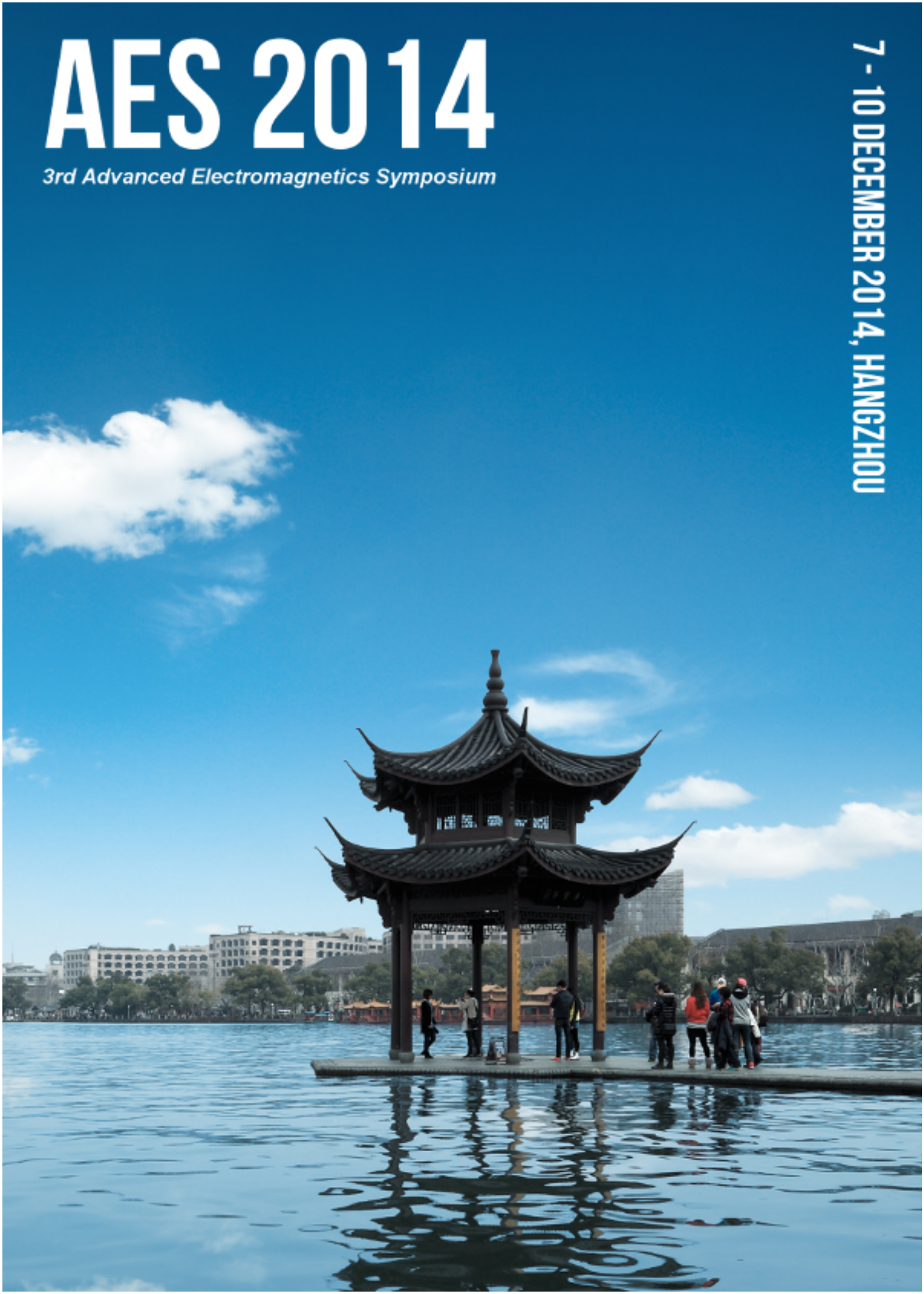
AES 2014

3rd Advanced Electromagnetics Symposium

7 - 10 DECEMBER 2014, HANGZHOU



AES 2014 Hangzhou - China

The 3rd Advanced Electromagnetics Symposium

Program

December 7 – 10, 2014
Hangzhou, China

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The 3rd Advanced Electromagnetics Symposium

Edited by

Said Zouhdi | Paris-Sud University, France
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Ke Wu | Ecole Polytechnique de Montreal, Canada

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AES 2014 VENUE

AES 2014 will be held on December 7-10, 2014, at Hangzhou Shujiang Hotel which is located within the campus of Hangzhou Dianzi University, China.

GUIDELINES FOR PRESENTERS

Oral Presentations

Each session room is equipped with a stationary computer connected to a LCD projector. Presenters must load their presentation files in advance onto the session computer. Technician personnel will be available to assist you.

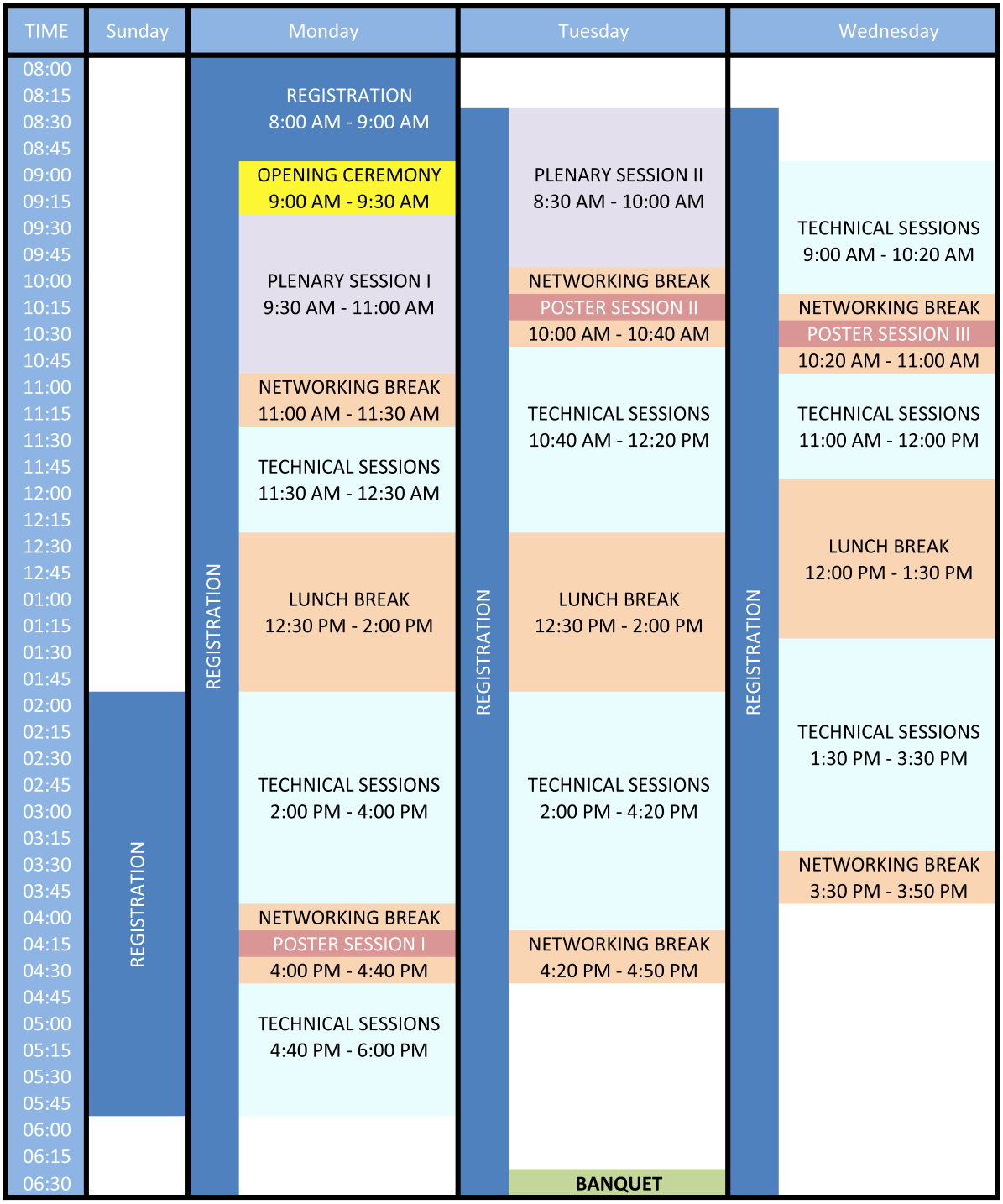
Scheduled time slots for presentation are 20 mn for regular and invited prensentations, 45 mn for plenary talks, and 30 mn for keynote talks, including questions and discussions. Presenters are required to report to their session room and to their session Chair at least 15 minutes prior to the start of their session.

The session chair must be present in the session room at least 15 minutes before the start of the session and must strictly observe the starting time and time limit of each paper.

Poster Presentations

Presenters are requested to stand by their posters during their session. One panel will be available for each poster. Pins or thumbtacks are provided to mount your posters on the board. All presenters are required to mount their papers one hour before the session and remove them at the end of their sessions.

PROGRAM OVERVIEW



TECHNICAL PROGRAM

Sunday 7th December, 2014

Registration

Hangzhou Shujiang Hotel

14:00 - 18:00

Monday 8th December, 2014

Registration

Hangzhou Shujiang Hotel

08:00 - 17:30

Opening ceremony

Room A

09:00 - 09:30

09:30 - 11:00 — Room A

Session 1A1

Plenary Session I

Chaired by: Boran Guan

09:30 : Plenary talk
Smart Antennas for Space-borne SAR
F. Qin, S. Gao, C. Mao, Z. Wang, Anton Patyuchenko

This talk will discuss smart antennas for space-borne synthetic aperture radars (SAR). First, some state-ofthe-art development in smart antennas for space-borne SAR systems is reviewed. Then, the talk will present a new generation of low-cost space-borne dual-band dual-polarization SAR system using digital beamforming on receive. The smart antenna system, consisting of a parabolic reflector and multi-feed array, is designed and optimized for dual-band dual-polarized digital beam-forming performance. The operating frequencies are at X and Ka bands with the center frequency of 9.6 GHz and 35.75 GHz, respectively. Some recent results are shown and discussed. A conclusion and future work will be given in the end.

10:15 : Plenary talk
Multiscale Computational Electromagnetics for Applications in Subsurface Sensing, Microwaves, and Nanophotonics
Qing Huo Liu

Electromagnetic sensing and system-level design problems are often multiscale and very challenging to solve. They remain a significant barrier to system-level sensing and design optimization for a foreseeable future. Such multiscale problems often contain three electrical scales, i.e., the fine scale (geometrical feature size much smaller than a wavelength), the coarse scale (geometrical feature size greater than a wavelength), and the intermediate scale between the two extremes. Most existing commercial solvers are based on single methodologies (such as finite element method or finite-difference time-domain method), and are unable to solve large multiscale problems. We will present our recent work in solving realistic multiscale simulation and imaging problems. Applications will be illustrated for subsurface sensing, microwaves, and nanophotonics.

Coffee Break and Exhibit Inspection

11:00 - 11:30

11:30 - 12:30 — Room B

Session 1A2

Optics and Photonics

Chaired by: Lei Shi

11:30 : Low-Light Detection: Learning from Mammalian Evolution
Thanh Xuan Hoang, Sara Nicole Nagelberg, Wensheng Chen, Mathias Kolle, George Barbastathis

We present optical properties of a two-layer sphere with different configurations which mimic the nuclear architecture of photoreceptor cells in retinas of nocturnal and diurnal mammals. We show that the concentric sphere can act like a lens with a high numerical aperture and focus light into an ultralong photonic jet. Our analytical model of light scattering by the concentric sphere is applicable to a beam with any state of polarization, such as linear, circular, radial, azimuthal polarization.

11:50 : Optical Resonators Modified by Random Modulation of Refractive Index
Ali Burak Parim, Mirbek Turduev, Zeki Hayran, Emre Bor, Hamza Kurt

We study a new type of optical resonator created from randomly distributed elements either in the form of air holes in dielectric background or the complementary version, dielectric cylinders in air background. Numerical simulations demonstrate that the scattering and emission of light from randomly placed elements provides broad photonic band gap and strong localization of light. The characteristics of the resonator show dependency on the random distributions and the size of the structure.

12:10 : Anomalous optical forces on radially anisotropic nanowires
H. L. Chen, Lei Gao

We establish full-wave electromagnetic scattering theory to study radially anisotropic nanowire. In certain conditions, the theoretical predictions can be derived that the electromagnetic scattering includes non-Rayleigh vanishing and diverging. Therefore, the anisotropic nanowires can be hardly visible or exhibit superscattering. Based on the condition, we will have further research about the optical forces.

11:30 - 12:30 — Room C

Session 1A3

Antennas and Microwave Technologies

Chaired by: Shi-Wei Qu

11:30 : Capacity analysis of antenna arrays with various transmitting angles
Shu-Han Liao, Chien-Ching Chiu, Su-Ei Wu

This paper focuses on the research of channel capacity of Multiple-Input Multiple-Output (MIMO) system with different transmitting angles in straight tunnels. The channel capacities of MIMO Long Term Evolution (MIMO-LTE) system using spatial and polar antenna arrays by different transmitting angles are computed. Numerical results show that, The channel capacity for transmitting angle at 15 degrees is largest compared to the other angles in the tunnels.

11:50 : Design of broadband circularly polarized microstrip antenna
Xing Jiang, Jinhong Yan

A broadband circularly polarized microstrip antenna which coupled by dual elliptical slot is presented. Two open stubs are embedded in the feedline to realize the proposed circularly polarized antenna. By removing of two rectangular slits from the ground plane, the return loss bandwidth is noticeably increased. Multi-layer

structure is used, and the CP performance is improved by increasing the size of reflector.

12:10 : Triplexers based on coupled resonators: design and comparision of two different topologies
Lidiane da Silva Araujo Costa, Antonio Jeronimo Belfort de Oliveira

This paper presents results of computer simulations of two triplexers with 9 resonators each one, conceived in two different topologies. Results show that the triplexer with 6 resonators presents lower performance than the one with 3 as for the reflection and insertion losses and isolation between their output ports. Results were obtained by optimizing the coupling coefficient matrix using the a Gradient based Method.

Lunch and Exhibit Inspection

12:30 - 14:00

14:00 - 16:00 — Room B

Session 1A4

Metamaterials, Plasmonics, Photonic Crystals and Complex Media

Chaired by: Xavier Begaud

14:00 : Invited talk
Enhanced light-matter interaction in graphene
Sanshui Xiao

Graphene has attracted lots of attention due to its remarkable electronic and optical properties, thus providing great promise in photonics and optoelectronics. However, the performance of these devices is generally limited by the relatively weak light-matter interaction in graphene. The combination of graphene with noble-metal nanostructures is currently being explored for strong light-graphene interaction. We introduce a novel hybrid graphene-metal system for studying light-matter interactions with gold-void nanostructures exhibiting resonances in the visible range.

14:20 : Nonreciprocal self-collimation in two-dimensional gyromagnetic photonic crystals and its applications in signal separation
Qing-Bo Li, Zhen Li, Ping Zhou, Rui-Xin Wu

We investigate self-collimation properties in two-dimensional gyromagnetic photonic crystals (GPCs) fabricated by semi-cylinder rods. Nonreciprocal self-collimation transmission is found by means of band structure and equi-frequency contours (EFCs) calculations. Introducing progressively tilting flat EFC by optimizing the structure of GPC, nonreciprocal spatial wavelength division can be arrived without introducing any corrugations inside the structure. Meanwhile, the frequency range for the nonreciprocal spatial wavelength division can also be flexibly manipulated by the external static magnetic field (ESMF).

14:40 : Topology-induced strong diamagnetic response of hollow structured metals at broadband microwave frequencies
Shahzad Anwar, Sucheng Li, Shuo Li, Qian Duan, Weixin Lu, Bo Hou

We introduce a deep subwavelength aperture with fractal shape and without loading high-index dielectric to the structured metallic plate, and show a strong diamagnetic response.

15:00 : EM diode based on two inversely configured non-reciprocal gyromagnetic gratings
Zhen Li, Rui-Xin Wu, Qing-bo Li

In this work, we proposed a new type ofElectromagnetic (EM) diode based on non-reciprocal gyro-magnetic rods gratings and explained its unidirectional behavior by geometric optics. The grating is a line array of

gyro-magnetic rods, it could reflect or steering the EM beam like negative refraction with different applied magnetic field or different injecting angle. The two gratings are reversely biased by different magnetic field and arranged asymmetrically. We demonstrated unidirectional transmission could be realized in this structure.

15:20 : Mimicking electromagnetically induced transparency in integrated plasmonics with radiative and subradiant resonators
Ting Wang, Yusheng Zhang, Zhi Hong, Zhanghua Han

We propose the use of radiative and subradiant resonators coupled to a metal-insulator-metal waveguide to represent the three-level energy diagram in conventional atomic systems and demonstrate a new realization of on-chip plasmonic analogue of electromagnetically-induced transparency (EIT) in integrated plasmonics. Numerical simulation results demonstrate well-pronounced intermediate transmission peak through the bus waveguide and also show that the EIT effect can be easily controlled by the relative position of the two Fabry-Perot resonators.

15:40 : Nano-beam cavity design with randomly located reflectors
Melih G. Can, Bilgehan B. Oner, Hamza Kurt

In this study, nano-beam cavity design is investigated by incorporating randomly placed holes acting as reflectors around the defect region. Various cases such as number of holes and locations of them are systematically studied. Due to variations of the lengths and related effective indices the reflectivity value varies.The structural parameters affecting the reflectivity parameter yields unique trends. The design is implemented by finite-difference time-domain method and results are interpreted by means of ABCD matrix technique.

14:00 - 16:00 — Room C

Session 1A5

Computational Electromagnetics

Chaired by: Lei Gao

14:00 : Analysis of the EM Wave Propagation Characteristic in the Time Varying Plasma Sheath
Jiangting Li, Lixin Guo, Qi Cheng, Wei Chen

By solving NS equations with AUSM format, the flow field of blunt cone model is simulated, the electron density distributions in plasma sheath at different flight speeds are obtained. Time domain and frequency domain characteristics of electromagnetic wave are calculated through this time varying plasma sheath using FDTD method based on time.

14:20 : Analysis of Electromagnetic Wave Propagation in Plasma Sheath when Reentry into Atmosphere
Wei Chen, Lixin Guo, Jiangting Li, Linjing Guo

One-dimensional inhomogeneous plasma sheath properties are analyzed by using the FDTD algorithm. Calculation of transmission coefficient of the inhomogeneous plasma sheath is provided. We also discuss the behavior of EM wave in the sheath.

14:40 : The Calculation of Irregularities scattering and Delay Power Spectrum in Mid-latitude Es Layer
Qi Cheng, Lixin Guo, Jiangting Li, Long He

A new method is adopted to simulate the delay power spectrum of irregularities multipath scattering in the ionosphere .We establish a mathematical model of irregularities multipath scattering by a geometric model of irregularities scattering along the ionosphere's field ,then we analyzes the impact of electron density and electromagnetic wave propagation distance of irregularities in the ionosphere to multi-path delay.

15:00 : High-Frequency Characterization of Through-Silicon Hole (TSH) Channel based on 3D Full-Wave Simulation
Jie Zheng, Wen-Sheng Zhao, Gaofeng Wang

In this paper, the electrical characteristics of through-silicon hole (TSH) structures are investigated. After validation with circuit model, the 3D full-wave simulations are employed to study the impacts of design parameters. The process variations including underfill and misalignment are also considered. Additionally, a single-end high-speed TSH channel is studied in the frequency-domain. The crack location is also presented by using Z-parameter variation.

15:20 : Application of LTSpice in Communication Electronic Circuit Course and Experiment Training
Guohua Liu, Zhiqun Cheng, Tao Zhou, Huajie Ke, Zhihua Dong

With the development of information computer technology, new Electronic Design Automation (EDA) tools are applied in college courses teaching.

15:40 : The Second-Harmonic Generation in a Dissipative and Dispersion Layered Structure
Erik S. Lotfi, Kazem Jamshidi-Ghaleh, Afshin Arghand-Hesar, Jamshid Soltanmohammadi, Hossein Masalehdan

The conversion efficiency of the fundamental radiation to the second harmonic wave is investigated under different linear absorptions of the interactive waves in a layered structure. We have considered that both the fundamental and the generated second harmonic waves are arbitrarily absorbed in each layer without any relation between them that has been considered on the previous studies. The layers of the structure are assumed to have different linear and nonlinear optical absorptions.

Coffee Break and Exhibit Inspection

Session 1P1

Poster session I

16:00 - 16:40

P1: Preparation and characterization of zinc oxide nanoparticles
Kitsakorn Locharoenrat

Zinc oxide nanoparticles are prepared using the pulsed laser ablation of the zinc metal target immersed in a solution of sodium dodecyl sulfate. The absorbance of the well prepared nanopartilces with the laser fluence dependent shows the single abd sharp peak around 375 nm indicating that the nanoparticles have a narrow size with almost spherical shape.

P2: Plasmonic properties of Au@Pd nanorods
Kitsakorn Locharoenrat, Pattareeya Kittidachachan

We report plasmonic properties of palladium-coated gold nanorods. Two characteristic plasmon bands of the nanorods have been detected. One at 525 nm is dependent of Pd-shell thickness and a dielectric index of medium. Another one at 820-860 nm shows a band shift with changes Pd-shell thickness and dielectric environment. This study indicates a new way for tuning the photo-catalytic performance of nanorods and for using them in bio-/chemical-sensor.

P3: A bandwidth-extended electrically small dipole antenna based on composite right/left handed (CRLH) transmission line
Weiping Cao, Beibei Li, Xinhua Yu, Yannan Jiang

A bandwidth-extended electrically small dipole antenna based on composite right/left handed (CRLH) transmission line is presented. The proposed structure is realized by a periodic ladder network of four unit cells

having air-gaps and wires. Simulated results show that, adjusting the gaps and wires without any additional matching network, a 6.36 percent impedance bandwidth can be achieved when the length of the antenna is 50.4mm, and well-behaved radiation patterns have been displayed.

P4: An ultra-wideband monopole antenna achieved by using metamaterial cladding with an I-shaped structure array in S/C-band
Yan N. Jiang, Wen C. Zhang, Wei P. Cao, Jiao Wang

A design of UWB antenna with a monopole antenna surrounded by an ISS array is proposed in S/C band. By embedding the monopole in a single cylindrical metamaterial cladding with negative epsilon, the impedance match bandwidth is improved by nearly five times compared to that without cladding. The simulations show the gain of UWB antenna is about 4.6-6.2 dB and with stable radiation patterns. A good agreement between the simulations and measurements validates the design.

P5: Non-reciprocal composite right/left-handed transmission line on ferrite YIG
Tao Zhou, Martine Le Berre, Francis Calmon, Guo Hua Liu, Zhi Hua Dong, Hua Jie Ke, Zhiqun Cheng, Lingling Sun

The modelling of composite right/left-handed transmission line and the corresponding theory have been studied. Then a parametric study of this components on ferrite has been driven. Both experimental and simulated scattering parameters are shown, and the corresponding propagation constants are given, that enables to identify the different frequency bands: left-handed band, right-handed band and bandgap. This non-reciprocal metamaterials has potential to be used in radio frequency integrated circuits.

P6: Electromagnetic scattering from a gyrotropic anisotropic sphere in an off-axis obliquely incident Gaussian beam
Yingying Tian, Youlin Geng

An analytical solution to the scattering of an off-axis Gaussian beam obliquely incident by a gyrotropic anisotropic sphere is obtained in the particle-centered system. The correctness of the theory is verified by comparing our numerical results with the results that the plane wave scattering by a gyrotropic anisotropic sphere.

P7: The Effects of Plasma Sheath on GPS Signal reception and Positioning Performance
Zhongguo Song, Xiaoli Xi, Jiangfan Liu, Yongxing Du

Plasma sheath can potentially degrade Global Navigation Satellite System (GNSS) through signal attenuation as wellas increased amplitude or phase noise when a hypersonic vehicle reenters the Earth's atmosphere. This paper proposes an estimation method for equivalent transmission function ofthe plasma sheath with stratified model. The effects of the plasma sheath on GPS signal reception and positioning performance are examined, such as carrier-to-noise ratio(CNR) and positioning error. Simulation and experimental results are presented and discussed, supporting the validityof the analytical method proposed.

P8: Scattering of cylindrical vector beams by a multilayered sphere
Renxian Li, Chunying Ding, Ruiping Yang

The scattering of a cylindrical vector beam by a multilayered sphere is investigated. An analytical formula for the calculation of beam shape coefficients of a cylindrical vector beam is first derived using Integral Localized Approximation. After the verification of beam shape coefficients by the comparison of the reconstructed field and the original field obtained from the definition, the far-field scattered intensity is evaluated, and the rainbow produced by cylindrical vector beams is also studied.

P9: A Novel Compact Microwave Dual-Band Bandpass Filter Using Stub-Loaded Resonators
Bin You, Long Chen, Xuan Wen

A novel compact microwave dual-band bandpass filter using stub-loaded resonators (SLR) is presented. The proposed dual-band filter comprises two dual-mode single band filters using common input/output lines. Each single band filter comprises a SLR. By tuning the length of main line or stub-loaded line of the resonator, either

the passband center frequency or the fractional bandwidth can be easily controlled and designed independently.

P10: A Radome Used for Circular Polarized Antenna Array
Jiang Xing, Huang Yingchao

A novel radome used for circularly polarized conformal antenna array in the C-band (4.5-5.1GHz) is presented in this paper. The structure of the radome is hemi-spherical and B- sandwich type. In order to study the influence of the radome, the antenna performances including axial-ratio, side lobe level, main beam direction and the 3 dB angular width were analyzed.

P11: Miniaturized coupled-fed printed antenna for WWAN/WLAN/WiMAX communication
Yi Chen Song, Jiang Sheng Zhou, Yun Long Lu

A miniaturized coupled-fed printed antenna for multi-band communication is presented. The antenna consists of a long radiation strip, a short circuited inductive shorting strip, and a coupling strip. By using the capacitive excitation of the coupling strip, the long radiating strip with the shorting strip can generate a wide lower band, and the coupling strip can form a wide upper band. The antenna is suitable to be disposed on a small no-ground board space of the system circuit board.

P12: Dual Frequency Reflectarray Using Square Ring with Four Branches
Tao Zhou, Xi-Wang Dai, Zhi-Hua Dong, Mian Pan, Guo-Hua Liu, Hua Jie Ke, Hai-Jun Gao, Jin-cai Wen, Zhiqun Cheng, Lingling Sun

A novel reflectarray, based on square ring with four branches, is proposed for dual frequency operation. It shows a dual-band characteristic due to the change of the current distribution. A crossed-dipole is applied on the front of cell element for adjusting the phase of reflection coefficient. The reflectarray can control reflected beams independently at dual frequencies with different polarizations. Prototypes of this reflectarray are present and studied, which validate the effectiveness of the reflectarray.

16:40 - 18:20 — Room B

Session 1A6

Antennas and Microwave Technologies

Chaired by: Steven Gao

16:40 : A Microstrip Triangular Spiral Resonator for a Tchebyshev Bandpass Filter Design
L. S. A. Costa, A. J. Belfort de Oliveira

This paper presents the design and computer simulation results of a microstrip three pole Tchebyshev filter based on a triangular spiral resonator. The objective of this paper is to show that a triangular spiral resonator filter with 48 percent of the area of a filter based on the triangular open loop resonator can perform very similarly in the band of interest and with the same Tchebyshev characteristics.

17:00 : Recent Development of Millimeter-Wave Bi-CMOS Multi-Band Amplifiers
Cuong Huynh, Jaeyoung Lee, Cam Nguyen

Recent developments of millimeter-wave BiCMOS multiband amplifiers including 0.18-μm SiGe BiCMOS concurrent dual-band power amplifier (PA) and tri-band low-noise amplifier (LNA) are presented. The PA can work in concurrent dual-band mode at 25.5 and 37 GHz as well as single-band mode at 25.5 or 37 GHz. In the dual-band mode, the measured maximum output power is 13 and 9.5 dBm at 25.5 and 37 GHz, respectively, and the total maximum PAE is 7.1 percent. The LNA operates concurrently around 13/24/35 GHz and achieves power gain of 22.4/23.7/20.2 dB at 13.5/24/35 GHz, respectively.

17:20 : Recent Development of Millimeter-Wave Bi-CMOS Multi-Band Amplifiers

Cuong Huynh, Jaeyoung Lee, Cam Nguyen

Recent developments of millimeter-wave BiCMOS multiband amplifiers including 0.18-μm SiGe BiCMOS concurrent dual-band power amplifier (PA) and tri-band low-noise amplifier (LNA) are presented. The PA can work in concurrent dual-band mode at 25.5 and 37 GHz as well as single-band mode at 25.5 or 37 GHz. In the dual-band mode, the measured maximum output power is 13 and 9.5 dBm at 25.5 and 37 GHz, respectively, and the total maximum PAE is 7.1 percent. The LNA operates concurrently around 13/24/35 GHz and achieves power gain of 22.4/23.7/20.2 dB at 13.5/24/35 GHz, respectively.

17:40 : Transmission Line Model for Compact Differential Dual-band Antenna with Stacked Patches
Liping Han, Gaofei Wu, Liyun Yan, Runbo Ma, Wenmei Zhang

The transmission line model for a compact differential dual-band antenna with stacked configuration is presented in this paper. The coupling admittance between stacked patches is calculated when the antenna is fed from the upper patch. To validate the transmission line model, two compact differential dual-band antennas are designed. The simulated results indicate that the proposed transmission line model is suitable for analyzing compact differential dual-band antennas with stacked configuration.

18:00 : Ultra-Compact Superdirective Two- and Three-Element Linear Arrays
Abdullah Haskou, Antonio Clemente, Ala Sharaiha, Christophe Delaveaud, Sylvain Collardey, Lionel Rudant

Superdirective parasitic arrays of two- and three-planar printed small loop antennas are presented. The unite-lement dimensions are lambda/14 xlambda/17 . It is shown that these antenna arrays with an inter-element spacing of 0:064 present maximum directivities of 6:3dBi and 9dBi respectively. Simulation results are provided and discussed.

16:40 - 18:00 — Room C

Session 1A7

Electromagnetic and Light Scattering

Organized by: Yang Lixia and Geng Youlin

Chaired by: Yang Lixia and Geng Youlin

16:40 : Study of UPML absorbing boundary condition for the five-step LOD-FDTD method
Li-Xia Yan, Xue-Jian Feng

In this paper, the uniaxial anisotropic perfectly matched layer (UPML) absorbing boundary condition in unconditionally stable five-step locally one-dimensional finite-difference time-domain (LOD5-FDTD) method are deduced, and optimized parameters of the UPML absorbing boundary condition are obtained by computing the radiation field of a point dipole. The results show that five-step LOD-FDTD method is more computational efficiency as compared with alternating direction implicit finite-difference time-domain (ADI-FDTD) method. In addition, target field phase distribution of a sinusoidal source is analyzed.

17:00 : An efficient implementation of NPML for truncating anisotropic media
Lijuan Shi, Lixia Yang, Zhichao Cai

In this paper, an efficient implementation of the modified nearly perfectly matched layer (NPML) absorbing boundary conditions (ABCs) for truncating anisotropic media is presented. The primary advantage of the proposed formulation is the simplicity in the FDTD implementations. Numerical results show that the presented scheme has good absorbing performance for anisotropic mediums.

17:20 : Analytical solution to electromagnetic scattering by a gyrotropic anistropic spherical

shell
Youlin Geng

Based on the spherical vector wave functions in gyrotropic anisotropic medium, and the first and second Bessel function satisfying the same different equation and recursive formula. Electromagnetic fields in gyrotropic medium can be obtained, and with the continue boundary condition in the surface of a gyrotropic spherical shell, a plane wave scattering by a gyrotropic spherical shell is derived. Some numerical results are given in the end of this paper.

17:40 : Broadband low-loss and small units left-handed metamaterials composed of slotted I shaped
Huai-Jing Dong, Youlin Geng, Zheng-Rui He

A method of designing a single side left-handed structure based on the integration of electric resonator and magnetic resonator is proposed.The left-handed units are formed by slotted I shaped placed on one side of the substrate, and then make them arranged in periodic structures. Software simulation shows that the left-handed structure exhibits negative effective permittivity and permeability simultaneously in a frequency range from 8.65 GHz to 14.17 GHz.

Tuesday 9th December, 2014

08:30 - 10:00 — Room A

Session 2A1

Plenary Session II

Chaired by: Zhiqun Cheng

08:30 : Plenary talk
Radiation control of electrically small antenna using superdirectivity
Ala Sharaiha

The recent state-of-the art in the field of miniature antennas shows new perspectives for the development of compact antennas presenting directivities higher than accepted normal limits (super-directivity properties). The increase of low directivity of electrically small-sized antennas is a modern motivation for super-directivity. Moreover, recent research activities in the field of active antennas offer new opportunities for practical superdirectivity implementation. Already, the state-of-the art shows concrete experiments of these issues. This presentation gives some results and examples on improving the directivity of electrically small antennas.

09:15 : Plenary talk
Common-mode Filter for EMC Design in 10+Gbps High-speed Circuits: A story from academic research to industrial application
Tzong-Lin Wu

Based on metamaterial concept, a novel common-mode filter (CMF) which can behave as bandstop filter the common-monde noise on high-speed differential circuits and give all-pass characteristics for the differential signals will be demonstrated. Through the miniaturization and bandwidth-enhanced techniques, the CMF is becoming available for industrial application to solve the EMC or RFI problems for high-speed differential interfaces such as USB, PCIe, and so on.

Coffee Break and Exhibit Inspection

Session 2P1

Poster session II

10:00 - 10:40

P1: Dual-Band Circularly Polarized Rectangular
Tao Zhou, Mian Pan, Hua-Jie Ke, Zhi-Hua Dong, Guo-Hua Liu, Hai-Jun Gao, Jin-Cai Wen, Zhi-Qun Cheng, Ling-Ling Sun

A coplanar waveguide fed dual-band circularly polarized rectangular slot antenna is presented. The circular polarization is generated by the S-shaped monopole which controls the path of the surface currents. A prototype is fabricated on a FR4 substrate with dielectric constant 4.4 . The proposed antenna achieves a 10 dB return loss bandwidth of 2.27-2.81 GHz and 4.94-6.08 GHz respectively. It also exhibits a 3 dB axial ratio bandwidth of 2.39-2.98 GHz and 5.42-5.92 GHz.

P2: Otto configuration for the TM and TE surface plasmon detection in doped graphene at terahertz frequencies
Felipe Ramos-Mendieta, J. Gaspar-Armenta, M. Palomino-Ovando

A numerical study of the TE and TM surface plasmon detection in free standing doped graphene by use of

the Attenuated Total Reflectance technique is presented. It is demonstrated for both polarizations that wave interference leads to the perfect absorption phenomenon. For graphene, doping levels as high as 0.8 eV and 1.2 eV have been used for calculations.

P3: A Wide-Band Wide-Coverage Printed Dipole Antenna for Spectrum Monitoring Applications
Yufeng Yu, Xiaoyi He, Yufeng Wang

A Wide-band wide-coverage dipole printed antenna is developed in this paper. A parasitic dipole is introduced above the driven dipole to broaden the impedance bandwidth and stabilize the radiation patterns.

P4: Monopole Antenna with metamaterials to reduce the exposure
Yenny Pinto, Xavier Begaud

This paper presents a simplified model of a terminal mobile where a monopole antenna is associated with three different metamaterials: Artificial Magnetic Conductor (AMC), Electromagnetic Band-Gap (EBG) and Resistive High Impedance Surface (RHIS). The exposure has been evaluated using a simplified phantom model. Results show that both AMC and RHIS reduce the exposure preserving the antenna performances.

P5: Analysis of GPR Antenna System Above Ground
Ji Ma, Guangyou Fang, Yicai Ji

We demonstrate an analysis of a ground penetrating radar (GPR) antenna system by using Wavenology EM, which is an efficient electromagnetic wave simulator. The system includes three identical half ellipse antennas: one is used for transmission, and the other two are for reception. Our investigations show that the antenna system has good radiation characteristics both in frequency and time domain. Furthermore, the ground effects on the antenna performance are taken into account by the FDTD method using adaptive mesh. The detection results of targets buried in soil by means of the proposed system are presented.

P6: A Compact Circularly-Polarized Patch Antenna With Dual-band For GNSS Applications
Hailong Yang, Xiaoli Xi, Zhongguo Song, Jiangfan Liu, Xiaomin Shi

A Compact Circularly-Polarized (CP) Patch antenna is designed and simulated in this paper. This compact dual-band antenna is designed for GPS, GLONASS, BDS-2 and GALILEO. A Stacked Patch is employed for the dual-band. The CP operation is achieved by an unequal cross-slot and dual-feed embedded in the patch. The antenna has and a small size of 50mm* 50mm. Analysis and design are conducted with Ansoft HFSS. Simulation results are presented and discussed.

P7: A Design of UHF-RFID Reader Antenna with Circular Polarization
Yanzhong Yu, Zhengbao Rao, Min Hu

A UHF-RFID reader antenna with circular polarization is designed in the present paper. In order to achieve the requirements of RFID reader applications, three measures are adopted. First way is to use a modified Minkowski fractal as radiating element for compacting dimension and broadening bandwidth. The second is to utilize the square truncation to obtain the circular polarization. In order to promote the gain of the proposed antenna, the slot-opened technology is employed lastly.

P8: Design of Remote Medical System Based On B/S Architecture
Zhiqun Cheng, Kai Xu

With the rapid development of network and information technology, telemedicine system has been widely concerned. A new type of medical system called remote medical consultation system is designed which is based on the Web technology and it is established based on the B/S model. Tornado framework and python scripting language ultimately are adopted to achieve many functions that include remote medical consultation, online instruction and online operation live and so on.

P9: Wideband Circularly-Polarized Smart-Skin Microstrip Antenna
Ming-Tao Tan, Bing-Zhong Wan

This paper presents a novel wideband circularly-polarized smart-skin antenna.The smart skin is an organic honeycomb sandwich structure.When the antenna is embedded in honeycomb sandwich structure, smart-skin antenna is formed. Electromagnetic simulation shows that the proposed smart-skin antenna has a good impedance match and circular polarization performances around 20GHz.

P10: Tunable Coplanar Waveguide Fed Ultra Wideband Terahertz Monopole Antenna Based on Graphene
Tao Zhou, Xing Qin, Hua-Jie Ke, Zhi-Hua Dong, Mian Pan, Guo-Hua Liu, Hai-Jun Gao, Jin-cai Wen, Zhiqun Cheng, Lingling Sun

We propose the concept and design of a CPW-fed tunable ultra wideband terahertz monopole antenna based on graphene sheet. The surface conductivity of graphene sheet under different chemical potential is studied systematically, the frequency-reconfiguration of the antenna under different chemical potential is studied. The proposed antenna has a characteristic of dynamic ultra wideband frequency-reconfiguration, low reflection coefficient, good omnidirectional radiation pattern and easy integration.

P11: Results of the optical measurements using the stand for protection from pulsed electromagnetic interference of accelerators
I. I. Dolgov, P. I. Dolgov, V. M. Isaev

The results of stands approbation for optical measurements under exposure of electron accelerators with nanosecond duration and accompanying pulsed broadband electromagnetic interference.

10:40 - 12:00 — Room B

Session 2A2

Material Modelling

Organized by: Laurent Daniel

Chaired by: Laurent Daniel

10:40 : Invited talk
Loss Analysis of Rotating Machines by Considering Mechanical Stress
Katsumi Yamazaki

A combined stress-electromagnetic field analysis has been developed for the loss estimation of rotating machines by considering mechanical stress caused by stator shrink fittings and rotor centrifugal forces. The effects of the stress on the reluctivity and losses of machine cores are modeled by using an equivalent stress, which considers the angle between magnetic field and principal stress.

11:00 : Invited talk
Efficient methods for macroscopic magnetization simulation described by the assembly of simplified domain structure models
Tetsuji Matsuo, Tomohiro Nakamura, Shumpei Ito, Takeshi Mifune, Chikara Kaido

This article presents two methods for the fast computation of macroscopic magnetization model called assembled domain structure model. First, an efficient method for computing the demagnetizing field is proposed. Secondly, a direct searching method of equilibrium point is developed, which greatly reduce the computation time.

11:20 : Invited talk
A review on the homogenization model based on inclusion problems
Romain Corcolle

This talk will focus on a mean-field homogenization model based on inclusion problems. It will be shown that this model is particularly powerful, retrieving classical ho- mogenization models, dealing with coupled behavior, and more...

11:40 : Magneto-Electric Effect for Multiferroic Heterostructures by Monte Carlo Simulation
Zidong Wang, Malcolm J. Grimson

Magneto-electric effect in a multiferroic heterostructure thin film has been investigated through the use of Monte Carlo simulations. The classical anisotropic Heisenberg model used consists of the interaction energy, the uniaxial anisotropic energy, and the Zeeman energy. The purpose of this article is to demonstrate the dynamic response of polarization is driven by an external magnetic field, when there is a linear magneto-electric coupling between the ferromagnetic and ferroelectric components.

12:20 - 12:40 — Room B

Session 2A3

Nanoplasmonics

Organized by: Sanshui Xiao and Jingjing Zhang

Chaired by: Sanshui Xiao and Jingjing Zhang

12:20 : Invited talk
Propagation of quantum signal in plasmonic waveguides
Xi-Feng Ren, Yong-Jing Cai, Ming Li, Chang-Ling Zou, Xiao Xiong, Hua-Lin Lei, Bi-Heng Liu, Guo-Ping Guo, Guang-Can Guo

Quantum photonic integrated circuit (QPIC) based on dielectric waveguides has been widely used in linear optical quantum computation. Here, on-chip quantum interference of two single surface plasmons is realized with dielectric loaded surface plasmon polariton waveguides. We also demonstrate for the first time the maintaining of quantum polarization entanglement in both a nanoscale dielectric tapered fibre and a plasmonic waveguide.

10:40 - 12:00 — Room C

Session 2A4

Antennas and Microwave Technologies

Chaired by: Ala Sharaiha

10:40 : Invited talk
Millimeter-Wave Cavity-Backed Antenna Arrays with Overlapped Aperture
Jiang Qi, Shi-Wei Qu

Conflict between cavity-backed antennas with electrically large size in applications to beam scanning arrays is addressed by partially overlapping the cavity aperture without performance degradation.

11:00 : A Low-Profile and Tightly-Coupled Microstrip Array with Wide-Angle Scanning Performance Based on Time Reversal Synthesis Method
Ren Wang, Bing-Zhong Wang, Xiao Ding, Ya-Qing Wen

A low-profile and tightly-coupled microstrip array with wide-angle scanning performance based on time reversal

synthesis method is proposed. The time reversal synthesis method can be used to optimize tightly-coupled array efficiently.

11:20 : The study on vibration and noise characteristics of small fan motors
Masaki Ogushi, Koki Shiohata, Takako Otsuka, Atsushi Taroda, Zhong Yan, Yoichi Kawai, Miyuki Furuya

In this study, the vibration and the noise in the small fan motor caused by electromagnetic dynamics and fluid dynamics were analyzed. Noise became the maximum at a frequency where the harmonic frequency of the electromagnetic force matches the natural frequency in the fan motor in the axial direction.

11:40 : Internal Homogenization of Biological Tissues for SAR Calculation
Hulusi Acikgoz

In this paper, the internal homogenization method is introduced to determine the effective physical properties (permittivity and conductivity) of biological tissues. This method is performed on a 2D child head model obtained from MRI data. The results are compared with those given by the original model where all tissues (4 tissues) are considered. It has been seen that the internal homogenization method allows reducing the computational time with a good accuracy.

Lunch and Exhibit Inspection

12:20 - 14:00

14:00 - 16:20 — Room B

Session 2A5

Nanoplasmonics

Organized by: Sanshui Xiao and Jingjing Zhang

Chaired by: Sanshui Xiao and Jingjing Zhang

14:00 : Invited talk
Subwavelength and Unidirectional Control of Electromagnetic Flux in Hyperbolic Mediums
Lian Shen, Runren Zhang, Zuojia Wang, Bin Zheng, Hongsheng Chen

We study the propagation of transverse-magnetic electromagnetic waves in the bulk and at the surface of two asymmetric hyperbolic metamaterials. We reveal that with appropriately designed material parameters, novel regimes of wave propagation emerge; in such special case, phase matching cannot be achieved unless surface voltage exists or the hyperbolic medium is regarded to be lossy. Our theoretical study also demonstrates a way to subwavelength control of electromagnetic waves without utilizing surface plasmons.

14:20 : Invited talk
Inverse Design for Optical Devices Using Nanowire Arrays
Jingjing Zhang

With artificially designed subwavelength structures, metamaterials have revolutionized the design paradigm of photonic devices and resulted in a variety of unprecedented optical effects and breakthrough applications, such as negative refraction, subwavelength imaging, and invisibility cloaking. Metamaterials consisting of subwavelength spaced nanowire arrays are demonstrated to work over a broad range of frequency with much lower material loss, and therefore have great potential in realizing optical devices.

14:40 : Invited talk
Hybrid photonic-plasmonic crystals with high Q factors and its related applications on coherent fluorescence emission and chemical sensor

Lei Shi

One of the main limitations in plasmonics is its intrinsic loss. Here, we propose that by using a dielectric grating on top of a flat metal surface, leaky surface optical modes with high Q factors including plasmonic and guided modes are well supported and coupled to the free space. Both experimental and theoretical results show that the plasmonic modes have the Q factors as high as 100 and the guided modes have the Q factors as high as 160.

15:00 : Invited talk
Two-dimensional graphene plasmons as analogue of two-dimensional hydrodynamic waves
Baile Zhang, Xiao Lin, Xihang Shi

Intricate and intriguing hydrodynamic wave phenomena are revealed to have counterparts in graphene plasmonics, including the plasmonic splashing generated by a fast-moving electron perpendicularly impacting upon a two-dimensional graphene monolayer and the plasmonic V-shaped ship-wake generated by a swift electron moving parallel above a graphene monolayer.

15:20 : Invited talk
Novel thermal devices engineered with artificial materials
Yungui Ma

In this talk we report our recent work on manipulation of transient heat flux employing this technique and showed two thermal devices: a heat flux cloak and an efficient plate heater. In the cloaking device we will show that heat flux can be guided by a transformed medium to flow around a vacuum obstacle and restore its diffusion direction as if nothing inhomogeneous exists in their trajectories.

15:40 : Purcell effect at silver nanowires and nanorings
Konstantin Filonenko, Vladimir G. Bordo

The spontaneous emission enhancement at metallic nanowires and nanoringsis studied and the results are compared with each other. The maximum of the Purcell factor over the broad range of principal and minor nanoring radii values is found and plotted as a function of the distance between the emitter and the nanoring for different mode numbers.

16:00 : Invited talk
Ultra-High Frequency Nano-mechanical Resonator with Graphene/Graphene Oxide Doubly Clamped Beam
Yuehang Xu, Tengda Mei, Yan Sun

The remarkable properties of graphene have renewed interest in ultra-high frequency nano-electromechanical systems (NEMS) with extraordinary mechanical and electronic attributes. However, the resonant frequency of graphene NEMS is still under 300MHz at room temperature. To further increase the resonator frequency, this paper presents an ultra-high frequency nano-mechanical resonator by using graphene/graphene oxide (G/GO) doubly clamped beam.The results show that the resonator frequency of G/GO nanomechanical resonator can reach up to 350.2MHz.

14:00 - 15:00 — Room C

Session 2A6

Remote Sensing, Inverse Problems, Imaging, Radar and Sensing

Chaired by: Tao Zhou

14:00 : Hybrid TDOA and AOA Localization using Weighted Least Square via RSS
Jungkeun Oh, Kyunghyun Lee, Wooram Lee, Kwanho You

In this paper, we propose an estimation technique based on hybrid time differential-of-arrival (TDOA) and angle-of-arrival (AOA) that allows the application of weighted least squares (WLS). The accuracy of localization is a very significant problem since the measurement data can be affected by environmental noise.

14:20 : RDOA based Emitter Localization using Constrained Least Square Algorithm under NLOS Environment
Kyunghyun Lee, Jungkeun Oh, Kwanho You

In this paper, we apply Kalman filter and constrained least square (CLS) algorithm for compensating these noises. With the proposed two algorithms, we can confirm high accuracy for localization. A simulation demonstrates the performance of our proposed algorithm.

14:40 : Seismic Wave Measurement using Laser Interferometer
Eunhwan Oh, Wooram Lee, Minwoo Lim, Kwanho You

In this paper, we propose a seismic signal measurement method using laser interferometer. The laser interferometer is very effective in the measurement of ultra-precision displacement. However, some error factors disturb an accuracy measurement. To enhance the accuracy in length measurement, we use the adaptive fading Kalman filter. A modified energy ratio (MER) is method used to calculate the distance of epicenter. We prove the performance of the proposed seismic measurement method through some simulations.

15:00 - 16:20 — Room C

Session 2A7

Optics and Photonics

Chaired by: Hamza Kurt

15:00 : Fabry-Perot interference of Terahertz Pulse radiation
Fa Tian, Sucheng Li, Weixin Lu, Bo Hou

In this summary we show the setup of a THz-TDS system in our new laboratory, Wave Functional Materials Lab. The transmission of a THz pulse radiation is shown in a semiconductor thin film. The Fabry-Perot interference is demonstrated in this ultrathin film by the THz pulse radiation. The theory calculations coincide with the experimental results.

15:20 : Light Focusing by Randomly Distributed Index Gradient Medium
Zeki Hayran, Mirbek Turduev, Ali Burak Parim, Emre Bor, Hamza Kurt

We propose a new concept for the design of inhomogeneous refractive index profile with random distributions of elements occupying the unit cells of photonic crystals. The positioning of PCs unit cells on the transverse direction is randomly achieved, thus disordered structures is originated from PCs. Specifically we have examined similarities of transmission efficiencies and focusing abilities at low frequency regime of the designed random PC structures. The idea of merging randomness with index gradient yields rich light manipulation capabilities.

15:40 : Influence of optical gyrotropy on two-wave mixing at dynamic hologram in photorefractive crystal
Mariya Asalkhanova, Roman Romashko

In this paper the theoretical analyze of the gyrotropy influence on the efficiency of record of dynamic hologram in the photorefractive crystals (PRC) is presented. The study is based on the modeling of two-wave mixing of a reference beam and a phase-modulated object beam in the cubic PRC. As estimation parameter of the interaction efficiency the object beam intensity modulation depth is used. Dependence of modulation depth on the interaction length is studied.

16:00 : Tuning Optical Nonlinearity in Epoxy plates
Erik S. Lotfi, Kazem Jamshidi-Ghaleh, Hossein Masalehdan

In this paper we presented open and closed-aperture Z-Scan method investigating 1 and 2 mm thickness optical epoxy plate nonlinear optical responses. The samples heated up to 175 C and the saturable absorption (SA) and two-photon absorption (TPA) processes reviewed. Since 2groups of the samples showed SA behavior for low intensity laser pulses then these plates promising candidate for saturable absorption devices.

Coffee Break and Exhibit Inspection

16:20 - 16:50

Wednesday 10th December, 2014

09:00 - 10:00 — Room B

Session 3A1

Computational Electromagnetic Methods and Their Applications

Organized by: Wen-Yan Yin

Chaired by: Wen-Yan Yin

09:00 : Invited talk
Study of High-Degree Stability for Marching-on-in-Degree Time Domain Technique
Ming-Da Zhu, Wen-Yan Yin

In this paper, the high-degree stability is studied for MOD method in the time domain integral equations. Results in this paper suggest that, the inaccurate numerical quadratures of high-degree associated Laguerre polynomials yield instable MOD solvers. Hence, a modified MOD technique for time-domain magnetic field integral equations (TD-MFIE) is proposed to solve this instability. Some numerical results are presented to illustrate the validity of these claims in solution of transient scattering problems.

09:20 : A Polynomial Interpolation Method of MoM Matrices for Analyzing Multilayer Structure in Frequency Sweeping
Zhen-Lei Wang, Wei-Dong Li, Zhe Song, Zhang-Cheng Hao

A polynomial interpolation method is presented for accelerating impedance MoM matrix filling in frequency sweeping from multilayer structure. In this method, frequency samples are expressed into analytical forms in terms of roots of Chebyshev polynomial, for enhancing the interpolation accuracy. The interpolated matrix element is a product of the normalized frequency and the remaining part after factoring out the dominant phase term from the original matrix element so that its frequency behavior can be captured by polynomial.Numerical examples show the accurate solutions over frequency band.

09:40 : Accurate Prediction of Shielding Effectiveness of Coated Cabin Using Conformal FDTD Method
Jian Wang, Wen-Yan Yin

A modified FDTD (2, 4) conformal technique is proposed for characterizing shielding effectiveness of an arbitrary coated cabin. This conformal scheme has higher accuracy than that of the conventional FDTD and FDTD (2, 4) methods. In our numerical treatment, only two integration loops of Faraday's law are used for updating magnetic field components. It is numerically demonstrated that high accuracy and low dispersion errors can be achieved in computing shielding effectiveness of some typical cabin structures.

Coffee Break and Exhibit Inspection

Session 3P1

Poster session III

10:20 - 11:00

P1: Extrapolation of Wideband Electromagnetic Response from Limited Frequency- and Time-Domain Data
Chu-Ming Gong, Wei-Lin Xiong, Jie-Fang Su, He-Nan Li, Ming-Da Zhu

In this paper, a novel extrapolation technique which using limited frequency- and time-domain information is presented. The wideband response is expressed as linear combination of associated Laguerre functions. A regularization method along with proper interpolation of the initial data is introduced to solve the ill-conditioned problem, which make the extrapolation technique much less sensitive to noise in the known part of the response.

P2: An Application of Active RFID and Zigbee Systems
Horng-Lin Shieh, Li Ying, Hung-Lun Kuo

This study used RFID technology to assist medical care personnel with ward round and nursing, so as to increase the management efficiency and reduce the human caused careless mistakes. Using the RFID tag, ZigBee technology, and long-range wireless communication, this study built an emergency care system. The proposed system consists of active RFID-ZigBee tag, active RFID-ZigBee positioning reader (including Router) and ZigBee-RS232 wireless network module.

P3: Generation of Multiple Excitons in Ag2S Quantum Dots: Single High-Energy versus Multiple-Photon Excitation
Jingya Sun, Weili Yu, Anwar Usman, Tayirjan T. Isimjan, Silvano Dgobbo, Erkki Alarousu, Kazuhiro Takanabe, Omar F. Mohammed

We explored the carrier multiplications generated by single high-energy and multiple photon absorption in Ag2S quantum dots (QDs) using femtosecond broadband transient absorption spectroscopy.

P4: UWB Printed Monopole Antenna with Dual Band-Notched Characteristic at WLAN and X-Band Communication Frequency
Xiaomu Hu, Wenhu Yang, Shuhui Yu, Rong Sun

A new kind of planar ultra-wideband (UWB) patch antenna with dual band-notched characteristics was proposed and analyzed. A folded slots and a dipole-like slot were etched out on the antenna patch to provide dual band-notched characteristic. The measured return loss of the antenna is lower than 10dB in 3.2-9.2GHz and has a dual band-notched characteristic at WLAN band and X-Band frequency respectively. Good agreement between the simulation and measurment is observed.

P5: A software tool for electromagnetic optimization teaching
Laurent Santandrea

In this work we propose to describe one of pratical tutorials, based on the use of a computer tool (OSD). Though a Graphical user interface proposes different optimization problems (analytical problems or practical electomagnetic problems) and differents methods to solve them.

P6: Circuit emulator of meminductor based on memristor
Guohua Liu, Zhiqun Cheng, Tao Zhou, Huajie Ke, Zhihua Dong

A meminductor circuit emulator utilizing a flux-controlled tunneling memristor is proposed. It imitates the behavior of a current-controlled meminductor. The memristor used in the emulator is designed by normal electronic devices and is measured in laboratory. The emulator is built from off-the-shelf electronic components. The SPICE simulation outputs of the emulator are consistent with the numerical results. The meminductor emulator provides an alternative solution of a meminductor model in real circuits.

P7: Studying the CPML absorbing boundary condition in FDTD method modeling the TEM response
Yan N. Jiang, Wen Liu, Jiao Wang

In FDTD modeling transient electromagnetic response, Dirichlet boundary condition is generally used. Hence, very large modeling region is required, and the computation amount increases rapidly. Considering the field approaching the dc limit at late times, magnetic field divergence equation must be incorporated explicitly and the CPML ABC is proposed to raise forward efficiency. It specially derives the CPML formulation dealing with the divergence equation explicitly. The proposed scheme was validated by the numerical results.

P8: Adaptive Optical Control in Disordered Medium
Wen-cheng Chang, Hsin-yao Chou, Yu Huang, Shugang Liu, Chin-Jung Chuang

Materials such as teeth, milk or human tissue are opaque. We have shown that coherent light can be focused through them and the principle can be applied in therapy. The two different optimization algorithms are programed. To approach the actual situation, we add a noise to the algorithms. By adaptive light control, more than 2 orders enhancement are demostrated.

P9: A Sierpinski Fractal Tag Antenna for RFID Applications
Yanzhong Yu, Xianhui Li, Xiaoying Wei

A design of Sierpinski fractal tag antenna at 2.45 GHz with match loop is presented in this paper. The Sierpinski fractal technology is employed to miniaturize the dimensions of tag antenna. And in order to realize impedance conjugate matching between tag antenna and chip, a match loop is introduced to tune flexibly the input impedance of tag antenna.

P10: Lattice dielectric loss in diamond and related materials at millimeter range
Boris Garin, Roman Denisyuk, Dmitry Kalenov, Vladimir Parshin, Evgeniy Serov, Vadim Derkach, Roman Golovashchenko, Vadim Korzh, Alexander Plevako, Sergey Tarapov

The manifestations of the lattice dielectric losses (both intrinsic lattice loss corresponding to ideal crystal, and nonintrinsic loss due to lattice disorder) are considered in some low loss diamond and related materials at the millimeter wavelengths range and very wide temperature region 1?900 K. The data are presented and discussed for the diamonds grown by the arc plasma jet technique, high purity crystal of silicon carbide (SiC), and crystal of semi-insulating InP.

11:00 - 12:00 — Room B

Session 3A2

Computational Electromagnetic Methods and Their Applications

Organized by: Wen-Yan Yin

Chaired by: Wen-Yan Yin

11:00 : An Efficient Macromodeling Methodology for Transient Simulation of Signal Integrity Problems
Ashish Sarvaiya, Sanjeev Gupta

This paper proposes an efficient macromodeling methodology for transient simulation of Signal Integrity (SI) problems. A Finite Integration Technique and Vector Fitting Method is used here. Resulting pole residue macromodel is directly embedded into HSPICE or compatible circuit solvers. A systematic macromodeling methodology is discussed and a simple procedure of embedding the macromodel into circuit solver is described. Single ended via connected with two microstrip lines example show the validity of the proposed methodology.

11:20 : Metal-nonmetal oscillations in doped blue phosphorene:a first-principles study
Weiyang Yu, Zhili Zhu, Chong Li, Chunyao Niu, Junhyung Cho, Yu Jia

Based on density functional theory(DFT), we have investigated systematically the geometry structure and electronic properties of non-metallic atom doped blue phosphorene, such as B-, C-, N-, O-, Al-, Si- and S-doped blue phosphorene systems.

11:40 : Plasma Sheath Multipath analysis and Its Effect on GNSS Navigation
Yongxing Du, Xiaoli Xi, Zhongguo Song, Jiangfan Liu

When hypersonic vehicle reenters the Earth's atmosphere, the plasma sheath will be generated by its collision with ambient air that would affect Global Navigation Satellite System (GNSS). Besides the attenuation on the signal energy, the multipath effect between the plasma sheath and the vehicle surface is also a serious factor The multipath of the plasma sheath is analyzed by finite-difference time-domain (FDTD) method combined with further signal processing.

Lunch and Exhibit Inspection

12:00 - 13:30

13:30 - 14:50 — Room B

Session 3A3

Optics and Photonics

Chaired by: Erik Lotfi

13:30 : Novel properties of Maxwell's fish eye as an optical microresonator
Khalil Dadashi, Mirbek Turduev, Hamza Kurt, Ramazan Esen

Whispering gallery modes (WGMs) in Maxwell's fish eye (MFE) as a graded index medium have interesting spectral and optical transport properties. We employ the finite-difference time-domain (FDTD) method to numerically study of these properties. In comparison to conventional microdisc, mode splitting and high quality factor have been achieved. Due to rapid advances in nanofabrication methods, it seems that MFE can be one of the key optical elements in the future photonic circuits.

13:50 : Subwavelength focusing by all dielectric graded index photonic crystal lens
Mirbek Turduev, Melih G. Can, Khalil Dadashi, Hamza Kurt

In this manuscript, we propose graded index (GRIN) medium to obtain subwavelength focusing of light by using all-dielectric materials. Continuous GRIN profile with hyperbolic secant refractive index distribution is approximated using 2D photonic crystals (PCs). Light focusing phenomenon is systematically and quantitatively analyzed at different operating frequencies and the results are numerically reported. Subwavelength focusing of light holds great potential in nanolithography, optical sensing / imaging / microscopy, optical precision measurements and data storage.

14:10 : A Zero Index Metamaterial Superstrate for Patch Antenna Gain Enhancement
S. M. Chaker, D. Bensafieddine, E. M. Laamari, M. Bouzouad

The objective of this paper is to use a zero refractive index (n) metamaterial as single or double layer superstrate suspended above a microstrip patch antenna (MPA), operating at 43 GHz, This metamaterial property allows gathering radiated waves from the antenna and collimates them towards the superstrate normal direction. The proposed design improves the antenna gain by 5.1 dB with single-layer superpstrate, and 7 dB with double-layer superstrate.

14:30 : Efficient and broadband Terahertz plasmonic absorbers with highly doped Si as the plasmonic material
Yusheng Zhang, Zhanghua Han

The design of efficient and broadband Terahertz plasmonic absorbers with highly doped Si as the plasmonic material is proposed and the performance of these absorbers are numerically investigated. The plasmonic properties of highly doped Si are first analyzed, based on which resonant plasmonic structures consisting of HDSi-SiO2-HDSi are presented. Numerical results demonstrate that these structures exhibit high absorption in the terahertz frequencies with large bandwidth and tenability.

Coffee Break and Exhibit Inspection

15:30 - 16:00

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