italy
16:00h - 16:40h	***Coffee Break***
16:40h - 17:30h	***A Company Overview on MWP Devices and Applications*** Annamaria Fiorello, Selex ES, Italy
17:30h - 18:20h	***A Practical Implementation: The PHODIR-Photonic-Based Fully Digital Radar System Project*** Paolo Ghelfi, CNIT, Italy

Duration: 09:00h to 13:00h **Room Flavia**

WF3 (EuRAD)
Compressive Sensing for Radar Application

Organisers:
Joachim Ender, Fraunhofer-Institute for High Frequency Physics and Radar Techniques FHR, Germany
Laura Anitori, TNO, The Netherlands

Abstract
The goal of the workshop is to bring together recognised experts in the field of Compressive Sensing (CS) and radar to provide the audience with the latest theoretical and experimental results on applications of CS to radar. CS is a relatively new method for acquisition and processing of sparse signals. The benefits of using this technique for reducing the acquisition time and costs will be discussed, and its high-resolution capabilities for target detection, classification and recognition will be presented. Particular interest will be dedicated to the fields of radar imaging, Synthetic Aperture Radar (SAR), sparse arrays and MIMO radars. Furthermore, although the application of CS to radar has been successfully demonstrated in the last few years, there are still several open questions regarding the integration and implementation of CS techniques in current and future operational systems. The workshop will provide an opportunity to the audience to address these open questions and discuss them with the experts.

Programme

09:00h - 09:50h	***An Overview on CS Radar Applications and Statistical Analyses*** Joachim Ender, Fraunhofer Institute FHR, Germany Laura Anitori, TNO, The Netherlands
09:50h - 10:40h	***Compressed Sensing Solutions for Airborne Low Frequency SAR*** S. I. Kelly, University of Edinburgh, UK Michael Davies, University of Edinburgh, UK
10:40h - 11:20h	***Coffee Break***
11:20h - 12:10h	***Compressive Sensing for Doppler and MicroDoppler Signature Estimation*** Moeness Amin, Villanova University, USA
12:10h - 13:00h	***Compressed Sensing in Electronics for Defence*** G. Prisco, Selex-ES, Italy P. Vinetti, Selex-ES, Italy M. D'Urso, Selex-ES, Italy

Duration: 09:00h to 13:00h **Room Iustina**

WF4 (EuMC & EuRAD)
Noise Radar: Monostatic, Multistatic and MIMO

Organisers:
Krzysztof Kulpa, Warsaw University of Technology, Poland
Gaspare Galati, University of Rome Tor Vergata, Italy

Abstract
In classical pulse radars, several types of waveforms are used. Most popular are linear and non-linear frequency modulation (chirp signals), Costas codes, polyphase codes, Barker codes and other. The pulse radar however have several limitations including range and velocity ambiguity, high peak power and lack of LPI (low probability of intercept) properties, as their emissions can easily be detected and classified. Since a long time more complicated waveform are being search to improve some significant properties of radars and increase it performance, including a renewed interest in the old concept of continuous wave radar, an architecture often used nowadays. A group of very interesting waveforms is based on band-limited noise, sometimes modified slightly to obtained required properties of its ambiguity function. While the available computational power is now very high, the main limitations in design of sophisticated noise radars come not from hardware (inc. computing power) but from the lack of deep knowledge of the synthesis means. The workshop will presents recent development in Noise Radar Technology with some practical examples and implementations. It will start with fundamentals of noise radar technology. Then the idea of multistate noise radar will be presented. The recent development in noise radars is focus on MIMO concept to increase the angular resolution and the sensitivity of noise radars. Some examples of noise radar demonstrator will be also presented, starting from simple monostatic ones via sophisticated designs of noise interferometric and synthetic aperture radars ending on MIMO demonstrators. The presentation will be focused on modern MIMO radars using noise and noise-like waveform to increase the radar sensitivity and its functionality. The presentation will highlight the concept of MIMO radars, shows different waveforms used in such systems and finally shows how to design noise waveforms for MIMO radar

Programme

09:00h - 09:50h	***Noise Radar Fundamentals – From Monostatic to MIMO*** Ram M. Narayanan, The Pennsylvania State University, USA
09:50h - 10:40h	***Signal Processing in Noise Radar*** Krzysztof Kulpa, Warsaw University of Technology, Poland
10:40h - 11:20h	***Coffee Break***
11:20h - 12:10h	***Pseudorandom and Semideterministic Waveforms Design for Noise and MIMO radar*** Gaspare Galati, Dept. of E.E.-Tor Vergata University, Italy
12:10h - 13:00h	***Active and Radiometric Noise Synthetic Aperture Radars – Challenges for High Resolution Images and High Resolution Interferometry*** Konstantin Lukin, National Academy of Sciences of Ukraine, Ukraine

Duration: 09:00h to 13:00h **Room Livia**

WF5 (EuRAD)
Forward Scatter Radar: Challenges, Capabilities and Modern Modalities

Organisers:
Marina Gashinova, University of Birmingham, UK
Alexander Myakinkov, Nizhny Novgorod State Technical University, Russia

Abstract
Research in Forward Scatter Radar (FSR) has proven the concept's high efficiency for the detection of 'difficult' targets in complex environments.
Currently interest in FSR is increasing, firstly because of the introduction of 'stealth' targets and small low flying aircraft, secondly for its capability to provide main radar missions using passive coherent location (PCL) potentially forming a low cost, self-sustaining multi-channel/multistatic radar network.
This workshop will focus on the key capabilities of FSR, such as detection, target motion parameter estimation, tracking and imaging. FSR is proposed as a potential solution to provide flexibility of counter-measures to emerging threats in a modern world, including the development of deployable low cost sensor networks, re-use of existing communication systems and over-the-horizon operation, as well as discussion of the issues associated with FSR.
The workshop will start with an overview of FSR (Prof. M. Cherniakov, UK), discussing current trends and challenges. Introduction into the Forward Scatter Mode of passive radar will be given by Prof. P. Lombardo (Italy). The next topic will be dedicated to ground and maritime for surface target detection and classification (Dr. M. Gashinova, UK). Finally the practical issues of air target detection and tracking in FSR will be analysed in detail by Prof. A. Myakinkov (Russia). All presenters have a long-standing experience of cooperation with industry.

Programme

09:00h - 09:50h	***Overview of Forward Scatter Radar. State-of the-art, Challenges and Future Trends*** Mikhail Cherniakov, University of Birmingham, UK
09:50h- 10:40h	***Passive Forward Scatter Radar operation*** Pierfrancesco Lombardo, University of Rome "La Sapienza", Italy
10:40h - 11:20h	***Coffee Break***
11:20h - 12:10h	***Fundamental and Practical Aspects of Target Detection and Classification In Ground-Based and Maritime FSR Sensor Networks*** Marina Gashinova, University of Birmingham, UK
12:10h - 13:00h	***Detection and Tracking of Low-Observable Moving Targets in FSR*** Alexander Myakinkov, Nizhny Novgorod State Technical University, Russia

Duration: 09:00h to 13:00h **Room Minerva**

WF6 (EuMC & EuRAD)
The Social and Societal Implications of Autonomous Driving

Organisers:
Holger H. Meinel, Daimler AG, Germany
Katharina Kilian-Yasin, University of Pforzheim, Germany

Abstract
Autonomous Driving is not only a technical, but also and especially in the future a social and societal subject - on one hand it is an old dream of mankind - on the other hand it takes control out of the hand of the driver, giving it on to a machine. If this societal situation and its very specific implications are not cleared entirely and positively, there will never be a market for autonomous driving anywhere in this world! This is quite a challenge we jointly have to overcome to make things happen. Bringing together technical and social researchers, as well as people being able to distinguish and analyze the variance of acceptance in very different societies, the BRIC-States for instance, we are going to discuss and analyze this subject.

Programme

09:00h - 09:45h	***Autonomous driving – What it is Today and What it will be in the Future*** Bela Peterson, consulting4drive, Germany
09:45h - 10:30h	***Societal Implications of Autonomous Driving*** Chris Schreiner, Strategy Analytics, USA
10:40h - 11:20h	***Coffee Break***
11:20h - 12:05h	***Socio-Economic Impact of Autonomous Driving in Emerging Countries - India as an Example*** Roland Haas, QSO Technologies India Pvt. Ltd., India
12:05h - 13:00h	***Social Acceptance of Autonomous Driving Within the BRICS-states*** Katharina Kilian-Yasin, University of Pforzheim, Germany

Duration: 09:00h to 13:00h **Room Niside**

SCF1 (EuMC & EuRAD)
Multibeam Antennas and Beamforming Networks/Electronic Scanned Arrays Design

Organisers:
Piero Angeletti, European Space Agency, The Netherlands
Giovanni Toso, European Space Agency, The Netherlands

Abstract
Multi-Beam Antennas (MBAs) find application in several fields including wireless and satellite communications, RADARs for electronic surveillance and remote sensing, science (e.g. radio telescopes), RF navigation systems, etc. Beam-Forming Networks (BFNs) play an essential role in any antenna system relaying on a set of radiating elements to generate a beam. The objective of the course is to present design principles and state-of-the-art in MBAs and BFNs. The course will cover both theoretical and practical aspects for the following topics:

- Overview of Multibeam Antennas and system requirements
- Satellite Communication Systems
- Wireless Communications
- RADARs
- Multibeam Array Antennas
- Array architecture and building blocks
- Aperture design (partitioning and sub-arrays, element lattices, feed design, grating and quantization lobes, etc.)
- Multibeam Reflector Antennas
- Single-Feed-per-Beam
- Multiple-Feed-per-Beam
- Beamforming Networks
- Analogue BFNs (Serial, Corporate, Blass, Nolen, Butler matrices)
- Digital BFNs

Programme

09:00h - 09:50h	***MBA for Telecom and Radar Applications*** Giovanni Toso, European Space Agency, The Netherlands
09:50h - 10:40h	***Array Based Solutions*** John S. Williams, The Aerospace Corporation, USA
10:40h - 11:20h	***Coffee Break***
11:20h - 12:10h	***Reflector Based Solutions*** Roberto Mizzoni, Thales Alenia Space, Italy
12:10h - 13:00h	***Analog and Digital Beamforming*** Piero Angeletti, European Space Agency, The Netherlands

Duration: 09:00h to 18:20h **Room Ottavia**

SCF2 (EuRAD)
Passive Radar Sensors: Theory and Application

Organisers:
Pierfrancesco Lombardo, University of Rome La Sapienza, Italy
Daniel W. O'Hagan, Fraunhofer Institute, Germany
Dominique Poullin, ONERA, France

Abstract
This Short Course is devoted to the passive radar sensor, which over the last five years has moved from an "emerging technology" to a mature sensor that is ready to be deployed in the field to fulfil the requirements of a range of surveillance applications. Whilst the progress in passive radar has largely been facilitated by the impressive increase in real-time signal processing capabilities, a significant technology enabler has come in the evolution of adaptive signal processing techniques, which permit superior effectiveness, reliability and agility. Special attention is devoted, in this course, to those applications which have gained a very wide scope and which are largely combined with advanced processing techniques. Therefore, the capability to cope with large amounts of data, perform long integration times, and adaptively cancel clutter and interferences are among the core aspects of realising passive radar surveillance. These features, in addition to several other advanced topics, will form the basis of the short course, which will also identify and discuss current relevant-technology trends. Specific attention will be given to air traffic surveillance applications with the combined use of multiband sensors, as well as applications for maritime situational awareness (MSA), which has potential for continuous coastal radar coverage. In certain operational environments, exploitation of forward scatter can enhance detection of low-observable targets. Furthermore, short-range applications have specific peculiarities for both air and surface target detection and classification that are presented in a unified frame that includes detection, cross-range profiling and multi-sensor operation.

The short course will cover the topic of tracking air and surface targets of interests. Both 2D and 3D tracking techniques will be presented by leading authorities. Additionally, advances in target identification will be shown. Finally, Earth observation applications which exploit space-based sources of opportunity complete a wide scope view of the present applications. These include the capability to form passive synthetic aperture radar images usable for differential interferometry applications, as well as the retrieval of environmental parameters of surface vegetation and atmosphere from the passive radar measurements.

Programme

09:00h - 09:20h	***Welcome and Introduction to the Short Course*** Pierfrancesco Lombardo, University of Rome La Sapienza, Italy
09:20h - 10:00h	***Surveillance Trends - and the Role For Passive Radar*** Chris Baker, The Ohio State University, USA
10:00h - 10:40h	***Air Traffic Surveillance with Multiband PCL*** Daniel W. O'Hagan, Fraunhofer Institute, Germany Heiner Kuschel, Fraunhofer Institute, Germany
10:40h - 11:20h	***Coffee Break***
11:20–11:55h	***Maritime Surveillance with PCL*** Alfonso Farina, SELEX-ES, Italy Enrico Tilli, SELEX-ES, Italy
11:55h - 12:25h	***Passive Forward Scatter Radar for Low Observable Targets*** Marina Gashinova, University of Birmingham, UK
12:25h - 13:00h	***Short-Range PCL for Surveillance and Classification*** Fabiola Colone, University of Rome La Sapienza, Italy Debora Pastina, University of Rome La Sapienza, Italy
13:00h - 14:20h	***Lunch***
14:20h - 14:55h	***STAP for Airborne Passive Radar*** Krzysztof Kulpa, Warsaw University of Technology, Poland
14:55h - 15:30h	***Passive Radar Tracking in 2D and 3D*** Marc Lesturgie, ONERA, France Dominique Poullin, ONERA, France
15:30h - 16:00h	***Passive Radar Imaging for Target Recognition and Identification*** Fabrizio Berizzi, University of Pisa, Italy Marco Martorella, University of Pisa, Italy
16:00h - 16:40h	***Coffee Break***
16:40h - 17:15h	***Earth Observation: Passive SAR Imaging and Change Detection*** Mikhail Cherniakov, University of Birmingham, UK Michael Antoniou, University of Birmingham, UK
17:15h - 17:50h	***Earth Observation: GNSS Reflecto-Metry for Environmental Monitoring*** Nazzareno Pierdicca, University of Rome La Sapienza, Italy
17:50h - 18:20h	***Conclusions*** Daniel W. O'Hagan, Fraunhofer Institute, Germany