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ABSTRACTS
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ABSTRACTS

FINAL PROGRAM

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ABSTRACTS

CONTENTS

Whistler Waves as a Remote Sensing Tool for Plasma Fluctuations

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Keywords: Radiation Belts, Chorus waves, Propagation in randomly inhomogeneous plasma, Multipoint measurements in space

Abstract: We present statistical model describing propagation of waves in randomly fluctuating plasma. These fluctuations result in variations of the refraction index, and the statistics of this last is supposed to be Gaussian with two characteristic correlation scales, along and perpendicular to the ray path. We show that multi-point measurements of these wave signals can allow one to determine these scales and the distance to the wave source. This technique is applied to real data of measurements of so called "chorus" waves that propagate as whistler mode waves onboard Cluster and THEMIS missions. The electron concentration perturbation scale was assumed and found to be much smaller than the estimated chorus generation region scale. The analysis performed allows to evaluate the parallel and transverse perturbation scales and to estimate the distance to the source along the magnetic field line. The discrete chorus elements were observed in the frequency range 0.15–0.25 of the local electron gyrofrequency typical for the outer magnetosphere. The field-aligned Poynting flux of whistler emissions shows that they propagate along the magnetic field lines in the direction away from the magnetic field minimum that is consistent with the waves being generated there. The averaged amplitude correlation analysis allows us to estimate the characteristic spatial half-width of the source region transverse to the local magnetic field to be about 2800–3200 km. The phase cross-correlation time dependences give a correlation scale from 250 to 500 km transverse to the local magnetic field. The obtained distance to the source region varies from 400 to 2000 km. An interesting observation following from the analysis consists in an estimate of the source speed to be about 5–10 thousands km/sec along the magnetic field line.

Radio Wave Propagation in the Amazon Region – A Review

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Keywords: Forest environment; radio wave attenuation; propagation mechanisms; lateral wave; search and rescue.

Abstract: This paper deals with radio wave propagation in a forest environment. Depending on the relative position of the radio stations, three propagation paths should be considered in the analysis of the problem: (a) Both equipments immersed in the jungle; (b) One radio equipment inside and the other on the ground outside the jungle; (c) A radio link between one equipment located in the forest and the other in a plane or helicopter. Comments on the application of these models to search and rescue, scientific and military missions in the jungle are also addressed.

Algorithm for Determination the Moments of Closing the Glottis within Phonation

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Keywords: Speech signal processing, Glottis wave, Periodical continuations, Recursive algorithm

Abstract: An algorithm for determination the moments of closing the glottis within phonation for speech signals is introduced. There are two main difficulties when solving this problem. The first that is the voiced segments of the speech signal may consist of only a couple of periods. The second is that the fluctuations of the frequency of the phonation and of the magnitude of the speech signal may be significant, without following a certain law of change. This is the reason why in most existing algorithms for the closing of the glottis a lot of extra heuristic estimations and rules are applied, besides the well-known digital signal processing theory and the theory for statistical processing of data. This heuristic rules, as one can imagine, are very hard for automatic implementation. In the proposed algorithm though, this problem does not exist. It is tunable and is easy for implementing in different systems for signal processing. It can be also used for seeking of periodic sequels in quasiperiodical signals in other domains of use, such as radiolocation, hydro location, seismology, electrocardiography, electroencephalography, electromyography economical analysis and others.

Low Latitude Earthquakes and Perturbation in the Atmosphere: A Study in Relation to Identifying Precursors and Epicenters Utilizing EM Techniques

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Keywords: TEC; Earthquake; VHF anomalous propagation; SODAR; Effective earth radius.

Abstract: The paper addresses aspects involved in identifying precursors of an impending low latitude earthquake by using electromagnetic techniques. One of the methods discussed here is the use of VHF signals from GPS and geostationary satellites providing columnar or Total Electron Content (TEC) profiles. Here the focus is on application of TEC in extraction of features related to dynamical and physical processes induced in the atmosphere by an approaching earthquake and then in identification of epicentre position. For this purpose the phenomena of extension/suppression of radio horizon of the transmitter-receiver by earthquake modified tropospheric situation reflected in pre-earthquake TEC, are brought in to the discussion. The paper then presents methodology adopted for extraction of earthquake time low-latitude foF2 features from ground based and topside ionosonde. The role of 'Anomaly Effect' at low latitudes in identifying precursors of earthquake is highlighted. It also covers techniques for un-earthing pre-seismic characters in F-region

electron density even when the density profile maintains a Quiet day (Q-day) pattern. The anomalous VHF propagation of audio and video signals received before an earthquake is introduced in relation to identification of an epicenter. Pre–earthquake seismic echo characters seen in Sodar echograms are also presented in the ambit of discussion

Identification of Low Latitude Earthquake Epicentre: An Attempt Utilising GPS and Ionosonde Data

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Keywords: Earthquake epicenter; TEC; foF2; magnetic field H

Abstract: The interest here is to examine spatial quake-time low-latitude TEC variations when epicenter is not far from the observing station (±5º latitudinal separation) and to focus on dynamical situations in the ionosphere associated with the earthquake events. Prelude to earthquake-induced TEC features i.e. enhancements and depletion in density is obtained through analysis on noon and post noon diurnal variations. The paper also presents a few observations in an attempt to identify epicentre of low latitude earthquakes. Contribution of earthquake induced current system at the epicentre zone to the modification in Low latitude TEC is suggested. In spatial mode of analysis when ionosonde data of foF2 are available from a number of stations in and around equator, special iterative method is adopted for extraction of earthquake induced anomaly magnitudes for locating an epicentre..

Beam Direction Variation and Compensation Plan for Large-Scale Deployable Antenna Mounted on Geostational Satellite for Satellite Communication

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Keywords: Satellite/Terrestrial Integrated mobile Communication System, large-scale deployable antenna

Abstract: To achieve a secured and safe society, the securing communication method at the emergency disaster is desired. In the background of this social tendency, the research and development of the mobile satellite communication system for the satellite terrestrial common terminal is begun. This system is called STICS (Satellite/Terrestrial Integrated mobile Communication System). The dual communication function that can be connected with both the terrestrial system and the satellite system is composed by using the common

terminal with a handheld and portable shape. To achieve such system, the dual mode terminal in the same size and weight as the ground cellular phone is used by installing a large-scale deployable antenna (LDR) of 30m class in the geostational satellite.

Recently, it is turned out LDR has variation of beam direction due to thermal environment on the orbit. Similar satellite measurement is made using ETS-8 geostational satellite, which has 13m radius LDR. Receiving level records of satellite beacon in multi earth station when eclipse in GSO. In the ecripse, main beam moves to east about 0.15 degrees.

To compensate such beam variation of LDR, excitation distribution of primary feeding array need to compensate. For this purpose we are now developing 'Simulation software for beam direction variation and compensation in LDR' which based on REV method in multiple earth stations.

Status of Space Solar Power System at USEF

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Keywords: Space solar power system (SSPS), Wireless Power Transmission(WPT), Japanese new space policy & new space plan, Ground microwave WPT

Abstract: Institute for Unmanned Space Experiment Free Flyer, USEF, has been studying Space Solar Power System, SSPS, from early 1990'. One of major activities is the development and demonstration of several important technologies for the realization of the microwave wireless power transmission system, WPT. They are beam steering, microwave transmission and microwave power utilization. As for the transmission and utilization, we have developed and tested light weight microwave transmission system and rectenna array. In 2008, new development plan for Ground microwave WPT has started in 2009. The system is intended to demonstrate microwave beam control and microwave wireless power transmission with about 100m distance and kilo watts level transmission power.

An investigation of Titan's resonant ionospheric cavity with the PWA instrument on the HUYGENS probe. The generation of ELF wave and the detection of a buried ocean at a depth of about 45 km

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Keywords: Titan; Atmospheres; Ionospheres; Magnetospheres; Schumann resonances; Planet interiors.

Abstract: During the descent of the Huygens probe through the atmosphere of Titan, the PWA instrument did not only record the local profiles of the ion and electron conductivities, but also measured the global characteristics of the ionospheric cavity and boundaries from the observation of the electromagnetic wave environment. The instrument, originally designed for the detection of possible lightning events, that trigger Schumann resonances on Earth, did not record any electric discharge but observed a continuous strong, narrow band, emission at around 36 Hz. This paper reviews the detailed and careful analysis performed by the team during the last five years, including an assessment of the instrument performance and a critical evaluation of misleading artefacts. Conductivity profiles obtained via two complementary different techniques are found to fit theoretical models, except above ~90 km where electrons might be captured by aerosols. Following a close examination, it appears that the 36 Hz wave emission is likely a natural phenomenon. The energy that sustains the emission in the whole resonant cavity is generated by the interaction of Titan with the co-rotating Saturn magnetosphere. The fact that the electromagnetic wave amplitude does not vanish at the surface of Titan, a rather poor conductor, indicates that the reflecting boundary, possibly the top of Titan's H2O-NH3 buried ocean, must lie at a depth of ~45 km

CDMA Wireless Communication System with Variable Information Rate Based on Families of Generalized Orthogonal Complementary Codes

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Keywords: CDMA wireless communication system, Families of orthogonal complementary codes.

Abstract: The wireless communication systems are in very rapid progress today. Despite of this the users and industry expect an even more significant enhancement of the quality of the services and the transmission rate, offered by these systems. A promising approach for meeting of the today requirements are the so – named families of orthogonal complementary codes (FOCCs), which are the mathematical model of radio signals possessing both autocorrelation functions (ACFs) with a small level of the side-lobes and small cross-correlation functions (CCFs) among all pairs of members of a family. With regard to the valuable correlation features of the FOCCS, in the paper we present a scheme of CDMA wireless communication system based on FOCCs. The main advantages of the proposed scheme are: the so-named self-interference (SI), caused by multipath spreading of electromagnetic waves, can be significantly reduced by a separate processing of the direct and reflected signals; the negative effect of simultaneous transmission of numerous users, named multi user interference (MAI), can be practically eliminated; the information transmission rate can be adjusted according to the concrete necessities of the users

Analysis of Forward Error Correction Codes for Improvement of the Energy Consumption in WSN

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Keywords: Wireless sensor networks, forward error correction codes, sensor nodes, sensor network lifetime.

Abstract: In this paper we study the effect of forward error correction codes on the energy consumption for communications in wireless sensor networks. These networks are extremely energy constraint, due to the limited battery capacity at each node, so the goal is to maximize the network lifetime. Channel coding can decrease the energy consumption, increase reliability and eliminate the need of costly retransmissions for sensor data.

MVDR Beamformer with a CFAR Processor for Jamming Suppression in GPS Receivers

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Keywords: Adaptive array processing; CFAR detection, satellite navigation systems.

Abstract: In this paper, the performance of a new three-stage algorithm for detection of weak GPS signals in heavy interference environment (GPS MDVR CFAR) is described and evaluated. Two different beamforming schemes, conventional and MVDR are applied to the input of a GPS receiver for jamming suppression before detection of the C/A code. The effect of beamforming on the detection performance is evaluated in terms of two quality factors: the signal-to-interference-plus-noise ratio (SINR) improvement factor estimated at the beamformer output and the detection probability evaluated at the CFAR detector output. The simulation results demonstrate the more effective anti-jamming protection of the new detection algorithm..

A Spatial Resource Management Scheme Suitable for Wireless Ad Hoc Networks

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Keywords: Wireless ad hoc network, adaptive array antenna, interference cancellation

Abstract: This paper introduces a new scheme for the spatial resource management in wireless ad hoc networks (WAHNs). WAHN is a network configured by nodes, without any centralized network control facilities. It has been considered that adaptive array antenna (AAA) is an effective means for improving the capacity of WAHN. This is because of its interference cancellation capability in the space domain. However, AAA is not perfect even though conventional studies concerning AAA for WAHN assume that it is a perfect tool for the interference cancellation. In this paper, a new scheme to utilize AAA more effectively, avoiding problems caused by the imperfect beamforming will be proposed. The concept of the proposed idea is comprehensively explained.

Miniaturization of Plasma Wave Receivers Onboard Scientific Satellites and its Application to the Sensor Network System for Monitoring the Electromagnetic Environment in Space

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Keywords: Space plasmas, Plasma waves, Electromagnetic environment in space, ASIC, Sensor network

Abstract: A plasma wave receiver onboard a scientific satellite has a role of observing electromagnetic/electrostatic waves in space. Since space plasmas are essentially collisionless, kinetic energies are transferred via plasma waves. Therefore, the observation of plasma waves is very significant in studying the energy transportation in space plasmas.

Recently, the downsized satellites in science missions such as formation flights and small satellites require the further reduction of power and mass budget for onboard instruments. We also face the similar problem on the lack of resources of spacecraft in planetary missions. Therefore, the breakthrough of plasma wave observations via spacecraft requires the extreme miniaturization of onboard plasma wave receivers. Since one of the characteristics of plasma wave receivers is the large occupation of circuit boards by analogue circuits, the miniaturization of the analogue circuits leads to the realization of the compact plasma wave receiver, effectively.

In order to achieve the extremely small analogue circuits, we make use of the analogue ASIC (Application Specific Integrated Circuits) technology. We have already succeeded in implementing necessary analogue components inside the chip with the size of 3mm x 3mm for the waveform type plasma wave receiver.

Rectennas and Energy Harvesting

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Keywords: Rectennas, Energy harvesting, environmental sources and micro-sources, Rectifiers, Renewable energy, Left Handed Materials, Antenna, Schottky diodes

Abstract: Energy harvesting is an increasingly important technology for both terrestrial and spatial applications, such as clean electrical energy, implantable medical devices, wireless sensor networks, traffic control systems, satellite, RFID, etc. There are various forms of environmental energy that can be harvested, like electromagnetic waves, solar, wind, acoustic, thermal and mechanical.

After a short reminder of renewable energy sources and micro-sources, this presentation describes the present characteristics of the rectennas, the prospects of Electromagnetic Energy Harvesting techniques (EEH). The applications prospects of the EEH techniques are varied on a wide range of harvested power. The practical limitations of EEH and future solutions, as the use of the Left Handed Materials, the high Q resonant structure, etc., will be also analyzed.

SAS and ISAR Signal Modeling and Image Reconstruction

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Keywords: Synthetic Aperture Radar (SAR). Inverse Synthetic Aperture Radar (ISAR). SAR/ISAR Signal Modeling. SAR/ISAR Image Reconstruction.

Abstract: Synthetic aperture radar (SAR) and Inverse Synthetic Aperture Radar (ISAR) are powerful tools for microwave imaging of the objects placed on the Earth surface and flying in the air or in the space. In this contribution a new concept of SAR and ISAR signal modeling is suggested. Analytical geometrical and kinematical equations for different SAR and ISAR scenarios are derived. Mathematical expressions for SAR signals reflected from the objects with complicated shape are devised. Image reconstruction procedures and their motion compensation interpretation are given. Verification of proposed signal models and image reconstruction procedures is performed by numerical experiments.

Opportunities and Challenges for Wireless Power Transmission

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Keywords: Wireless Power Transmission, Microwave, Space-based Solar Power, Solar Power Satellite,

Abstract: Recent announcements in the United States and Japan have brought renewed interest in space based solar power and wireless power transmission. In the United States, the first commercial contract to deliver electric power from space to the electric utility grid was announced between Pacific Gas and Electric Company and Solaren Corporation. In Japan, the government announced a phased program leading to a full-scale demonstration solar power satellite in 2030. Opportunities for using wireless power transmission have been identified on earth and beyond.

While judged technically feasible since the 1981 National Research Council report on the NASA Definition Study, the deployment of an operational space based solar power system still presents many challenges. These challenges are both technical and programmatic. Similar challenges will be encountered in other applications of wireless power transmission.

Demonstration Experiments of Microwave Power and Information Transmission from an Airship

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Keywords: Phase-Controlled Magnetron, Radial Line Slot Antenna, Direction-of-Arrival Estimation, Rectenna.

Abstract: The world's first experiments: "Demonstration Experiments of Microwave Power and Information Transmission from an Airship" (abbreviated as "Airship Experiments") were conducted on the Uji campus ground, Kyoto University on March 5th and 10th, 2009. The objectives of the Airship Experiments are to demonstrate wireless transmission of electrical power and information simultaneously, to reduce the size and weight of microwave transmitting system, and to remote-control the microwave transmitting system. The Airship Experiments consist of a transmitting system, a direction-of-arrival estimation system, a remote control and telemetry system, and a receiving system. The transmitting system consisted of lithium-ion battery, power supply, two magnetrons, waveguide couplers, two-element radial line slotted antennas. The 17m-long airship was launched at an altitude of around 30m. Total microwave power of 220 W was radiated from the transmitting system mounted on the bottom of the airship. The Airship Experiments were

successful with regard to demonstration of wireless power transmission, direction-of-arrival detection received by a pilot signal, remote control by 429MHz specified low-power radio communication.

Nonlinear Distortion Compensation Techniques for Future Mobile Communication Base Stations

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Keywords: power amplifier, nonlinear distortion, linearizer, intermodulation distortion, feed-forward, predistortion

Abstract: A microwave power amplifier (PA) used in the base station of mobile communication systems requires high power efficiency to achieve low power consumption as well as to offer easy installation and maintenance of the base station. The PA can offer high power efficiency if it is operated around its saturation region; however, when doing so the PA generates a high level of nonlinear distortion components. Because these components cause adjacent channel interference and violate spectrum emission specifications of mobile communication systems, it is indispensable for the PA to employ a nonlinear distortion compensation technique that can compensate for the nonlinear distortion components while maintaining an appropriate output backoff level. This paper presents two nonlinear distortion compensation techniques. The first is a new feed-forward amplifier configuration that employs a harmonic reaction amplifier as the main amplifier for high-efficiency operation. The second is a digital predistortion linearizer that can compensate for the frequency-dependent intermodulation distortion components.

Emission Security and Operating Environment Investigation

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Keywords: Emission Security, Malicious Attacks, Malicious Software, Computing Systems, Video Controllers, Protection Systems, Tempest Viruses, EmSec Viruses.

Abstract: In this paper the issues, related to the emissions from visualizing terminal devices are considered. Main accent on display devices of different types computing systems is set. Special attention to the possibility for creating and real implementing of malicious attacks by using electromagnetic emissions under computing systems, based on Windows OS, Linux OS and Mac OS, is paid. The possibilities for modifying video drivers, which manage video controllers in different computing systems, are considered. Possibilities for creating of software protections, which protects the video controllers against unwanted regime of increased emissions, are presented. In conclusion, the benefits and disadvantages of malicious attacks, based on emissions, are evaluated. The benefits and disadvantages of existing

systems for protection against similar type of attacks, is also inspected. All analyses and investigations are carried out in case of clearly defined limit between specialized military applications, concerning the national security, and wide distributed commercial systems used in business activities.

A Reconfigurable Multi-band Power Amplifier for Mobile Terminals

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Keywords: High efficiency, Multiband, Power amplifier, Reconfigurable circuits, Switch

Abstract: This paper presents a highly-efficient multi-band power amplifier (PA) for future mobile terminals. The PA employs reconfigurable matching networks (MNs) that consist of transmission lines, semiconductor switches, and lumped capacitors. The MN achieves the desired matching condition in the target frequency band by controlling the on/off status of switches. The fabricated PA prototype has three stages and the reconfigurable MNs are employed in the second and final stages. The reconfigurable PA has 8 states to cover 9 frequency bands from 0.7 to 2.5 GHz. Experimental results show that the PA achieves a linear gain of over 30 dB, a saturated output power of greater than 34 dBm, and a maximum power added efficiency of over 40% at the supply voltage of 3.5 V when operating in each band.

Theory and Simulations of Whistler-mode Chorus Emissions in the Magnetosphere

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Keywords: Wave-particle interaction, Nonlinear, Whistler, VLF, Simulation, Chorus, Radiation belts

Abstract: We develop a nonlinear wave growth theory [1,2] of whistler-mode chorus emissions, which are frequently observed in the inner magnetosphere including the radiation belts. Taking into account the spatial inhomogeneity of the static magnetic field and the plasma density variation along the magnetic field line, we derive theoretical expressions for the nonlinear growth rate and the amplitude threshold for the generation of self-sustaining chorus emissions. We assume that nonlinear growth of a whistler mode wave is initiated at the magnetic equator where the linear growth rate maximizes. Self-sustaining emissions become possible when the wave propagates away from the equator during which process the increasing gradients of the static magnetic field and electron density provide the conditions for nonlinear growth. The amplitude threshold is tested against both observational data and self-consistent particle simulations of the chorus emissions [3]. The self-sustaining mechanism can result in a rising tone emission covering the frequency range below the

equatorial electron gyrofrequency. During propagation, higher frequencies are subject to stronger dispersion effects that can destroy the self-sustaining mechanism. We obtain a pair of coupled differential equations for the wave amplitude and frequency. Solving the equations numerically, we reproduce a rising tone of VLF whistler mode emissions that is continuous in frequency. Chorus emissions, however, characteristically occur in two distinct frequency ranges, a lower band and an upper band, separated at half the electron gyrofrequency. We explain the gap by means of the nonlinear damping of the longitudinal component of a slightly oblique whistler mode wave packet propagating along the inhomogeneous static magnetic field. Chorus emissions can induce microburst precipitation of energetic electrons trapped by the magnetic field [4]. The nonlinear growth mechanism of chorus emissions is also applicable to the left-handed polarized electromagnetic ion cyclotron waves with rising frequency, which was observed near the plasma pause by CLUSTER spacecraft [5,6]

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2D-DoA Estimation with Pilot Signals and Select Technique

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Keywords: DoA estimation, beamforming, pilot

Abstract: A two-dimensional direction-of-arrival (2D-DoA) estimation using pilot signals and select technique with 7-element hexagonal array is proposed. An estimate candidate of 2D-DoA, associated with a pilot signal, is estimated with two set-of-subarrays, where the estimation is based on the computation of the phase shift between the two subarrays with subarray beamforming. The estimate DoA is selected from the estimated elevation and azimuth angles in the three estimate candidates obtained from the three combinations of two set-of-subarrays. Benefiting from the multiple subarrays and the pilot signals, the proposed algorithm suppresses the error dependence on relation of subarrays, and gives a larger estimation capacity than the number of subarray elements. Simulation verifies the efficiency of error suppression and estimation capacity.

Cognitive Radio and Green Communications: Power Consumption Consideration

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Keywords: Cognitive Radio, Green communications, sensors, power consumption.

Abstract: Green Cognitive Radio (GCR) is a Cognitive Radio, which is aware of sustainable development and takes it as an additional constraint in the decision making function of the cognitive cycle. In this paper, we remind the Cognitive Radio concept, and then explain how the sensors distributed within the three layers of our model help to reach GCR. The use of these sensors, so as to make the correct decision and to comply with the sustainable development constraints, is explained through two examples related to power consumption

Advanced Signal Processing Algorithms for Wireless Communications

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Keywords: SAGE algorithm, Gibbs sampling, CDMA system

Abstract: Inexpensive and rapid computational power provided powerful tools to overcome the limitations of current technologies and enabled us to apply several advanced statistical signal processing techniques for the design of receivers in wireless communications systems. In this presentation, we first mention the knowledge gaps in general. Then, we briefly explain two techniques, namely, (i) the expectation maximization (EM) and its modified version called the space-alternating generalized expectation maximization (SAGE) algorithm (ii) the Monte Carlo Markov Chain (MMCC) technique based on the Gibbs Sampling algorithm.

To demonstrate the applications of these techniques to wireless communications, we will then give two examples from our recent research; the first one is on CDMA, entitled "computationally efficient, joint transmission delay and channel parameter estimation algorithm for uplink asynchronous direct-sequence CDMA systems", and the second one is on OFDM entitled "OFDM receiver design in the presence of high mobility fading channels". The presentation will end with a conclusion..

MF Waves Observed by DEMETER

Michel Parrot

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Keywords: VLF transmitter, Lightning activity, South Atlantic Anomaly

Abstract: DEMETER is an ionospheric micro-satellite launched on a polar and circular orbit at an altitude of 710 km in June 2004. This altitude was decreased to 660 km in December 2005. Its main scientific objectives are to study the ionospheric perturbations in relation with seismic and anthropogenic activities. Therefore, its scientific payload allows to measure electromagnetic waves and plasma parameters all around the Earth except in the auroral zones. In the MF frequency range, the data of an electric field antenna are recorded up to 3 MHz. Two different topics will be discussed in this paper.

1. Global maps of the Earth reveal a persistent wave activity at MF frequencies above the location of ground-based VLF transmitters. It is shown that it is due to the perturbation of the ionosphere by these transmitters which produce ionospheric irregularities. Whistler waves generated by lightning strokes can therefore penetrate trough the ionosphere at MF frequencies at the location of these VLF transmitters.
2. Global maps of the Earth also show a clear increase of the amplitude of the electric field in a narrow frequency band (660-680 kHz) right above the South Atlantic Anomaly (SAA). This effect is not observed during summer in the Southern hemisphere. The paper will discuss the relation of these MF waves with the constant precipitation of energetic particles in the SAA due to the lower altitude of their mirror points. Characteristics of these waves and conditions of propagation up the satellite altitude are studied.

Influence of Amplitude Fluctuations on Nonlinear Estimation of Wave Front

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Keywords: nonlinear estimation; Markov process; random field

Abstract: Inclusion of amplitude fluctuations estimation in the procedure of signal processing can improve estimation of phase of a signal, whose wave front was distorted during propagation through a random medium. On the basis of Markovian methods of the nonlinear filtration theory, conditions are formulated under which the joint processing of amplitude and phase may be appropriate.

Signal Processing of Ultra Low Frequency (ULF) magnetic field data related to seismic activity in Europe during 2008 and 2009

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Keywords: Ultra Low Frequency, Earthquake, Power Spectral Density, Cross Correlation

Abstract: A strong earthquake (Ml=5.8, Mw=6.3) hit L'Aquila (Central Italy, Abruzzo region, LT=UT+1) on April 6, 2009, 01:32 UT, causing more than 300 deaths and damage. We present Ultra Low Frequency (ULF) magnetic field measurements in the range from 10 mHz to 50 mHz before and during time periods of strong seismic activity. In the frame of the South European GeoMagnetic Array (SEGMA) a European collaboration runs ULF facilities (fluxgate magnetometer) continuously monitoring the background in ULF variations related to geomagnetic phenomena. Among others, the immediate scientific objective is the investigation of signal variations due to seismic activity and the discrimination of other natural and human influences. Concerning the L'Aquila earthquake the closest recording SEGMA station in L'Aquila (AQU) provided data during the time period 2008 and 2009. The available data give the possibility to perform signal processing analysis for a 16 months lasting time period. The distance to the main stroke epicenter was ~ 6 km. For the analysis we consider the nighttime period from 22.00 - 02.00 UT and determine the power spectral density of the horizontal and vertical field components. To compare the results we use data from SEGMA stations in greater distance to L'Aquila which are Ranchio (RNC), Castello Tesino (CST), both Italy, and Nagycenk (NCK), Hungary. Two major noise generation effects related to earthquakes are analyzed. (i) A direct electromagnetic (EM) effect where signals are possibly emitted within the earthquake focal zone. (ii) Indirect precursor effects, like strong seismic activity, can lead to Atmospheric Gravity Waves (AGWs) causing turbulence in the lower ionosphere leading to a depression of ULF waves down going from the magnetosphere.

Queuing Modeling of Handovers in 4G Wireless Mobile Networks

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Keywords: Wireless Mobile Networks, Queuing Systems, Traffic Models, Handover.

Abstract: The queuing modelling of handover in 4G mobile networks is under consideration. Handover is the process of changing the channel (frequency, time slot,

spreading code, or combination of them) associated with the current connection while a call is in progress. Call Admission Control and quality of service requirements are considered for determining of traffic classes in multimedia wireless networks. The existing models of the handover simplify the traffic processes and concern the multidimensional heterogeneous traffic only via queues in handover. In this paper is worked out a model, where as queues are presented channels in non-preemptive priority handover schemes. This queuing model is suitable for searching of effective solutions for handover parameters and quality of service parameters for multimedia traffic in modern wireless mobile networks. The model allows implementation of different methods for traffic parameters determination – Markov chains, diffusion equations etc.

Global MHD Modeling of Coronal Mass Ejections and Related Shocks from Complex Active Regions

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Keywords: MHD–shock waves–Sun: corona–Sun: coronal mass ejections (CMEs)–Sun: magnetic fields–acceleration of particles

Abstract: The physical causes of coronal mass ejections (CMEs) have been debated by the solar community for over three decades now. The vast majority of proposed models agree that CMEs are the result of catastrophic loss of mechanical equilibrium or stability of the coronal magnetic field due to changes in the distribution of magnetic flux elements at the photosphere. These models usually involve idealized physical circumstances with either dipolar or quadrupolar underlying magnetic field geometries. The real Sun, however, demonstrates cases far more complex than those idealized configurations. Therefore, studying the actual magnetic field geometries involved during CMEs is crucial for understanding the dynamical time scales of the eruption, acceleration profiles, etc. By means of fully compressible 3-D magnetohydrodynamic simulations, we have investigated the CME events that took place on Apr 21 and Aug 24 of 2002. We have used high-resolution SoHO/MDI data to set realistic boundary condition for the magnetic field at the Sun. The loss of equilibrium and subsequent eruption have been achieved by stretching and twisting the opposite polarity feet of a newly emerged magnetic dipole in the vicinity of the source region of the CME. As the result of reconnection at 3-D null points, magnetic flux and helicity are transferred from the compact flux system containing the emerged dipole to the larger-scale flux systems in the neighboring active regions. The CME dynamics have been found to proceed in a manner different than that predicted by earlier models, yielding fast ejections with properties similar to those observed. This paper summarizes the simulated dynamics of the CMEs and associated shock waves, and their comparison with observations.

Sub-Ionospheric and Trans-Ionospheric VLF Wave Propagations and Its Relation to Seismo-Electromagnetic Phenomena

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Keywords: Seismicity, VLF, Transionospheric, Subionospheric, Atmospheric Electricity

Abstract: The Graz VLF facility is part of a European seismo-electromagnetic VLF/LF network. The radio paths between the European VLF/LF transmitters and ground- and satellite borne receivers are used in order to investigate the lithospheric-ionospheric coupling of European active seismic regions. Mainly the pre-, co-and after-seismo-electromagnetic phenomena of the 6-April-2009 earthquake in the Abruzzo region in Central Italy near L'Aquila have been used for this study. A major emphasis is on the analysis of the amplitude and phase variations of the seismo-electromagnetic VLF radio signals received by the European ground-based receiver network and aboard the DEMETER microsatellite.

Development of High Efficient Phased Array for Microwave Power Transmission of Space Solar Power Satellite/Station in Kyoto University

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Keywords: SPS, Microwave Power Transmission, Phased Array

Abstract: The SPS (Space Solar Power Satellite/Station) is most huge and important application of the wireless power transmission via microwaves. For the SPS, we need 'higher efficient' 'higher accurate' 'lighter weight' 'lower cost' phased array with 'huge number of antenna elements'. However, there was no suitable phased array and no project of developing the phased array for the MPT. In Kyoto University, we have a governmental budget to develop the high efficient phased array as an experimental equipment for all SPS engineers. We are developing the phased array with GaN semiconductors. In the phased array, there are software phase adjustments with REV (Rotating Electromagnetic Vector) method and software retrodirective target detecting with mono pulse pilot signal for beam controlling

On the Optimization of Side-Lobes in Large Antenna Arrays for Microwave Power Transmission

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Keywords: microwave power transmission, large antenna array, uniform spacing, random spacing, spatial and amplitude tapering, side lobe level, grating lobes, workspace, transmitting efficiency.

Abstract: The concept of placing enormous Solar Power Satellite (SPS) systems in space represents one of a handful of new technological options that might provide large scale, environmentally clean base load power to terrestrial markets. Recent advances in space exploration have shown a great need for antennas with high resolution, high gain and low side lobe level (SLL). The last characteristic is of paramount importance especially for the Microwave Power Transmission (MPT) in order to achieve higher transmitting efficiency (TE) and higher beam collection efficiency (BCE). In order to achieve low side lobe levels, statistical methods play an important role. Various interesting properties of a large antenna arrays with randomly, uniformly and combined spacing of elements have been studied, especially the relationship between the required number of elements and their appropriate spacing from one viewpoint and the desired SLL, the aperture dimension, the beamwidth and TE from the other. We propose a new unified approach in searching for reducing SLL by exploiting the interaction of deterministic and stochastic workspaces of proposed algorithms. Our models indicate the side lobe levels in a large area around the main beam and strongly reduce SLL in the entire visible range. A new concept of designing a large antenna array system is proposed. Our theoretic study and simulation results clarify how to deal with the problems of side lobes in designing a large antenna array, which seems to be an important step toward the realization of future SPS/MPT systems.

Markovian Approach to Optimal Information-Measuring Facilities Integration Problems

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Keywords: Markovian theory, a priori description, probability density function (PDF), Stratonovich equation, Gaussian approximation, nonlinear estimation, joint processing, a posteriori correlation matrix, phase-modulated signal, phase lock loop (PLL), signal/noise ratio.

Abstract: Application of the Markovian nonlinear processing theory to optimal information-measuring facilities integration problems is considered. The integration purpose consists in estimation error reduction at the expense of joint processing of signals observed by several receivers in Gaussian noise background. Generalized Stratonovich equations for a

posteriori probability density function (PDF) of information parameters under estimation are deduced. They cover the most general situations when these parameters are generated under the influence of both Gaussian and non-Gaussian external force on nonlinear system. In addition, signals and noises may be both random processes and random fields. Gaussian approximation equations for Bayesian estimates and a posteriori correlation matrix are obtained and discussed. The joint demodulation problem of phase-modulated radio signals with various carrier frequencies is considered. These signals are observed by several receivers in presence of additive white Gaussian noise. Structure scheme of joint processing which includes interconnecting phase lock loops (PLL) is synthesized and filtering error reduction due to receivers integration is calculated in terms of general signal/noise ratio enhancement.

Cellular Neural/Nonlinear/Nanoscale Network (CNN) Computing

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Keywords: Cellular Neural Networks, Cellular Nano Networks, Image Processing, Image Recognition, Image Coding

Abstract: Spatial and spatio-temporal patterns occur widely in physics, chemistry and biology. In many cases, they seem to be generated spontaneously. These phenomena have motivated a great deal of mathematical modeling and the analysis of the resultant systems has led to a greater understanding of the underlaying mechanisms. Partial differential equations of diffusion type have long served as models for regulatory feedbacks and pattern formation.

We are witnessing a technical development in our fields where the sensing, computing, activating circuits and systems are becoming inherently connected; physically and theoretically, as well. Moreover, as a result of this, our notion about sensory computing, even about computing, is in a continuous transformation. Hence, we have to make a closer look about the fundamentals of computing.

How, now, can we characterize a brain-like system?

We might summarize the key properties as follows:

- Continuous time continuous (analog) valued signal arrays (flows)
- Several 2Dimensional strata of analog "processors" (neurons)
- Typically, mainly local, or sparse global (bus-like) interconnections
- Sensing and processing are integrated
- Vertical interconnections between a few strata of neuron "processors"
- Variable delays
- Spatial-temporal active waves
- Events are patterns in space and/or time

In developing a universal and canonical computing architecture, after having been decided the forms of data, we are tending to use the simplest possible building blocks, with the simplest possible interconnections, elementary instructions and programming constructs. Then we introduce algorithmic stored programmability to make it universal and practical.

CNN is simply an analogue dynamic processor array, made of cells, which contain linear capacitors, linear resistors, linear and nonlinear controlled sources. It is known that some autonomous CNNs represent an excellent approximation to nonlinear partial differential

equations (PDEs). In this paper we will present the receptor-based model by a reaction-diffusion CNNs. The intrinsic space distributed topology makes the CNN able to produce real-time solutions of nonlinear PDEs

Scintillations Climatology over Low Latitudes: Statistical Analysis and WAM Modeling

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Keywords: Scintillation models, Scintillation climatology, Ionospheric irregularties, Phase

Abstract: Attempts of reconstructing the spatial and temporal distribution of the ionospheric irregularities have been conducted developing a scintillation "climatology" technique, which was very promising in characterizing the plasma conditions triggering L-band scintillations at high latitudes ([1.],[2.]) and further analysis on bipolar high sampling rate (50 Hz) GPS data are currently in progress for deeper investigations. The core of the scintillation climatology technique is represented by the maps of percentage of occurrence of the scintillation indices above a given threshold. The maps at high latitude are expressed in terms of geomagnetic coordinates (Magnetic Latitude vs. Magnetic Local Time) and their fragmentation depends on the available statistics. Typically the selected thresholds are 0.25º for the phase scintillation index σΦ and 0.25 for the amplitude one S4, which represent a good compromise between the need of a meaningful sample in each map bin and the necessity to distinguish moderate/strong scintillations. The scintillation climatology technique has been very useful in identifying the main areas of the ionosphere (from mid to cusp/cap latitudes) in which plasma irregularities could lead to scintillation phenomena on GPS signals and their dependence on different geomagnetic conditions of the ionosphere and on different level of the solar activity.

As the promising results achieved, we propose to apply the same approach to draw a first raw representation of the scintillations climatology over the Latin America sector. In the development of the study, it will be considered that, at low latitudes, scintillations effects are most severe around the magnetic equator and around the crests of the equatorial anomaly in the early evening hours. Moreover, the morphology of the ionosphere is different from that at other latitudes, because the magnetic field B is nearly parallel to the Earth's surface, leading to different configurations, dimensions and dynamics of the ionosphere irregularities causing scintillation.

Scintillation climatology in geographic coordinates will be performed on scintillation data collected at the site of Presidente Prudente (Brazil, 22.12ºS, 51.41ºW) via a SCINTMON receiver [3.]. The SCINTMON receiver is developed by the space plasma physics group from Cornell University and designed to monitor the amplitude scintillations at the L1 frequency (1.575 MHz). The SCINTMON is capable of logging the signal intensity at 50 samples per second for up to 11 visible satellites simultaneously, then the data collected are post-processed via software, and for each 60 s interval of data the S4 scintillation index is computed for all satellites tracked during the observation nights (0900–2100 UT).

In relation with the aforementioned climatology, here we also discuss the extension to low latitudes of the empirical Wernik-Alfonsi-Materassi (WAM) [4.] model. This is a simple phase screen model of propagation of a plane wave through the irregular ionosphere. It ingests the electron density in situ satellite data to reproduce empirically the irregular medium. WAM was originally developed to model high latitude irregularities, and nowit is going to be extend to lower latitudes. The concept of such extension is here described. The low latitude scintillation climatology will be used for understanding the key points to be carefully explored to concretely envisage a reliable modelling.

The main innovative idea of the WAM model [4.] is that the statistics of the medium, giving rise to the irregular pattern formation called "scintillation" when crossed by an electromagnetic wave, should be constructed from in situ data instead of being assumed a priori. This is because the ionization fluctuations, due to a form of "dirty plasma" turbulence, are expected to show non-trivial statistics, often non Gaussian ones, due to the strong gradients possibly occurring in the ionosphere.

WAM was constructed as a phase screen model, good for climatological use, with the statistics of the phase fluctuations $\delta\varphi$ directly calculated from the in situ data of the ionization fluctuations δN collected by the DE2 mission in the years 1981-1983. The S4 scintillation index is predicted, along an assigned satellite-ground radio link, via the analytical formulæ for the weak scattering due to Rino [5.]. The location and thickness of the phase screen, and the value of the ionization maximum, all enter in Rino's formulæ, and these are given in WAM by matching the background ionization as measured by the DE2 satellite with the ionospheric profile provided by some ionospheric background model. In its original form, WAM uses the IRI95 as a profiler [6.]. In its first release, described in [4.], the model predicts the S4 climatology within high invariant latitudes (larger than 50°), and may calculate the most likely S4 along a given radio link of identified geometry, time and geomagnetic conditions (represented through the Kp index).

The choice of high latitudes was due to some elements: being DE2 a polar orbiting satellite, its passes form a denser network around poles; real scintillation measurements to compare with are more abundant in the polar regions; the IRI95 profiler is an excellent tool for mid-high latitudes (with some suitable corrections for the topside at high latitudes).

In order to extend the WAM model to low latitudes as well, some changes to it must be done. First of all, low latitude in situ observations from DE2 are included, plus other similar data of a low latitude orbiting satellite (in the future, possibly ROCSAT data [7.]). The background ionosphere must be represented via some model which turns out to be more reliable than IRI95 to represent the so Equatorial Anomaly, which is the main feature of the low latitude ionosphere.

The successive developments of IRI95 represent improvements of the low latitude background, among the other things, but the choice here was to use the further development referred to as NeQuick model [8.], in its ITU-R version [9.].

Once the WAM model has been expanded to ±40° of latitude thanks to further in situ data and the NeQuick background model, it will be possible to predict climatology of S4 that will be tested against the real data of the scintillation climatology: this comparison will allow for operation of finer tuning in the low latitude extended WAM model.

Acknowledgment

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Microwave emission due to material fracture and its application to earthquake monitoring

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Keywords: hypervelocity impact, rock crash, microwave emission, mechanism, field test, earthquake, volcanic activities.

Abstract: This paper describes a series of researches relevant to microwave emission phenomena due to material fracture. We found the phenomena using a hypervelocity impact or by a static pressure in laboratory. As earthquakes and volcanic activities are associated with rock fractures, we conceived the practical applications of the phenomena to monitor such natural events. In a field test, we successfully detected the microwave emissions in strong correlation with the collapses of a volcano crater. Then, the brightness temperature data obtained by a remote sensing satellite were analyzed. Actually, the emission was confirmed in great earthquakes and volcanic eruptions. As a result, the microwave emission phenomena can be applied to the detection and monitoring of earthquakes or volcanic activities.

Radio Resource Control Technologies among Autonomously Operating Radio Systems for ISM Band

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Keywords: Spectral efficiency, dynamic spectrum access, dynamic spectrum control, control channel, ISM band.

Abstract: As 900MHz, 2.4GHz, and other ISM bands are getting used more and more densely to realize ubiquitous network society by SRDs: short range radio devices of wireless LAN, Bluetooth devices and so on, it is expected that ISM bands will become crowded and that available spectrum resources will be scarce. To cope with such radio resource problems, Ministry of Internal Affairs and Communications of Japan annually plans R&D projects. This paper introduces the activities of one of the projects, named Research and development on radio resource control technologies among multiple radio systems on same frequency band, applicable to SRD systems and shows its scope, goal, approach, and recent study results.

Measurement Experimentation of Interference From Mobile Terminals and Base Stations in Satellite-Terrestrial Integrated Mobile Communication Systems

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Keywords: STICS, satellite mobile communication system, interference, IMT2000

Abstract: The National Institute of Information and Communications Technology (NICT) has been studying a new satellite mobile communication system, named Satellite-Terrestrial Integrated Mobile Communication Systems (STICS), in which terrestrial mobile and satellite communication systems coexist and which is seamlessly integrated in the same frequency band. The interference from the terrestrial base stations or mobile terminals to the satellite system is one of the important parameters for realization of the STICS and must be evaluated. There are no studies that evaluate the amount of radiation of cellular base stations and mobile terminals toward the satellite to our knowledge. We conducted an experiment to measure the radiation power of the existing mobile base stations and mobile terminals toward satellites using an airship as part of the interference evaluation against this background. As one of the results of the experiment, we observed that the received power at the airship in the downlink channel is larger than in the uplink channel to 25-30 dB. This paper gives the overview of the experiment and some of the results..

Single-RF diversity for OFDM system using ESPAR antenna with periodically changing directivity

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Keywords: OFDM, ESPAR antenna, diversity, frequency selective fading.

Abstract: This paper presents a single-RF diversity scheme for orthogonal frequency division multiplexing (OFDM) receiver using Electronically Steerable Passive Array Radiator (ESPAR) antenna with periodically changing directivity at the OFDM symbol rate. OFDM is widely used for mobile communication systems because of its broadband digital wireless transmission capability in a severe time dispersive multipath propagation channel. OFDM is, however, is not efficient for mitigating the performance degradation due to fading. Diversity is a well-known efficient technique for solving this problem. Although maximal ratio combining diversity is the most efficient technique for compensating for the degradation, it requires the same number of RF and baseband signal processing circuitry. ESPAR antenna based diversity requires only a Single-RF and baseband components, however, the convergence is not fast enough to track the fast variation of the channel state. Furthermore, it is not efficient in a frequency selective channel. In this paper, we propose a new OFDM diversity scheme using ESPAR antenna with periodically changing directivity. The proposed scheme is capable of obtaining the diversity gain in a frequency selective fading environment and it solves the slow convergence rate problem in the conventional ESPAR antenna based diversity scheme. Computer simulation result shows that the proposed scheme gives diversity gain in a frequency selective fading channel, and also works well on fast fading environment.

Plasma Particle Simulation on Interactions Between an Artificial Small Magnetosphere and the Solar Wind

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Keywords: dipole field, PIC simulation, magneto-plasma sail, adaptive mesh refinement (AMR), solar wind interaction

Abstract: Magneto Plasma Sail (MPS) is proposed as one of the innovative interplanetary flight systems. In order to evaluate the basic principle of MPS and the propulsion performance, we need to examine the multi-scale kinetic interactions between the solar wind plasma and the small-scale artificial magnetosphere created around the spacecraft. To obtain the maximum thrust, the small magnetosphere should be expanded so that the solar wind can interact with the extended magnetosphere and transfer the momentum to MPS as much as possible. In the current study, we examine the inflation process of a dipole magnetic field by plasma injection by performing plasma particle simulations. As a result of the gyration motion, an ion-rich region is formed near the stagnation point of the injected ions. Magnetic inflation takes place due to the flow of electrons toward the ion-rich region, which carries the field lines of the original magnetosphere. This inflation process is effective for a

magnetosphere with a scale comparable to the gyration radius of the injected ions. We are also interested in the interaction between the solar wind and the inflated magnetosphere particularly occurring at the boundary layer.

Nonlinear effects in the diffusion of charged particles in 3-dimensional stochastic magnetic fields

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Keywords: space plasma, stochastic transport, magnetic turbulence.

Abstract: Charged particles transport in stochastic magnetic fields is studied for conditions relevant to astrophysical plasmas by developing a semi-analytical statistical method. This is a complex process due to the Lagrangian non-linearity determined by the space-dependence of the stochastic magnetic field. The transport coefficient for given particle energy is determined as function of the statistical characteristics of the stochastic magnetic field. We show that there are two nonlinear effects that produce trajectory trapping and a strong influence on the diffusion coefficient. These two trapping effects are the cause of the rich class of anomalous diffusion regimes identified in numerical simulations.

Dynamical Coupling of the Low Latitude Ionosphere-Thermosphere

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Keywords: Ionosphere, Thermosphere, Super-rotation, Equatorial ionization anomaly

Abstract: The zonal neutral wind flows strongly at the Earth's magnetic dip equator instead of the geographic equator around 20 magnetic local time (MLT) in the thermosphere. On the other hand, the fast zonal plasma drift occurs in the low latitude F region of evening ionosphere, but the velocity decreases at the magnetic dip equator. Therefore, the fast plasma drift velocity structure forms an arch in the frame of latitude and altitude in the evening. The fast zonal neutral wind occurs inside of the arch. Since the fast zonal plasma drift is strongly associated with equatorial ionization anomaly (EIA), we suggest that the ionosphere-thermosphere coupling associated with F region dynamo is significantly important in the low latitude F region ionosphere/thermosphere. The fast neutral wind occurring at the magnetic dip equator in the evening of F region may result in atmospheric super-rotation in the low latitude thermosphere.

Scintillation Measurements as a Means for Diagnosis of Ionospheric Plasma Turbulence

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Keywords: Scintillation, Ionosphere, Plasma turbulence, GPS

Abstract: Scintillation of radio waves traversing the ionosphere is caused by scattering and refraction on small scale electron density irregularities. Since their beginning, scintillation measurements have been used as a tool to study ionospheric irregular structure: its local and global morphology, statistical properties of irregularities, dynamics, and generation mechanisms. We will briefly review the techniques in scintillation analysis providing information about ionospheric plasma turbulence and present the most important results.

Modelling the Stochastic Component of Seismo-Electromagnetic Time Series Recorded by Demeter

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Keywords: Demeter, ionosphere, continuous wavelet, scaling exponent, prediction.

Abstract: This work focuses on multiscale analysis of ionospheric disturbances recorded by the microsatellite Demeter. Firstly, we analyze the time series related to plasma experiments recorded above Italy. The spectral analysis of the seismo-ionospheric signals shows that Fourier power spectra follow power law behaviour, as f-β (ffrequency, β- spectral exponent), typical of fractal self affine process. Thus, the possibility that these time series show the scale invariance associated with correlation to long ranges led us to propose the use of Continuous Wavelets Transform as a natural tool for investigation of ionospheric perturbations. Secondly, we examine the seismo-electromagnetic signals using a Fourier spectral analysis. We observe that the spectral behavior varies from one signal to another which means that electric and magnetic measurements recorded by Demeter are complex. However, some parameters are characterized by self affinity, reflecting properties of persistence or anti-persistence. These observations open the way to a theoretical analysis based on local wavelet exponents, and poses several questions concerning the use of signals regularity and its link to prediction of the seismic activity.

SYMPOSIUM PROGRAM

ISRSSP'10 - SYMPOSIUM PROGRAM

(Preliminary)

AUG 25, 2010 WED

8.00-900	**Registration**
9.00-9.45	**OPENING SESSION** **Chair: M. Konstantinov**, IICREST, Bulgaria
9.45-10.00	**Coffee Break**
Session "C" - Radio-Comm. and Telecomm. Syst. and Sign. Processing **Chair:** **E. Panayirci**, Has University, Istanbul, Turkey	
10.00-10.25 Invited C1-I-3119	Cognitive Radio and Green communications: power consumption considerations ***Jacques Palicot*** , Institut d' Electronique et de Telecommunications de Rennes, Rennes, France
10.25-10.50 Invited C1-I-3604	Beam direction variation and compensation plan for large-scale deployable antenna mounted on geostational satellite for satellite communication ***Yoshiyuki Fujino***[1] , *Mitsuteru Orikasa*[2] *Masaski SATO*[2] *Amane Miura*[1] , *Naokazu Hamamoto*[1] *and Ryutaro Suzuki*[1] , [1] National Institute of Information and Communications Technology, Tokyo, Japan; [2] National Institute of Information and Communications Technology, Ibaraki, Japan.
10.50-11.15 Invited C1-I-4126	Markovian Approach to Optimal Information-Measuring Facilities Integration Problems ***Alexander Shmelev***, Radiotechnical Institute by Academician A.L.Mints, Moscow, Russia
	Break
Session "C" - Radio-Comm. and Telecomm. Syst. and Sign. Processing **Chair:** **E. Nikolov**, Bulgarian Academy of Sciences, Sofia, Bulgaria	
11.20-11.45 Invited C1-I-0127	Cellular/Nonlinear/Nanoscale Network (CNN) Computing ***Angela Slavova***, Bulgarian Academy of Sciences, Sofia, Bulgaria
11.45-12.10 Invited C1-I-1115	Nonlinear Distortion Compensation Techniques for Future Mobile Communication Base Stations ***Shoichi Narahashi, Yasunori Suzuki, Junya Ohkawara*** NTT DOCOMO, INC., Kanagawa, Japan
12.10-12.35 Invited C1-I-1108	A Spatial Resource Management Scheme Suitable for Wireless Ad Hoc Networks ***Yukihiro Kamiya***, Tokyo University of Agriculture and Technology
12.35-13.55	**LUNCH**

AUG 25, 2010 WED	
Session "G" - Transionospheric Propagation. Investigation of Space Environments via Satellite Observations **Chair:** **T. Takano,** Nihon University, Funabashi, Japan	
13.55-14.20 Invited G1-I-3121	MF Waves Observed by DEMETER ***Michel Parrot,*** LPC2E/CNRS, Orle'ans, France
14.20-14.45 Invited G1-I-4102	Radio Wave Propagation in the Amazon Forest – a Review ***Mauro S. Assis***, Fluminense Federal University, Brazil
14.45-15.10 Invited G1-I-1133	Dynamical Coupling of the Low Latitude Ionosphere-Thermosphere ***Shigeto Watanabe***, Hokkaido University, Sapporo, Japan
15.10-15.25	**Coffee Break**
Session "H" Generation and Propagation of Waves in Plasmas. Interaction between Waves and Wave Particles **Chair:** **Y. Omura**, Kyoto University, Kyoto , Japan	
15:25-15:50 Invited H1-I-3334	Scintillation measurements as a means for diagnosis of ionospheric plasma turbulence ***A. W. Wernik[1]***, *M. Grzesiak[1], M. Materassi[2]* [1] Space Research Center, PAS, Warsaw, Poland, [2] Istituto dei Sistemi Complessi ISC-CNR, Florence, Italy
15.50-16.15 Invited H1-I-2323	Global MHD Modeling of Coronal Mass Ejections and Related Shocks from Complex Active Regions ***Ilia I. Roussev*** *(1), Noé Lugaz(1), and Igor V. Sokolov (2)* (1) Institute for Astronomy, University of Hawaii, USA (2) Department of AOSS, University of Michigan, USA
16.15-16.40 Invited H1-I-1131	Plasma Particle Simulation on Interactions Between an Artificial Small Magnetosphere and the Solar Wind ***Hideyuki Usui***, ***Toseo Moritaka*** Kobe University, Kobe, Japan
	Break
Session "SPS" – SPS Systems and related Radio Technologies. Further Directions in SPS Systems **Chair:** **F. Little**, Texas A&M University , Texas, USA	
16.45-17.10 Invited S1-I-1124	Development of High Efficient Phased Array for Microwave Power Transmission of Space Solar Power Satellite / Station in Kyoto University ***Naoki Shinohara***, Kyoto University, Kyoto, Japan
17.10-17.35 Invited S1-I-1914	Demonstration Experiments of Microwave Power and Information Transmission From an Airship ***Tomohiko Mitani****(1), Hiroshi Yamakawa(1), Naoki Shinohara(1), Kozo Hashimoto(1), Shigeo Kawasaki(1,2), Fumito Takahashi(1), Hideaki Yonekura(1), Takahiro Hirano(1), Teruo Fujiwara(3), Kenji Nagano (4), Hideki Ueda(5), and Makoto Ando(5),* (1) Kyoto University, Japan; (2) Japan Aerospace Exploration Agency; (3) Sho Engineering Corp., Japan; (4) Space Technology, Japan; (5) Tokyo Institute of Technology
17.35-18.00 Invited S1-I-3111	Rectennas and Energy Harvesting ***Mohamed Latrach,*** Ecole Supérieure d'Electronique de l'Ouest (ESEO) Angers, France

AUG 26, 2010 THUR

Session "SPS" - SPS Systems and related Radio Technologies. Further Directions in SPS Systems **Chair:** **N. Shinohara**, *Kyoto University, Kyoto, Japan*	
9:00 -9:25 Invited S1-I-2113	Opportunities and Challenges for Wireless Power Transmission ***Frank E. Little,*** TEES Distinguished Research Scientist, Space Engineering Research Center, Texas A&M University, USA
9.25-9.50 Invited S1-I-0325	New Stochastic Algorithm for Minimization of Side Lobes in Large Antenna Arrays for MPT ***B. Shishkov*** [(1)]***,*** *N. Shinohara*[(2)]*, H. Matsumoto*[(3)]*, K. Hashimoto*[(2)]*, T. Mitani*[(2)] [1] Bulgarian Academy of Sciences, Bulgaria [2] Research Institute for Sustainable Humanosphere, Kyoto University, Kyoto, Japan [3] Kyoto University, Kyoto, Japan
9.50-10.15 Invited S1-I-1405	Current Status of Space Solar Power System at USEF ***Yoshiharu Fuse****, Takashi Saito, Shoichiro Mihara, Koichi Ijichi* Institute for Unmanned Space Experiment Free Flyer
10.15-10.30	**Coffee Break**
Session "C" - Radio-Comm. and Telecomm. Syst. and Sign. Processing **Chair:** **A. Slavova,** Bulgarian Academy of Sciences, Sofia, Bulgaria	
10.30-10.55 Invited C1-I-1229	Radio Resource Control Technologies Among Autonomously Operating Radio Systems for ISM Band ***Makoto Taromaru, Kazuto Yano, Yasuo Suzuki, Satoshi Tsukamoto, and Masazum Ueba*** ATR Wave Engineering Laboratories, Kyoto, Japan
10.55-11.20 Invited C1-I-1530	Measurement Experimentation of Interference from Mobile Terminals and Base Stations in Satellite-Terrestrial Integrated Mobile Communication Systems ***Hiroyuki Tsuji****, Amane Miura, Yoshiyuki Fujino, Naokazu Hamamoto, and Ryutaro Suzuki* Space Communications Group, National Institute of Information and Communications Technology (NICT), Japan
11.20-11.45 Invited C1-I-0116	Emission Security and Operating Environment Investigation ***Eugene Nickolov,*** Bulgarian Academy of Sciences, Sofia, Bulgaria
11:45-12:10 Invited C1-I-0307	MVDR Beamformer with CFAR Processor for Jamming Suppression in GPS Receiver *Vera Behar*[1]*,* ***Christo Kabakchiev***[2]*, Hermann Rohling*[3] [1] Bulgarian Academy of Sciences, Sofia, Bulgaria [2] Sofia University, Sofia, Bulgaria [3] Technical University Hamburg-Harburg,, Hamburg, Germany
12.10-13.30	**LUNCH**
Session "G" - Transionospheric Propagation. Investigation of Space Environments via Satellite Observations **Chair:** **M. Parrot** LPC2E/CNRS, Orle'ans, France	
13.30-13.55 Invited G1-I-2113	Microwave emission due to material fracture and its application to earthquake monitoring ***Tadashi Takano,*** Nihon University, Funabashi, Japan

13.55-14.20 Invited G1-I-0325	Miniaturization of Plasma Wave Receivers Onboard Scientific Satellites and its Application to the Sensor Network System for Monitoring the Electromagnetic Environment in Space ***Hirotsugu Kojima[(1)], H. Fukuhara[(1)], S. Okada[(1)], H. Ikeda[(2)], and H. Yamakawa[(1)],*** [(1)]Kyoto University, Kyoto, Japan [(2)]Japan Aerospace Exploration Agency , Kanagawa, Japan
	Break
Session "H" - Generation and Propagation of Waves in Plasmas. Interaction between Waves and Wave Particles **Chair: A. Wernik**, Polish Academy of Sciences, Warsaw, Poland	
14.25-14.50 Invited H1-I-1118	Theory and Simulations of Whistler-Mode Chorus Emissions in the Magnetosphere ***Yoshiharu Omura*** Kyoto University, Kyoto, Japan
14.50-15. 15 Invited H1-I-3506	A Plasma-Driven Schumann Resonance on Titan and the Putative Ocean Buried at Some 45 km Depth Disclosed by the PWA-HASI Instrument Onboard HUYGENS ***M. Hamelin [(1)],*** *C.Béghin[(2)], R.Grard[(3)], J.J.Lopez Moreno[(4)], O. Randrianboarison[(2)], K. Schwingenschuh[(5)], F. Simoes[(1,6)], C. Sotin[(7)]* [(1)]Université Versailles St Quentin CNRS/INSU LATMOS-IPSL, Paris, France [(2)]LPCE-CNRS-Université d'Orléans, Orléans, France [(3)]RSSD, ESA-ESTEC, European Space Agency, Noordwijk, The Netherlands [(4)]Instituto de Astrofisica de Andalucia, CSIC, Granada, Spain. [(5)]Space Research Institute, Austrian Academy of Sciences (IWF), Graz, Austria [(6)] NASA/GSFC, Greenbelt, MD, USA [(7)]Jet Propulsion Laboratory and California Institute of Technology, Pasadena, CA, USA
15:15-15:40 Invited H1-I-3232	Nonlinear Effects in The Diffusion of Charged Particles in 3-Dimensional Stochastic Magnetic Fields ***Madalina Vlad****, Florin Spineanu* National Institute for Laser, Plasma and Radiation Physics, Bucharest, Romania
15:40-16:05 Invited H1-I-3210	Whistler Waves as a Remote Sensing Tool for Plasma Fluctuations ***Agapitov Oleksiy[(1,2)]****, Vladimir Krasnoselskikh [(1)]* [(1)] LPC2E / CNRS-Universite d'Orleans Orleans, France [(2)]National Taras Shevchenko University of Kyiv, Kyiv, Ukraine.
16.05-16.20	**Coffee Break**
Session "C" - Radio-Comm. and Telecomm. Syst. and Sign. Processing **Chair: A. Shmelev**, Radiotechnical Institute by Academician A.L.Mints, Moscow, Russia	
16.25-16.50 Invited C1-I-4120	Advanced Signal Processing Techniques for Wireless Communications ***Erdal Panayirci*** Princeton University, On leave from Kadir Has University, Istanbul, Turkey
16.50-17.15 Invited C1-I-1117	A Reconfigurable Multi-band Power Amplifier for Mobile Terminals ***Hiroshi Okazaki,*** *Atsushi Fukuda, Takayuki Furuta, Kunihiro Kawai, Shoichi Narahashi* NTT DOCOMO, INC. Kanagawa, Japan
17.15-17.40 Invited C1-I-0212	SAR and ISAR Signal Modeling and Image Reconstruction ***Andon D. Lazarov****,* BFU, Burgas, Bulgaria
17:40-18:05 Invited C1-I-0322	Queuing Modeling of Handovers in 4g Wireless Mobile Networks *Dimitar Radev,* ***Dragan Stankovski****, Svetla Radeva* University of Rousse, Rousse, Bulgaria

19:00–22:30 **BANQUET**	

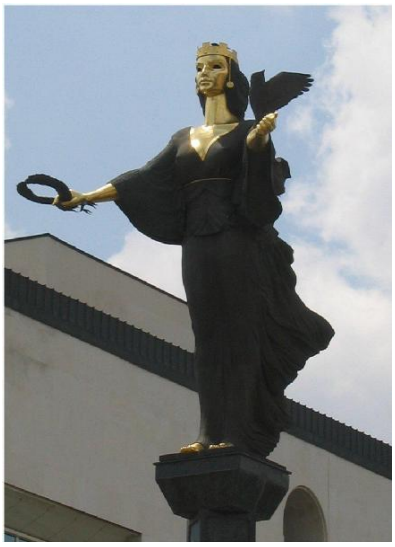
AUG 27, 2010 FRI

Session "C" - Radio-Comm. and Telecomm. Syst. and Sign. Processing **Chair:** **S. Narahashi,** NTT DOCOMO, INC., Kanagawa, Japan	
9:00 -9:25 C1-R-1343	Single-RF diversity for OFDM system using ESPAR antenna with periodically changing directivity ***Satoshi Tsukamoto****, Tomoya Kozu and Minoru Okada* Nara Institute of Science and Technology, Nara, Japan
9.25-9.50 C1-R-1339	2D-Doa Estimation With Pilot Signals And Select Technique ***Jun Ozawa****, Tomoyuki Kitada, Jun Cheng, Yoichiro Watanabe* Doshisha University, Kyotanabe, Kyoto, Japan
9.50-10.05	**Coffee Break**
Session "G" Transionospheric Propagation. Investigation of Space Environments via Satellite Observations **Chair:** **Hirotsugu Kojima**, *Kyoto University, Kyoto , Japan*	
10.05-10.30 G1-R-3438	Scintillations Climatology over Low Latitudes: Statistical Analysis and WAM Modeling ***Luca Spogli*** [1] *, Lucilla Alfonsi* [1] *, Massimo Materassi* [2] *, Andrzej W. Wernik* [3] [1] INCV – Instituto Nazionale di Geofisika e Vulkanologia, Rome, Italy [2] Istituto dei Sistemi Complessi ISC-CNR, Florence, Italy [3] Space Research Center, PAS, Warsaw, Poland
10.30-10.55 G1-R-3941	Sub-Ionospheric and Trans-Ionospheric VLF Wave Propagations and its Relation to Seismoelectromagnetic Phenomena ***K. Schwingenschuh*** [(1)] *, H. Eichelberger* [(1)] *, G. Prattes* [(1)] *, B.P. Besser* [(1)] *, F. Simoes* [(5)] *, A. Rozhnoi* [(2)] *, M. Solofiefa* [(2)] *, O. Molchanov* [(6)] *, M. Friedrich* [(4)] *, G. Stangl* [(1)] *, M.Y.Boudjada* [(1)] *, H. Biernat* [(1)] *, R. Döller* [(7)] *, P.F. Biagi* [(3)] *, P. Nenovski* [(6)] [(1)] Space Research Institute, Graz, Austria, [(2)] IFZ, Moscow, Russian Federation, [(3)] University of Bari, Bari, Italy, [(4)] University of Technology, Graz, Austria, [(5)] NASA/GSFC, Space Weather Laboratory (Code 674), Greenbelt, USA, [(6)] Geophysical Institute, Sofia, Bulgaria, [(7)] Institute of Physics, Department of Geophysics, Astrophysics and Meteorology, KFUniversity, Graz, Austria
10.55-11.20 G1-R-3942	Signal Processing of Ultra Low Frequency (ULF) magnetic field data related to seismic activity in Europe during 2008 and 2009 ***G. Prattes*** [1] *, K. Schwingenschuh* [1] *, H. Eichelberger* [1] *, M. Stachel* [1] *, W. Magnes* [1] *, M. Vellante* [2,3] *, U. Villante* [2,3] *, P. Nenovski* [4] *, V. Wesztergom* [5] [1] Experimental Space Research, Space Research Institute, Austrian Academy of Sciences, Graz, Austria, [2] Dipartimento di Fisica, Università L'Aquila, L'Aquila, Italy, [3] Consorzio Area di Ricerca in Astrogeofisica, L'Aquila, Italy, [4] Geophysical Institute, Sofia, Bulgaria, [5] Geodetic and Geophysical Research Institute, Hungarian Academy of Science, Sopron, Hungary

11:20-11:45 Invited G1-I-4103	Low latitude earthquakes and perturbation in the atmosphere: A study in relation to identifying precursors and epicenters utilizing EM techniques ***Minakshi Devi,*** *A.K. Barbara* Gauhati University, Assam, India
11.45-12.15 G1-R-4650	Identification of Low Latitude Earthquake Epicentre : an Attempt Utilising GPS, Ionosonde and VHF Anomalous Propagation Data ***M. Devi[1]****, A.K. Barbara[1] and P. Kashyap[1], A. Depueva[2], Ya Yu Ruzhin [2] and V. Depuev[2]* [1] Department of Physics, Gauhati University, Guwahati, India [2] IZMIRAN, Troisk, Moscow Region , Russia
12.15-13.30	**LUNCH**
Session "C" - Radio-Comm. and Telecomm. Syst. and Sign. Processing **Chair: A. Lazarov,** BFU, Burgas, Bulgaria	
13.30-13.55 C1-R-4140	Algorithm for Determination the Moments of Closing the Glottis within Phonation *V. Galabad,* ***D. Damyanov*** Technical University of Sofia, Sofia, Bulgaria
13.55-14.20 C1-R-0436	Influence of Ampltude Fluctuations on Nonliner Esimation of Wave Front ***Viacheslav Potapov,*** Mints Radiotechnical Institute, Moscow, Russia
14.20-14.45 C1-R-0235	Analysis of Energy Consumption Improving Forward Error Correction Codes in WSN *Georgi Hristov,* ***Teodor Iliev,*** *Dimitar Radev, Mihail Iliev* University of Rousse, Rousse "Angel Kanchev", Bulgaria
14.45-15.10 C1-R-0237	CDMA Wireless Communication System with Variable Information Rate Based on Families of Generalized Orthogonal Complementary Codes *Mihail Iliev[1] , Borislav Bedzhev[2] ,* [1] University of Rousse "Angel Kanchev", Rousse, Bulgaria [2] University of Shumen "Bishop Konstantin Preslavsky", Shumen, Bulgaria
	Break
15:15-15:45	**CLOSING CEREMONY**
15:45-16:00	**Coffee Break**
16:00-	**Bus for City Tour** 
16:30–17:30	**MUSEUM** 
17:30– 9:00	**WALKING TOUR** 
19:30 -	**Hotel "Hilton"**

Social EVENTS

- BANQUET
- VISITING MUSEUM & CITY TOUR



BANQUET

The ISRSSP'10 Banquet will take place on Thursday, August 26, 2010 from 19:00 to 22:30.

You will be in a restaurant with traditional Bulgarian atmosphere and taste typical Bulgarian dishes.

From 21:00 to 22:00 you will enjoy the special folklore show.

Sofia City Tour

Roads from all parts of the world have intersected here from nearly 7000 years. Civilizations have risen and fallen, but the sity have stayed: Serdika => Sredets=> Sofia

Walk in the capital will start with visiting The National Institute of Archaeology with Museum and the exhibition of treasures. You will see:
- Mask with individual features, solid 23-carat gold and weighs about 670 g;

- Bronze head of a bearded man with eyes semi-stones - the head has a natural size and extend to the statue, 1.8 meters high;

- And were found many bronze, golden and silver vessels, among which stands a silver vessel, gilded inside and has a cap, which is nothing different from the logo of Shell

- And other as:

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