

The annual Meeting of the Italian URSI Committee will be held on **October 1-2, 2024** jointly with the XXV Riunione Nazionale di Elettromagnetismo (Italian National Meeting on Electromagnetics – RiNEM) (<http://rinem2024.unipi.it>)

Venue: The conference is jointly organized at the he conference is organized at the conference center Principino Eventi, Viale Guglielmo Marconi 130, Viareggio, Lucca.

Date: Tuesday 1 and Wednesday 2, October 2024

Organizers: Carlo Carobbi (University of Florence), Giuliano Manara (University of Pisa)

PROGRAMME

The URSI Italian National Meeting is intended to disseminate and promote the activities of the International Radio Science Union, one of the oldest and largest scientific Unions supporting education and research in all Radio Science fields (www.ursi.org). The meeting offers an URSI Special Session with tutorials exemplifying the activities of three URSI Scientific Commissions, and the presentations of the three finalist papers of the 2024 Best Paper Young Scientist Award delivered by the URSI Italian National Committee and named after Prof. Roberto Sorrentino.

Tuesday, October 1 URSI WIRS Italy Chapter Session

Session Chair: Micaela Liberti, Chair Chapter URSI WIRS Italy

15:45-16:00

Carlo Carobbi and Micaela Liberti

Introduction to the URSI Italian National Committee Meeting and WIRS Chapter Session

16:00-16:30

Lucilla Alfonsi

“New challenges for radio sciences in Antarctica: AGATA”

“Roberto Sorrentino” Award Session

Session Chair: Giuliano Manara, Secretary URSI Italy

16:30-17:30

Presentations of the three finalist papers (15 minutes plus 5 minutes questions each)

16:30-16:50

Giulio Maria Bianco

“Smart Packaging with Microfluidic-Antenna System for Monitoring Meat Degradation”

16:50-17:10

Micol Colella

“A novel observable in TMS numerical dosimetry: the Effective Electric Field”

17:10-17:30

Luca Tosi

“Thinned Array Antenna Design for Interference Suppression Through Quantum Optimization Method”

20:00 Social Dinner and Joint URSI-SIEM Award Ceremony

the programme continues in the next page

Wednesday, October 2
URSI Special Session
Session Chair: Carlo Carobbi, President URSI Italy

8:45-9:25

Filippo Giannetti

Commissions C, F and J

"One Parabola for Three Commissions: C, F and J"

9:25-10:05

Giovanni Nico, Manilo Monaco, Pier Francesco Biagi, Anita Ermini, and Aleksandra Nina

Commission G

"Detection of anomalies in time series of VLF signals"

10:05-10:45

Luca Bastianelli, Emanuel Colella, Alfredo De Leo, Gabriele Gradoni, Franco Moglie, and

Valter Mariani Primiani

Commissions B, C and E

"Reverberation Chambers as Complex Environments for Wireless System Optimization"

10:45

Coffee break

end of the programme

SUMMARY OF THE URSI WIRS ITALY CHAPTER SESSION PRESENTATION

New challenges for radio sciences in Antarctica: AGATA

Lucilla Alfonsi

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Abstract: The Antarctic continent is not yet fully explored due to harsh environmental conditions and to heavy logistics needed to support the scientific research. In this framework the radio science-based experiments, campaigns and permanent observatories play a key role in advancing the current understanding of our planet and of the outer space. In the past decades historical and political reasons made difficult to coordinate the national polar scientific programs and, consequently, the synergy among the different communities. AGATA (Antarctic Geospace and ATmosphere reseArch) is a SCAR (Scientific Committee on Antarctic Research) Programme Planning Group, led by Italy, bidding to become a new Scientific Research Programme to gather the interest of different communities around common objectives to benefit the next generation of scientists.

SUMMARIES OF THE URSI SPECIAL SESSION PRESENTATIONS

One Parabola for Three Commissions: C, F and J

Filippo Giannetti

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Abstract: Commercial-grade terminals, equipped with a parabolic reflector antenna, are commonly used for the reception on Earth of the signals transmitted by approximately 480 satellites for telecommunications currently active in the geostationary orbit for either one-way services, i.e., broadcasting, or two-way, i.e., broadband connectivity. But besides this use for satellite communication systems, the same type of receiving equipment can also be effectively used as an "opportunity" sensor for atmospheric remote sensing and even for applications in the field of radio astronomy. This tutorial will illustrate and examine these three different utilization modes, both conventional and non-conventional, of low-cost broadcast, or broadband, satellite receive terminals.

Detection of anomalies in time series of VLF signals

Giovanni Nico¹, Manilo Monaco², Pier Francesco Biagi³, Anita Ermini⁴, and Aleksandra Nina⁵

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²Italian Space Agency, Matera, Italy

³Department of Physics, University of Bari, Bari, Italy

⁴Department of Industrial Engineering, University of Tor Vergata, Rome, Italy

⁵Institute of Physics Belgrade, University of Belgrade, Belgrade, Serbia

Abstract: This presentation provides an overview of the techniques for the detection of anomalies in the trend of VLF signals and their potential use to reveal radio precursors of earthquakes. Wavelet and time series analysis techniques are applied to VLF (10-60 kHz) signals acquired by the receivers of the INFREP European radio network installed since 2009. A few case studies are presented referred to recent earthquakes occurred in the Mediterranean region.

Reverberation Chambers as Complex Environments for Wireless System Optimization

Luca Bastianelli¹, Emanuel Colella¹, Alfredo De Leo¹, Gabriele Gradoni²,

Franco Moglie¹, Valter Mariani Primiani¹

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Abstract: Future wireless network architectures aim to achieve unprecedented signal coverage and data-rates via dynamic modulation of the propagation medium. A practical way to achieve this stands on the reconfigurable intelligent surface (RIS) technology, which uses pixelated reflective meta-surfaces with individually tuneable unit cells. Besides improving signal coverage and reducing hot spots, the RIS reduces signal variability, which is underpinned by impaired electromagnetic (EM) wave propagation. Wireless communications in complex environments occur via multiple propagation paths that are best characterised by a statistical channel model. Therefore, antenna arrays and RIS devices are excited by a stochastic EM field, i.e., instantaneous variability at a specific point in space is hard-to-predict. Inherently, channel Hardening (CH) occurs in Multiple-Input Multiple-Output (MIMO) systems where the wireless signal is spatially averaged through a large antenna array, thus reducing EM field fluctuations. As a practical consequence, the receive array perceives a dramatic reduction of the multi-path fading. We have optimised a RIS-assisted digital link operating within an electromagnetic reverberation chamber, where two software defined radios control both transmit and receive arrays. We show both the measured onset of CH for optimal RIS configurations, and the predicted bounds devised via extended random matrix theory. Results are of interest for reducing the computational complexity carried by channel state information algorithms in mobile wireless networks, and to develop accurate protection technologies in directed energy scenarios.