Millimeter Wave Communications for 5G

In this talk, the current research status of China 5G is briefly introduced, including the candidate frequency bands, goal and key technologies etc. Then, the research advances in millimeter wave indoor and outdoor communications for 5G is presented. Especially, the research advance in IEEE 802.11aj(45GHz) or Q-LINKPAN in China is reviewed, which was proposed mainly by the authors and now is considered as a part of Chinese 5G. Besides, the development and measurement of multibeam antennas for 5G massive MIMO are also reviewed.

About the speaker

Prof. Wei Hong / Southeast University, China

Mr. Tomohiro Saito joined NHK (Japan Broadcasting Corporation) in 1987. From 1990, he worked at NHK Science & Technology Research Laboratories (STRL) and engaged in research and development related to digital transmission and transmission system, especially on digital satellite television broadcasting (ISDB-S). He worked at Engineering Administration Department and engaged in international standardization activity with groups such as ITU. He was the head of Advanced Transmission Systems Research Division of STRL from 2014 and has been Executive Research Engineer of STRL since 2015.
The 5G network will allow ultra-fast data transfer, significantly decrease latency, and also support massive connectivity of heterogeneous devices. Although the telecoms industry has already started working on 5G, network operators, vendors, and regulatory bodies have yet to agree on a standard for spectrum and radio technologies. To clear this hurdle and timely roll out commercial 5G services, KT is actively working on both 5G R&D and global standardization, closely collaborating with industry, government, and global telecom alliances. KT already announced the vision of 5G GiGAtopia in MWC 2015 and is accordingly preparing 5G pre-commercial services for 2018 PyeongChang Winter Olympic Games. In this talk, we will share KT’s view and vision on 5G, and also introduce what KT has done so far, and what KT is currently working on for launching 5G networks in collaboration with our partners, mainly focusing on our 5G pre-commercial specifications and corresponding service plan.

About the speaker

Mr. Jongsik Lee / KT, Korea

Jongsik Lee is currently the head of 5G TF in Infra Lab. of Institute of Convergence Technology. He joined KT in 1998 and has worked on various wireless areas including 3G, Mobile WiMAX, and LTE-related R&D project. Since 2014, he has been leading LTE Evolution and 5G-related R&D projects. He received the B.S. & M.S. degrees in Electrical Engineering from the Seoul National University in 1996 and in 1998, respectively. His main research areas were RF and microwave engineering.

A theoretical analysis of a cylindrical ferrite resonator antenna with steady magnetization utilizing the boundary conditions of a magnetic wall is presented. We theoretically derived exact eigenvalue equations for the mode-splitting phenomenon of hybrid mode. The presented theory is used to measure the permeability tensor and analysis the antenna performance.

About the speaker

Prof. Seong-Ook Park / Korea Advanced Institute of Science and Technology, Korea

Seong-Ook Park received the M.S. degree from Korea Advanced Institute of Science and Technology (KAIST), Daejeon, in 1989, and the Ph.D. degree from Arizona State University, Tempe, in 1997, under the supervision of Professors Constantine A. Balanis. From March 1989 to August 1993, he was a Research Engineer with Korea Telecom, Daejeon, working with microwave systems and networks. He later joined the Telecommunication Research Center, Arizona State University, until September 1997. He has been a member of the faculty at the Information and Communications University from October 1997 to 2008, and has been currently a full professor since 2009 at KAIST. He has studied the improvement of antenna function inside of handset platforms, analytical and numerical techniques in the area of electromagnetics wave, and the precision technique of antenna measurement. His main focus is on the theoretical analysis of a ferrite antenna, low loss Magneto-Dielectric antenna, and the new material based miniature antenna system. He has over 145 publications in refereed journals. He recently served as the Director General, Satellite Technology Research Center, KAIST.
Additive manufacturing (AM), or often called 3D printing is an emerging research area which has received much attention recently. It allows 3D objects with arbitrary geometry to be printed automatically layer by layer. 3D printing technology offers several advantages compared to conventional manufacturing techniques such as capability of more flexible design, prototyping time and cost reduction, less human interaction and faster product development cycle. This paper reviews state-of-the-art 3D printed antennas from microwave to THz frequencies and offers practical and futuristic perspectives on the potentials and challenges of 3D printed antennas.

Invited Talk 2

Functional Metamaterial Devices for Manipulation of Waves in Microwave Region Based on Transformation Optics

As an effective approach for manipulating propagation of waves, transformation optics has inspired many novel applications during past decades. In this paper, our recent efforts in metamaterial devices for manipulation of waves in microwave region are reviewed with emphasis on (1) multifunctional device with three different kinds of electromagnetic properties, (2) homogeneous illusion device exhibiting transformed and shifted scattering effect and (3) wave bending devices with homogeneous complementary material. Our designs possess potential applications in fields of electromagnetic engineering.

About the speaker

Prof. Qun Wu / Harbin Institute of Technology, China

WU QUN received his B.Sc. in Radio Engineering, M. Eng. In Electromagnetic Fields and Microwaves, and Ph.D. in Communication and Information Systems, all at Harbin Institute of Technology (HIT), Harbin, China in 1977, 1988, and 1999, respectively. He worked as a Visiting Professor at Seoul National University (SNU) in Korea, from 1998 to 1999, and Pohang University of Science and Technology, from 1999 to 2000, and a two-month short period of visiting professor at National University of Singapore from 2003 to 2010 and Nanyang Technological University in 2011, respectively. Since 1990, he has been with School of Electronics and Information Engineering at HIT, China, where he is currently a Professor and a director of Center for Microwaves and EMC. He published several books like Electromagnetic Compatibility: Principle and Techniques, Microwave Engineering and Techniques, Simulation and Design for RF & Microwave Circuits by Using Genesys, Theory and Applications of Metamaterials. Professor Wu has published nearly 200 international and regional refereed journal papers. He is a Member of Chinese Microwave Society, and senior member of the IEEE. He is a technical reviewer for several international journals. His recent research interests are mainly metamaterials, RF active and passive circuits, antennas and antenna arrays. He is also a vice chair for IEEE Harbin section, and chair of IEEE Harbin EMC/AP/MTT joint society chapter.

Invited Talk 3

3D Printing Technology for RF and THz Antennas

Additive manufacturing (AM), or often called 3D printing is an emerging research area which has received much attention recently. It allows 3D objects with arbitrary geometry to be printed automatically layer by layer. 3D printing technology offers several advantages compared to conventional manufacturing techniques such as capability of more flexible design, prototyping time and cost reduction, less human interaction and faster product development cycle. This paper reviews state-of-the-art 3D printed antennas from microwave to THz frequencies and offers practical and futuristic perspectives on the potentials and challenges of 3D printed antennas.

About the speaker

Prof. Hao Xin / The University of Arizona, USA

Hao Xin, Professor of Electrical and Computer Engineering at the University of Arizona. He is named an Arizona Engineering fellow in Aug. 2013. He is the inaugural director of the Cognitive Sensing Center at the University of Arizona starting Jan. 2016. He joined University of Arizona since August 2005 as an assistant professor. He was promoted to tenured associate professor in 2009 and to full professor in 2012. He received his Ph.D in Physics from Massachusetts Institute of Technology in February 2001. From 2000 to 2003, he was a research scientist with the Rockwell Scientific Company. He was a Senior Principal Multidisciplinary Engineer with Raytheon Company from 2003 to 2005. His primary research interests are in the area of microwave / millimeter wave / THz antennas, devices, circuits and their applications in wireless communication and sensing systems. His recent research activities have covered a broad range of high frequency technologies, including applications of new technologies and materials in microwave and millimeter wave circuits such as electromagnetic band gap crystals and other meta-materials, carbon nano-tubes devices, solid state devices and circuits, active or semi-active antennas, and passive circuits. He has authored over 250 refereed publications and 14 patents (13 issued and 1 pending) in the areas of microwave and millimeter-wave technologies, random power harvesting based on ferro-fluidic nano-particles and carbon nanotube based devices. His group’s work on active metamaterials have been published in prestigious journals including Physical Review Letters, Nature Communications, etc. and have received extensive media coverage (the story on the active metamaterial work received over 200 million visits). He is a senior member of IEEE and chair of the joint chapter of IEEE AP/MTT/EMC/COMM in Tucson AZ. He is a general co-chair of the 8th International Workshop on Antenna Technology. He also serves as an associate editor for IEEE Antennas and Wireless Propagation Letters. hxin@ece.arizona.edu 520-626-6941.
Phased Array of Switched Beam Elements and Applications

This paper presents a two-element phased array antenna. The phase shifter for each element has one bit and each element has four beam directions. The suitable distance between elements provides side lobe level of less than -10 dB and gain higher than 6.3 dBi. With this simple configuration, this array antenna is useful in modern wireless communications and sensing applications.

Prof. Monai Krairiksh
King Mongkut’s Institute of Technology Ladkrabang, Thailand

Monai KRAIRIKSH was born in Bangkok, Thailand. He received the B.Eng., M.Eng. and D.Eng. degrees in electrical engineering from King Mongkut’s Institute of Technology Ladkrabang (KMITL), Thailand in 1981, 1984, and 1994, respectively. He was a visiting research scholar at Tokai University in 1988 and at Yokosuka Radio Communications Research Center, Communications Research Laboratory (CRL) in 2004. He joined the KMITL and is currently a Professor at the Department of Telecommunication Engineering. He has served as the Director of the Research Center for Communications and Information Technology during 1997-2002. His main research interests are in antennas for mobile communications and microwave in agricultural applications. Dr. Krairiksh was the chairman of the IEEE MTT/AP/Ed joint chapter in 2005 and 2006. He served as the General Chairman of the 2007 Asia-Pacific Microwave Conference, and the advisory committee of the 2009 International Symposium on Antennas and Propagation. He was the President of the Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology Association (ECTI) in 2010 and 2011 and was an editor-in-chief of the ECTI Transactions on Electrical Engineering, Electronics, and Communications. He was recognized as a Senior Research Scholar of the Thailand Research Fund in 2005 and 2008 and a Distinguished Research Scholar of the National Research Council of Thailand. He has been a distinguished lecturer of IEEE Antennas and Propagation Society during 2012-2014.

Water Vapor Estimation using the Propagation Delay of Digital Terrestrial Broadcasting Waves

The feasibility of measuring water vapor from the propagation delay of digital terrestrial broadcasting waves is under investigation. A real-time delay measurement system with software-defined radio technique is developed. In this paper, experimental results with this system using reflected waves are reported. We have succeeded in observing the propagation delay between the observing point and the reflector from the balance between phases of direct waves and reflected waves. Data obtained with this technique may contribute to improve numerical forecast of localized severe weather phenomena through data assimilations.

Dr. Seiji Kawamura
National Institute of Information and Communications Technology, Japan

Seiji Kawamura is a senior researcher at Applied Electromagnetic Research Institute, National Institute of Information and Communications Technology (NICT), Japan. He received his B.E., M.E., and Ph.D. in informatics from Kyoto University, Kyoto, Japan, in 1998, 2000, and 2003, respectively. During his M.E. and Ph.D. programs, he studied at Radio Science Center for Space and Atmosphere (RASC, currently RISH), Kyoto University, and served as a Japan Society for the Promotion of Science (JSPS) doctoral course student fellow from 2000 to 2003. After completing his doctorate, he served as a JSPS postdoctoral fellow at Communications Research Laboratory (CRL, currently NICT) and then joined the NICT in 2006. He worked at NICT Okinawa Electromagnetic Technology Center, Onna, Okinawa from 2007 to 2011. He started his research from ionospheric studies using the MU radar at the graduate school. Then his interest moved down to the mesosphere (using MF radars) and to the troposphere (using weather radars and wind profiler radars). His main focus is R&D of radar remote sensing technologies using software-defined radio.
Design and Characterization of Cost-Effective Planar Antennas with Steerable Beams: Gap Waveguides, SMT and Random LOS

This paper presents the recent developments of gap waveguide technology and random-LOS OTA test technology. The applications on beam-steerable massive MIMO antennas and the characterization with random-LOS are emphasized.

About the speaker

Jian Yang / Chalmers University of Technology, Sweden

Jian Yang received the B.Sc. degree in electrical engineering from the Nanjing University of Science and Technology, Nanjing, China, in 1982, the M.Sc. degree in electrical engineering from the Nanjing Research Center of Electronic Engineering, Nanjing, in 1985, and the Swedish Licentiate and Ph.D. degrees from Chalmers University of Technology, Gothenburg, Sweden, in 1998 and 2001, respectively.

From 1985 to 1996, he was with the Nanjing Research Institute of Electronics Technology, Nanjing, China, as a Senior Engineer. From 1999 to 2005, he was with the Department of Electromagnetics, Chalmers University of Technology, Gothenburg, Sweden, as a Research Engineer. During 2005 and 2006, he was with COMHAT AB as a Senior Engineer. From 2006 to 2010, he was an Assistant Professor and, since 2010, he has been an Associate Professor with the Department of Signals and Systems, Chalmers University of Technology. His research interests include 60–120-GHz antennas, terahertz antennas, MIMO antennas, ultrawideband (UWB) antennas and UWB feeds for reflector antennas, UWB radar systems, UWB antennas in near-field sensing applications, hat-fed antennas, reflector antennas, radome design, and computational electromagnetics.

Assistant Prof. Andrés Alayón Glazunov / Chalmers University of Technology, Sweden

Andrés Alayón Glazunov is currently an Assistant Professor at the Department of Signals and Systems, Chalmers University of Technology, Gothenburg, Sweden. He obtained the M.Sc. (Engineer-Researcher) degree in Physical Engineering from Saint Petersburg State Polytechnical University, Russia, and the Ph.D. degree in Electrical Engineering from Lund University, Sweden, during 1988-1994 and 2006-2009, respectively. He has held various positions at research labs in the Swedish telecom industry, e.g., member of the Research Staff at Ericsson Research, Senior Research Engineer at Telia Research, and Senior Specialist in Antenna Systems and Propagation at TeliaSonera. In academia, he has held a Marie Curie Senior Research Fellowship at the Centre for Wireless Network Design (CWiND), University of Bedfordshire, UK, and a post-doc position at the Electromagnetic Engineering Lab, KTH-The Royal Institute of Technology, Stockholm, Sweden.

Alayón Glazunov has been one of the pioneers in establishing OTA measurement techniques. He has conducted, or is conducting research, in areas related to advanced receiver performance evaluation, applied electromagnetic wave propagation, stochastic channel modelling, smart and MIMO antennas and systems, network optimization, fundamental limitations on antenna-channel interactions, and Over-The-Air (OTA) performance evaluation of wireless devices. He has actively contributed to the European COST Actions 259 and 273. He has contributed to the EVEREST and NEWCOM European research projects as well as to the 3GPP and the ITU standardization bodies.

Alayón Glazunov is the author of various scientific and technical publications. He is the co-author and co-editor of LTE-Advanced and Next Generation Wireless Networks (Wiley 2012).
Design of Antennas with Crossed Dipoles

With the rapid development of today’s wireless communication markets, higher demands have been raised for the antenna design, including compact sizes, high efficiencies, broad bandwidths, multiple bands, specific radiation profiles, ease of fabrication and integration, and low costs. The crossed dipole is a common type of modern antenna with an RF- to the millimeter-wave frequency range. Therefore, crossed dipole antennas have been widely developed for current and future wireless communication systems. They can generate isotropic, omnidirectional, unidirectional, dual-polarized, and circularly polarized (CP) radiation. Moreover, by incorporating a variety of primary radiation elements, they are suitable for single-band, multiband, and wideband operations.

Two techniques, namely insertions a meander line and an arrowhead-shaped end in each dipole arm, are used to realize a compact size of the cross dipole. For CP radiation with single-feed, the dipoles with the reduced length are crossed through a pair of vacant-quarter printed ring. For multi-band applications, each dipole arm is divided into multi-branches with different lengths to obtain multiple resonances. Wideband radiating elements such as bowtie dipoles are employed for wideband applications. To improve the radiation pattern, these radiators are combined with different reflectors, namely metallic cavity and artificial magnetic conductor surfaces.

In this Workshop, the designs, characteristics, and applications of crossed dipole antennas along with recent developments will be presented. Considerations of profile miniaturization, radiation pattern control, bandwidth enhancement, and multiband operation are emphasized.

About the speaker

Prof. Ikmo Park / Ajou University, Korea

Ikmo Park received the B.S. degree in Electrical Engineering from the State University of New York at Stony Brook, and M.S. and Ph.D. degrees in Electrical Engineering from the University of Illinois at Urbana-Champaign. He joined the Department of Electrical and Computer Engineering at Ajou University in March 1996. Prior to joining Ajou University, he has been working with the Device & Materials Laboratory of LG Corporate Institute of Technology, Seoul, Korea, where he had been engaged in research and development of various antennas for personal communication systems, wireless local area networks, and direct broadcasting systems. He was a Visiting Professor at the Department of Electrical and Computer Engineering, POSTECH, Pohang, Korea, from March 2004 to February 2005, and the Department of Electrical and Computer Engineering, University of Arizona, Tucson, Arizona, USA, from July 2011 to June 2012. He has authored and co-authored over 300 technical journal and conference papers. He also holds over 30 patents. He served as a Chair of the Department of Electrical and Computer Engineering at Ajou University. He is a member of Board of Directors at the Korea Institute of Electromagnetic Engineering and Science (KIEES). He serves as chairs, organizers, and members of the program committees for various conferences, workshops, and short courses in electromagnetic related topics. His current research interests include the design and analysis of microwave, millimeter-wave, terahertz wave, and nano-structured antennas. He is also a member of Eta Kappa Nu and Tau Betta Pi.

Reflectarray Antennas: Theory, Designs, and Applications

In the recent years, reflectarrays have emerged as a new generation of high-gain antennas, which have attracted an increasing interest in the antenna community because of their low-profile, low-mass, and low-cost features. The reflectarray antenna is a hybrid design that combines many favorable features of reflectors and printed arrays. The aim of this short course is to present a comprehensive overview of reflectarray system design and state-of-the-art technology. This short course will enable attendees to understand the basics of reflectarray systems, become familiar with reflectarray design, analysis techniques, and enabling technologies, and apply this knowledge to designing reflectarrays for various applications.

The proposed curriculum for this course consists of two parts. In the first part, the history of reflectarray antenna development is first reviewed and then basic theories for analysis and design of reflectarray antennas are presented in detail. This section of the course builds the fundamental knowledge one needs to have in order to understand the governing dynamics of a reflectarray antenna system, and efficiently design and analyze reflectarray antennas. The second part of the course is intended for researchers that have a good knowledge of the basic theories in reflectarray and aim at designing reflectarray antennas for specific applications. This part starts with a discussion on bandwidth limitation and solutions for broadband designs, and afterwards several advanced application oriented topics in reflectarray antennas will be presented.

About the speaker

Prof. Fang Yang / Tsinghua University, China

Fan Yang received the B.S. and M.S. degrees from Tsinghua University, Beijing, China, and the Ph.D. degree from the University of California at Los Angeles (UCLA).

From 2002 to 2004, he was a Post-Doctoral Research Engineer and Instructor with the Electrical Engineering Department, UCLA. In 2004, he joined the Electrical Engineering Department, The University of Mississippi as an Assistant Professor, and was promoted to an Associate Professor. In 2011, he joined the Electronic Engineering Department, Tsinghua University as a Professor, and has served as the Director of the Microwave and Antenna Institute since then.


Dr. Yang served as an Associate Editor of the IEEE Transactions on Antennas and Propagation (2010-2013) and an Associate Editor-in-Chief of Applied Computational Electromagnetics Society (ACES) Journal (2008-2014). He was the Technical Program Committee (TPC) Chair of 2014 IEEE International Symposium on Antennas and Propagation and USNC-URSI Radio Science Meeting.
Dr. Yang has been the recipient of several prestigious awards and recognitions, including the Young Scientist Award of the 2005 URSI General Assembly and the 2007 International Symposium on Electromagnetic Theory, the 2008 Junior Faculty Research Award of the University of Mississippi, the 2009 inaugural IEEE Donald G. Dudley Jr. Undergraduate Teaching Award, and the 2011 Recipient of Global Experts Program of China.

**Fundamentals of Practical Antenna Measurement to Get More Accurate Data for Input Impedance and Pattern**

To examine the antenna characteristics, quantities to be measured are classified according to circuit and spatial aspects. For circuit aspect, there are input impedance, radiation resistance, VSWR, return loss, reflection coefficient, radiation efficiency and bandwidth. For spatial aspect, there are radiation pattern, directivity, gain, beam width, polarization, effective area, RCS, radiation efficiency and bandwidth. In this workshop, for circuit aspect, I will discuss input impedance measurement using a vector network analyzer or VNA, with electrical length compensation and the effect of unbalanced current on the coaxial cable. For spatial aspect, will discuss pattern measurements and related error sources with the methods to reduce them, and gain measurements using comparative method.

**About the speaker**

Prof. Nozomu Ishii / Niigata University, Japan

Nozomu Ishii received B.S., M.S., and Ph.D degrees from Hokkaido University, Sapporo, Japan, in 1989, 1991, and 1996, respectively. In 1991, he joined the faculty of Engineering at Hokkaido University. Since 1998, he has been with the faculty of Engineering at Niigata University, Japan, where he is currently an Associate Professor of the Department of the Biocybernetics. His current interests are in the area of small antennas and antenna analysis and measurement. He is the author of textbook entitled “Antenna Basic Metrology” written in Japanese. He is now the Chairperson of Expert Committee on Advanced Measurement Technology for Radio Equipment and Antenna System, IEICE, Japan. He is a member of the IEEE.
A New Look at Transformation Optics (TO) Approach for Designing Electromagnetic Devices such as Flat Lenses, and Cloaks

In this tutorial presentation we will discuss the basics of the Transformation Optics (TO) method, aka the Transformation Electromagnetics approach, to designing a number of "microwave" devices such as: cloaks; flat lenses; and reflectarrays. Recently, there has been considerable interest in using the transformation optics (TO) algorithm, which is based upon transforming the geometry of an object from real space to virtual space while keeping the Maxwell's field solutions from real space to virtual space intact, because it provides an alternative (to traditional) and innovative way to design a class of EM devices. However, the caveat is that the TO algorithm typically leads to designs that call for anisotropic epsilon and mu values in real space, in order to preserve the field variations as we navigate from the real space to virtual space and vice versa. Furthermore, depending on the geometry of the problem, the values may be very unrealistic to realize in practice, even when artificially synthesized materials aka metamaterials (MTM) are employed for the realization, whose use often leads to designs that are narrowband, lossy, dispersive and polarization-sensitive—attributes that are clearly undesirable for practical applications. We show how we can address this problem encountered with the TO by using an algorithm based on "Field Transformation (FT)," as opposed to geometry transformation. The FT algorithm has been designed to transform the electromagnetic field distribution in an input aperture, generated by a given source distribution, to a desired distribution in the exit aperture. We show how we can cast the design problem into a Scattering Matrix approach, where in the case of RCS reduction problem the design is based on controlling only the Magnitude of S11, whereas for the Lens or Reflectarray problems, we are specifying only the desired Phase of S12 without being concerned about its magnitude. In contrast to this, the TO imposes strict conditions on both the magnitude and phase characteristics of S11 and S12, which in turn calls for anisotropic dielectric and magnetic metamaterials. The Scattering Matrix/Field Transformation approach avoids these problems altogether and is able to work with epsilon-only materials for the lens and reflectarray problems, and with realizable magneto-dielectrics with complex Mu and epsilon materials, which have wideband characteristics and which do not suffer from the shortcomings of the MTMs.

A number of practical examples will be included in the presentation, not only to point out the shortcomings of the TO, but to also show how we can get around its difficulties in a systematic way when dealing with some real-world problems.

**Prof. Raj Mittra**

*Pennsylvania State University / University of Central Florida, USA*

Raj Mittra is Professor in the Electrical Engineering department of the Pennsylvania State University. He is also the Director of the Electromagnetic Communication Laboratory, which is affiliated with the Communication and Space Sciences Laboratory of the EE Department. Prior to joining Penn State he was a Professor in Electrical and Computer Engineering at the University of Illinois in Urbana Champaign. He is a Life Fellow of the IEEE, a Past-President of AP-S, and he has served as the Editor of the Transactions of the Antennas and Propagation Society. He won the Guggenheim Fellowship Award in 1965, the IEEE Centennial Medal in 1984, the IEEE Millennium medal in 2000, the IEEE/AP-S Distinguished Achievement Award in 2002, the AP-S Chen-To Tai Distinguished Educator Award in 2004 and the IEEE Electromagnetics Award in 2006. He has been a Visiting Professor at Oxford University, Oxford, England and at the Technical University of Denmark, Lyngby, Denmark. He has also served as the North American editor of the journal AEÜ. His professional interests include the areas of Communication Antenna Design, RF circuits, computational electromagnetics, electromagnetic modelling and simulation of electronic packages, EMC analysis, radar scattering, frequency selective surfaces, microwave and millimetre wave integrated circuits, and satellite antennas. He has published over 1000 journal and symposium papers and more than 40 books or book chapters on various topics related to electromagnetics, antennas, microwaves and electronic packaging. He also has four patents on communication antennas to his credit. He has supervised about 100 Ph.D. theses, 85 M.S. theses, and has mentored more than 50 postdocs and Visiting scholars. He has directed, as well as lectured in, numerous short courses on Computational Electromagnetics, Electronic Packaging, Wireless antennas, Metamaterials and Transformation Optics, both nationally and internationally.
Ultra Wideband Phased Arrays and Transceivers

Wide band antennas and arrays are essential for high resolution imaging, cognitive sensing, high data rate communication links, multi-waveform, and multi-function frontends for holistic spectrum utilization and secure communications. With wireless data traffic expected to grow more than 40% annually in the foreseeable future, wideband RF front ends will play an essential role in the years to come. However, there is a longstanding difficulty in realizing small and conformal aperture version of these arrays. But recent miniaturization techniques, bandwidth enhancements and establishment of theoretical limits, feed technology, digital beam forming transceivers and post-processing algorithms have led to a new class of conformal antennas and tight-coupled arrays that can operate from UHF to millimeter wave frequencies. This short course will cover RF front-ends from the array aperture to transceivers and digital processors to realize ultra wideband communications with channel coding for spread spectrum communications. The course will cover: 1) theory and realization of ultra wideband conformal arrays with as much as 14:1 bandwidths, 2) theoretical bandwidth limits versus array thickness, 3) ultra wideband balanced feeds, 3) material and superstrates for optimal array design, 4) beam forming techniques at near grazing angles, 5) reconfiguration methods for bandwidth rejection and passband control, 6) low power and low cost digital beam formers via on-site coding, and 7) reduced hardware back-ends. This short course is based on the work of many Ph.D. students and collaborators at the Ohio State ElectroScience Lab. They include: Chi-Chih Chen, Kubilay Sertel, Elias Alwan, Waleed Khalil, Nima Ghalichechian, Brian Dupiaux, Abe Akhiyat, Justin Kasemodel, Ioannis Tzanidis, William Moulder, Jonathan Doane, Satheesh Bojja venkatakrishnan, Dimitris Papantonis and Markus Novak.

Prof. John L. Volakis / The Ohio State University, USA

John L. Volakis was born in Chios, Greece in 1956 and immigrated to the U.S.A. in 1973. He is the Chope Chair Professor at The Ohio State University, Electrical and Computer Engineering Dept. and also serves as the Director of the ElectroScience Laboratory. He was on the faculty of the University of Michigan-Ann Arbor from 1984 to 2003, serving as the Director of the Radiation Laboratory from 1998-2000. He is the author/co-author or 8 books, over 370 journal articles and 700 conference articles, with almost all of these in the IEEE APS venues. Over the years, he carried out research in antennas, wireless communications and propagation, radar scattering and diffraction, computational methods, electromagnetic compatibility and interference, design optimization, RF materials, multi-physics engineering, bioelectromagnetics, and medical sensing. Volakis has graduated/mentored nearly 80 doctoral students/post-docs with 27 of them receiving best paper awards at conferences. His service to Professional Societies include: 2004 President of the IEEE Antennas and Propagation Society, twice the general Chair of the IEEE Antennas and Propagation Symposium, Vice Chair of USNC/URSI Commission B, IEEE APS Distinguished Lecturer, IEEE APS Fellows Committee Chair, IEEE-wide Fellows committee member & Associate Editor of several journals. He is a Fellow of IEEE and ACES, and in 2004 he was listed by ISI among the top 250 most referenced authors. Among his awards are: The Unix of Michigan College of Engineering Research Excellence award (1993), Scott award from The Ohio State Univ. College of Engineering for Outstanding Academic Achievement (2011), IEEE Tai Teaching Excellence award (2011), the IEEE Henning Mentoring award (2013), the IEEE Antennas & Propagation Distinguished Achievement award (2014), and the Ohio State Univ. Distinguished Scholar Award (2016).
Multi-Probe Antenna Measurement Systems with Applications to Telecom, Space and Defense

This course is a fast pace introduction to modern applications of multi-probe near field antenna measurements. Following a brief introduction to general antenna measurements and near field measurements theory, the course will focus on the implementation of multi-probe system for different antenna measurements applications in areas such as telecom, space and defense. The course will emphasize the state of the art of two challenging scenarios for antenna measurement such as MIMO and Active Antenna Systems.

Course outline:
- Theory and application of far-field and near field antenna measurements
- Modulated scattering technique and implementation in multi probe systems
- Post-processing and link between measurements and numerical simulation
- Application in telecom and defense measurement scenarios
- Introduction to state-of-the art SISO and MIMO measurements

About the speaker

Mr. Lars J. Foged /Microwave Vision Group, Italy

Lars Jacob Foged was born in Viborg, Denmark in 1966. He received his B.Sc from Aarhus Teknikum, Denmark in 1988 and M.Sc. in Electrical Engineering from California Institute of Technology, USA in 1990.

He became a “graduate trainee” of the European Space Agency, ESTEC in the Netherlands and spent the following ten years designing antennas for high performance communication and navigation satellites. In 2001, he joined SATIMO and founded the branch office in Italy. Since then, he has held different technical leadership positions in SATIMO and later Microwave Vision Group. He is currently the scientific director of Microwave Vision Group and associate director of Microwave Vision Italy.

He was a member of the EURAAP delegate assembly from 2009 to 2012 and responsible for the working group on antenna measurements. He was Vice-Chair of the EuCap 2011 conference in Rome, Industrial Chair of EuCap 2012 and 2014 conference in Prague and Den Haag and Technical Program Chair of EuCap 2016 in Davos. Since 2006, he is a member of the board of the European School of Antennas (ESOA), and technical responsible and teacher in the biannual antenna measurement course.

He is a senior member of IEEE and fellow of AMTA. He is secretary of the IEEE antenna standards committee and near-field working group since 2004. He is contributing to the IEC 62209 standard(s) on human exposure to electromagnetic fields since 2010. In 2016 he was appointed chairman of the Industry Initiatives Committee (IIC), a standing committee of IEEE APS. Time permitting he is an occasional reviewer on the IEEE Antennas and Wireless Propagation Letters and IEEE Transactions on Antennas and Propagation.

He has authored and co-authored more than 200 journal and conference papers on antenna design and measurement topics, contributed to 3 books and standards, and holds 4 patents.
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Technical Seminar

Oct. 25 (Tue)
12:50-13:20  NSI-MI Technologies
"How to Specify and Understand Positioning Accuracy in Antenna Measurement Systems"
"Advanced Antenna and Wireless Design for IoT, 5G, and Automated Cruise using ANSYS HFSS and ANSYS Savant."
14:00-14:30  WIPL-D d.o.o.
"Antenna design using the CMA (Characteristic Mode Analysis) Solver"

Oct. 26 (Wed)
12:50-13:20  MICROWAVEVISION, VITEC GLOBAL ELECTRONICS
"MVG Antenna measurement solution"
13:25-13:55  MARUBUN / PCTEL
"Interference case study for LTE network--how can we hunt it-- ?"

Oct. 27 (Thu)
"RCS simulation of F35, Fighter Aircraft at 10 GHz using DDS, Domain Decomposition Solver"
"An Integrated Design Flow for Seamless Antenna design - From System Level Evaluation to Prototype"
14:00-14:30  Nippon Pillar Packing Co., Ltd.
"Introduction of Fluoro-Carbon Resin Substrate for mmW Application"

Rohde & Schwarz
"Fixture compensation and multiport network analyzer"
Altair
"Introduction of the Latest HyperWorks 14 FEKO"
## Technical Program

### October 25 (Tue)

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Details</th>
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<tr>
<td>09:30</td>
<td>Opening Ceremony</td>
<td>Chair: Nobuyoshi Kikuma (Nagoya Institute of Technology, Japan)</td>
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<tr>
<td>10:10</td>
<td>Plenary Talk</td>
<td>Co-Chairs: Jiro Hirokawa (Tokyo Institute of Technology, Japan)</td>
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<td>Keizo Cho (Chiba Institute of Technology, Japan)</td>
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<tr>
<td>1A1:</td>
<td>Metamaterial-Inspired Antennas I</td>
<td>14:00 - 15:40 (Room A)</td>
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<tr>
<td>1:</td>
<td>Millimeter Wave Communications for 5G</td>
<td>Wei Hong, Southeast University, China</td>
</tr>
<tr>
<td>3:</td>
<td>5G Trial in 2018 PyeongChang Winter Olympics - Technical challenges</td>
<td>Jongsik Lee, Korea Telecom, Korea</td>
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<tr>
<td>1A2:</td>
<td>Antennas for Mobile Communications I</td>
<td>14:00 - 15:40 (Room B)</td>
</tr>
<tr>
<td>1:</td>
<td>Conformal Integrated Multi-Layer Thin-Film Antenna by Novel LITA Technology for Smartwatch Wearable Device Applications</td>
<td>Wei-Yu Li (1), Fu-Ren Hsiao (2), Tune-Hune Kao (3), and Meng-Chi Huang (2), Industrial Technology Research Institute (ITRI), Taiwan, Advanced-Connectex INC. (ACON), Taiwan</td>
</tr>
<tr>
<td>2:</td>
<td>Compact Multi-Layer Handset Phone 13.56 MHz NFC Antenna Design by Novel Laser-Induced Thin-Film Antenna (LITA) Technologies</td>
<td>Wei-Yu Li (1), Fu-Ren Hsiao (2), Tsung-Lin Li (2), and Meng-Chi Huang (2), Industrial Technology Research Institute (ITRI), Taiwan, Advanced-Connectex INC. (ACON), Taiwan</td>
</tr>
<tr>
<td>3:</td>
<td>A Slot Antenna with Multiple Steps for Mobile Phone Applications</td>
<td>Wei-Hua Zong (1), Xiao-Mei Yang (1), Shan-Dong Li (2), Xi-Tao Guo (3), and Shao Jun Zhang (2), Qingdao University, China, Goertek Inc, China, Beijing Hexiehangdian Information and Technology Co., Ltd, China, Shandong Aerospace Electronics and Technology Institute, China</td>
</tr>
<tr>
<td>4:</td>
<td></td>
<td>15:20 Break Time</td>
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<tr>
<td>1A3:</td>
<td>Metamaterial-Inspired Antennas II</td>
<td>16:00 - 17:40 (Room A)</td>
</tr>
<tr>
<td>1:</td>
<td>Design of a Printed, Metamaterial-Based Beamformer</td>
<td>Brian B. Tierney and Anthony Grbic, University of Michigan, United States</td>
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<tr>
<td>2:</td>
<td>Surface Wave Manipulation based on Transformation Optics: from Design to Manufacturing</td>
<td>Luigi La Spada and Yang Hao, Queen Mary University of London, United Kingdom</td>
</tr>
<tr>
<td>3:</td>
<td>Efficient, Electrically Small Metamaterial-Inspired Antennas with High Directivity</td>
<td>Ming-Chun Tang (1), Richard W. Ziolkowski (2), Chongqing University, China, University of Arizona, United States, University of Technology Sydney, Australia</td>
</tr>
<tr>
<td>4:</td>
<td>Enhancement of Bandwidth for Low-Profile Omnidirectional Zeroth-Order Resonant Antennas</td>
<td>Tetsuya Ueda (1), Kohei Enomoto (2), Masakazu Ikeda (1), Yuji Sugimoto (1), Hiroaki Kuraoka (2), and Shiro Koido (3), NIPPO SOKEN, INC., Japan, Kyoto Institute of Technology, Japan, DENSO CORPORATION, Japan</td>
</tr>
<tr>
<td>5:</td>
<td>Composite Right/Left-Handed Coplanar Strip Leaky Wave Antenna for MIMO Applications</td>
<td>Takuya Seki (1), Ichiro Oshima (2), Naobumi Michishita (3), Keizo Cho (1), Denki Kogyo Co., Ltd., Japan, National Defense Academy, Japan, Chiba Institute of Technology, Japan</td>
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</tbody>
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**Note:** The above table is a summary of a technical program focusing on various aspects of antennas and electromagnetic technology. Each session includes details on the topic, the presenters, and the institutions associated with the presentations. The table is structured to highlight the diversity of topics ranging from millimeter wave communications, 5G technology, wireless transmission for Ultra-high-definition television, and advanced antenna designs for 5G and mobile communications. The sessions are categorized under 1A, 1B, 2, 3, 4, and 5, with specific times and locations indicated for each talk.
Technical Program

October 25 (Tue)

1B4: Antennas for Mobile Communications II 16:00 - 17:40 (Room B)
Co-Chairs: Ala Sharaiha (University of Rennes 1, France)
Amane Miura (NICT, Japan)

1: 16:00 A Compact EBG Structure using Interdigital Capacitor Resonator Technique for LTE Antenna
*Piyaporn Krachodnoke(1), Pongsathorn Chomtong(2) and Prayoot Akkaraekthalin(1),
(1)Suranaree University of Technology, Thailand, (2)King Mongkut's University of Technology North Bangkok, Thailand

2: 16:20 A Compact D-CRLH Metamaterial Antenna for WLAN and WiMAX Multiband
*Hieu Ngoc Quang and Hiroshi Shirai, Chu University, Japan

3: 16:40 TX-RX Isolation Method based on Polarization Diversity, Spatial Diversity and TX Beamforming
*Ehsan Foroozanfar, Elisabeth De Carvalho and Gert Frælund Pedersen, Aalborg University, Denmark

4: 17:00 An Open Terminated Folded Inverted-L Antenna with Slits
*Keisuke Noguchi, Akhiro Tanaka, Shigeru Makino, Tetsuo Hirota and Kenji Itoh, Kanazawa Institute of Technology, Japan

17:20 Break Time

1C3: Antenna Technologies in Wireless Power Transfer 14:00 - 15:40 (Room C)
Co-Chairs: Seungyoung Ahn (Korea Advanced Institute of Science and Technology, Korea)
Hiroshi Hirayama (Nagoya Institute of Technology, Japan)

1: 14:00 85 kHz Band 44 kW Wireless Power Transfer System for Rapid Contactless Charging of Electric Bus
*Tetsu Shijo, Kenichiro Ogawa, Fumi Moritsuka, Masatoshi Suzuki, Hiroaki Ishihara, Yasuhiro Kanekiyo, Koji Ogura, Masaki Ishida, Shuichi Obayashi, Shuhei Shimmyo, Koji Maki, Fumiki Takeuchi and Nobumitsu Tada, Toshiba Corporation, Japan

2: 14:20 Evaluation of Electromagnetic Field Radiation from Wireless Power Transfer Electric Vehicle
*Kibeon Kim(1), Jonghoon Kim(1), Hongkyun Kim(1), Jangyong Ahn(1), Hyun Ho Park(1) and Seungyoung Ahn(1), (1)Korea Advanced Institute of Science and Technology, Korea, (2)The University of Suwon, Korea

3: 14:40 Design Procedure for Wireless Power Transfer to Integrated Circuit
*Dukju Ahn(1) and In Kui Cho(2), (1)Incheon National University, Korea, (2)Electronics and Telecommunications Research Institute, Korea

4: 15:00 A Compact Shorted Patch Rectenna Design with Harmonic Rejection Properties
*Jui-Hung Chou(*) and Ling Tien(*), (1)National Chung-Shan Institute of Science and Technology, Taiwan, (2)National Taipei University of Technology, Taiwan

5: 15:20 A Broadband Rectenna For Harvesting Low-Power RF Energy
Heng Ye, and *Qing-Xin Chu, South China University of Technology, China
## Technical Program

### 1D4: Propagation Models for International Regulations by ITU-R and Related Topics II

**Co-Chairs:** Naoki Kita (NTT, Japan), Hajime Suzuki (CSIRO, Australia)

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
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</table>
| 16:00 | Arrival Angular Characteristics at Low Base Station facing the Street in Micro Cell for Mobile Communications  
       | Hideki Omote and Masayuki Miyashita, Softbank Corp., Japan               |
| 16:20 | Estimating Tropospheric Ducting Effects from Received Signal Quality of Digital TV Services  
       | Hajime Suzuki(1), Jinghui Wu(1) and Roger Bunch(1), (2)CSIRO, Australia, (2)Free TV Australia, Australia |
| 16:40 | Radio Link Clear-air Fading Prediction from Surface Weather Station Data  
       | Stephen J. Salamon, Hedley J. Hansen and Derek Abbott, University of Adelaide, Australia |
| 17:00 | Long-term Rain Attenuation Statistics and Variations in Ku Band Satellite Communications  
       | Hideki Miura and Yasuyuki Maekawa, Osaka Electro-Communication University, Japan |
| 17:20 | Effects of Rain Area Motions on Site Diversity Techniques in Ku Band Satellite Signal Attenuation  
       | Yasuyuki Maekawa, Naoki Kubota and Yoshiaki Shibagaki, Osaka Electro-Communication University, Japan |

### 1E3: Multi-Frequency Antennas

**Co-Chairs:** Mayumi Matsunaga (Ehime University, Japan), Haim Matzner (Holon Institute of Engineering, Israel)

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
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</table>
| 14:00 | Low-profile Cavity-backed Archimedean Spiral Antenna with a Stop Band  
       | Hisamatsu Nakano, Rintaro Kato and Junji Yamauchi, Hosei University, Japan          |
| 14:20 | Side Lobe Suppression by Various Conical Wall Edge of Multiband Spiral Antenna  
       | Kyeong-Sik Min, Korea Maritime and Ocean University, Korea                          |
| 14:40 | A Strip-helical DipoleAntenna with Wide Bandwidth and High Gain  
       | Kihui Tang and Jilun Zhang, Shenzhen University, China                              |
| 15:00 | Miniaturization of Logarithmic Spiral Antenna using Fibonacci Sequence and Koch Fractals  
       | Chetna Sharma and Dinesh Kumar V, PDPM Indian Institute of Information Technology Design and Manufacturing, India |
| 15:20 | Low Profile Dual-Polarized Wideband Antenna  
       | Abdul Sattar Kaddour(1), Serge Bories(1), Anthony Bellion(2) and Christophe Delaveaud(1), (2)University Grenoble-Alpes, France, (2)CNES, France |

### 1E4: 3D-Printed Lens and Antennas

**Co-Chairs:** Hao Xin (University of Arizona, United States), Qiang Chen (Tohoku University, Japan)

<table>
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<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
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</table>
| 16:00 | 3D-Printed Fresnel Zone Plate Lens  
       | Shiyu Zhang, Will Whittow and Yiannis Vardaxoglou, Loughborough University, United Kingdom |
| 16:20 | 3D-Printed Graded Index Lens for RF Applications  
       | Shiyu Zhang(1), Yiannis Vardaxoglou(1), Will Whittow(1) and Raj Mittra(2),  
       | Loughborough University, United Kingdom, (2)University of Central Florida, United States & KAU, Saudi Arabia |
| 16:40 | 3D Printed Reflectarray Antenna at 60 GHz  
       | Bao-Jie Chen(1), Huan Yi(2), Kung Bo Ng(2), Shi-Wei Qu(2) and Chi Hou Chan(1),  
       | City University of Hong Kong, China, (2)University of Electronic Science and Technology of China, China |
| 17:00 | A 3D Printed Near-Isotropic Antenna for Wireless Sensor Networks  
       | Muhammad Fahad Farooqui and Atif Shamim, King Abdullah University of Science and Technology (KAUST), Saudi Arabia |

### 1F3: Reconfigurable and Tunable Antennas I

**Co-Chairs:** Kin-Lu Wong (National Sun Yat-sen University, Taiwan), Yuichi Kimura (Saitama University, Japan)

<table>
<thead>
<tr>
<th>Time</th>
<th>Title</th>
<th>Authors</th>
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</table>
| 14:00 | Polarization Reconfigurable Frequency-scanning Antenna Based on Half Mode Substrate Integrated Waveguide  
       | Aixin Chen and Jiaheng Wang, Beihang University, China                  |
| 14:20 | Polarization Reconfigurable Omnidirectional Antennas  
       | HongLin Li and Yi Fan, South China University of Technology, China     |
| 14:40 | Switched-Beam Antenna for Small Cell Application  
       | Chia-Lun Tang and Chun-Hua Chen, Auden Techno Corp., Taiwan             |
| 15:00 | Pattern Reconfigurable Slot Antenna Array  
       | Alexis Martin, Vincent Le Neillon and Mohammed Himdi, Universite de Rennes 1, France |
| 15:20 | Frequency Reconfigurable Antenna for Wireless Applications  
       | Rajya Lakshmi Valluri and Devi Perla, ANITS, India                     |
### Technical Program

#### October 25 (Tue)

**1F4: Reconfigurable and Tunable Antennas II**
16:00 - 17:40 (Room F)

Co-Chairs: Qiaowei Yuan (National Institute of Technology, Sendai College, Japan) Mohamed Himdi (Université de Rennes, France)

<table>
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<tr>
<th>Time</th>
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<tbody>
<tr>
<td>1:00</td>
<td>Graphene Metamaterials Array Based Reconfigurable Antenna</td>
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<tr>
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<td><em>Xianjun Huang</em>(1,2), Abdullah Alburkhan*(1), Ting Leng*(1), Zhirun Hu*(2), Jijun Huang*(3),</td>
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<td></td>
<td>Yujian Qin*(2) and Peiguo Liu*(3), (1)University of Manchester, United Kingdom, (2)National</td>
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<td></td>
<td>University of Defense Technology, China</td>
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<tr>
<td>2:00</td>
<td>A Reconfigurable Multiband CPW-Fed Antenna Based on a Quad-Mode Slot-Line Resonator</td>
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<td><em>Biao Peng</em>(1,2), Shufang Li*(1), Ardavan Rahimian*(2), Qianyun Zhang*(2), Li Deng*(2),</td>
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<td></td>
<td>Qingsheng Zeng*(3) and Yue Gao*(3), (1)Beijing University of Posts and Telecommunications,</td>
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<td></td>
<td>China, (2)Queen Mary University of London, United Kingdom, (3)University of Ottawa, Canada</td>
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<tr>
<td>3:00</td>
<td>Measurement of 15 GHz Beam Adjustable Microstrip Antenna Arrays with a Variable Short Stub and</td>
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<td>with a Varactor Diode</td>
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<td><em>Shunsuke Kamimura</em>(1), Sakuyoshi Saito*(1), Yuichi Kimura*(1), Riichiro Nagareda*(2) and</td>
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<td>Masayuki Nakano*(3), (1,Saitama University, Japan, (2)KDDI Corp, Japan, (3)KDDI R&amp;D Laboratories,</td>
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<tr>
<td></td>
<td>Japan</td>
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<tr>
<td>4:00</td>
<td>Influence of the Mesh Dimensions on Optically Transparent and Active Antennas at Microwaves</td>
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<td><em>Alexis Martin, Xavier Castel, Mohammed Himdi and Olivier Lafond, Université de Rennes 1, France</em></td>
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<tr>
<td>5:00</td>
<td>A Hybrid Antenna with Solid and Liquid Materials</td>
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<td></td>
<td>Chenglong Lin*(1), Gaosheng Li*(2), Peiguo Liu*(2), Yujian Qin*(1) and Yi Huang*(2), (1)</td>
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<td></td>
<td>National University of Defense Technology, China, (2)University of Liverpool, United Kingdom</td>
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#### October 26 (Wed)

**2A1: EurAAP Session: Recent Advances in European Antennas and Propagation Research I**
9:00 - 10:40 (Room A)

Co-Chairs: Juan R. Mosig (Ecole polytechnique federale de Lausanne EPFL, Switzerland)
Lars J. Foged (Microwave Vision Group, Italy)

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<th>Time</th>
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<tbody>
<tr>
<td>1:00</td>
<td>Invited: Design and Characterization of Cost-Effective Planar Antennas with Steerable Beams:</td>
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<tr>
<td></td>
<td>Gap Waveguides, SMT and Random LOS</td>
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<td></td>
<td><em>Jian Yang and Andres Alayon Glazunov, Chalmers University of Technology, Sweden</em></td>
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<tr>
<td>2:00</td>
<td>Multiple Beam Antenna based on a Parallel Plate Waveguide</td>
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<td>Continuous Delay Lens Beamformer</td>
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<td><em>Hervé Legay</em>(1), Ségolène Tubau*(1), Etienne Girard*(1), Jean-Philippe Fraysse*(1),</td>
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<td>Renaud Chiniard*(1), Cheikh Diallo*(2), Ronan Sauleau*(1), Mauro Ettorre*(2) and Nelson Fonseca</td>
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<td></td>
<td>*(3)*Thales Alenia Space, France, (1)University of Rennes 1, France, (2)Moltek Consultants Ltd</td>
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<tr>
<td></td>
<td>for the European Space Agency, The Netherlands</td>
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<tr>
<td>3:00</td>
<td>Dual-Band Terahertz Reflectarray Integrated on a Silicon Substrate</td>
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<td><em>Hamed Hasani</em>(1,2), Santiago Capdevila*(1)<em>, Michele Tamagnone</em>(1), Clara Moldovan*(1),</td>
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<td>Wolfgang A. Vitale*(1), Adrian M. Ionescu*(2), Custódio Peixeiro*(2), Anja Skrivervik*(2)</td>
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<td></td>
<td>and Juan R. Mosig*(1)*, EPFL, Switzerland, (2)University of Lisbon, Portugal</td>
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<tr>
<td>4:00</td>
<td>A Phased Array Antenna with Horn Elements for 300 GHz Communications</td>
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<td><em>Sebastian Rey</em>(1), Thomas Merkle*(2), Axel Tessmann*(2) and Thomas Kürner*(1),</td>
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<td></td>
<td>(1)Technische Universität Braunschweig, Germany, (2)Fraunhofer Institut für Angewandte</td>
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<td>Festkörperphysik IAF, Germany</td>
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**2A2: EurAAP Session: Recent Advances in European Antennas and Propagation Research II**
11:00 - 12:40 (Room A)

Co-Chairs: Jian Yang (Chalmes University of Technology, Sweden)
Jiro Hirokawa (Tokyo Institute of Technology, Japan)

<table>
<thead>
<tr>
<th>Time</th>
<th>Presentation</th>
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<tbody>
<tr>
<td>1:00</td>
<td>Recent and Future Research Trends in Planar Multi-beam Antennas in the Millimeter Wave Range</td>
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<tr>
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<td>at IETR-France</td>
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<td><em>Karim Tekkou</em>(1,2), <em>Mauro Ettorre</em>(1), Francesco Foglia Manzillo*(1), Thomas Potelon*(1),</td>
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<td>Maciej Smierzchalski*(1), Darwin Blanco*(1), Laurent Le Coq*(1) and Ronan Sauleau*(1), (1)</td>
</tr>
<tr>
<td></td>
<td>Université de Rennes 1, France, (2)Tokyo Institute of Technology, Japan</td>
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<tr>
<td>2:00</td>
<td>Detection and Suppression of Scattered Fields from Coplanar Micro-Probe and Positioner in</td>
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<td>Millimeter Wave On-Chip Antenna Measurements</td>
</tr>
<tr>
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<td><em>Lars J. Foged</em>, Lucia Scialacqua*(1), Per O. Iversen*(2) and E. Szpindor*(2), (1)Microwave</td>
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<td>Vision Italy, Italy, (2)ORBIT/FR, Inc.,United States</td>
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<tr>
<td>3:00</td>
<td>Ka Band Active Array Antenna for Mobile Satellite Communications</td>
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<tr>
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<td>*Manuel Sierra Castañer, Jose Manuel Fernández González, Manuel Sierra Pérez, Adrián Tamayo</td>
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<td>Dominguez and Alfonso Muriel Barrado, Universidad Politecnica de Madrid, Spain</td>
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<tr>
<td>4:00</td>
<td>Progress in Body-Worn Antennas for On-Body Propagation</td>
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<td></td>
<td>*Kaj B. Jakobsen, Technical University of Denmark, Denmark</td>
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<tr>
<td>5:00</td>
<td>Antenna Current Optimization and Optimal Design</td>
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<td>*Mats Gustafsson, Lund University, Sweden</td>
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</tbody>
</table>
October 26 (Wed)

2A3: Meteorological Sensing  16:00 - 17:40 (Room A)
Co-Chairs: Nobuyoshi Kikuma (Nagoya Institute of Technology, Japan)
Satoshi Fujii (University of the Ryukyus, Japan)

1:  16:00 Invited: Water Vapor Estimation using the Propagation Delay of Digital Terrestrial Broadcasting Waves
*Seiji Kawamura, Hiroki Ohta, Hiroshi Hanado, Masayuki Yamamoto, Nobuyasu Shiga, Kouta Kido, Satoshi Yasuda, Tadahiro Goto, Ryuichi Ichikawa and Jun Amagai, National Institute of Information and Communications Technology, Japan

2:  16:40 Analysis of Directional Dependence of Site Diversity Gain using Rain Radar Data
*Yushi Inose and Hajime Fukuchi, Tokyo Metropolitan University, Japan

3:  17:00 Observational Study on Precipitation Patterns in the Fukui Plain using Weather Radar and Wind Profiler Radars
*Tomoyuki Nakajo(1), Masayuki Yamamoto(2) and Hiroyuki Hashiguchi(3), (1)Fukui University of Technology, Japan, (2)NICT, Japan, (3)Kyoto University, Japan

4:  17:20 Convective Rain Study with Radiometer, Radar and Electric Field Observations at a Tropical Location
*Animesh Maity, Soumyajyoti Jana and Rohit Chakraborty, University of Calcutta, India

2B1: MIMO Antennas and Decoupling Technologies  9:00 - 10:40 (Room B)
Co-Chairs: Wen-Shan Chen (Southern Taiwan University of Technology, Taiwan)
Shigeki Takeda (Ibaraki University, Japan)

1:  09:00 MIMO Dongle Antennas for LTE700 Applications
*Wen-Shan Chen, Ching-Yu Huang, Hung-Jui Hsu and Tzu-Chi Lu, Southern Taiwan University of Science and Technology, Taiwan

2:  09:20 A Simple Wave-Traps MIMO Antenna Design for WLAN Application
*Wen-Hsiu Hsu(1), Shan-Cheng Pan(3) and Chia-Lun Tang(2), (1,2)Shu-Te University, Taiwan, (3)Auden Techno Corp, Taiwan

3:  09:40 Field Test Results and Analysis of A Semi-Automatic Effective Diversity Gain Measurement System for MIMO and Diversity Antennas
*Wen-Jiao Liao, Chia-Hong Chuang and Bang-Yun Dai, National Taiwan University of Science and Technology, Taiwan

4:  10:00 Broadband Characteristic of Dual-Band Decoupling for Closely Spaced Antennas
*Kelta Kuriyama(1), Hiroshi Sato(2) and Masaharu Takahashi(1), (1)Chiba University, Japan, (2)Panasonic Corporation, Japan

5:  10:20 Experimental Evaluation of Inter-Array Decoupling Technique Suitable for MIMO Full-Duplex System
*Masakuni Tsunekawa(1), Naoki Honma(1), Kazuya Takahashi(1), Kentaro Murata(2) and Kentaro Nishimori(3), (1)Iwate University, Japan, (2)National Defense Academy, Japan, (3)Niigata University, Japan

2B2: Advanced Base Station Antennas  11:00 - 12:40 (Room B)
Co-Chairs: Masayuki Nakano (KDDI R&D Labs., Japan)
Ichiro Oshima(Denki Kogyo Co., Ltd., Japan)

1:  11:00 9-GHz-Band Active Antenna System for Cellular Base Stations
*Keisuke Sato, Yukitaka Takahashi and Ichiro Oshima, Denkikogyo Co., Ltd., Japan

2:  11:20 Antenna Radiation Pattern Arrangement with Pipe-Formed Frequency Selective Surface
*Toyohisa Takano(1), Suguru Yamagishi(3), Masayuki Nakano(2) and Ho Yu Lin(2), (1)SUMITOMIC ELECTRIC INDUSTRIES, LTD., Japan, (2,KDDI R&D Laboratories Inc., Japan

3:  11:40 Dual Polarized Antenna Using a Part of Spherical Reflector with a Rim
*Yasuko Kimura(1), Yoshiho Ebine(3) and Yoshihiro Ishikawa(1), (1,3)NTT DOCOMO, INC., Japan, (2)NICT, Japan, (3)ZNAZ Co., Ltd., Japan

4:  12:00 Gain Enhancement of Slot Array for Base Station Using Cavity of Curved-Woodpile Metamaterial
*Rangsan Wongsan(1) and Paowphatra Kamphikul(2), (1,Suranaree University of Technology, Thailand, (2)Chiang Mai University, Thailand

5:  12:20 Broadband Multiband Phased Array Antennas for Cellular Communications
Ray Butler, Igor Timofeev and Martin Zimmerman, Commscore, United States

2B3: Electromagnetic Wave Theory I  16:00 - 17:40 (Room B)
Co-Chairs: Ryoichi Sato (Niigata University, Japan)
Yoshio Inasawa (Mitsubishi Electric Corporation, Japan)

1:  16:00 Accurate Analysis of Electromagnetic Shielding Problems using MoM SIE Method
*Branko Lj. Mrdakovic(1) and *Branko M. Kolundzija(2), (1,2)WPL-D d.o.o, Serbia, (1,2)University of Belgrade, Serbia

2:  16:20 SPACA-MLFACA Algorithm for Fast Solution of Electromagnetic Scattering Problems
*Xinlei Chen(1,2), Chao Fei(1), Yang Zhang(1), Zhuo Li(1,2) and Changqing Gu(1), (1,2)Nanjing University of Aeronautics and Astronautics, China, (2)Southeast University, China

3:  16:40 Performance Evaluation of RCS Near-Field-to-Far-Field Transformation Technique for Aircrafts
*Yasuhiro Nishikawa, Yoshiho Inasawa, Tai Tanaka and Hiroaki Miyashita, Mitsubishi Electric Corporation, Japan

4:  17:00 Simulation Accuracy of Normal-Mode Helical Antenna Used in Human Body
*Nguyen Thanh Tuan(1), Yoshihide Yamada(1), Dang Tien Dung(2), Nguyen Quoc Dinh(3) and Naobumi Michishita(3), (1,2)Universiti Teknologi Malaysia, Malaysia, (3)Le Quy Don Technical University, Vietnam, (2)National Defense Academy, Japan

5:  17:20 Accuracy Enhanced Beamorming Method Based on Envelope Surface Extraction for Non-contact UWB Breast Cancer Radar
Fuki Endo and *Shouhei Kidera, The University of Electro-Communications, Japan
Technical Program

October 26 (Wed)

2C1: Frequency Selective Surfaces 9:00 - 10:40 (Room C)

Co-Chairs: Toshikazu Hori (University of Fukui, Japan)
Qun Wu (Harbin Institute of Technology, China)

1: 9:00  Spatial Filter with Multilayered FSS for Wideband Orthogonal Polarization Conversion
Shiro Handa, Toshikazu Hori and Mitsuo Fujimoto, University of Fukui, Japan

2: 9:20  Experimental Investigation of 2-bit Active Frequency Selective Surface
Chenchen Yang, Yi Wang, Huangyan Li and Qunsheng Cao, Nanjing University of Aeronautics and Astronautics, China

3: 9:40  Metamaterial Absorber using Complementary Circular Sector Resonator
Nguyen Toan Trung and Sungjoon Lim, Chung-Ang University, Korea

4: 10:00  3D-Printed Frequency Selective Surfaces for Microwave Absorbers
Rainer Kronberger and Patrick Soboll, TH Koeln University of Technology, Germany

5: 10:20  Design of Metamaterial Lens for Antenna Array
Guohong Du, Junqing Lan and Haoran Sun, Chengdu University of Information Technology, China

2C2: Metasurface Technologies I 11:00 - 12:40 (Room C)

Co-Chairs: Young Joong Yoon (Yonsei University, Korea)
Yang Hao (Queen Mary University of London, United Kingdom)

1: 11:00  Quasi-Isotropic Chiral Particles Composed of Twisted Thin-Wire Staples
Masamitsu Asai(i), Hideaki Wakabayashi(2) and Jiro Yamakita(2), Kindai University, Japan,
Okayama Prefectural University, Japan

2: 11:20  Graphene Supercapacitor based Resistive Loops for Ultra Broadband Microwave Absorption
Jian Wang, Wei Bing Lu, Jin Zhang, Zhen Guo Liu, Hao Chen, Xiao Bing Li and Bao Hu Huang, Southeast University, China

3: 11:40  Investigation on Carpet Cloaking and Illusion Using Metasurface
Aritomo Wada, Yuki Fujimoto, Hiroyuki Deguchi and Mikio Tsuji, Doshisha University, Japan

4: 12:00  Planar Metasurface as Generator of Bessel Beam Carrying Orbital Angular Momentum
Yueyi Yuan(i), Junqian Niu(2), Xumin Ding(1), Kuang Zhang(1) and Qun Wu(i),
Harbin Institute of Technology, China, Beijing Institute of Electronic System Engineering, China

12:20  Break Time

October 26 (Wed)

2C3: Metasurface Technologies II 16:00 - 17:40 (Room C)

Co-Chairs: Kwok L. Chung (Qingdao University of Technology, China)
Takeshi Fukusako (Kumamoto University, Japan)

1: 16:00  Recent Research Progress in Microwave Metasurfaced Antenna
Kwok L. Chung(i), Yansheng Li(i), Hailiang Zhu(2) and Chunwei Zhang(i), Qingdao Technological University, China,
Northwestern Polytechnical University, China

2: 16:20  RCS Reduction Characteristics of Thin Wave Absorbers Composed of Flat and Curved Metasurfaces
Hiroshi Ishii(1), Tomohiro Masaki(1), Naobumi Michishita(2), Hisashi Morishita(1) and
Hideki Hada(2), National Defense Academy, Japan,
Fujitsu, Ltd., Japan

3: 16:40  Gain Characteristics Improvement of Broadband Circularly Polarized Patch Antenna Using Artificial Ground Structure
Kojuro Kai and Takeshi Fukusako, Kumamoto University, Japan

4: 17:00  A Novel Base Station Antenna Based on Rectangular Waveguide
Hailiang Zhu(i), Can Ding(i), Gao Wei(i) and Yingjie Jay Guo(i), Northwestern Polytechnical University, China,
University of Technology Sydney, Australia

5: 17:20  Broadband Circularly Polarized Reflectarray Antenna Using Metasurface Polarizer
Koichi Furuya and Takeshi Fukusako, Kumamoto University, Japan

2D1: Indoor Propagation 9:00 - 10:40 (Room D)

Co-Chairs: Tetsuro Imai (NTT Docomo, Japan)
Hideki Omote (Softbank Corporation, Japan)

1: 9:00  Performance Evaluation of Propagation Control Devices for Active Propagation Control
Ryo Araki, Kenichiro Kamohara, Hisato Iwai and Hideichi Sasaoka, Doshisha University, Japan

2: 9:20  Radio Propagation Loss Study by Hybrid Simulation for Smart Meter Communication in Apartment Building
Nodoka Nakagaki(i), Yasushi Yamao(i), Reina Nagayama(2) and Takuya Kawata(2),
The University of Electro-Communications, Japan,
Tokyo Gas Co., Ltd., Japan

3: 9:40  LOS Probability Modeling for 5G Indoor Scenario
Jian Li, Huawei Technologies Co., LTD., China

4: 10:00  Empirical Model Indoor Corridor Path Loss at 5 GHz
Chi-Hou Chio and Sio-Weng Ting, University of Macau, China

5: 10:20  Three-dimension Channel Spatial Characteristics Emulation Based on Genetic Algorithm in a MIMO OTA Setup
Muyuan Li, Weimin Wang, Yongle Wu, Yuanan Liu and Shulan Li, Beijing University of Posts and Telecommunications, China
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<td><em>Satoshi Nishida</em>, <em>Gilbert S. Ching</em>, <em>Yukiko Kishiki</em> and <em>Yuichiro Nakayama</em>, <em>Kyoan Electric Manufacturing Co., Ltd., Japan</em>, <em>Kozo Keikaku Engineering Inc.</em>, <em>Tokin-System Co., Ltd., Japan</em></td>
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<td><strong>3:</strong> 11:40 Study of the Millimeter-wave Propagation Characteristics in the Railway Environment</td>
<td><em>Kazuki Nakamura</em>, <em>Daisuke Yamaguchi</em>, <em>Nagateru Iwasawa</em> and <em>Kunihiro Kawasaki</em>, <em>Railway Technical Research Institute, Japan</em></td>
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<td><strong>4:</strong> 12:00 Effect of Building on VHF Propagation above Airport Surface</td>
<td><em>Atsushi Kozaka</em>, <em>Susumu Saito</em>, <em>Takayuki Yoshihara</em> and <em>Shinji Saitoh</em>, <em>Electronic Navigation Research Institute, Japan</em></td>
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<td><strong>5:</strong> 12:20 The Effect of Human Body Blockage to Path Loss Characteristics in Crowded Areas</td>
<td><em>Mitsuki Nakamura</em>, <em>Motoharu Sasaki</em>, <em>Minoru Inomata</em> and <em>Takeshi Onizawa</em>, <em>NTT Corporation, Japan</em></td>
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<td><strong>2:</strong> 16:20 Evaluation of the Human Detection System using UHF Band TV Waves for the Car Security</td>
<td><em>Keiichi Shin</em>, <em>Kohei Yabata</em>, <em>Koki Momota</em> and <em>Masahiro Nishi</em>, <em>Horoshima City University, Japan</em></td>
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<td><strong>3:</strong> 16:40 Field Evaluation on High or Low Mobile Terminal Velocity Decision Algorithm Using Doppler Spread Detection</td>
<td><em>Sourab Mati</em>, <em>Manabu Mikami</em> and <em>Kenji Hoshino</em>, <em>Softbank Corp., Japan</em></td>
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<td><strong>4:</strong> 17:00 Isolation Characteristics of Full-Duplex Visible Light Communication with Image Sensor</td>
<td><em>Tomoki Kondo</em>, <em>Ryotaro Kitao</em> and <em>Wataru Chujo</em>, <em>Meijo University, Japan</em></td>
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<td><strong>5:</strong> 17:20 Comparison of Slit Transmittances between Metal Plates at Terahertz Range and PEC Plate</td>
<td><em>Jong-Eon Park</em> and <em>Hosung Choo</em>, <em>Hongik University, Korea</em></td>
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**2E3: Antenna Measurements**

Co-Chairs: Katsugise Harima (NICT, Japan)
Rainer Kronberger (TH Koeln University of Technology, Germany)

1: 16:00 Microwave Field Measurement by using Semiconductor Scatterer with Optical Modulation
Takahiro Kurosawa, Akita Industrial Technology Center, Japan
2: 16:20 Simulation of Direct Measurement Method for Balanced and Unbalanced Mode of a Small Antenna
Takashi Yanagi, Toru Fukasawa and Hiroaki Miyashita, Mitsubishi Electric Corporation, Japan
3: 16:40 On an Expression of Antenna Factor for Transmitting Small Loop Antenna in Liquid
Nozomu Ishii(1,2), Lira Hamada(1), Chakarothai Jerdvisanop(1), Kanako Wake(1) and Soichi Watanabe(1)
National Institute of Information and Communications Technology, Japan, (2)Niigata University, Japan
4: 17:00 Simulation and Experimental Investigation of Jig Using Semi-Rigid Cable for S-Parameter Method
Ryuta Tozawa, Takayuki Sasamori, Teruo Tobana and Yoji Isota, Akita Prefectural University, Japan
5: 17:20 Influence of Jig Made of Microstrip Line for S-Parameter Method
Kazuma Endo, Takayuki Sasamori, Teruo Tobana and Yoji Isota, Akita Prefectural University, Japan

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**2F2: Reflectors and Feeds**

Co-Chairs: Erik Jorgensen (TICRA, Denmark)
Susu Nakazawa (NHK, Japan)

1: 11:00 Radiation Pattern Analysis for Reflector Antennas using the Near-Field Measurements of Primary Feed
Michio Takikawa, Yoshio Inasawa and Hiroaki Miyashita, Mitsubishi Electric Corporation, Japan
2: 11:20 Optimization of a Parabolic Reflector Antenna Parameters for Malaysia Beam Coverage
Nur Faqih Fauzi(1), Mohd Tarnizi Ali(1), Nurul Huda Abd. Rahman(1) and Yoshitide Yamada(2), (1)University Teknologi MARA, Malaysia, (2)Universiti Teknologi Malaysia, Malaysia
3: 11:40 A 3D-Printed Compact Dual-Circularly Polarized Corrugated Horn with Integrated Septum Polarizer
Tan-Huat Chio(1,2), Guan-Long Huang(1), Shi-Gang Zhou(1) and Wai-Yean Lim(2), (1)National University of Singapore, Singapore, (2)QVista Pte Ltd, Singapore
4: 12:00 Multistep Rectangular Horn Loading Grooves for Orthogonally Polarized Elliptical Beam
Naoki Kubo, Reiko Omi, Hiroyuki Deguchi and Mikio Tsuji, Doshisha University, Japan
12:20 Break Time

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**2F3: MIMO and Related Technologies**

Co-Chairs: Hiroyuki Tsuji (NICT, Japan)
Tomoki Murakami (NTT, Japan)

1: 16:00 Inter-symbol Interference Suppression Scheme Employing Periodic Signals in Network MIMO-OFDM Systems
Hirofumi Suganuma, Tomoki Maruko and Fumiaki Maehara, Waseda University, Japan
2: 16:20 Interference Detection Performance using Asynchronous MU-MIMO and Self-Interference Cancellation Technique
Kazuma Ando(1,2), Kentaro Nishimori(1), Takefumi Hiraguri(1) and Yoshihide Inoue(1,2)
National Institute of Information and Communications Technology, Japan
3: 16:40 Performance Evaluation of Wireless Communications using Orbital Angular Momentum Multiplexing
Doohwan Lee(1), Theerat Sakdejayont(2), Hirofumi Sasaki(1,2), Hiroyuki Fukumoto(1) and Tadao Nakagawa(1), (1)NTT Corporation, Japan, (2)The University of Tokyo, Japan
4: 17:00 Preamble Signal Shortening Employing Least Squares Search Methods in MIMO-OFDM Base Wireless LAN Systems
Joseph Muguro and Shuji Kubota, Shibaura Institute of Technology, Japan
5: 17:20 Measured Separation of Sectorized Reception for ITS V2V Relay-Assisted Communication in Urban Environment
Le Tien Trien and Yasushi Yamao, The University of Electro-Communications, Japan
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#### October 26 (Wed)

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Pre-Registration October 26 (Wed)

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46: Compact Planar Transmission-line Transition Direct-connecting from a Waveguide to Four Microstrip-lines
*Shigenori Kitanaka, Kunio Sakakibara and Nobuyoshi Kikuma, Nagoya Institute of Technology, Japan

47: Cross-Arranged Dielectric Resonator Antenna with Cross Slot Excitation
*Zhe Chen and Hang Wong, City University of Hong Kong, Hong Kong

48: A Compact Antipodal Vivaldi Antenna with Improved Radiation Performance
%Hao Li, Lijia Chen, Jinhui Qiu and Caitian Yang, Harbin Institute of Technology, China

49: Double-slot Antipodal Vivaldi Antenna for Improved Directivity and Radiation Patterns
*Youngmin So¹, Woojoong Kim¹, Jaesik Kim¹, Young Joong Yoon¹ and Jinsung Park², ¹Yonsei University, Korea, ²Agency for Defense Development, Korea

50: Dual Polarized Vivaldi Antenna for Digital Television Applications
Zengui Li, Xiaole Kang, Jianxun Su, Hui Zhang and Dazhi Piao, Communication University of China, China

51: Polarization Improvement through Sinuous Antenna Arm Modification
*Yunsu Kang and Kangwook Kim, Gwangju Institute of Science and Technology, Korea

52: High Gain Yagi-Uda Origami Antenna
*Syed Imran Hussain Shah and Sungjoon Lim, Chung-Ang University, Korea

53: A Study on Broadband Printed Bell-Shaped Monopole Antenna with Narrow Stub
*Nobuyasu Takemura, Takayoshi Moriyama, Joichiro Suzuki, Takuya Takeda and Takefumi Hiraguri, Nippon Institute of Technology, Japan

54: Wideband Printed Rectangular Monopole Antenna for Circularly Polarization
*Takaya Ishikubo and Takafumi Fujimoto, Nagasaki University, Japan

55: Broadband Circularly Polarized Bowtie Dipole Antenna
*Zhi-Ya Zhang, Guang Fu and Dan Wu, Xidian University, China

56: Broadband Circularly Polarized Patch Antenna for WLAN System Application
*Chunlan Lu¹, Changsong Wu¹, Juhong Shen², Yan Zhang¹ and Fangju Meng¹, ¹College of Communications Engineering, China, ²Troops of 63811 PLA, China

57: Stub-loaded Broadband Dual-Polarized Antenna for 2G/3G/LTE Base Stations
*Rui Wu and Qing-Xin Chu, South China University of Technology Guangzhou, China

POS1: Poster Session I
14:00 - 15:40 (Exhibition Hall)

58: A Compact Circular Polarization Active Phased Array Antenna with Low Axial Ratio
*Chao-ran Hu, Shu Lin, Ling Liu, Cai-tian Yang, Meng-chuan Wei and Xi-bin Cao, Harbin Institute of Technology, China

59: High FoM Liquid Crystal based Microstrip Phase Shifter for Phased Array Antennas
*Longzhu Cai, Huan Xu, Jinfeng Li and Daping Chu, University of Cambridge, United Kingdom

60: A Compact Multi-Beam Antenna Without Beam Forming Network
Dongfang Guan¹, ¹Can Ding² and Y. Jay Guo¹², ¹National University of Defence Technology, China, ²University of Technology Sydney (UTS), Australia

61: A Microstrip Antenna Array on a Narrow Wall of a Rectangular Waveguide for Linear Polarization Perpendicular to the Axis
*Shintaro Shimamori, Sakuyoshi Saito and Yuichi Kimura, Saitama University, Japan

62: Principle and Realization of an ESPAR Antenna Using L and C
*Dae-Geun Yang, Eun-Seok Kang, Kyung-Soo Kim, Che-Young Kim and Sung-Soo Hong, Kyungpook National University, Korea

63: Simple Design of Null-fill for Linear Array
*Masashi Yamamoto¹, Hiroyuki Arai¹, Yoshio Ebino² and Masahiko Nasuno², ¹Kochi National University, Japan, ²NAZCA LTD., Japan

64: Evaluation of Power Spectrum of 2-element Dipole Antenna with Periodically Variable Antenna Pattern
*Kosei Kawano¹, Yusuke Idoguchi¹² and Masato Saito¹², ¹University of the Ryukyus, JAPAN, ²IKEGAMI TSUSHINKI CO.,LTD.

65: Iterative FFT Algorithm for Thinning Planar Array
*Ying Suo, Shuangbin Yin and Wei Li, Harbin Institute of Technology, China

66: Optimization of Smooth Walled Horn Antenna using Multilevel Fast Multipole Method
*Kohei Tsukamoto and Hiroyuki Arai, Yokohama National University, Japan

67: Fused Deposition Modelling for Microwave Circuits & Antennas
Darren Cadman, Shiyu Zhang and Yiannis Vardaxoglou, Loughborough University, United Kingdom

68: Planar Circularly Polarized Circular Antenna with Clover Slot for RFID System
*Jui-Han Lu and Hai-Ming Chin, National Kaohsiung Marine University, Taiwan

69: The Radial Line Concentric Slot Array Antenna
*Tao Zhou, Yasuhito Tsuematsu and Naohisa Goto, Takushoku University, Japan

70: Design of Waveguide Shuttered Slot Arrays Formed on Copper-plated Dielectric Sticks in Millimeter-wave Band
*Yuta Miyachi, Kunio Sakakibara and Nobuyoshi Kikuma, Nagoya Institute of Technology, Japan
Technical Program

October 26 (Wed)

POS1: Poster Session I 14:00 - 15:40 (Exhibition Hall)

71: A Printed H-plane Horn Antenna with Loaded Dielectric-metal Composite Lens in Ka band
  Zong Hua, Chen Yue, Lin Shu, Liu Beijia, Li Hongmei and Wu Qun, Harbin Institute of Technology, China

72: BIC-Based Optimization of the Identification of Multipath Propagation Clusters in MIMO Wireless Systems
  Daniel Dominic N. Abinoja and Lawrence Y. Materum, De La Salle University, Philippines

73: An Autocorrelated Inverse Method for Nakagami-m Envelope Simulation
  Shi Lei(1), Li Qi(2) and Guo Zhen(1), Xidian University, China, Xi'an University of Finance and Economics, China

74: Miniaturization of RFID Reader Front-End Circuit Based on Low Temperature Co-fired Ceramic
  Hongmei Li, Yuyun Zhu, Ying Zhao and Lifei Bao, Harbin Institute of Technology, China

75: A Proposal to Improve Ray Launching Techniques
  Andres Navarro(1,2), Dinael Guevara(1,2) and Narcis Cardona(3), Universidad Icesi, Colombia, Universidad Francisco de Paula Santander, Colombia, Universitat Politècnica de València, Spain

  Wojciech Marynowski and Piotr Kowalczyk, Gdansk University of Technology, Poland

77: An RF Multiplier Integrated Planar Antenna for DOA Estimation
  Rimi Rashid, Daiki Hattori, Eisuke Nishiyama and Ichihiko Umehara, Saga University, Japan

78: Non-Contact Respiration Measurement Using Ultra-wideband Array Radar with Adaptive Beamforming Technique for Cancer Radiotherapy
  Masashi Muragaki(1), Shigeaki Okumura(2) and Toru Sato(1), Kyoto University, Japan, University of Hyogo, Japan

79: Extension of Two-Level Nested Array with Larger Aperture and More Degrees of Freedom
  Yusuke Iizuka and Koichi Ichige, Yokohama National University, Japan

80: Acceleration for Wind Velocity Vector Estimation by Neural Network for Single Doppler LIDAR
  Taro Matsuo(1), Guanghao Sun(1), Shouhei Kidena(1), Tetsuo Kirimoto(1), Hiroshi Sakamaki(2) and Teruyuki Harab(2), University of Electro-Communications, Japan, Mitsubishi Electric Corporation, Japan

81: Frame Rate Analysis of Video Synthetic Aperture Radar (ViSAR)
  He Yan, Xinhua Mao, Jindong Zhang and Daiyin Zhu, Nanjing University of Aeronautics and Astronautics, China

82: Multiple Target Tracking and Separation Technique Based on Texture Information in Range-Time Image using Ultra-Wideband Radar
  Takuro Sato(1), Yukaya Sakamoto(1,2), Shigeaki Okumura(1) and Toru Sato(1), Kyoto University, Japan, University of Hyogo, Japan

83: Oceanographic Observation in Hyuga-Nada by the High-Frequency Ocean Radar
  Hirotsuka Oshiro(1,2), Satoshi Fujii(1) and Tsutomu Tokeshi(2), University of the Ryukyus, Japan, Miyazaki Prefectural Government, Japan

84: Observation of The 2011 Tohoku Tsunami by Using HF Radar in Ise Bay
  Yu Toguchi(1), Satoshi Fujii(1) and Hirofumi Hinata(2), University of the Ryukyus, Japan, Ehime University, Japan

85: Ocean Wave Measurement using Synthetic Aperture Radar Cross-track Interferometry
  Akitsu Nagai, Toshihiko Umemura, Shoichiro Kojima and Jyunpei Uemoto, National Institute of Information and Communications Technology, Japan

86: Accuracy Analysis of Propagating-Path Identification Using FDTD Method and Compressive Sensing
  Tomohiro Komatsu, Naoki Honma and Yoshihata Tsunekawa, Iwate University, Japan

87: Optimum Directivity of Base Station Antenna in Street Microcell
  Tatsuka Matsuta, Toshikazu Hori and Mitsuo Fujimoto, University of Fukui, Japan

88: Novel Frequency Selective Surface with Quasi-Elliptic Response
  Wen Jiang, Shuxi Gong, Shuai Zhang and Tao Hong, Xidian University, China

89: Beam-Steering Multi-Layer Metasurface at 35GHz
  Jiран Qi, Shanshan Xiao, Zhiying Yin and Jinghui Qiu, Harbin Institute of Technology, China

90: The Ultra-Wideband RF MEMS Single-Pole-Four-Throw Switch
  Jin Lin, Nanjing Research Institute of Electronics Technology, China

91: Approximate Field Continuity Conditions for Thin Anisotropic Conductive Layer
  Adam Kusiek, Wojciech Marynowski and Jerzy Mazur, Gdansk University of Technology, Poland

92: Resonance Frequency Calculation of Microstrip Structure Located on Cylindrical Surface Using Hybrid Technique
  Adam Kusiek and Rafal Lech, Gdansk University of Technology, Poland

93: Large-Scale Electromagnetic Analysis of Realistic Human-Body Exposure Using GPU Supercomputer
  Jerdvisanop Chakarothai, Kanako Wake and Soichi Watanabe, National Institute of Information and Communications Technology, Japan

94: Breast Cancer Treatment by Combining Microwave Hyperthermia and Radiation Brachytherapy
  Gindriyda B Deb Nath(1), Kazuyuki Saito(2), Koichi Ito(3) and Mitsuru Uesaka(1), University of Tokyo, Japan, Chiba University, Japan
## Technical Program

### October 26 (Wed)

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<td>Precise Scattering Center Extraction for ISAR Image using the Shooting and Bouncing Ray</td>
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<td>Performance Comparison of Multi-Beam Massive MIMO by the Switch Configuration</td>
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<td><em>Kohei Kameyama</em>&lt;sup&gt;(1)&lt;/sup&gt;, <em>Kentarou Nishimori</em>&lt;sup&gt;(1)&lt;/sup&gt;, <em>Takefumi Hiraguri</em>&lt;sup&gt;(1)&lt;/sup&gt;, <em>Hiroyoshi Yamada</em>&lt;sup&gt;(1)&lt;/sup&gt; and <em>Hideo Makino</em>&lt;sup&gt;(1)&lt;/sup&gt;, <em>Niigata University, Japan,</em> and <em>Nippon Institute of Technology, Japan</em></td>
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<td>Kalman-based Moving Object Tracking Using Nonuniform Pulse Transmission Scheme</td>
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<td><em>Nobuya Arakawa</em>&lt;sup&gt;(1)&lt;/sup&gt;, <em>Keiichi Ichieg</em>&lt;sup&gt;(1)&lt;/sup&gt; and <em>Osamu Shibata</em>&lt;sup&gt;(2)&lt;/sup&gt;, <em>Yokohama National University, Japan,</em> and <em>Murata Manufacturing Co., Ltd., Japan</em></td>
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<td>Performance Evaluation for Multi-User Environment by NOMA and Beam-Forming with User Scheduling</td>
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## Technical Program

### 116: Experimental Investigation of Contact Currents in the Vicinity of a Wireless Power Transfer System in 100 kHz Band

- Kanako Wake<br> - Jerdvisanop Chakarothai<br> - Yuhei Aoki<br> - Toru Uno and Soichi Watanabe

**Institute:** National Institute of Information and Communications Technology, Japan, Tokyo University of Agriculture and Technology, Japan

### 117: High-Efficiency Wireless Power Transfer by Controlling Free Resonant Frequencies

- Dong-Wook Seo, Jae-Ho Lee and Mi-Ryong Park

**Institute:** Electronics and Telecommunications Research Institute (ETRI), Korea

### 118: Wireless Power Transfer System for External Memory Hard by using Small Magnetic Coils

- In-Kui Choi, Jeong-Min Kim, Jeong-Ik Moon, Jae-Hun Yoon and Hyung-Do Choi

**Institute:** ETRI, Korea

### 119: Effectiveness of Transmitting Cross Coil Stacked with Arrayed Coils in Wireless Power Transfer with Magnetically Coupled Resonance

- Kazunari Mase, Nobuyoshi Kikuma and Kunio Sakakibara

**Institute:** Nagoya Institute of Technology, Japan

### 120: Study on Rectenna Harmonics Reradiation for Microwave Power Transfer with a Harmonics-Based Retrodirective System

- Shogo Kawashima, Naoki Shinohara and Tomohiko Mitani

**Institute:** Kyoto University, Japan

### 121: A Multi-frequency WiPT System with a Stable Communication Carrier

- Shan Jiang, Chang Chen, Chi Zhang and Weidong Chen

**Institute:** Chinese Academy of Science, China

### 122: On a Transmission Efficiency of Tape-wound Spiral Antenna for Coupled Resonant Wireless Power Transfer

- Keigo Nakamura and Hiroshi Hiyarama

**Institute:** Nagoya Institute of Technology, Japan

### 123: A Novel Wireless Power Transmission System Using Microstrip Coil Structure with Ferrite and Dielectric Layers

- Fang-Hua Liu, Shi Pu, Wuhan University of Technology, China

### 124: An H-Plane Wide-Angle Rectenna Using an In-Phase/Anti-Phase Dual-Feed Antenna

- Hiroshi Satow, Yuki Tanaka, Eisuke Nishiyama and Ichihiko Toyoda

**Institute:** Saga University, Japan

### 125: Compact Mikaelian Lens Design Using Metasurface Structure

- Cheng Jie Syue, Malcolm Ng Mou Kehn and Oscar Quevedo-Teruel

**Institute:** National Chiao Tung University, Taiwan, Royal Institute of Technology, Sweden

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### 3A1: Recent Progress in Millimeter-Wave and THz Antenna Technologies I

**Co-Chairs:** Kyeong-Sik Min (Korea Maritime and Ocean University, Korea)<br> Kunio Sakakibara (Nagoya Institute of Technology, Japan)

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<td>9:00</td>
<td>1</td>
<td>Invited: 3D Printing Technology for RF and THz Antennas&lt;br&gt; Min Liang, Junqiang Wu, Xiaoju Yu and Hao Xin, University of Arizona, United States</td>
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<td>2</td>
<td>Plate-Laminated Corporate-SlotFed Slotted Waveguide Array Antenna at 350-GHz Band by Silicon Process&lt;br&gt; Karim Tekkouk, Jiro Hirokawa, Kazuki Oogimoto, Tadao Nagatsuma, Hiroiuky Seto, Yoshiyuki Inoue and Mikiko Saito&lt;br&gt; Tokyo Institute of Technology, Japan, Osaka University, Japan, Kyoto University, Japan, Waseda University, Japan</td>
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<td>10:00</td>
<td>3</td>
<td>Design and Fabrication of High-Gain 3-Dimensional Printed Reflectarray Antenna for W-Band Millimeter-Wave Radar Applications&lt;br&gt; Shunichi Futatsumori, Kazuyuki Morioka, Akiko Kohmura, Nobuhiro Sakamoto and Naruto Yonemoto&lt;br&gt; Electronic Navigation Research Institute, Japan</td>
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<td>10:20</td>
<td>4</td>
<td>Terahertz Dual Polarizations Offset Reflector Antenna Using Sic And CFRP Material&lt;br&gt; Wang Hongjian and Yi Min, National Space Science Center, China</td>
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### 3A2: Recent Progress in Millimeter-Wave and THz Antenna Technologies II

**Co-Chairs:** Manabu Yamamoto (Hokkaido University, Japan)<br> Zhang-Cheng Hao (Southeast University, China)

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<td>1</td>
<td>Development of MMW Waveguide Slot Arrays for Gigabit Wireless Access in 5G Cellular Network&lt;br&gt; Miao Zhang, Jiro Hirokawa and Makoto Ando&lt;br&gt; Xiamen University, China, Tokyo Institute of Technology, Japan</td>
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<td>11:20</td>
<td>2</td>
<td>A D-band High-Gain Antenna for Terahertz Applications&lt;br&gt; Zhang-Cheng Hao and Jia Wang&lt;br&gt; Southeast University, China</td>
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<td>11:40</td>
<td>3</td>
<td>Terahertz Reflectarray and Transmirtarray&lt;br&gt; Shi-Wei Qu, Peng-Yu Feng, Huan Yi, Baojie Chen, Kung Bo Ng, Chi Hou Chan and Geng-Bo Wu&lt;br&gt; University of Electronic Science and Technology of China (UESTC), City University of Hong Kong, China</td>
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<td>12:00</td>
<td>4</td>
<td>Through-Hole Less Microstrip Line to Waveguide Transition with Quarter-Wavelength Open Stubs&lt;br&gt; Hiromasa Nakajima, Akimichi Hirota, Naofumi Yoneda and Hiroaki Miyashita&lt;br&gt; Mitsubishi Electric Corporation, Japan</td>
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<td>12:20</td>
<td>5</td>
<td>PWW Bandpass Filter for 60 GHz Band Based on 2D MoM Design Optimization&lt;br&gt; Royosse Hosono, Yusuoke Uemichi, Osamu Nukaga, Xu Han and Ning Guan&lt;br&gt; Fujikura Ltd., Japan</td>
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### Technical Program

#### October 27 (Thu)

##### 3A3: Next 50 Years Antennas and Propagation Technologies in Japan

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<td>Antenna Systems for Next 50 Years</td>
<td>Kentaro Nishimori, Niigata University, Japan</td>
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<td>1:25</td>
<td>My Personal Expectations about Electromagnetics and Simulation Techniques for Next 50 Years</td>
<td>Takui Arima, Tokyo University of Agriculture and Technology, Japan</td>
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<td>1:50</td>
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<td>Expectation for Metamaterials for Antenna Applications</td>
<td>Naobumi Michishita, National Defense Academy, Japan</td>
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<td>2:15</td>
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<td>Future 50 Years of Mobile Radio Propagation Research</td>
<td>Koshiro Kitao, NTT DOCOMO, INC., Japan</td>
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**Co-Chairs:** Hiroki Shoki (Toshiba Corporation, Japan) Yoshihiko Konishi (Hiroshima Institute of Technology, Japan)

#### October 27 (Thu)

##### 3B2: Recent Advances in Computational Electromagnetics II

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<td>Scattering of Light by Periodic Array of Metal- Coated Nanocylinders on Dielectric Slab</td>
<td>Kiyotoshi Yasumoto(1), Vakhtang Jandieri(2), Peiwen Meng(2) and Yunfei Liu(3), (1)Nanjing Forestry University, China, (2)Free University of Tbilisi, Republic of Georgia, (3)Delft University of Technology, Netherlands</td>
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<td>3:25</td>
<td>3:25</td>
<td>Accelerating Nonlinear Inversion Algorithms on GPU platform for Electromagnetic Data</td>
<td>Maokun Li(1), Xue Yang Wang(1) and Aria Abubakar(2), (1)Tsinghua University, China, (2)Schlumberger, United States</td>
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<td>3:50</td>
<td>3:50</td>
<td>Basic Study of an InSb Grating Filter in the Terahertz Region</td>
<td>Jun Shibayama, &quot;Ryo Umezawa, Junji Yamauchi and Hisamatsu Nakano, Hosei University, Japan</td>
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<td>4:15</td>
<td>4:15</td>
<td>A Discontinuous Galerkin Augmented Electric Field Integral Equation for Low-Frequency Electromagnetic Scattering Analysis</td>
<td>Yibei Hou, Xueze Tian and &quot;Gaobiao Xiao, Shanghai Jiao Tong University, China</td>
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<td>4:40</td>
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<td>Propagation Characteristics for Dielectric Waveguide Composed of Dielectric Circular Cylinder with Air-hole Cylinder Array</td>
<td>Tsuneki Ozaki and &quot;Tsuneki Yamasaki, Nihon University, Japan</td>
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<td>5:15</td>
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<td>Study of Optical Coupling at Junction of Plasmonic Waveguides</td>
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**Co-Chairs:** Shinichiro Ohnuki (Nihon University, Japan) Maokun Li (Tsinghua University, China)

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<td>Hiroshi Shirai (Chuo University, Japan)</td>
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**Co-Chairs:** Hiroshi Shirai (Chuo University, Japan) Rafal Lech (Gdansk University of Technology, Poland)

**Room A**
Technical Program

3C1: Antennas and Propagation for 5G Systems

Co-Chairs: Katsuyuki Haneda (Aalto University School of Electrical Engineering, Finland) Jiro Hirokawa (Tokyo Institute of Technology, Japan)

1: 9:00 Prototype System Evaluation and Field Trial of 40 GHz-band Directional Division Duplex (DDD) Radio System
Yu Sudoh(1), Yasuhiro Toriyama(1), Koichiro Akahori(1), Yuki Hashimoto(1), Kazuya Kojima(1), Toru Taniguchi(1), Miao Zhang(2,3), Jiro Hirokawa(2) and Makoto Ando(2), (1)Japan Radio Co.,Ltd., Japan, (2)Tokyo Institute of Technology, Japan, (3)Xiamen University, China

2: 9:20 Multiplexing Efficiency of High Order MIMO in Mobile Terminal for 5G communication at 15GHz
Zhinong Ying(1), Kun Zhao(1,2), Thomas Bolin(1), Sailing He(2), Alessandro Scannavino(3), Lars J. Foged(1) and Gross Nicolas(3), (1)SONY Mobile Communications AB, Sweden, (2)KTH Royal Institute of Technology, Sweden, (3)Microwave Vision Group, France

3: 9:40 Radio Channel Sounding Campaigns in EU H2020 mmMAGIC Project for 5G Channel Modeling
Katsuyuki Haneda(1), Michael Peter(2), Jonas Medbo(3), Mark Beach(4), Raffaele d’Errico(5), Shangbin Wu(6) and Jean-Marc Conrat(7), (1)Aalto University School of Electrical Engineering, Finland, (2)Fraunhofer HHI, Germany, (3)Ericsson Research, Sweden, (4)University of Bristol, United Kingdom, (5)CEA-LETI, France, (6)Samsung Research, United Kingdom, (7)Orange, France

4: 10:00 A Novel Method for Inter-Cell Interference Cancelation in Cellular Networks
Shuo Yang, Kyunghoon Kim, Heungseop Ahn and Seungwon Choi, Hanyang University, Korea

5: 10:20 Investigation of Planar Near-Field Measurement of Millimeter-Wave Antenna for 5G Application
Bo Xu(1,4), Jakob Helander(2), Andreas Ericsson(2), Zhinong Ying(3), Sailing He(1), Mats Gustafsson(2) and Daniel Sjöberg(2), (1)KTH Royal Institute of Technology, Sweden, (2)Lund University, Sweden, (3)SONY Mobile Communications AB, Sweden, (4)Zhejiang University, China

3C2: MIMO Based Techniques for Future Wireless Communication Systems

Co-Chairs: Tsuyoshi Kashima (Huawei Technologies Japan K.K., Japan) Kentaro Nishimori (Nigata University, Japan)

1: 11:00 Large Scale Massive MIMO Field Trial for 5G Mobile Communications System
Tsuyoshi Kashima(1), Jing Qiu(2), Haihua Shen(3), Chen Tang(3), Tingjian Tian(2), Xin Wang(1), Xiaolin Hou(3), Huiying Jiang(2), Anass Benjebbour(4), Yuya Saito(4) and Yoshishita Kishiyama(4), (1)Huawei Technologies Japan K.K., Japan, (2)Huawei Technologies Co., Ltd, China, (3)DOCOMO Beijing Communications Laboratories, Co., Ltd., China, (4)NTT DOCOMO, INC., Japan

Tomoki Murakami(1), Keisuke Ujihara(2), Yasushi Takatori(1), Masato Mizoguchi(1) and Fumiaki Maehara(2), (1)Nippon Telegraph and Telephone Corporation, Japan, (2)Waseda University, Japan

3: 11:40 Comparison of Large Scale Parameters of mmWave Wireless Channel in 3 Frequency Bands
Hua Yan(1), Ziming Yu(1), Yanshen Du(1), Jia He(1), Xiongfei Zou(1), David Steer(2) and Guangjian Wang(1), (1)Huawei Tech. Co., Ltd, China, (2)Huawei Technologies Canada Co., Ltd., Canada

4: 12:00 Ray-tracing Based Performance Evaluation of 5G mmWave Massive MIMO in Hotspots
Chenwei Wang(1), Haralabos Papadopoulos(1), Koshiro Kitao(2) and Tetsumaro Imai(2), (1)DOCOMO Innovations, Inc., United States, (2)NTT DOCOMO INC, Japan

5: 12:20 Testbed Implementation of Near-field Magnetic MIMO Communication System using SDR
Sukhyun Hwang, Han-joon Kim, Kyung Tae Kim and Ji-Woong Choi, Daegu Gyeongbuk Institute of Science & Technology, Korea
Technical Program

October 27 (Thu)

3D1: Radar, Remote Sensing, and Applications I  9:00 - 10:40 (Room D)
Co-Chairs: Hirokazu Kobayashi (Osaka Institute of Technology, Japan)
Jian Yang (Univ. Science & Technology Beijing, China)

1: 9:00 Time Series Observation of Wetland "Sakata" by PISAR-2
Yoshiyo Yamaguchi(1), Hiroyoshi Yamada(1) and *Shoichiro Koijima(2), (1)Niigata University, Japan, (2)National Institute of Information and Communication Technology, Japan

2: 9:20 Constraint Least-Squares Estimation for Polarimetric Parameters in Compact Data
Junjun Yin(1) and Jian Yang(2), (1)University of Science and Technology Beijing, China, (2)Tsinghua University, China

3: 9:40 Lab Color Space Assignment for Decomposed Fully Polarization Pi-SAR Data
Cheng-Yen Chiou(1), Kun-Shan Chen(2), *Chin-Yuan Chu(2), Yoshiyo Yamaguchi(2) and Kuo-Chin Fan(1), (1)National Central University, Taiwan, (2)Chinese Academy of Science, China, (3)G-AVE Technology Corp., Taiwan, (4)Niigata University, Japan

4: 10:00 Accuracy Enhanced RPM Method Using Doppler Based Range Points Clustering for 140GHz Band UWB Radar
Shouhei Kidera(1), Yuta Sasaki(1), Shang Fang(2), Tetsuo Kirimoto(1), Ken-ichi Itoh(1), Takeshi Siode(2), and Michio Takikawa(2), (1)The University of Electro-Communications, Japan, (2)Ritsumeikan University, Japan, (3)Kyoto University, Japan

5: 10:20 An Inverse Scattering Method for Lossy Objects Using Time-Reversed Fields
Toshifumi Moriyama(1), Toshiyuki Tanaka(1) and Takashi Takenaka(2), (1)Nagasaki University, Japan, (2)South China Normal University, China

October 27 (Thu)

3D2: Radar, Remote Sensing, and Applications II  11:00 - 12:40 (Room D)
Co-Chairs: Shouhei Kidera (The University of Electro-Communications, Japan)
Animesh Maitra (University of Calcutta, India)

1: 11:00 Least Square Image Reconstruction Method for Sparse Array Radar System
Takeshi Takehara(1), Shigeru Makino(1)(2), Keisuke Noguchi(3), Tetsuo Hirota(3), Kenji Itoh(1), Takeshi Siode(2), and Michio Takikawa(2), (1)Kanazawa Institute of Technology, Japan, (2)Mitsubishi Electric Corporation, Japan, (3)Tokyo University, Japan

2: 11:20 Radar Waveform Design for Extended Random Target Model with Random Pose Angle Parameters
Ilya Chervyak and *Motoyuki Sato, Tohoku University, Japan

3: 11:40 A Maneuvering Target Detection in Time-Series Doppler Spectrums with Self-Organizing Model
*Hiroki Yamaguchi, Air Systems Research Center, Japan

4: 12:00 Short-Chirp Signal-based Ground Penetrating Radar System for Detecting Shallow-Depth Pipelines
*Masaru Tsunasaki(1), Atsuo Senga(2) and Ichiro Sugimoto(3), (1)Osaka Gas Co., Ltd., Japan, (2)Nippon Signal Co., Ltd., Japan, (3)Laboratory of Energy & Human Life Science Inc., Japan

5: 12:20 Doppler Compensation of MISO Range Response in Subband Division LFM Pulse MIMO Radar
*RYUHEI TAKAHASHI, TORU TAKAHASHI AND HIROHIKO TASHI, MITSUBISHI ELECTRIC CORPORATION, JAPAN

October 27 (Thu)

3D3: Reflectarray  16:00 - 17:40 (Room D)
Co-Chairs: Shigeru Makino (Kanazawa Institute of Technology, Japan)
Fan Yang (Tsinghua University, China)

1: 16:00 A Study of the Broadband Characteristic of Reflectarray Antennas Using Aberration Theory
Kento Takeshima(1), Shigeru Makino(1)(2), Keisuke Noguchi(3), Tetsuo Hirota(3), Kenji Itoh(1), Takeshi Siode(2), and Michio Takikawa(2), (1)Kanazawa Institute of Technology, Japan, (2)Mitsubishi Electric Corporation, Japan, (3)Tokyo University, Japan

2: 16:20 Design of Dual-Band Reflectarray using Genetic Algorithm
*Tomami Maruyama(1), Chou(2), S Kameda(2) and N Suematsu(3), (1)National Institute of Technology, Hakodate College, Japan, (2)Tohoku University, Japan, (3)Tokyo Institute of Technology, Japan

3: 16:40 Electromagnetic Model of All-Metal Reflectarray Antennas with Non-Resonant Elements
*Yao-Jiu Chen(1), *Hsi-Tseng Chou(2) and Hsien-Kwei Ho(3), (1)Yuan Ze University, Taiwan, (2)National Taiwan University, Taiwan, (3)National Taiwan University, Taiwan

4: 17:00 High-Performance Curved Reflectarrays for Telecommunication Applications
Min Zhou, *Erik Jørgensen and Stig B. Sørensen, TICRA, Denmark

5: 17:20 Reflectarray with Arbitrarily Shaped Elements for Linear-to-Circular Polarization
Shogo Matsumoto, *Hiroki Yamada, Hiroyuki Deguchi and Mikio Tsuji, Doshisha University, Japan
Technical Program

**October 27 (Thu)**

**3E1: Circulary Polarized Antennas** 9:00 - 10:40 (Room E)

- Co-Chairs: Kangwook Kim (Gwangju Institute of Science and Technology, Korea), Akinori Matsui (Saitama Institute of Technology, Japan)

  1. 9:00 Pillbox Antenna Integrating Amplitude Monopulse Technique in SIW Technology
     *Karim Tekkouk(1,2), Mauro Ettorre(1) and Ronan Sauleau(1), (1)University of Rennes 1, France, (2)Tokyo Institute of Technology, Japan

  2. 9:20 A Compact Circularly Polarized SIW Slot Antenna
     *Hengfei Xu, Jianyi Zhou and Zhiqiang Yu, Southeast University, China

  3. 9:40 Millimeter-Wave High-Gain Wideband Circularly Polarized Antenna Array by Employing Aperture-Coupled Magneto-Electric Dipoles
     *Yujiang Li(1), Jingxue Wang(1), Junhong Wang(1) and Kuai-Man Luk(2), (1)Beijing Jiaotong University, China, (2)City University of Hong Kong, China

  4. 10:00 Design of Tilted Beam Circularly Polarized Antenna for CP-SAR Sensor Onboard UAV
     *Yohandri(1), Asrizal(1) and Josaphat Tetuko Sri Sumantyo(1), (1)FMIPAUniversitas Negeri Surabaya, Indonesia, (2)Chiba University, Japan

  5. 10:20 A Circularly Polarized Radial Line Dielectric Resonator Antenna Array
     *Lin Shi, Ming Su, Yuanan Liu, Jianguo Yu and Shulan Li, Beijing University of Posts and Telecommunications, China

**3E2: Electromagnetic Analysis** 11:00 - 12:40 (Room E)

- Co-Chairs: Hiroyasu Sato (Tohoku University, Japan), Titipong Lertwiriyaprapa (King Mongkut's University of Technology North Bangkok, Thailand)

  1. 11:00 Fast and Memory-Efficient Method for Full-Wave Analysis of Electrically Large Reflector Antennas and Satellite Platforms
     *Erik Jørgensen, Oscar Borries, Peter Meincke and Niels Vesterdal, TICRA, Denmark

  2. 11:20 Radiation Modes Investigation of Hyugens Source Type Antenna Using Spherical Wave Expansion
     *Abdul Sattar Kaddour(1), Serge Bories(1), Antonio Clemente(1), Anthony Bellion(2) and Christophe Delaveau(1), (1)University Grenoble Alpes, France, (2)CNES, France

  3. 11:40 Radiation Analysis of an Equivalent Magnetic UHF-RFID Tag Located on a Coated Metallic Sphere using UTD method
     *Kittisak Phaebua(1), Pitchanun Wongiartnorra(1), Titipong Lertwiriyaprapa(1) and Chuwong Phongcharoenpanicha(1), (1)King Mongkut's University of Technology North Bangkok, Thailand, (2)King Mongkut's Institute of Technology Ladrabang, Thailand

  4. 12:00 The FDTD Analysis of the Radiation Pattern of an Antenna Mounted on a Rocket
     *Yiwei He(1,2), Toshihiro Sezai(2) and Koji Sunami(2), (1)Osaka Electro-Communication University, Japan, (2)JAXA, Japan

  5. 12:20 Advances in FETI Methods for the Simulation of Multi-Source Electromagnetic Problems
     *Andre Bara and Francois-Xavier Roux, The French Aerospace Lab, France

**October 27 (Thu)**

**3E3: Antennas for Wireless Applications** 16:00 - 17:40 (Room E)

- Co-Chairs: Tan-Huat Chio (National University of Singapore, Singapore), Daisuke Uchida (Toshiba Corporation, Japan)

  1. 16:00 Two by Two MIMO Antenna Composed of Inverted L Elements Printed on Dielectric Substrate
     *Mitsuo Taguchi and Shoji Mori, Nagasaki University, Japan

  2. 16:20 An Ink-Reducing Printed Rectangular CPW Antenna Design via Selective Area Thickening
     *Pornanong Pongpaibool, Pathakorn Rattanawatan, Manatee Kitjaroen, Werayuth Wallada and Siwaruk Siwamogsatham, National Electronics and Computer Technology Center, Thailand

  3. 16:40 Design of Antipodal Vivaldi Antennas Using Kernel Regression Optimization
     *Gangil Byun and Hosung Choo, Hongsik University, Korea

  4. 17:00 Development of GPS Antenna Mounted on Shoes for Human's Position Observation
     *Tetsuya Nakamura and Yoshinobu Okano, Tokyo City University, Japan

  5. 17:20 Beam Divergence Reduction Using Dielectric Lens for Orbital Angular Momentum Wireless Communications
     *Hiroyuki Fukamoto, Hirofumi Sasaki, Doohwan Lee and Tadao Nakagawa, NTT, Japan

**3F1: Array Antenna Technologies I** 9:00 - 10:40 (Room F)

- Co-Chairs: Seong-Ook Park (Korea Advanced Institute of Science and Technology, Korea), Satoshi Yamaguchi (Mitsubishi Electric Corporation, Japan)

  1. 9:00 Design of a Double Layer Cavity backed Slot Array Antenna in Gap Waveguide Technology
     *Peiye Liu, Ashraf Uz Zaman and Pei-Simon Kildal, Chalmers University of Technology, Sweden

  2. 9:20 Design of Broadband Planar Array Composed of 2x2 Slotted Cavities Fed by E-plane Waveguide Parallel-Feeding Circuit in Millimeter-wave Band
     *Katsuhiro Miyaizaki, Kunio Sakakibara and Nobuyoshi Kikuma, Nagoya Institute of Technology, Japan

  3. 9:40 A Low-profile, Decade Bandwidth, Tightly-Coupled Vivaldi Phased Array
     *Jing Dai(1), Hao Wang(1), Haiqing Wang(1), Xun Jiang(1), Dalong Xu(2) and Yong Huang(2), (1)Nanjing University of Science and Technology, China, (2)Suzhou Bohai Momentum Wireless Communications

  4. 10:00 A Photonic Phased Array Using Frequency Quadrupling without Optical Filtering
     *Yuta Hasegawa, Yusuke Nakatani, Yusuke Uemichi, Xu Han, Ryohei Hosono and Ning Guan, Fujikura Ltd., Japan

  10:20 Break Time
Technical Program

3F2: Array Antenna Technologies II 11:00 - 12:40 (Room F)

Co-Chairs: Shin-ichiro Matsuzawa (Toyota Central R & D Labs., Inc., Japan)
Eko Rahardjo (Universitas Indonesia, Indonesia)

1:  11:00 Dual-Circularly Polarized Parabolic Reflector Antenna with Microstrip Antenna Array for 12-GHz Band Satellite Broadcasting Reception
*Masafumi Nagasaka, Susumu Nakazawa and Shoji Tanaka, NHK, Japan

2:  11:20 A Prototype Array-fed Shaped Reflector Antenna for 21-GHz Band Broadcasting Satellite
*Susumu Nakazawa, Masafumi Nagasaka and Shoji Tanaka, NHK, Japan

3:  11:40 A 3.37:1 Bandwidth and Low-profile Tightly Coupled Array Antenna
*Hakjune Lee and Sangwook Nam, Seoul National University, Korea

4:  12:00 Study on Primary Radiator using Leaky-Wave Antenna with Left-Handed Waveguides
*Shigeyuki Nishimura, Hiroyuki Deguchi and Mikio Tsuji, Doshisha University, Japan

5:  12:20 CRLH Leaky-Wave Antenna using Transmission Line Resonators
*Yujiro Kushiyama, Takuji Arima and Toru Uno, Tokyo University of Agriculture and Technology, Japan

3F3: Millimeter Wave Antennas 16:00 - 17:40 (Room F)

Co-Chairs: Miao Zhang (Xiamen University, China)
Chi H. Chan (City University of Hong Kong, Hong Kong)

1:  16:00 Millimeter-Wave Tapered Slot Array for Automotive Radar Applications
Meijiao Li(1), Paul Schmalenberg(2) and Jae Seung Lee(2), (1)University of California Davis, United States, (2)Toyota Research Institute North America, United States

2:  16:20 Influence of Resin Cover on Antenna Gain for Automotive Millimeter Wave Radar
*Shin-ichiro Matsuzawa and Toshiaki Watanabe, Toyota Cetral R & D Labs., Inc., Japan

3:  16:40 Antenna Arrays with Slot Open Waveguide Radiation Elements
*Vladimir Veremey, Qualcomm Inc., United States

4:  17:00 A Study of Orbital Angular Momentum Generated by Parabolic Reflector with Circular Array Feed
*Tung Nguyen, Ryuji Zenkyu, Masashi Hirabe and Eisaku Sasaki, NEC Corporation, Japan

5:  17:20 SIW Cavity-Backed Circularly Polarized Dual Loop Antenna with Broadband at Ka Band
*Huan Mei, Xuexia Yang and Yingjie Yu, Shanghai University, China

POS2: Poster Session II 14:00 - 15:40 (Exhibition Hall)

1:  A Multiband Antenna Based on a CRLH Structure for Mobile Handsets
*RongLin Li, Liang Zheng, South China University of Technology, China

2:  Efficiency Improvement of Mobile Antenna by Controlling Ground Structure
*Sangmoon Yoo and Hyeongdong Kim, Hanyang University, Korea

3:  Low Profile Weak Coupling PIFA Based On EBG Structures
*Xiaogang Zhang(1), Jun Cao(1), Mouping Jin(1) and Pei Li(1), (1)China Electronics Technology Group Corporation No.38 Research Institute, China, (1)Key Lab of Aperture Array and Space Application, China

4:  Small-size Half-loop Frame Antenna Integrated with a USB Connector and Having a Narrow Ground Clearance for the LTE Metal-framed Smartphone
*Li-Yu Chen and Kin-Lu Wong, National Sun Yat-Sen University, Taiwan

5:  A Small Quadrifilar Helical Antenna with Parallel Resonance Circuit for Dual-Band Application
*Hiroaki Sakamoto, Takashi Yanagi, Toru Fukasawa and Hiroaki Miyashita, Mitsubishi Electric Co., Japan

6:  Radiation Efficiency of Multi-arm Open-ended Spherical Helix Antennas
*Keisuke Fujita and Hiroshi Shirai, Chuo University, Japan

7:  Wide Beamwidth Quadrifilar Helix Antenna with Improved Axial Ratio
Usheon Kim, Seah Choi and Gilho Kim, EMW Co., Ltd., Korea

8:  Gap-Coupled Miniaturized Antenna on IPD Process for WLAN Tablet Computer
*Chao-Shun Yang(1), Ta-Yeh Lin(2), Da-Chiang Chang(2) and Guo-Wei Huang(1), (1)National Nano Device Laboratories, Taiwan, (2)National Chip Implementation Center, Taiwan

9:  Design of Printed Antenna for USB Dongle for IEEE 802.11 a/b/g Application
*Wen-Shan Chen, Guang-Yuan Cai and Tzu-Chi Lu, Southern Taiwan University of Science and Technology, Taiwan

10: A Preliminary Study on Design Coverage Extension of Automatic Composition Design for Human Body-Equivalent Phantoms with Low Relative Permittivity and Low Conductivity
*Takaki Kurashige and Tadahiko Maeda, Ritsumeikan University, Japan

11: Internal Inductance Correction for Permittivity Measurements of Planar Transmission Lines
*Patrick Seiler, Bernhard Klein and Dirk Plettemeier, Technische Universität Dresden, Germany

12: Radiation Efficiency Measurements of Embroidered Textile Radiating Elements Placed in the Vicinity of a Human Equivalent Phantom
*Hiromichi Nomura and Tadahiko Maeda, Ritsumeikan University, Japan
Technical Program

October 27 (Thu)

POS2: Poster Session II

14:00 - 15:40 (Exhibition Hall)

13:  Optimal Test Set-up for Generating Rayleigh Fading Channel in Reverberation Chamber
    Tien Manh Nguyen(1), Jae-Young Chung(1) and Jong Hwa Kwon(2), (1)Seoul National University of Science and Technology, Korea, (2)Electronics and Telecommunications Research Institute, Korea

14:  Two-Port S-Parameter Measurement of Wide-Band Balun
    *Kuniaki Suto and Akinori Matsui, Saitama Institute of Technology, Japan

15:  High-Gain Microstrip Antenna for Microwave Power Transmission
    Junhui Ou(1), Andrey S. Andrenko(2), Chao Fu(1,2), Zhaoxia Xie(1,2) and Zhongzhou Tan(1,2), (1)Sun Yat-sen University, China, (2)SYSU-CMU Shunde International Joint Research Institute, China

16:  The Simulation Design of a Low-Side Lobe Level High Gain and Broadband Microstrip Patch Antenna Array
    Zhang Yu-wei, Lin Shu, Liu Ling, Yang Cai-tian, Lan Sheng-chang and Liu Hao, Harbin Institute of Technology, China

17:  Research of Planar Inverted-F Antenna Based on Electromagnetic Band Gap
    Hongmei Li, Yayun Zu, Ying Zhao and Lifei Bao, Harbin Institute of Technology, China

18:  A High-Gain Planar Dual Reflector Antenna
    Zong Hua, Zhang He, Lin Shu, Li Hongmei, Liu Beiija and Wu Qun, Harbin Institute of Technology, China

19:  Semiconductor-Based Reflector Antenna Using Integrated PIN Diodes
    Young-Kyun Cho, Cheol Ho Kim, SeokBong Hyun, Kwang Chun Lee and Bong Hyuk Park, Electronics and Telecommunications Research Institute (ETRI), Korea

20:  A Dual-band Omni-directional Printed Antenna Array for WLAN Application Design
    Si Zhang(1,2), Shao-bin Liu(1), Cai-tian Yang(2), Ling Liu(2), Chao-ran Hu(2), Peng Zhao(2) and Di Wu(2), (1)Nanjing University of Aeronautics and Astronautics, China, (2)Harbin Institute of Technology, China, (3)China Mobile Group Design Co. Ltd. Heilongjiang branch, China

21:  A Broadband Probe-Fed 4x4 Array Antenna for Ku-band Applications
    Chung-Yi Hsu(1), Lih-Tyng Hwang(1), Fa-Shian Chang(2), Shun-Min Wang(2) and Chih-Feng Liu(2), (1)National Sun Yat-sen University, Taiwan, (2)Cheng Shiu University, Taiwan

22:  Sidelobe Reduction in Uniformly-Fed Microstrip Arrays by Applying Parasitic Elements
    Shai Nasirov(1), Eli Levine(2) and Haim Matzner(1), (1)Holon Institute of Technology, Israel, (2)Afeka College of Engineering, Israel

23:  Traveling-wave Design of Cross-junction Power-dividers for Two-dimensional Microstrip Planar Array with 45-degree Polarization in Submillimeter-wave Band
    Yuta Mouri, Shigenori Kitazaka, Kazumasa Shida, Kunio Sakakibara and Nobuyoshi Kikuma, Nagoya Institute of Technology, Japan

24:  A Near-Field Focused Planar Microstrip Array for 2.4 GHz RFID Readers
    Ji-nuan Lin, Nan-nan Wang and Tian-yao Du, Harbin Institute of Technology, China

25:  Design of 8 × 8 Slot Array based on Inverted Microstrip Gap Waveguide
    Jinlin Liu, Abbas Vosough, Ashraf Uz Zaman and Per-Simon Kildal, Chalmers University of Technology, Sweden

26:  Reduction of Reflection Loss from Dielectric Plate by Reflection-phase Control of Frequency Selective Surface
    Goro Nomoto, Masamu Chiba, Kunio Sakakibara and Nobuyoshi Kikuma, Nagoya Institute of Technology, Japan

27:  The Waveguide Slot Array Antenna using Non Resonant Mode to Improve Grating Lobes
    Kento Ueda, Yasuhiro Tsunemitsu and Naohisa Goto, Takushoku University, Japan

28:  Heartbeat and Respiratory Monitoring Using Standing Wave Radar and Independent Component Analysis
    Daiki Matsumoto and Yoshihiko Kuwahara, Shizuoka University, Japan

29:  Analysis of The Radial Line Slot Array Antenna with Cross Slot Mutual Coupling Effects
    Kouichi Sugita, Yasuhiro Tsunemitsu and Naohisa Goto, Takushoku University, Japan

30:  A High Gain Monopolar Patch Antenna with Low Profile
    Kai Xu Wang and Hang Wong, City University of Hong Kong, Hong Kong

31:  Design of Patch Type Meta-surface for Orthogonal Polarization Conversion
    Yasuhiro Tomii, Toshikazu Hori and Motohi Fujimoto, University of Fukui, Japan

32:  Design Method of Unit Cell Structure for Realizing Broadband Artificial Magnetic Conductor
    Masaru Nagata, Toshikazu Hori and Motohi Fujimoto, University of Fukui, Japan

33:  Design of a High Gain and Dual Polarized Transmittary Using FSS of Smaller Unit Cells
    Chung-Yi Hsu(1), Lih-Tyng Hwang(1), Pei-Shou Lee(1), Shun-Min Wang(2) and Fa-Shian Chang(1), (1)National Sun Yat-sen University, Taiwan, (2)Cheng Shiu University, Taiwan

34:  The Impact of Ground Plane to A Capacitor Loaded Rectangular Patch Antenna
    K. L. Lai, Shin-Hung Wu and M. C. Liang, National University of Kaohsiung, Taiwan

35:  A 325-500 GHz High Gain Antenna for Terahertz Applications
    Kuikui Fan, Zhang-Cheng Hao and Wei Hong, Southeast University, China

36:  Optimization of a Small Lens for a Leaky-Wave Slit Dipole Antenna at the Terahertz Band
    Niamat Hussain and Ikmo Park, Ajou University, Korea
### Technical Program

**October 27 (Thu)**

#### POS2: Poster Session II 14:00 - 15:40 (Exhibition Hall)

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<td>Young-Jin Won(1,2) and Jae-Hyun Lee(2), Korea Aerospace Research Institute, Korea, Chungnam National University, Korea</td>
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<td>Akira Moro, Fang Shang, Shouhei Kidera and Tetsuo Kimoto, The University of Electro-Communications, Japan</td>
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<td>Yuta Izumi(1), Sevket Demirci(2), Mohd Zafri Baharuddin(1) and Josaphat Tetuko Sri Sumantyo(1), Chiba University, Japan, Mersin University, Turkey</td>
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<td>Nadiisanka Tupasinghe(1), Yuichi Kakishima(2), Ismail Guenc(1) and Koshiro Xita(2) and Tetsuro Imai(2), Florida International University, United States, Dooco Innovations, Inc., United States, NTT Docomo, Inc., Japan</td>
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High Selectivity and isolation Microstrip Diplexer With Mixed Electromagnetic Coupling
Tianwei Zhu, Hongwei Deng, Tao Zhang, Fei Liu and Yongjiu Zhao, Nanjing University of Aeronautics and Astronautics, China

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POS2: Poster Session II 14:00 - 15:40 (Exhibition Hall)

85: X-Band Tunable Frequency Selective Surface with Embedded Bias Network
Kunzhe Zhang, Wen Jiang, Shuxi Gong and Tao Hong, Xidian University, China

86: Some Analytic Formulations of Weakly Singular Integrals over Polygon for IPO Applications
Jae-Won Rim and Il-Suek Koh, Inha University, Korea

87: Evaluation of Transmission Quality by Time-Domain Analysis for High-Speed Interconnectors
Chi-Fang Huang and Yu-Ching Hung, Tatung University, Taiwan

88: Analysis of Magnetic Photonic Crystals Using Complex Envelope ADI-FDTD Method
Sang-Gyu Ha, Jeahoon Cho, Minseok Park, Jaewoo Baek and Kyung-Young Jung, Hanyang University, Korea

89: The Minimum Sample Region Required to Predict the Far-Field RCS from the Bistatic Near-Field Data
Jiaojiao Dang, Nanjing Li, Yuan Luo and Zuxun Song, Northwestern Polytechnical University, China

90: Plane Wave Scattering from Omega-medium Cylindrical Objects of Arbitrary Cross-section
Rafal Lech, Gdansk University of Technology, Poland

91: Efficient Parametric Analysis of Cavity-Backed Slot Coupled DRA with Finite Element Method
Adam Lamecki, Lukasz Balewski and Michal Mrozowski, Gdansk University of Technology, Poland

92: Shielding Effect by a Buried Metallic Pipe against the Induced Voltage
Kang-In Lee and Sangmu Lee, Electronics and Telecommunications Research Institute, Korea

93: Fourth Order Debye Model for the Skin at the Millimetre-Wave Band Using Heuristic Genetic Algorithm
Syed A.R. Naqvi, Beadaa Mohammad and Amin M. Abbosh, The University of Queensland, Australia

94: Dual-Band Unequal Wilkinson Power Divider with High Power-Dividing Ratio
Fang-Yu Lei, Yi-Hsin Pang and Ming-Cheng Liang, National University of Kaohsiung, Taiwan

95: Differential Unequal Power Divider with Bandpass Response
Yu-Ting Chiu, Yi-Hsin Pang and Hsiang-Cheh Huang, National University of Kaohsiung, Taiwan

96: Balanced-to-Balanced Rat-Race Coupler with Bandpass Response
Yu-Ju Huang and Yi-Hsin Pang, National University of Kaohsiung, Taiwan

97: High Selectivity and isolation Microstrip Diplexer With Mixed Electromagnetic Coupling
Tianwei Zhu, Hongwei Deng, Tao Zhang, Fei Liu and Yongjiu Zhao, Nanjing University of Aeronautics and Astronautics, China

98: Microstrip Filter with Reconfigurable Frequency Responses Based on Capacitor Chips
Achmad Munir and Hardy Lukius, Institut Teknologi Bandung, Indonesia

99: Quadruple-Mode Wideband Filter Using Slotted Substrate Integrated Waveguide Circular Cavity
Fei Huang and Jianyi Zhou, Southeast University, China

100: Microfluidic Chemical Sensor based on SIW Cavity
Muhammad Usman Memon and Sungjoon Lim, Chang-Ang University, Korea

101: Study of Dual-Frequency Absorbing Materials Based on Frequency Selective Surfaces
Yin Xinyu, Oleksandr Denisov, Qiu Jinghui and Liu Hao, Harbin Institute of Technology, China

102: Design of an All-dielectric Band-stop Frequency Selective Surface
Jinpi Tak and Jaehoon Choi, Hanyang University, Korea

103: FEM Simulation of Induced Interference Voltage at Implantable Cardiac Pacemaker due to Wireless Power Transfer in HF-band
Naoki Tanaka(1), Takashi Hikage(1), Juan Corcoles(2) and Toshiro Nojima(3), Hokkaido University, Japan, 1Universidad Autonoma de Madrid, Spain

104: Calculation of SAR and Temperature in Pregnant Female Models for a Half-Wavelength Dipole Antenna at 900 MHz and 2 GHz
Tomoki Nagao(1), Akira Tateno(2), Katsuyuki Saito(2), Masaharu Takahashi(2), Soichi Watanabe(1) and Koichi Ito(1), 1National Institute of Information and Communications Technology, Japan, 2Hitachi Kokusai Electric Inc., Japan, 3Chiba University, Japan

105: Confocal Imaging by Turning Antennas with CMOS Integrated Circuits for Breast Cancer Detection
Hang Song(1), Hayato Kono(1), Yuji Seo(1), Afreen Azhari(2) and Takamaro Kikkawa(3), 1Panasonic Corporation, Japan, 2Hiroshima University, Japan, 3Tianjin University, China

106: Evaluation of Human Sitting-up Detection System using Electromagnetic Noise from Power-supply Line
Yuki Wakasa, Yuri Tanai, Koichi Shin and Masahiro Nishi, Hiroshima City University, Japan

107: RSSI-Based Estimation Method of Living-Body Direction Using Parasitic Antennas
Katsumi Sasaki(1), Naoki Honma(1), Takeshi Nakayama(2) and Shoichi Iizuka(3), 1Hokkaido University, Japan, 2Hokkaido University, Japan, 3Chiba University, Japan

108: Basic Study of Optically Transparent Functional Wall Having Absorption and Permeation Effect
Keita Nakamura and Yoshinobu Okano, Tokyo City University, Japan

109: Wearable Metamaterial Absorber using Screen Printed Chanel logo
Dongju Lee and Sungjoon Lim, Chang-Ang University, Korea

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110: Experimental Estimation of E-Field Distribution in a Vehicle under Multipath Propagation Environment Using a Reverberation Chamber
Katsushige Harima(1), Tetsuya Nakamura(2), Daichi Akita(3), and Shinobu Ishigami(3),
(1) National Institute of Information and Communications Technology, Japan,
(2) TOYO Corporation, Japan, (3) Tohoku Gakuin University, Japan

111: Design of Wideband Directional Couplers Using Three Types of Broadside Coupled-Lines
In Bok Kim(1), Sung Kyun Kim(2), Wahab Mohyuddin(2), Hyun Chul Choi(2) and Kang Wook Kim(2),
(1) LIG Nex1 CO. Ltd, Japan, (2) Kyungpook National University, Korea

112: 2-loop Antenna Measurement Method for the Emission Noise Test of Automotive Component
Yasuyuki Matsuda(1), Hiroyuki Arai(1), Takanori Uno(2), Ichiro Akahori(2) and Toshiyasu Tanaka(2),
(1) Yokohama National University, Japan, (2) DENSO EMC ENGINEERING SERVICE CORPORATION, Japan,
(3) Microwave Factory Co., Ltd., Japan

113: Reduction of Edge Diffraction Effect of MUT Holder Using EM Absorber in W-band Free-space Material Measurements
Jin-Seob Kang, Jeong-Hwan Kim and Jeong-II Park, Korea Research Institute of Standards and Science (KRISS), Korea

114: The Design of Current Probe in the IEC Conducted Emission Measurement above 1 GHz
Yin-Cheng Chang(1,2), Ta-Yeh Lin(2), Ping-Yi Wang(1), Shawn S. H. Hsu(1), Mao-Hsu Yen(1), Yen-Tang Chang(1), Ming-Shan Lin(1) and Da-Chiang Chang(1),
(1) National Tsing Hua University, Taiwan, (2) National Applied Research Laboratories, Taiwan,
(3) National Taiwan Ocean University, Taiwan, (4) Bureau of Standards, Metrology and Inspection, M.O.E.A, Taiwan

115: Field Strength Estimation through a Vehicle Structure using Topological Model and PWB Method
Jae-Min Lee(1), JaeW Lee(1) and Jong-Hoon Han(2), (1) Korea Aerospace University, Korea,
(2) National Security Research Institute, Korea

116: Stretchable Frequency Selective Surfaces for Large-Area-Tuning and High-Power Applications
Yu-Chieh Hung and Chien-Hao Liu, National Taiwan University, Taiwan

117: A Practical Microwave Absorber Design based on Salisbury Screens
Shih-Chung Tuan(1), Hsi-Tseng Chou(1), Yi-Sheng Chang(3,4), Hsieh-Ming Kun(4),
Pai-Lu Wang(4) and Jun-Wen Zhang(4), (1) Oriental Institute of Technology, Taiwan,
(2) National Taiwan University, Taiwan, (3) Yuan Ze University, Taiwan,
(4) National Chung-Shan Institute of Science & Technology, Taiwan

118: Study on the Effective Loading Method of the Magnetic Sheet for NFC / WPT Dual-Band Antenna
Takahiro Sekiguchi(1), Hiromu Odanaka(1), Yoshinobu Okano(1) and Satoshi Ogino(2),
(1) Tokyo City University, Japan, (2) Microwave Absorbers Inc., Japan

119: Transmission Characteristics of RFID Antennas in a Closed Space
Luong Anh Tuan(1), Naobumi Michishita(1), Hisashi Morishita(1) and Takayuki Koshi(2),
(1) National Defense Academy, Japan, (2) Komatsu Ltd., Japan

POS2: Poster Session II 14:00 - 15:40 (Exhibition Hall)

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120: Design of the High-sensitivity RFID Sensor Tag with MOEA/D-DE
Xiaolian Song(1), Gang Wang(2) and Yuxing He(1), (1) University of Science and Technology of China, China,
(2) Chinese Academy of Sciences, China

121: Development of Nearby Tags Detection Unit with UHF-RFID Technology
Kyosuke Mayama and Yoshinobu Okano, Tokyo City University, Japan
Technical Program

October 28 (Fri)

4A1: Recent Advances in Antennas and Propagation in ASEAN countries I 9:00 - 10:40 (Room A)

Co-Chairs: Jiro Hirokawa (Tokyo Institute of Technology, Japan)
Mohamad Kamal A. Rahim (Universiti Teknologi Malaysia, Malaysia)

1: 9:00 Invited: Phased Array of Switched Beam Elements and Application
Chainarong Kittiyapanuya and *Monai Krairiksh, King Mongkut’s Institute of Technology Ladkrabang, Thailand

2: 9:40 Design of Beam Steering Antenna for Localization Applications
*Thi Duyen Bui, Van Duc Ngo, Ba Hieu Nguyen, Quoc Cuong NGUYEN and Minh Thuy LE, *Hanoi University of Science and Technology, Viet Nam, 
*Electric Power University, Viet Nam

3: 10:00 A Tri-band Slot Antenna using Capacitive CPW and Meander Line Stub Technique
Pongsathorn Chomtong, Suwaluck Meesonmkin and *Prayoot Akkaraekthalin, King Mongkut’s University of Technology North Bangkok, Thailand

4: 10:20 Dual Band Electromagnetic Band Gap Structure with Wideband Antenna
Muhammad Abdul Hamid, Mohamad Kamal A Rahim and Umar Mussa, Universiti Teknologi Malaysia, Malaysia

4A2: Recent Advances in Antennas and Propagation in ASEAN countries II 11:00 - 12:40 (Room A)

Co-Chairs: Monai Krairiksh (King Mongkut’s Institute of Technology Ladkrabang, Thailand)
Minh-Thuy Le (Hanoi University of Science and Technology, Viet Nam)

1: 11:00 Design of Circularly Polarized Unidirectional Antenna using Probe-Excited Circular Ring Antenna above the Square Reflector with Inserted Metallic Slabs
Chuwong Phongcharoenpanich, *Kittima Lertsakwimarn, Rungsinee Sukkamat, Nattaset Mhudtong, Sompol Kosulvit and Prayoot Akkaraekthalin, King Mongkut’s Institute of Technology Ladkrabang, Thailand, 
*Rambhai Barni Rajabhat University, Thailand, 
*King Mongkut’s University of Technology North Bangkok, Thailand

2: 11:20 Circular Polarized Textile Antenna at 2.4 GHz
Umar Mussa, *Mohamad kamal A Rahim and Muhammad Abdul Hamid, Universiti Teknologi Malaysia, Malaysia

3: 11:40 Stretching Method Using Chebyshev Polynomial for Linear Sparse Array Antenna Design
Efi Sandi, Fitri Yuli Zulkifli, Basari and *Eko Tjipto Rahardjo, Universitas Indonesia, Indonesia

4: 12:00 A Dipole Antenna using Sierpinski Carpet Fractal Technique for RF Altimeter System
Jirada Thongbai, Apirada Namsang and *Pongsathorn Chomtong, *Civil Aviation Training Center, Thailand, 
*King Mongkut’s University of North Bangkok, Thailand

5: 12:20 Development of Automatic G/T Measurement Program for THAICHOTE Ground Station
*Likhit Waranon, Pawut Karrngandee and Rapirat Ritronnasak, *Geo-Informatics and Space Technology Development Agency (GISTDA), Thailand, 
*Sripatum University, Thailand

4A3: Small Antennas 14:00 - 15:40 (Room A)

Co-Chairs: Hisashi Morishita (National Defense Academy, Japan)
Qing-Xin Chu (South China University of Technology, China)

1: 14:00 Invited: Analysis of Low Loss Magneto-Dielectric Antenna for the Mobile Communication
*Seong-Ook Park, Tae-Wan Kim and Byeong-Yong Park, KAIST, Korea

2: 14:40 Evaluation of Bandwidth for Tunable Antennas with Physical Limitations on Small Antennas
*Seiya Kishimoto and Makoto Higaki, Toshiba Corporation, Japan

3: 15:00 An Efficient Design Method of a Folded Inverted-L Antenna Including a Matching Circuit
*Takashi Yamagajo, Yohei Koga and Manabu Kai, Fujitsu Laboratories Limited, Japan

4: 15:20 A Compact Dual-Band Circularly Polarized Spiral Antenna
*Mayumi Matsunaga, Ehime University, Japan

4B1: Wearable Device Networks 9:00 - 10:40 (Room B)

Co-Chairs: Masaharu Takahashi (Chiba University, Japan)
Jaehoon Choi (Hanyang University, Korea)

1: 9:00 Curved Dual Band Film Antenna of Smart Watch for Cellular Communications
*Yuki Tasaka and Hisao Iwasaki, Shibaura Institute of Technology, Japan

2: 9:20 Design of an All-textile Antenna Integrated in Military Beret for GPS/RFID Applications
*Heesjae Lee, Jinpil Tak, Youngtaek Hong and Jaehoon Choi, Hanyang University, Korea

3: 9:40 Dual Band Magnetic Textile Antenna for Body Area Network Application
*Basari, Abdurrahman Wahid, Fitri Yuli Zulkifli and Eko Tjipto Rahardjo, Universitas Indonesia, Indonesia

4: 10:00 Textile Antenna for Biological Information Monitoring
*Yuta Nakatani and Masaharu Takahashi, Chiba University, Japan

5: 10:20 Dynamic Characteristics of Intrabody Communication Channels
*Nozomi Haga, Yusaku Kasahara and Kuniyuki Motojima, Gunma University, Japan
4B2: Human Body Interactions and Sensors
11:00 - 12:40 (Room B)

Co-Chairs: Takashi Hikage (Hokkaido University, Japan)
Basari (Universitas Indonesia, Indonesia)

1: 11:00 Experimental Study of Transmission Factor Through Conducting Human Body Equivalent Liquid
Hiroyasu Sato, Yang Li and Qiang Chen, Tohoku University, Japan

2: 11:20 FDTD Analysis of Capsule Dipole Antenna In Digestive System of Human Body
Yang Li, Hiroyasu Sato and Qiang Chen, Tohoku University, Japan

3: 11:40 Compact 24-GHz Doppler Radar Module for Non-Contact Human Vital-Sign Detection
Tzu-Wei Hsu and Chao-Hsiung Tseng, National Taiwan University of Science and Technology, Taiwan

4: 12:00 RF Stretchable Sensor Using Flexible Substrate and Eutectic Gallium-Indium
Seung-Hyun Eom and Sungjoon Lim, Chung-Ang University, Korea

12:20 Break Time

4B3: RFID Antennas and Systems
14:00 - 15:40 (Room B)

Co-Chairs: Hisao Iwasaki (Shibaura Institute of Technology, Japan)
Ikmo Park (Ajou University, Korea)

1: 14:00 Closely Located RFID Tag Antennas on High Dielectric Objects
Kuan-hua Chen, Qiang Chen and Kunio Sawaya, Tohoku University, Japan

2: 14:20 Dual-Loop NFC Chip Antenna Based on Z-Shaped Coil
Anping Zhao, Fuqiang Ai and Yu Xu, Shenzhen Sunway Communication, China

3: 14:40 RFID Based Solution for the Sensing of Home Electrical Devices Activity
Ali Louiz, Rupesh Kumar and Jean-Yves Le Naou, Technicolor, France

4: 15:00 Dual-band Chipless RFID Sensor for A Material Quality Monitoring Application
Rattapong Suwalak(1), Kittima Lertsakwimarn(2), Chuwong Phongcharoenpanich(1) and Danai Torrungrueng(1), King Mongkut's Institute of Technology Ladkrabang, Thailand, (2)Rambhai Barni Rajabhat University, Thailand, (3)Asian University, Thailand

5: 15:20 On the Decoding of Equiprobable UWB Chipless RFID Tags Using a Minimum Distance Detector
Marvin Barahona, Diego Betancourt and Frank Ellinger, Technische Universität Dresden, Germany

4C1: Sparsity-aware Array Antenna Technologies
9:00 - 10:40 (Room C)

Co-Chairs: Wen-Qin Wang (University of Electronic Science and Technology of China, China)
Koichi Ichige (Yokohama National University, Japan)

1: 9:00 Suppression of Scattering Waves from the Outside of a Search Area Using a Gating Technique in Compressed Sensing Based Scatterer Detection
Daisuke Abe, Yasutaka Ogawa, Toshihiko Nishimura and Takeo Ohgane, Hokkaido University, Japan

2: 9:20 Study on Digital Beamforming for Spaceborne SAR Based on Sparse DOA Estimation
Taoli Yang(1) and Yong Wang(1,2), (1)University of Electronic Science and Technology of China, China, (2)East Carolina University, United States

3: 9:40 Underdetermined DOA Estimation for Uniform Circular Array Based on Sparse Signal Reconstruction
Thomas Basikolo, Koichi Ichige and Hiroyuki Arai, Yokohama National University, Japan

4: 10:00 2-D DOA Estimation of Multiple Signals Based on Sparse L-shaped Array
Zhi Zheng, Yuxuan Yang, Wen-qin Wang, Jiao Yang and Yan Ge, University of Electronic Science and Technology of China, China

Suguru Ohashi, Hiroyoshi Yamada and Yoshio Yamaguchi, Niigata University, Japan

4C2: DOA Estimation I
11:00 - 12:40 (Room C)

Co-Chairs: Hiroyoshi Yamada (Niigata University, Japan)
Taoli Yang (University of Electronic Science and Technology of China, China)

1: 11:00 Direction-of-Arrival Estimation with Lüneburg Lens and Metamaterial Absorber
Aya Ohmae(1,2), Wen Li(1), Isao Hoda(1), Takashi Suga(1) and Satoshi Yagitani(2), Hitachi Ltd., Japan, (2)Kanazawa University, Japan

Makoto Jomoto, Nobuyoshi Kikuma and Kunio Sakakibara, Nagoya Institute of Technology, Japan

3: 11:40 Extension of a Received Signal Estimation Method at a Remote Location to a 3-Dimensional Space
Shun-suke Abe, Hisato Iwai and Hideichi Sasaoka, Doshisha University, Japan

4: 12:00 Influence of Mutual Coupling between Array Elements in Location Estimation of Radio Sources Using Near-Field DOA-Matrix Method
Kensuke Tanaka, Nobuyoshi Kikuma and Kunio Sakakibara, Nagoya Institute of Technology, Japan

5: 12:20 Lagrange Multiplier Setting for Lp-CS Based DOA Estimation
Takeshi Amishima and Nobuhiro Suzuki, Mitsubishi Electric Corporation, Japan
Technical Program

**4C3: DOA Estimation II**
1: 14:00 DOA Estimation of Desired Signals Using In-Phase Combining of Multiple Cyclic Correlations and Spatial Smoothing Processing
   *Yuta Kamiya, Nobuyoshi Kikuma and Kunio Sakakibara, Nagoya Institute of Technology, Japan*
2: 14:20 DOA Measurements Using Synthetic Aperture Method in Outdoor Environments
   *Kazuma Tomimoto, Masayuki Miyashita, Hideki Omote and Ryo Yamaguchi, Softbank Corp., Japan*
3: 14:40 Effect of Redundancy of Element Placement on DOA Estimation with Circular Array
   *Rikako Yamano, Nobuyoshi Kikuma and Kunio Sakakibara, Nagoya Institute of Technology, Japan*
4: 15:00 Estimation of Received Signals at Arbitrary Remote Locations based on Estimation of Arriving Waves by Compressed Sensing
   *Tomoya Sugimoto, Misato Iwai and Hidechi Sasaoka, Doshisha University, Japan*
5: 15:20 Target Direction Estimation by MIMO Radar Using Root-MUSIC with Minimum Redundancy Array
   *Masatake Hokiguchi, Nobuyoshi Kikuma and Kunio Sakakibara, Nagoya Institute of Technology, Japan*

**4D1: Millimeter-Wave Antennas and Modules**
9:00 - 10:40 (Room D)
Co-Chairs: Noriharu Suematsu (Tohoku University, Japan)
Vladimir Veremei (Qualcomm Inc., United States)
1: 9:00 BGA Organic Module for 60 GHz LOS communications
   *Aimeric Bisognin, (1) Diane Titz (1,2), Frederic Gianselatto (2), Pierino Calascibetta (2), Jean-Michel Riviere (3), Didier Campos (3), Daniel Gloria (3), Frederic Devillers (3) and Cyril Luxey (3), (1 Université Nice Sophia Antipolis, France, (2) ST Microelectronics, France, (3) Orange Labs-CREMANT, France*
2: 9:20 Operational Frequencies of In-Body/Out-Body Dual Use Antenna for Tablet/Pill Implementation
   *Takuto Sato, Mizuki Motoyoshi, Suguru Kameda and Noriharu Suematsu, Tohoku University, Japan*
3: 9:40 5G Antenna in Inverted Microstrip Gap Waveguide Technology Including a Transition to Microstrip
   *Eva Rajo-Iglesias (1,2) and Astrid Alagba Brazalez (2), (1) University Carlos III, Spain, (2) Ericsson Research, Sweden*
4: 10:00 UHF-Band Meander Line Antenna and 60-GHz-Band Patch Antenna with Single Feed Structure for 5G Terminal Application
   *Satoshi Yoshida, Keishi Maruyama, Daisuke Matsuhashita and Kenjiro Nishikawa, Kagoshima University, Japan*
5: 10:20 Side Coaxial Connector Feed Design for a Millimeter-Wave Patch Antenna Measurement
   *Mizuki Motoyoshi, Wenyiing Ye, Suguru Kameda and Noriharu Suematsu, Tohoku University, Japan*

**4D2: Base Station Antennas for Mobile Communications**
11:00 - 12:40 (Room D)
Co-Chairs: Ryo Yamaguchi (Softbank Corporation, Japan)
Hao Wang (Nanjing University of Science and Technology, China)
1: 11:00 Design of a Dual-Band MIMO Antenna with Orthogonal Bi-directional Radiation Patterns
   *Ho-Yu Lin and Masayuki Nakano, KDDI R&D Labs Inc., Japan*
2: 11:20 Broadband Dual-Polarized Antenna Array For Base Station Applications
   *Wei-Ji Chen (1), Joseph Poujoung Wang (1), Li-Ruei Kuo (2) and Tai-Hung Lin (2), (1) Industrial Technology Research Institute, Taiwan, (2) Wha Yu Industrial Co. Ltd, Taiwan*
3: 11:40 Design of A Dual-Band Verre de Champagne Fractal CPW Antenna for LTE and Aircraft Altimeter Application
   *Tanapat Phasithjirakul (1), Teerapat Wannasirimongkol (2), Apirada Namsang (1), Reungyot Lerdwanittipit (2) and Pongsaithorn Chomthong (2), (1) Civil Aviation Training Center, Thailand, (2) King Mongkut’s University of Technology North Bangkok, Thailand*
4: 12:00 Radiation Analysis of Antenna Located on Mobile Phone Cylindrical Tower by Using UTD Method
   *Kittisak Phaeboa (1), Titipong Lertwiriyaprapa (2), Rattapon Suwalak (3) and Chuwong Phongcharoenpanich (3), (1) King Mongkut’s University of Technology North Bangkok, Thailand, (2) King Mongkut Institute of Technology Ladkrabang, Thailand*

**4D3: Adaptive and Phased Array**
14:00 - 15:40 (Room D)
Co-Chairs: Eisuke Nishiyma (Saga University, Japan)
Hervé Legay (Thales Alenia Space, France)
1: 14:00 Incoming Waves Separating Adaptive Array for ISDB-T Mobile Reception
   *Takanobu Tabata (1,2), Mitsoshi Fujimoto (2), Satoshi Hori (1), Tomohisa Wada (3,4) and Hirokazu Asato (1), (1) Kojima Industries Corporation, Japan, (2) University of Fukui, Japan, (3) University of the Ryukyus, Japan, (4) Magna Design Net, Inc., Japan*
2: 14:20 Compact Phased Array Design with Beamforming Network for 5G MIMO System at 60-GHz
   *Anil Kumar Pandey, Keysight Technologies, India*
3: 14:40 Feasibility Study on Delay Difference Estimation through Space for Phased Array Antennas
   *Takashi Maruyama (1,2), Hiroyuki Matsumura (2), Satoshi Yamaguchi (1), Masataka Otsuka (1) and Hiroaki Miyashita (1,2), (1) Mitsubishi Electric Engineering Company Limited, Japan, (2) Mitsubishi Electric Corporation, Japan, (2) Mitsubishi Electric Engineering Company Limited, Japan*
4: 15:00 The Planar Array Antenna with Two-Dimensional Radiation Pattern Reconfigurable Elements
   *Takashi Uesaka, Takashi Maruyama, Satoshi Yamaguchi, Naoyuki Yamamoto, Masataka Otsuka and Hiroaki Miyashita, Mitsubishi Electric Corporation, Japan*
5: 15:20 Beam Switched Antenna Using Inverted F Antenna for Mobile Terminal
   *Shun Yonezawa (1), Rohani Bakar (1), Hiroyuki Arai (1,2), Amane Miura (1,2) and Hiroyuki Tsuji (1), (1) Yokohama National University, Japan, (2) NICT, Japan*
## Technical Program

### 4E1: Antennas for MIMO Applications  
**October 28 (Fri)**  
9:00 - 10:40 (Room E)  
**Co-Chairs:** RongLin Li (South China University of Technology, China)  
Takashi Yanagi (Mitsubishi Electric Corporation, Japan)

1. **9:00**  
   **Planar Triple-band MIMO Dipole Antenna for LTE / WLAN Access Points**  
   Jui-Han Lu, *Yong-Yong Zhang* and Ming-Tsung Hung, National Kaohsiung Marine University, Taiwan

2. **9:20**  
   **MIMO Dipole Antenna with Triple-band Operation for LTE Femtocell Access Points**  
   Jui-Han Lu, *Chia-Hao Cheng* and Ming-Tsung Hung, National Kaohsiung Marine University, Taiwan

3. **9:40**  
   **A Wideband 4-Port MIMO Antenna Using Leaf-Shaped Notch Antennas**  
   *Jumpei Motohashi* and Manabu Yamamoto, Hokkaido University, Japan

4. **10:00**  
   **A Dual-Band Star Chain Fractal CPW Antenna for LTE and RF Altimeter Systems**  
   *Raviroj Somvadee*, Apirad Namsang, Reungyot Lerdwanittip and Pongsatrom Chomtong, *Civil Aviation Training Center, Thailand*, *King Mongkut's University of Technology North Bangkok, Thailand*

5. **10:20**  
   **Omnidirectional Dual Polarized Low-profile Antenna for 4G MIMO Indoor Applications**  
   *Xia Bai*, Ming Su, Yuanan Liu and Shulan Li, *Beijing University of Posts and Telecommunications, China*

### 4E2: Broadband Antennas  
**11:00 - 12:40 (Room E)**  
**Co-Chairs:** Danai Torrungrueng (Asian University, Thailand)  
Nobuyasu Takemura (Nippon Institute of Technology, Japan)

1. **11:00**  
   **Compact LTE/WWAN Antenna with Reduced Ground Effects for Tablet/Laptop Applications**  
   *Chow-Yen-Desmond Sim*, Zhe-Yu Li and Chih-Yang Chiang, *Feng Chia University, Taiwan*

2. **11:20**  
   **Study of Dual Band RFID Near field Antenna for 0.92 GHz/2.45GHz**  
   *Zijian Xing*, Kun Wei, Ling Wang and Jianying Li, *Northwestern Polytechnical University, China*

3. **11:40**  
   **Potential Causes of PIM Problems in the LTE Outdoor Base Station Multi-Band Antennas**  
   *Sheng-Ju Chou*, *Hsi-Tseng Chou* and Li-Ruei Kuo, *Yuan Ze University, Taiwan*, *National Taiwan University, Taiwan*, *Whayu Industrial Corp. Inc., Taiwan*

4. **12:00**  
   **A Novel Broadband Rectenna for Energy Harvesting**  
   *Shenyi Song*, Ming Su, Yuanan Liu, Shulan Li and Bihua Tang, *Beijing University of Posts and Telecommunications, China*

5. **12:20**  
   **Design and Analysis of Through Dielectric Copper Posts Based 3D Antenna**  
   *Madhav Rao* and Sowmya N, *International Institute of Information Technology Bangalore, India*