

Commission E
on
Electromagnetic Noise and Interference
2005-2008 Triennium Report

I. Terms of Reference

During the New Delhi URSI General Assembly, it was decided to update the terms of reference as follows:

Commission E - Electromagnetic Noise and Interference.

The Commission promotes research and development in:

- a) Terrestrial and planetary noise of natural origin, seismic associated electromagnetic fields;
- b) Man-made noise;
- c) The composite noise environment;
- d) The effects of noise on system performance;
- e) The lasting effects of natural and intentional emissions on equipment performance;
- f) The scientific basis of noise and interference control, electromagnetic compatibility;
- g) Spectrum management.

During a business meeting of GA in New Delhi it was discussed on a possible change of name for Commission E, with the aim of better reflecting the challenges of new technologies. It was decided to discuss again at next GA in Chicago, if proposals come from National Delegates.

II. Working Groups

During the New Delhi URSI General Assembly, it was decided to slightly change the various working groups (WG) in order to renew and update their field of interest. The new Working Groups are:

- E.1. Terrestrial and Planetary Electromagnetic Noise Environment
Co-Chairs: M.Hayakawa (Japan), A.P. Nickolaenko (Ukraine), and C. Price (Israel).
Objectives: his WG deals with the study on the characteristics of electromagnetic noises taking place not only in the terrestrial, but also in the planetary environment. The most well-known noise is the atmospheric radio noise from the lightning discharges (so-called sferics in a wide frequency range from ULF to VHF). Some examples of topical subjects on sferics are (1) monitoring of global lightning activity as studied by high frequency noise and Shumann resonance phenomena in the ELF band and (2) ELF transients related with the optical emissions in the mesosphere due to the lightning. Higher frequency lightning emission

provides us with the information on the fine structure of lightning electrical structure, while lower frequency noise provides us with the macroscopic nature of lightning. The noise coming from the ionosphere/magnetosphere will be discussed as well; micro pulsations in the ULF range, VLF/ELF emissions and HF emissions due to the plasma instabilities in the space. Also, our recent topic is the radio emission from the lithosphere, which covers again a wide frequency range from DC to VHF (or even more). The characteristics and generation mechanisms of those effects and also the seismic effect onto the ionosphere will be discussed. Finally, the radio noise environment on other planets (like Jupiter) will be our topic as well. The interaction of these natural noises with artificial noises due to human activity is also another subject. Power line harmonic radiation penetrates into the ionosphere/magnetosphere and induces the particle precipitation into the lower ionosphere (this is a kind of pollution of the natural environment by human activity). Also, we discuss the interaction of natural environment with human activity.

- E.2. Intentional Electromagnetic Interference
Co-Chairs: M. Bäckström (Sweden), and W. Radasky (U.S.A)
- E.3. High Power Electromagnetics
Co-Chairs: C.E. Baum (U.S.A), and R.L. Gardner (U.S.A)
The subject of this working group is the physics and engineering associated with electromagnetic sources for which nonlinear effects associated with high-field regions must be avoided or included in the analysis and design. This includes (but is not limited to) EMP simulators, high-power narrowband and mesoband sources and antennas, and hyperband (impulse) sources and antennas. It also includes the environment near lightning channels and in nuclear EMP source regions. In some cases it includes the high-field regions on, or in targets. This committee actively encourages participation in scientific symposia related to this subject, including URSI and other societies (such as AMEREM/EUROEM, etc.)
- E.4. Lightning Discharges and Related Phenomena
Chair: Z. Kawasaki (Japan)
- E.5. Interaction with, and Protection of, Complex Electronic Systems
Co-Chairs: J.Nitsch (Germany), and J-P. Parmentier (France)
- E.6. Spectrum Management
Chair: T.Tjelta (Norway).
For more information on a group for “Radio Spectrum Management” The use of radio spectrum is a very hot issue today and a lot of discussion is taking place with respect to regulation and spectrum trading. For example, in Europe it seems that a general trend is to liberalise current regulation schemes for the benefit of business developments and users of

wireless communication. From a scientific point of view a number of concerns can be raised and research is necessary to obtain better future solutions. A group in this area will work under the following objectives and activities:

Objective

- Utilization of the electromagnetic spectrum (for wireless communications and radio-based observations of the Earth and space)
- Protection of radio-based services and spectrum sharing

- Activity protection of services
 - Scientific passive and active observation of the nature
 - Radio-based services definitions of the International Telecommunication Union (ITU) seem inappropriate as service convergences is taking over
 - The appropriate spectrum masks
 - Spectrum use efficiency
 - Monitor and control of spectrum use
- Activity spectrum sharing
 - Reasonable spectrum sharing conditions
 - Co-existence of radio systems
 - Violation control

- E.7. Geo-Electromagnetic Disturbances and their Effects on Technological Systems
Chair: A. Viljanen (Finland)

- E.8. Electromagnetic Compatibility in Wire and Wireless Communication Systems
Co-Chairs: J. Gavan (Israel), and A.Zeddami (France)

- Inter-Commission working group on Solar Power Satellites
Chair: H. Matsumoto (Japan)
Secretary: K. Hashimoto (Japan)
Co-Chair for Commission E: Z. Kawasaki (Japan)

- EGH. Seismo Electromagnetics (Lithosphere-Atmosphere-Ionosphere Coupling)
Co-Chair for Commission E: M. Hayakawa (Japan)

III. Meetings

Most of the Commission E activities have been devoted to the organization of meetings and conferences and to the preparation of the Chicago General Assembly.

Furthermore it must be outlined that, within the EMC conferences, an increasing number of sessions were devoted to applications in different domains as: automotive, railway system, power engineering, etc. and to EMC in wire and wireless communication system.

Commission E has sponsored the following meetings

- Short Course: HPE 201-06 High-Power Electromagnetics: Environments, Interaction, Effects and Hardening 1-7 October 2006, Freiburg, Switzerland.
- The 4th International Beijing Symposium on EMC – 2007
National Symposium on Environmental Electromagnetics and EMC, Beijing, 2007,
Prof. Y.- G.Gao, Beijing Univ. of Posts & Telecommunications
- North American Radio Science Meeting, 22-26 July 2007, Ottawa, Canada
<http://ursi2007.ee.umanitoba.ca/>
- ICEAA '07, 17-21 September 2007, Torino, Italy
<http://www.iceaa.polito.it/>
- The Swedish Commission E, 23 members, usually arranges two meetings per year sometimes in collaboration with the Swedish IEEE EMC chapter. Every third year SNRV, which is the Swedish counterpart of URSI, arranges a Nordic URSI conference denoted RVK ("Radio Science and Communication"). RVK has been arranged 19 times since the first time in Stockholm in 1949. the number of participants has been between 250 and 500.
- EUROEM 2008, 21-25 July 2008, Lausanne, Switzerland. Prof. Farhad Rachidi
<http://www.euroem.org/>

These meetings cover nearly all aspects of EMC and its applications.

IV. Reviews of Radio Science

Associate Editor for Commission E: Professor Christos Christopoulos

The following papers have been published or are in preparation:

- “An Overview of High-Power Electromagnetic (HPEM) Radiating and Conducting Systems” D.V Giri, F.M Tesche, Carl E. Baum. (In Press)
- “Electromagnetic Phenomena Associated with Earthquakes – Recent Progress” M. Hayukawa. (In Preparation)
- “EMC for Space Applications” A. Ciccolella. (In Preparation)

V. Website

At the end of year 2005, the following website <http://www.ursi.org/E/Homepage.htm> was activated and hosted by URSI. The website is maintained by the Commission Vice Chair, Professor Christos Christopoulos.

The information of this website is structured under the following headings, corresponding to specific webpages:

- Introduction to URSI
- Terms of Reference of Commission E

- Officers
- Past Chairs
- National Delegates
- Meetings
- Guidelines and rules for URSI sponsorship of meetings
- Working Groups
- Reviews of Radio Science
- Commission E News and Reports
- Links to National Committees
- Job vacancies