



# Commission D

## 2008-2011 Triennial Report

### *I. Conferences supported by Commission D*

- EMC 2009 VIII International Symposium and Exhibition on Electromagnetic Compatibility and Electromagnetic Ecology, St Petersburg, Russia, June 2009
- META'10, 2nd International Conference on Metamaterials, Photonic Crystals and Plasmonics, 22-25 February, 2010, Cairo, Egypt.
- ISSSE 2010, International Symposium on Signals, Systems and Electronics, Sep 16, 2010 - Sep 19, 2010, Nanjing, China.
- ICEAA 10, International Conference on Electromagnetics in Advanced Applications, September 20-24, 2010, Sydney, Australia.
- AP-RASC 2010 Asia-Pacific Radio Science Conference, September 22-26, 2010, Toyama, Japan.
- APMC 2010 Asia-Pacific Microwave Conference, December 7-10, 2010, Yokohama, Japan.

### *II. Program of Commission D for URSI GASS 2011 in Istanbul*

#### **1. D01: RFID TECHNOLOGY AND APPLICATIONS,**

Conveners: S. Tedjini, Prof Grenoble-inp/lcis, France

Even if the RFID concept was introduced many decades ago, it still very attractive and fertile in terms of R&D and new applications. Today, RFID is seen as a very enabling technology and it is under consideration for thousands of applications covering a large variety of domains among them : ID papers, security, access control, toll road, ticketing, pharmacy, logistic, manufacturing, gambling, sensors, etc.. RFID is an enabling technology for identification by means of radiofrequency signals. RFID tags may be located on or in almost anything and RFID is used for a very wide variety of purposes in an extremely wide variety of locations. This session focus on the advances on RFID. It will cover all the aspects of RFID, from Tag

technology to application like Internet Of Things

## **2. DB1: MODELING OF HIGH FREQUENCY DEVICES AND CIRCUITS**

Conveners : Peter Russer, TU Munich, Germany and Irsadi Aksun, Koç University, Turkey.

The development will be characterized by a further increase of integration density, higher frequencies, lower power consumption and enhanced functionality. Wireless technology and vehicular technology and the need for high-speed digital circuits are major drivers for the increased demand for high-frequency and optoelectronic devices. On a long-term time scale also quantum information processing will come into consideration. The main characteristics of new technologies include nanoelectronic devices with structure dimensions from below 100 nm down to atomic structures, low-cost materials, low power electronics, and fast design cycles. Circuit elements will not only be connected via traditional wiring but also will directly interact via field coupling. In the near future nanoelectronics will be dominated by CMOS technology and the trends will include mixed signal techniques, systems on a chip, and systems in package. Long term research and development will go beyond CMOS and involve novel materials as graphene, carbon nanotubes, magnetic materials and superconductors, novel technologies as nanoimprint lithography and novel device concepts based on these materials and technologies. As the basis for the development of future high-frequency and optoelectronic nanoscale devices and circuits and systems based upon these devices advanced analytic and numerical modeling and simulation tools are required. These tools include the modeling of electromagnetic, electron transport and other phenomena in a multiphysics environment. This session reviews the latest developments in this area.

## **3. D03: LASERS**

Conveners: Alphan Sennaroglu, Koç University, Turkey and U. Morgner, University of Hannover, Germany

This topic includes, but is not limited to laser sources covering all wavelength ranges from THz to the x-ray region. Lasing media comprise semiconductors, solid-state materials, fibers, gases or free electrons. The generated waveform may range from continuous waves to ultrashort pulses. Also high speed modulation of lasers, novel laser structures, amplifiers, laser applications and modeling are of interest.

## **4. DBC: SIGNAL PROCESSING ANTENNAS,**

Conveners: S. Tedjini, Prof Grenoble-inp/lcis, France and Heinz J. Chaloupka, Microwave & Antenna Engineering, Germany.

For many RF systems the antenna is the most important device and its performance will determine the overall characteristics of, for example, a wireless communication system. This session will focus on the evolution of the antenna function, which increasingly integrates electronics, sensors and signal processing. These new capabilities are transforming the original passive antenna to signal processing antenna (SPA). Signal-processing antennas combine a multiple-antenna-structure e.g. an array with signal-processing capabilities to enable adaptive and knowledge aided processing in space and time. By sensing the spatial and spectral properties of the electromagnetic environment SPAs can adaptively optimize the spatial and temporal signal processing operations in order to enhance system relevant performance metrics like the spectral efficiency in wireless communication systems and the

probability of detection in radar. Furthermore, limits of adaptive SPAs can be overcome by combining prior knowledge with measured data (knowledge-aided processing).

## **5. DB2: PLASMONICS**

Conveners : F. de Fornel and Nader Engheta

Surface plasmons are interfacial electromagnetic modes that can be exploited to control the propagation and local oscillation of electromagnetic energy. This topical conference will explore fundamental and applied plasmonic concepts, the control and manipulation of local and propagating surface plasmons, plasmon dynamics, and novel plasmonic nanostructures.

## **6. DT: RFID Technology and Applications**

Session Chair: Franz Kaertner

M. M. Tentzeris, et al. , "Inkjet-printed paper/polymer-based RFID and wireless sensor nodes, Georgia Tech, USA.

## **7. DB3: METAMATERIAL APPLICATIONS**

Conveners: C. Caloz, R. W. Ziolkowski, and N. Engheta

In the last decade, there has been a renewed interest in using fabricated structures at various length scales to develop composite materials that mimic known material responses or that qualitatively have new, physically realizable response functions that do not occur, or may not be readily available, in nature. Researchers have studied the exotic physics associated with these metamaterials and the potential use of their properties for interesting engineering applications, including lenses, cloaking, antennas, small waveguides and cavities, and other devices at microwave, millimeter-terahertz and optical frequencies. We have two sessions dedicated to this topic. This joint DB session on metamaterials, as a companion to another joint BD session, is intended to review and to present recent research advances in the applications of metamaterials.

## **8. D07: MICRO AND NANO PHOTONICS**

Convener: M. Watts, mwatts@mit.edu;

High index contrast micro- and nano-photonics devices, photonic crystals, plasmonics, electronic and photonic integration. High density integrated photonics based on group IV as well as group III-VI semiconductor materials, metals and dielectrics. Passive and active devices and a combination thereof, design tools, or micro and nano-fabrication techniques. Nonlinear effects in micro and nano devices, linear and nonlinear effects enhanced by high index contrast waveguides, photonic crystals and plasmons.

## **9. D08: NONLINEAR OPTICS AND GUIDED WAVE DEVICES**

Conveners: Omer Ilday, Bilkent University, Turkey and G. Steinmeyer, Max-Born-Institute, Germany

This topic includes, but is not limited to, nonlinear wavelength conversion, optical parametric processes, QPM components and devices; wave mixing, stimulated scattering, self- and cross-phase modulation; nonlinear propagation and instabilities, continuum generation, filamentation and optical solitons; nonlinear optics in waveguides and fibers; novel nonlinear materials and structures; nonlinearities in gain media; nonlinear effects in nanostructures and semiconductor microstructures; methods and applications of nonlinear spectroscopy; novel optical applications of nonlinear phenomena; nonlinear optics of metamaterials; nonlinear optical effects in laser damage.

#### **10. DAF1: Enabling technologies for Millimeter and THz wave applications I**

Conveners: Rene Beigang, University of Kaiserslautern, Germany,  
Sami N. Gopalsami, Argonne National Laboratory, US  
Hakan Altan, METU, Turkey  
Tadao Nagatsuma, Osaka Univ., Japan

The latest developments in millimeter-wave and terahertz-wave devices for signal generation, transmission and detection including photonic/electronic devices and materials, metamaterials, MEMS, transmission media, etc. will be discussed, including their implementation to measurement and sensing systems.

#### **11. DAF2: Enabling technologies for Millimeter and THz wave applications II**

Conveners: Rene Beigang, University of Kaiserslautern, Germany,  
Sami N. Gopalsami, Argonne National Laboratory, US  
Hakan Altan, METU, Turkey  
Tadao Nagatsuma, Osaka Univ., Japan

The topic includes recent progress in real-world and/or industrial applications of millimeter and THz waves in non-destructive testing, security, medicine/biology communications, spectroscopic and sensors.

#### **12. DF: HYPERSPECTRAL SENSING AND LIDAR**

Conveners: E. Schweicher,

Hyperspectral sensors (HS) may offer significant improvement over existing sensors in detecting camouflaged and hidden targets. HS is the paradigm of all multispectral sensors, because of its high spectral (or wavelength) resolution and, thereby, with the advent of high performance staring arrays, is potentially able to defeat any CCD (Camouflage, Concealment and Deception) measure! LIDAR (also termed LADAR or Laser raDAR) is an acronym for Light Detection and Ranging. Contributions may address: humanitarian demining by HS & LIDAR, camouflage removal by HS & lidars, various corrections and thematic algorithms for HS, whiskbroom and pushbroom scanning HS, various kind of lidars: mechanical scanning, electronic scanning, coherent (laser vibrometry) and incoherent, 2-D, 3-D & n-D, sensing of atmospheric aerosols by LIDAR, air data systems (aircraft flow fields), pollution monitoring, chemical agent detection, biological (pathogen) agent detection, Differential Absorption Lidar (DIAL) as example of incoherent LIDAR, coherent processing by LIDAR: Atmospheric flow field mapping, wind sensing, ballistic wind determination; underwater detection & imagery & bathymetry; spectral signature data bases for HS, fishing zones and other sorts of monitoring (like novice,

applications of HS in agriculture, geology, health, management of resources, urban zone management, soil practicability & traffic ability, coastal zone bathymetry, pollution detection, maritime applications of HS, like oil spills & discerning objects and organisms below the sea surface, military applications of HS like target identification & target mitigation.

### **13. AD: LOW NOISE MICROWAVE GENERATION**

Conveners: M. Tobar, University of Western Australia ,

Franz X. Kärtner, Massachusetts Institute of Technology, USA

Topics include, but are not limited to, low noise microwave oscillators based on electrical or dielectric resonators, optoelectronic oscillators, cryogenic technologies for low noise oscillators, optical techniques for low noise microwave generation, microwave frequency references.

### **14. AD: OPTICAL FREQUENCY METROLOGY:**

Conveners: F. Hong, AIST, Japan and T. Schibli, University of Colorado, USA

Topics include optical devices, instruments, and technologies for precision measurements of time and frequency; optical frequency standards; optical clocks; lasers, supercontinua, and broadband sources for optical metrology; frequency-comb generation, control, and applications; conversion between optical and microwave frequencies; instrumentation and devices for optical frequency metrology, including precision interferometry and other novel measurement methods, optical transmission of metrology signals, including reference-frequency and pulsed transmission and remote measurements.

### **15. BD: Metamaterial Theory**

Conveners: R. W. Ziolkowski, C. Caloz, and N. Engheta

In the last decade, there has been a renewed interest in using fabricated structures at various length scales to develop composite materials that mimic known material responses or that qualitatively have new, physically realizable response functions that do not occur, or may not be readily available, in nature. Researchers have studied the exotic physics associated with these metamaterials and the potential use of their properties for interesting engineering applications, including lenses, cloaking, antennas, small waveguides and cavities, and other devices at microwave, millimeter-terahertz and optical frequencies. We have two sessions dedicated to this topic. This joint BD session on metamaterials, as a companion to another joint DB session, is intended to review and to present recent theoretical research advances in metamaterials.

### **Commission D Poster Sessions:**

DP1 – Poster : RFID and Signal Processing Antennas

DP2 – Poster: High frequency Devices and Multiphysics Techniques

DP3 – Poster: Photonics

DP4 – Poster: Metamaterials and Microwave Techniques

***III. Papers contributed to RSB by Commission D***

S. Tedjini and E. Perret, “ RFID system and advances in Tag design.”