

# **2017 IEEE Conference on Antenna Measurements & Applications (CAMA 2017)**

**Tsukuba, Japan  
4-6 December 2017**



**IEEE Catalog Number: CFP1799X-POD  
ISBN: 978-1-5090-5029-1**

**Copyright © 2017 by the Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP1799X-POD
ISBN (Print-On-Demand):	978-1-5090-5029-1
ISBN (Online):	978-1-5090-5028-4

**Additional Copies of This Publication Are Available From:**

Curran Associates, Inc  
57 Morehouse Lane  
Red Hook, NY 12571 USA  
Phone: (845) 758-0400  
Fax: (845) 758-2633  
E-mail: [curran@proceedings.com](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2017 IEEE Conference on Antenna Measurements & Applications (CAMA)

## Antenna Metrology, Precision Antenna Measurement and Related Technology I

<i>Three Antenna Ranges Based on Articulated Robotic Arms at the National Institute of Standards and Technology - Usability for Over-the-Air and Standard Near-Field Measurements</i> David Novotny (US National Institute of Standards and Technology, USA), Joshua Gordon (National Institute of Standards and Technology, USA), Michael S Allman (National Institute of Standards and Tehnology, USA), Jeffrey Guerrieri (National Institute of Standards and Technology, USA), Alexandra Curtin (National Institute of Standards and Technolgy, USA) .....	1
<i>Antenna Measurements and Applications in Millimeter Frequency Range</i> Jin-Seob Kang (KRISS, Korea) .....	5
<i>Errors estimation regarding probes in the measurements using the Kim method</i> Masanobu Hirose (National Institute of Advanced Industrial Science and Technology, Japan), Satoru Kurokawa (National Institute of Advanced Industrial Science and Technology, Japan) .....	9
<i>Amplitude and Phase Errors Analysis on Spherical Multi-Probe Antenna Near-Field Measurement</i> Chufeng Hu (Northwestern Polytechnical University, P.R. China), Lifang Guo (Northwestern Polytechnical University, P.R. China), Peng Guo (Northwestern Polytechnical University, Xi'an, Shaanxi Province, P.R. China) .....	12

## Antenna Applications for Transportation I

<i>An Outdoor Measurement Technique for Large Structures Antennas</i> Cheick Diakite (Université Cote d'Azur, CNRS, LEAT, France), Jerome Lanteri (Université Nice Sophia Antipolis, France), Claire Migliaccio (Université Nice Sophia Antipolis, France) .....	16
<i>Study of the New Application using the Millimeter-Wave in the Railway</i> Kazuki Nakamura (Railway Technical Research Institute, Japan), Nagateru Iwasawa (Railway Technical Research Institute, Japan), Kunihiro Kawasaki (Railway Technical Research Institute, Japan), Nobuhiko Shibagaki (Hitachi Kokusai Electric, Japan), Yosuke Sato (Hitachi Kokusai Electric Inc., Japan), Kenichi Kashima (Hitachi Kokusai Electric Inc., Japan) .....	20
<i>Millimeter-Wave Communication System Using Photonic-Based Remote Antennas for Configurable Network in Dense User Environment</i> Hiroshi Murata (Osaka University, Japan), Yui Otagaki (Osaka University, Japan), Naruto Yonemoto (Electronic Navigation Research Institute, MPAT, Japan), Yasuyuki Kakubari (Electronic Navigation Research Institute, MPAT, Japan), Kensuke Ikeda (Central Research Institute of Electric Power Industry, Japan), Nobuhiko Shibagaki (Hitachi, Japan), Hiroyuki Toda (Doshisha University, Japan), Hiroshi Mano (Koden Techno Info KK & EverySense Inc, Japan), Usman Habib (University of Kent, United Kingdom (Great Britain)), Nathan J Gomes (University of Kent, United Kingdom (Great Britain)) .....	24
<i>Design of Antenna-Coupled-Electrode Electro-Optic Modulators for 5G Mobile Systems</i> Yui Otagaki (Osaka University, Japan), Yuki Matsukawa (Osaka University, Japan), Hiroshi Murata (Osaka University, Japan), Atsushi Sanada (Osaka University, Japan), Satoru Kurokawa (National Institute of Advanced Industrial Science and Technology, Japan) .....	28

## Recent Research of Radio Wave Propagation in Natural and Living Environments

<i>Measurements of Cross-Polarization Discrimination Degradation of Ka-band Satellite Communication Signals in Thunderstorm Events</i> Yasuyuki Maekawa (Osaka Electro-Communication University, Japan) .....	32
<i>Estimation of Effective Earth Radius Factor under Overreach Interference Condition of Terrestrial TV Wave from Korea to Japan</i> Koichi Shin (Hiroshima City University, Japan), Koki Kanekura (Hiroshima City University, Japan), Masahiro Nishi (Hiroshima City University, Japan) .....	36
<i>Path Loss Model in Crowded Areas Considering Multiple Human Blockage at 4.7 and 26.4 GHz</i> Mitsuki Nakamura (NTT Corporation, Japan), Motoharu Sasaki (NTT Access Network Service Systems Laboratories, Japan), Naoki Kita (Nippon Telegraph and Telephone Corp., Japan), Yasushi Takatori (NTT Network Innovation Laboratories, Japan) .....	40
<i>Prediction Accuracy of Hybrid Method Based on Ray-Tracing and Effective Roughness Model in Indoor Environment for Millimeter Waves</i> Minoru Inomata (NTT DOCOMO, INC., Japan), Tetsuro Imai (NTT DOCOMO, INC., Japan), Koshiro Kitao (NTT DOCOMO, INC., Japan), Yukihiro Okumura (NTT DOCOMO, INC., Japan), Motoharu Sasaki (NTT Access Network Service Systems Laboratories, Japan), Yasushi Takatori (NTT Network Innovation Laboratories, Japan) .....	44
<i>Evaluation of Cell Quality by Comparing 2D and 3D Base Station Antenna Patterns</i> Masayuki Nakano (KDDI Research, Japan) .....	47

## Recent Antenna Techniques

<i>Study on Reconfigurable Corrugated Waveguide Using Moveable Shorting Plate</i> Kei Yokokawa (Mitsubishi Electric Corporation, Japan), Narihiro Nakamoto (Mitsubishi Electric Corporation, Japan), Satoshi Yamaguchi (Mitsubishi Electric Corporation, Japan), Toru Fukasawa (Mitsubishi Electric Corporation, Japan), Jun Goto (Mitsubishi Electric Corporation, Japan), Masataka Ohtsuka (Mitsubishi Electric Corporation, Japan), Kazunari Kihira (Mitsubishi Electric Corporation, Japan), Tomohito Takahashi (Mitsubishi Electric Corporation, Japan), Tomohiro Mizuno (Mitsubishi Electric Corporation, Japan), Hiroaki Miyashita (Mitsubishi Electric Corporation, Japan) .....	49
<i>A Broadband Resonant Cavity Antenna Using a Metamaterial Based on Double-Side Identical Arrays</i> Komsan Kanjanasit (Prince of Songkla University, Thailand) .....	51
<i>Spiral Antenna with Reconfigurable HIS using Liquid Crystals for Monopulse Radar Application</i> Sarah Yasmin Mohamad (International Islamic University Malaysia, Malaysia), Robert Cahill (Queens University Belfast, United Kingdom (Great Britain)) .....	55
<i>Plane Wave Excitation of Optical Leaky Waveguide Antenna by Arrayed Slow Taper</i> Hashiguchi Hiroshi (Yokohama National University, Japan), Toshihiko Baba (Yokohama National University, Japan), Hiroyuki Arai (Yokohama National University, Japan) .....	59

## Antenna Metrology, Precision Antenna Measurement and Related Technology II

<i>Evaluating the Effectiveness of Applying the Phase Center for Antenna Measurements</i> Katsushige Harima (National Institute of Information and Communications Technology, Japan) .....	61
<i>Implementation and Characterization of GTEM CELL using Ferrite Tile Absorber</i> Sarinya Pasakawee (National Institute of Metrology Thailand, Thailand), Vitawat Sittakul (King Mongkut's University of Technology North Bangkok, Thailand) .....	65
<i>Research on Calibration Accuracy of D-Dot transient electric field sensor</i> Yunsheng Jiang (Tsinghua University, P.R. China), Cui Meng (Tsinghua University, P.R. China) .....	69
<i>Analysis and Measurement of Rapidly Attenuating Fields Around Magnetic Multipoles in Low-Frequency Band</i> Ai-ichiro Sasaki (NTT Corporation, Japan), Junichi Kodate (NTT Corporation, Japan) .....	72
<i>Development of permittivity measurement system at microwave and millimeter wave frequencies for low-loss substrate characterization</i> Yuto Kato (National Institute of Advanced Industrial Science and Technology & Osaka University, Japan), Yuanfeng She (National Institute of Advanced Industrial Science and Technology, Japan), Masahiro Horibe (National Institute of Advanced Industrial Science and Technology, Japan), Satoru Kurokawa (National Institute of Advanced Industrial Science and Technology, Japan) .....	76

## Antenna Applications for Transportation II

<i>W-Band Millimeter-Wave Patch Antennas on Optical Modulator for Runway Security Systems</i> Yusuf Nur Wijayanto (Indonesian Institute of Sciences (LIPI), Indonesia), Atsushi Kanno (National Institute of Information and Communications Technology, Japan), Hiroshi Murata (Osaka University, Japan), Tetsuya Kawanishi (Waseda University & National Institute of Information and Communications Technology, Japan), Adhi Purwoko (Indonesian Institute of Sciences, Indonesia) .....	79
<i>Field Trials for Air-to-Ground Direct Communication Using LTE on VHF Band</i> Tatsuro Yata (NTT DOCOMO, INC, Japan), Yoshisuke Yamamoto (NTT DOCOMO, INC, Japan), Kenta Kimishima (NTT DOCOMO, INC, Japan), Michiaki Onishi (NTT DOCOMO, INC, Japan), Naruto Yonemoto (Electronic Navigation Research Institute, MPAT, Japan), Kazuyuki Morioka (Electronic Navigation Research Institute, Japan), Yasuto Sumiya (Electronic Navigation Research Institute, Japan) .....	83
<i>ADS-B Anti-Spoofing Performance of Monopulse Technique with Sector Antennas</i> Junichi Naganawa (Electronic Navigation Research Institute, Japan), Hirohisa Tajima (Electronic Navigation Research Institute, Japan), Hiromi Miyazaki (Electronic Navigation Research Institute, Japan), Tadashi Koga (Electronic Navigation Research Institute, Japan), Camille Chomel (French Civil Aviation School, France) .....	87
<i>Antenna Configuration Mitigating Ground Reflection Fading on Airport Surface for AeroMACS</i> Junichi Naganawa (Electronic Navigation Research Institute, Japan), Kazuyuki Morioka (Electronic Navigation Research Institute, Japan), Junichi Honda (Electronic Navigation Research Institute, Japan), Naoki Kanada (Electronic Navigation Research Institute & Faculty of Science and Engineering, Waseda University, Japan), Naruto Yonemoto (Electronic Navigation Research Institute, MPAT, Japan), Yasuto Sumiya (Electronic Navigation Research Institute, Japan) .....	91

## Research in the Field of Radar, Telecommunications & Electronic Warfare

<i>Directivity and ellipticity study for planar and 3D conformal RF-seeker antennas</i> Luc Fourtignon (Cranfield University & Telecom-Bretagne, United Kingdom (Great Britain)), Yves Quéré (Université de Brest, France), Christian Person (Lab-STICC/MOM UMR CNRS, France), Alessio Balleri (Cranfield University, Defence Academy - College of Management and Technology, United Kingdom (Great Britain)), Annaig Martin-Guennou (Université de Brest, France), Eric Rius (Université de Brest, France), Guillaume Lesueur (Thales Air Systems, France), Thomas Merlet (Thales Air Systems, France) .....	95
<i>Hybrid H-matrix/FMM solvers for antennas and RCS problems</i> Toufic Abboud (IMACS, France), Denis Barbier (IMACS, France) .....	99
<i>Metamaterial for microwave absorption improvement of pyramidal absorbers</i> Laura Pometcu (CEA, LETI, Minatec Campus & Univ\ Grenoble-Alpes, France), Ala Sharaiha (Université de Rennes 1 & IETR, France), Ratiba Benzerga (IETR - Université de Rennes 1, France), Pouliguen Philippe (DGA, France) .....	103

## Radio Propagation

<i>Empirical Characterization of Fading Effects Due to On-axis Rotation of an Embedded Antenna</i> Calvin Artemies Hilario (Advanced Science and Technology Institute & University of the Philippines - Diliman, Philippines), Joel Joseph Jr. S. Marciano (University of the Philippines & Wireless Communications Engineering Laboratory, Philippines) .....	106
<i>An Improved Two-way Parabolic Equation Method in Obstacles Environmen</i> Qiao-Fei Wei (National University of Defense Technology, P.R. China) .....	110
<i>Smartphone Based LoRa In-soil Propagation Measurement for Wireless Underground Sensor Networks</i> Xue-fen Wan (North China Institute of Science and Technology, P.R. China), Jian Cui (Beijing University of Aeronautics and Astronautics, P.R. China), Xing-jing Du (North China Institute of Science and Technology, P.R. China), Yi Yang (Donghua University, P.R. China), Jing-wen Zhang (Donghua University, P.R. China), Muhammad Sardar (Donghua University, P.R. China) .....	114
<i>Numerical and experimental investigations of radio wave propagation at 2450 MHz for optimum network coverage</i> Vikass Monebhurrn (SUPELEC, France) .....	118
<i>Improvement of Communication Performance in Indoor Environment using Screen Printed Frequency Selective Film</i> In Gon Lee (Kongju National University, Korea), Sung-Sil Cho (Kongju National University, Korea), Ic Pyo Hong (Kongju National University, Korea), Sun-Hong Yoon (KETI, Korea) .....	120

## Advances in Electromagnetic Inverse Scattering: Theory and Applications I

<i>Microwave Modeling and Experiments for Non Destructive Control Improved Quality of fruit</i> Christian Y. Pichot (Université de Nice - Sophia Antipolis, CNRS, France), Jerome Lanteri (Université Nice Sophia Antipolis, France), Claire Migliaccio (Université Nice Sophia Antipolis, France), Hawraa Jawad (Université Côte d'Azur, CNRS, France), Ian G Platt (Lincoln Agritech Ltd, New Zealand), Ian M Woodhead (Lincoln, New Zealand), Adrian Tan (Lincoln Agritech Limited & Lincoln University, New Zealand), Kimberley W. Eccleston (Lincoln Agritech Ltd, New Zealand) .....	124
<i>Detecting granulated fruit by measuring dual-frequency back scattered waves</i> C. Kittiyapunya (KMITL, Thailand), Monai Krairiksh (King Mongkut's Institute of Technology Ladkrabang, Thailand), Chuwong Phongcharoenpanich (KMITL, Thailand) .....	128
<i>Inverse scattering methods as a tool for the design of GPCs devices</i> Roberta Palmeri (University of Reggio Calabria, Italy), Martina Teresa Bevacqua (University Mediterranea, Italy), Andrea Francesco Morabito (University Mediterranea of Reggio Calabria, Italy), Tommaso Isernia (University of Reggio Calabria, Italy) .....	130
<i>Feasibility Evaluation of Interference Mitigation Methodology for Optically-Connected Millimeter-Wave Radar Based on Common Transmission Signal</i> Shunichi Futatsumori (Electronic Navigation Research Institute, Japan), Kazuyuki Morioka (Electronic Navigation Research Institute, Japan), Akiko Kohmura (Electronic Navigation Research Institute, Japan), Norihiko Miyazaki (Electronic Navigation Research Institute, Japan), Naruto Yonemoto (Electronic Navigation Research Institute, MPAT, Japan) .....	133

## Antennas in EMC Measurement

<i>Reflection Characteristic Measurements of Thin EM Wave Absorbers in the Microwave Band</i> Shinichiro Yamamoto (University of Hyogo, Japan), Kenichi Hatakeyama (University of Hyogo, Japan), Takanori Tsutaoka (Hiroshima University, Japan) .....	135
<i>Investigation of Deconvolution Filters for High-Resolution Time-Domain Antenna Measurements - A numerical study</i> Zhong Chen (ETS-Lindgren, USA), Zubiao Xiong (ETS-Lindgren, Inc., USA) .....	138
<i>Plane Wave Integral Representations inside a Reverberation Chamber having Field Anisotropy</i> Young Seung Lee (Electronics and Telecommunications Research Institute, Korea), Hyung Do Choi (ETRI, Korea) .....	142
<i>Measurement of ESD Noise Voltage Induced on Human Body By Considering It as an Equivalent Antenna</i> Keinosuke Nagai (Nagoya Institute of Technology, Japan), Daisuke Anzai (Nagoya Institute of Technology, Japan), Jianqing Wang (Nagoya Institute of Technology, Japan) .....	144
<i>Effect of Concentration of Solution on Microwave Absorption and Shield</i> The-Nan Chang (Tatung University, Taiwan) .....	146

## Signal Processing, Data Analysis and Systems for SAR

<i>High-Resolution 2D SAR Imaging by the Millimeter-Wave Automobile Radar</i> Hiroyoshi Yamada (Niigata University, Japan), Takumi Kobayashi (Niigata University, Japan), Yoshio Yamaguchi (Niigata University, Japan), Yuuichi Sugiyama (Fujitsu TEN Limited, Japan) .....	149
<i>Single-pass cross-track interferometry SAR analysis based on Particle Swarm Optimization</i> Toshifumi Moriyama (Nagasaki University, Japan), Fumiaki Jitsufuji (Nagasaki University, Japan), Jyunpei Uemoto (National Institute of Information and Communications Technology, Japan) .....	151
<i>L-band interferometric UAVSAR</i> Masanobu Shimada (Tokyo Denki University & Japan Aerospace Exploration Agency, Japan), Takashi Kohno (JAXA, Japan) .....	155
<i>2-D and 3-D Near Range SAR Imaging</i> Motoyuki Sato (Tohoku University, Japan) .....	157
<i>Polarimetric scattering analysis from simplified man-made objects model covered by snow layer</i> Ryoichi Sato (Niigata University, Japan), Shusei Hayashi (Niigata University, Japan), Yoshio Yamaguchi (Niigata University, Japan), Hiroyoshi Yamada (Niigata University, Japan) .....	161

## Wireless System

<i>Relationship between Receiving Antenna Pattern and Aircraft Position using DTTB Signal Delays</i> Junichi Honda (Electronic Navigation Research Institute, Japan), Masato Watanabe (Electronic Navigation Research Institute, Japan), Yoshio Makita (Electronic Navigation Research Institute, Japan), Takuya Otsuyama (Electronic Navigation Research Institute, Japan) .....	164
<i>Preliminary Assessment of an Lp Banach-Space Inversion Approach for Through-the-Wall Imaging</i> Alessandro Fedeli (University of Genoa, Italy), Matteo Pastorino (University of Genoa, Italy), Andrea Randazzo (University of Genoa, Italy), Silvio Todella (University of Genoa, Italy) .....	167
<i>Estimate Distance Measurement using NodeMCU ESP8266 based on RSSI Technique</i> Suvankar Barai (Jadavpur University, India), Debajyoti Biswas (Jadavpur University, India), Buddhadeb Sau (Jadavpur University, Kolkata, India) .....	170
<i>Tri-Band Ring Dielectric Resonator Based Integrated Antenna for WLAN/WiMAX Applications</i> Anand Sharma (Indian School of Mines, Dhanbad, India), Gourab Das (Indian School of Mines Dhanbad, India), Ravi Kumar Gangwar (IIT(ISM) Dhanbad, India) .....	174

## Advances in Electromagnetic Inverse Scattering: Theory and Applications I

<i>Metamaterial-based Microwave Tomography and Remote Sensing Using Linear Sampling Method</i> Mehdi Salarkaleji (Wayne State University, USA), Mohammadreza Eskandari (Isfahan University of Technology, Iran), Jimmy Ching-Ming Chen (Wayne State University, USA), Chung-Tse Michael Wu (Rutgers University, USA) .....	178
---	-----



## Recent Antenna Techniques

### *Design of Frequency Selective Surface by Matrix Transformation of Layer Structure to Reduce Return Loss of Thick Dielectric Plate*

Tomihiko Ikegami (Nagoya Institute of Technology, Japan), Kunio Sakakibara (Nagoya Institute of Technology, Japan), Goro Nomoto (Nagoya Institute of Technology, Japan), Shota Ino (Nagoya Institute of Technology, Japan), Nobuyoshi Kikuma (Nagoya Institute of Technology, Japan) ..... 182

## Antenna Applications for Transportation I

### *Vector Signal Generation by Optical Frequency Doubler for MMW Train Communication Systems*

Naoki Kanada (Electronic Navigation Research Institute & Faculty of Science and Engineering, Waseda University, Japan, Japan), Naruto Yonemoto (Electronic Navigation Research Institute, MPAT, Japan), Tetsuya Kawanishi (Waseda University & National Institute of Information and Communications Technology, Japan) ..... 186

## Lunch & Poster Session

### *RCS Reduction of Array Antenna Using Circulator and Phase Shifter*

Narihiro Nakamoto (Mitsubishi Electric Corporation, Japan), Toru Takahashi (Mitsubishi Electric Corporation, Japan), Toru Fukasawa (Mitsubishi Electric Corporation, Japan), Naofumi Yoneda (Mitsubishi Electric Corporation, Japan) ..... 190

### *Far Field Estimation on Earth from Near Field Measurements for Car Windscreen based Antenna*

Thomas Basikolo (Yokohama National University, Japan), Hiroyuki Arai (Yokohama National University, Japan) ..... 194

### *Study of RCS of Complex Target: Experimental Measurements and Gaussian Beam Summation method*

Helmi Ghanmi (ENSTA Bretagne, France), Ali Khenchaf (ENSTA Bretagne & LAB-STICC UMR CNRS 6285, France), Pouliguen Philippe (DGA, France), Papa Ousmane Leye (CEA DAM, Gramat France, France) ..... 196

### *Compact Batteryless Photodiode Module for Measurement of Radiation Characteristics*

Shingo Yamaura (Mitsubishi Electric Corporation, Japan), Junya Nishioka (Mitsubishi Electric Corporation, Japan), Eisuke Haraguchi (Mitsubishi, Japan), Toru Fukasawa (Mitsubishi Electric Corporation, Japan), Toshiyuki Ando (Mitsubishi Electric Corporation & Information Technology R&D Center, Japan), Yasuhiro Nishioka (Mitsubishi Electric Corporation, Japan), Naofumi Yoneda (Mitsubishi Electric Corporation, Japan) ..... 200

### *Improvement of MAW Spiral Measurements by Filtering Spherical Modes in the Far Field*

Riley Pack (University of Colorado Boulder, USA), Gregor Lasser (University of Colorado, Boulder, USA), Dejan Filipovic (University of Colorado at Boulder, USA) ..... 204

<i>Study of Radiation Characteristic Measurement System of 3.5 GHz Active Antenna System</i> Keisuke Sato (Denki Kogyo co., Ltd., Japan), Nozomu Sasaki (Denki Kogyo co., Ltd., Japan), Shuta Morinaga (Denki Kogyo co., Ltd., Japan), Susumu Miura (Denki Kogyo co., Ltd., Japan), Kota Shishido (Denki Kogyo co., Ltd., Japan), Yukitaka Takahashi (Denki Kogyo co., Ltd., Japan), Katsumori Sasaki (Denki Kogyo Co., Ltd., Japan), Ichiro Oshima (Denki Kogyo Co., Ltd., Japan) .....	208
<i>A Wide-Band Wide-Beam Dielectric Resonator Antenna</i> Yan He (National University of Defense Technology, P.R. China), Weihua Wang (National University of Defense Technology, P.R. China), Xiangyu Du (National University of Defense Technology, P.R. China) .....	210
<i>A New Method to Enhance the Omnidirectionality of the Dielectric Resonator Antenna Array</i> Taolin Liu (National University of Defense Technology, P.R. China), Wei Zhang (National University of Defense Technology, P.R. China) .....	213
<i>Wideband MIMO Hybrid Cylindrical Dielectric Resonator Antenna with Improved Diversity Performance</i> Gourab Das (IIT(ISM) Dhanbad, India), Nimesh Sahu (IIT(ISM) Dhanbad, India), Anand Sharma (Indian School of Mines, Dhanbad, India), Ravi Kumar Gangwar (IIT(ISM) Dhanbad, India) .....	217
<i>Dual Conformal Strip fed Cylindrical Dielectric Resonator Antenna for Circular Polarization</i> Reena Kumari (IIT(ISM) Dhanbad, India), Ravi Kumar Gangwar (IIT(ISM) Dhanbad, India) .....	221
<i>Frequency Control of a Circularly-Polarized Ring Microstrip Antenna Fed by an L-probe with Four Varactor Diodes</i> Yuma Ikeda (Saitama University, Japan), Sakuyoshi Saito (Saitama University, Japan), Yuichi Kimura (Saitama University, Japan) .....	225
<i>Bandwidth Enhancement of Circular Polarized XBand Microstrip Array Antenna using ERS</i> Farohaji Kurniawan (Chiba University & Indonesian National Institute of Aeronautics and Space, Japan), Josaphat Tetuko Sri Sumantyo (Chiba University, Japan), Atik Bintoro (Indonesian National Institute of Aeronautics and Space, Indonesia), Dede andhika Purnamasari (Indonesian National Institute of Aeronautics and Space, Indonesia) .....	228
<i>Dual circularly polarization antenna with High XPD for downlink communication of earth observation satellite</i> Kaneko Tomoki (The University of Tokyo, Japan) .....	232
<i>Performance Analysis and Simulation of Two Conformal Arrays with Dual Patch and Quadruple Patch Antenna Elements on the Human Trunk</i> Srabonty Soily (University of Liberal Arts Bangladesh, Bangladesh), Rezaul Karim Mazumder (University of Liberal Arts Bangladesh, Bangladesh) .....	235
<i>A High Gain Collinear Antenna with Interdigital EBG Reflector for WLAN System</i> Pongsathorn Chomtong (King Mongkut's University of Technology North Bangkok, Thailand), Prayoot Akkaraekthalin (King Mongkut's University of Technology North Bangkok, Thailand) .....	239
<i>Dual-Band Dipole Antenna Based on an Anisotropic Fractal</i> Akmara Imanbayeva, A. K. (Institute of Experimental and Theoretical Physics Al Farabi Kazakh National University & IETP, Kazakhstan), Zeinulla Zhanabaev (Kazakh National University, Kazakhstan), Beibit Karibayev (Institute of Experimental and Theoretical Physics, Kazakhstan), Amirkhan Temirbayev (Kazakh National University, Kazakhstan), Timur Namazbayev (Institute of Experimental and Theoretical Physics, Kazakhstan) .....	N/A

<i>Design of a Dual-Polarized Triple-Band Hybrid MIMO Antenna for WLAN/WiMAX Applications</i> Nikesh Sahu (IIT(ISM) Dhanbad, India), Gourab Das (IIT(ISM) Dhanbad, India), Anand Sharma (Indian School of Mines, Dhanbad, India), Ravi Kumar Gangwar (IIT(ISM) Dhanbad, India) .....	246
<i>A phase-shifterless beam scanning array antenna for agricultural applications</i> Phaisan Ngamjanyaporn (Rangsit University, Thailand), Monai Krairiksh (King Mongkut's Institute of Technology Ladkrabang, Thailand) .....	249
<i>Omnidirectional UWB Antenna for Radar Detector Applications</i> Mashury Wahab (PPET-LIPI, Indonesia), Yussi Saputera (Indonesian Institute of Sciences, Indonesia), Topik Teguh Estu (PPET LIPI, Indonesia) .....	253
<i>Spatial Diversity for HF Remote Sensors</i> Terry Koziniec (Murdoch University, Australia), David E Murray (Murdoch University, Australia), Michael Dixon (Murdoch University, Australia) .....	257
<i>A Dual-Band Cavity Bandpass Filter using Interdigital Technique</i> Pongsathorn Chomtung (King Mongkut's University of Technology North Bangkok, Thailand), Prayoot Akkaraekthalin (King Mongkut's University of Technology North Bangkok, Thailand) .....	261
<i>ISAR Imaging of Rotating Targets via Estimation of Rotation Velocity and Keystone Transform</i> Min Liu (Nanjing University, P.R. China), Xinggan Zhang (Nanjing University, P.R. China) .....	265

## Advances in Electromagnetic Inverse Scattering: Theory and Applications II

<i>Radar Imaging of Breast Cancer Using Kirchhoff Migration and Singular Value Decomposition</i> Takuya Sakamoto (University of Hyogo & University of Hawaii at Manoa, Japan), Hang Song (Hiroshima University, Japan), Takamaro Kikkawa (Hiroshima University, Japan) .....	268
<i>Breast tumor detection with microwave applicators in open air</i> Nikola Petrovic (Mälardalen University, Sweden), Magnus Otterskog (Mälardalen University, Sweden), Per Olov Risman (Mälardalen University, Sweden) .....	272
<i>Microwave Data Inversion in Hemorrhagic Brain Stroke Imaging: A Newton-Conjugate-Gradient Based Approach in <math>L_p</math> Banach Spaces</i> Igor Bisio (University of Genoa, Italy), Alessandro Fedeli (University of Genoa, Italy), Fabio Lavagetto (University of Genoa, Italy), Matteo Pastorino (University of Genoa, Italy), Andrea Randazzo (University of Genoa, Italy), Andrea Sciarrone (University of Genoa, Italy), Claudio Estatico (University of Genoa, Italy) .....	275
<i>Identification of Buried Objects Using Scattering Model Parameters</i> Masahiko Nishimoto (Kumamoto University, Japan) .....	279
<i>Sparsity based Regularization for Microwave Imaging with NESTA Algorithm</i> Emre Yalcin (Istanbul Technical University, Turkey), Ulas Taskin (Istanbul Technical University, Turkey), Ozgur Ozdemir (Istanbul Technical University, Turkey) .....	282

## MIMO Measurement and Related Topics

<i>Realizing In-Band Full-Duplex MIMO With Feasible RF-Chain: Key Challenges</i> Naoki Honma (Iwate University, Japan), Masakuni Tsunetzawa (Iwate University, Japan), Yoshiyuki Yamamoto (Iwate University, Japan), Yuta Kashino (Iwate University, Japan) .....	284
<i>Experimental testbed for massive MIMO at 2.4/5.1/19.5 GHz bands</i> Shigeki Morisawa (Niigata University, Japan), Kentaro Nishimori (Niigata University, Japan), Fumiya Muramatsu (Niigata University, Japan), Ryotaro Taniguchi (Niigata University, Japan), Tutomu Mitsui (Niigata University, Japan), Takefumi Hiraguri (Nippon Institute of Technology, Japan) .....	288
<i>Antenna Arrangement suitable for Massive MIMO in Actual Outdoor Environment</i> Kota Shishido (Denki Kogyo co., Ltd., Japan), Kentaro Nishimori (Niigata University, Japan), Katsumori Sasaki (Denki Kogyo Co., Ltd., Japan), Ichiro Oshima (Denki Kogyo Co., Ltd., Japan) .....	291
<i>Decoupling Mechanism for Improving the Radiation Gain of an AOA Estimation Circular Array Antenna</i> Daishi Iwamoto (University of Toyama, Japan), Kazuhiro Honda (University of Toyama, Japan), Koichi Ogawa (University of Toyama & Faculty of Engineering, Japan) .....	293
<i>Compressed Sensing-Based DOA and DOD Estimation in Bistatic Co-Prime MIMO Arrays</i> Zhimin Chen (Shanghai Dianji University, P.R. China), Peng Chen (Southeast University, P.R. China) .....	297

## Antennas for e-Health Applications

<i>Investigation of Skull Defect using Resistive Dipole Antenna on Cranial Surgery Phantom Model</i> Doojin Lee (Gwangju Institute of Science and Technology, Korea), Daniel Nowinski (Akademiska Sjukhuset, Sweden), Robin Augustine (Uppsala University, Sweden) .....	301
<i>Experimental Analysis of the Human Body Effect on Miniature LPWAN Antennas</i> Hajar Berrada (Université Côte d'Azur, CNRS, LEAT, France), Leonardo Lizzi (Université Côte d'Azur, CNRS, LEAT, France), Fabien Ferrero (University Nice Sophia Antipolis, CNRS, LEAT & CREMANT, France), Christophe Dancheski (Abeeway, France), Stephane Boudaud (Abeeway, France) .....	304
<i>Wireless interrogation of small animal phantoms with a miniature implanted UHF RFID tag</i> Van Hieu Nguyen (LEAT CNRS UMR-7248 06903 France & CNRS, France), Aliou Diallo (Université Côte d'Azur- LEAT-CNRS, France), Philippe Le Thuc (Université Côte d'Azur, CNRS, LEAT, France), Robert Staraj (Universite Cote d'Azur, CNRS, LEAT, France), Georges F Carle (Université Côte d'Azur, CEA, BIAM, France), Stéphane Lanteri (INRIA - Sophia Antipolis, France) .....	306
<i>Reliability of the Fat Tissue Channel for Intra-body Microwave Communication</i> Noor Badariah Asan (Uppsala University, Sweden & FKEKK, Universiti Teknikal Malaysia Melaka, Malaysia), Jacob Velander (Uppsala University, Sweden), Syaiful Redzwan Mohd Shah (Uppsala University, Sweden), Emadeldeen Hassan (Umeå University, Sweden & Menoufia University, Egypt), Daniel Noreland (Umeå University, Sweden), Taco Blokhuis (University Medical Center Maastricht, The Netherlands), Thiemo Voigt (Swedish Institute of Computer Science & Uppsala University, Sweden), Robin Augustine (Uppsala University, Sweden) .....	310

<i>Antenna system for radio wave type laparoscope -Part 2-</i> Takafumi Fujimoto (Nagasaki University, Japan), Takuya Matori (Nagasaki University, Japan), Keiya Kawashima (Nagasaki University, Japan), Toshiyuki Tanaka (Nagasaki University, Japan) .....	314
---	-----

## **Advances in Electromagnetic Inverse Scattering: Theory and Applications III**

<i>The Design of a UAV Mounted Snow Depth Radar</i> Adrian Tan (Lincoln Agritech Limited & Lincoln University, New Zealand), Kimberley W. Eccleston (Lincoln Agritech Ltd, New Zealand), Ian G Platt (Lincoln Agritech Ltd, New Zealand), Ian M Woodhead (Lincoln, New Zealand), Wolfgang Rack (University of Canterbury, New Zealand), Josh McCulloch (University of Canterbury, New Zealand) .....	316
<i>Direction of Arrival (DoA) for 180 degree phase ambiguity RFID UHF Reader: Limits and Perspectives</i> Dien Hoa Truong (Université Côte d'Azur, France), Fabien Ferrero (University Nice Sophia Antipolis, CNRS, LEAT & CREMANT, France), Luc Deneire (University Côte d'Azur & CNRS - I3S, France) .....	320
<i>Edge preserving regularized FBTS algorithm without a priori information on incident field</i> Toshifumi Moriyama (Nagasaki University, Japan), Zhiqi Meng (Fukuoka University, Japan), Rui Yang (South China Normal University, P.R. China), Takashi Takenaka (Nagasaki University, Japan) .....	324
<i>Measurement Set-up for the Assessment of User Impact on Handheld Terminal Beyond 10 GHz</i> Cyril Buey (Orange Labs - La Turbie, France), Fabien Ferrero (University Nice Sophia Antipolis, CNRS, LEAT & CREMANT, France), Leonardo Lizzi (Université Côte d'Azur, CNRS, LEAT, France), Philippe Ratajczak (Orange Labs, France) .....	327

## **Antenna Measurement using Photonic Technique**

<i>Electrooptic field visualization and its application to millimeter-wave and terahertz antenna characterization</i> Shintaro Hisatake (Gifu University, Japan) .....	330
<i>Photonics-based millimeter-wave radar system for handheld applications</i> Atsushi Kanno (National Institute of Information and Communications Technology, Japan), Kaori Fukunaga (National Institute of Information and Communications Technology, Japan), Naokatsu Yamamoto (National Institute of Information and Communications Technology, Japan), Tetsuya Kawanishi (Waseda University & National Institute of Information and Communications Technology, Japan) .....	334
<i>MMW Remote Antenna System of Vector Network Analyzer for Propagation Measurement in Stadium</i> Naruto Yonemoto (Electronic Navigation Research Institute, MPAT, Japan), Yasuyuki Kakubari (Electronic Navigation Research Institute, MPAT, Japan), Yui Otagaki (Osaka University, Japan), Hiroshi Murata (Osaka University, Japan), Kensuke Ikeda (Central Research Institute of Electric Power Industry, Japan) .....	337

<i>MMW Mobile Terminal Positioning using Remote Receivers</i> Yasuyuki Kakubari (Electronic Navigation Research Institute, MPAT, Japan), Naruto Yonemoto (Electronic Navigation Research Institute, MPAT, Japan) .....	341
<i>Microwave Receiving System Using Electro-absorption Optical modulator for Broadband Horn Antenna Calibration</i> Satoru Kurokawa (National Institute of Advanced Industrial Science and Technology, Japan), Masanobu Hirose (National Institute of Advanced Industrial Science and Technology, Japan) .....	345

## **Radar Cross Section and Related Technologies**

<i>Subdivision Technique in Near-Field Far-Field Transformation for 2-D Radar Cross Section Measurement for Large Objects</i> Shuntaro Omi (Tokyo University of Agriculture and Technology, Japan), Toru Uno (Tokyo University of Agricultural Technology, Japan), Takuji Arima (Tokyo University of Agriculture and Technology, Japan), Takao Fujii (Fujitsu System Integration Laboratories Ltd., Japan) .....	348
<i>Monostatic and Bistatic RCS Measurements for Thin Metasurfaces</i> Tomohiro Masaki (National Defense Academy, Japan), Yuka Ishii (National Defense Academy, Japan), Naobumi Michishita (National Defense Academy, Japan), Hisashi Morishita (National Defense Academy, Japan), Hideki Hada (Fujitsu Ltd., Japan) .....	351
<i>Fundamental study on scattering cancellation of microwaves using plasma</i> Teruki Naito (Mitsubishi Electric Corporation, Japan), Tai Tanaka (Mitsubishi Electric Corporation, Japan), Yuichiro Fukuma (Mitsubishi Electric Corporation, Japan), Osamu Sakai (Kyoto University, Japan) .....	353
<i>Experimental study for detecting vehicle in flooding urban area using quad-pol SAR data</i> Takanori Ishikuro (Niigata University, Japan), Ryoichi Sato (Niigata University, Japan), Yoshio Yamaguchi (Niigata University, Japan), Hiroyoshi Yamada (Niigata University, Japan) .....	356
<i>An Overview of Scattering Measurements of Scaled Dynamic Wind Turbines in the Context of Navigation Systems</i> Robert Geise (Technische Universität Braunschweig, Germany), Naruto Yonemoto (Electronic Navigation Research Institute, MPAT, Japan), Björn Neubauer (Technische Universität Braunschweig, Germany), Georg Zimmer (Technische Universität Braunschweig, Germany), Achim Enders (TU Braunschweig, Germany) .....	359

## **Measurement Technology in Near-Field Wireless Power Transfer**

<i>Dipole Antenna Pair Revisited from <math>kQ</math> Product and Poincare Distance for Wireless Power Transfer (invited)</i> Takashi Ohira (Toyoashi University of Technology, Japan) .....	363
<i>Simple Equivalent Circuit Model with Foreign Object on Wireless Power Transfer via Magnetic Resonant Coupling</i> Takehiro Imura (The University of Tokyo, Japan) .....	367
<i>Wireless Power Transfer Efficiency between Arbitrary Transmitter and Receiver by Using S-parameters</i> Qiaowei Yuan (National Institute of Technology, Sendai College, Japan) .....	371

<i>Comparison of two Measurement Methods on Net Power Delivery with Dual Directional Couplers</i>	
Dabo Li (National Institute of Metrology, P.R. China), Zhenfei Song (National Institute of Metrology, P.R. China), Meng Donglin (National Institute of Metrology, P.R. China) .....	374

## **Antenna Research in Vietnam: Perspectives and Recent Achievements**

<i>Impact of mechanical accuracy in mmW spherical measurements</i>	
Fabien Ferrero (University Nice Sophia Antipolis, CNRS, LEAT & CREMANT, France), Jerome Lanteri (Université Nice Sophia Antipolis, France), Laurent Brochier (Université de Nice-Sophia Antipolis, France), Claire Migliaccio (Université Nice Sophia Antipolis, France) .....	377
<i>Signal Propagation of LoRa Technology Using for Smart Building Applications</i>	
Le Huy Trinh (University of Information and Technology & Vietnam National University, Vietnam), Minh Hoang Le (Ho Chi Minh University of Technology, Vietnam), Van Xung Bui (University of Information and Technology, Vietnam), Tran Quang Khai Nguyen (Ho Chi Minh University of Technology & University Cote d'Azur, Vietnam), Fabien Ferrero (University Nice Sophia Antipolis, CNRS, LEAT & CREMANT, France) .....	381
<i>X-band Transmitarray Unit-Cell with 1-bit Phase Control</i>	
Nguyen Binh Duong (International University, Vietnam), Nguyen Minh Thien (International University, Vietnam), Van-Su Tran (International University, HCMC VNU, Vietnam), Le Dinh (International University, Vietnam) .....	385
<i>X-band Transmitarray Using Cut-Ring Patch</i>	
Nguyen Binh Duong (International University, Vietnam), Nguyen Minh Thien (International University, Vietnam) .....	389

## **Antennas and Human Body**

<i>Radar-based Hand Gesture Recognition Using I-Q Echo Plot and Convolutional Neural Network</i>	
Takuya Sakamoto (University of Hyogo & University of Hawaii at Manoa, Japan), Xiaomeng Gao (University of California, Davis, USA), Ehsan Yavari (University of Hawaii at Manoa, USA), Ashikur Rahman (University of Hawaii at Manoa, USA), Olga Boric-Lubecke (University of Hawaii at Manoa, USA), Victor Lubecke (University of Hawaii at Manoa, USA) .....	393
<i>An OTA measurement setup considering human body shadowing effect for indoor millimeter link in specific floor environment</i>	
Shuichi Obayashi (Toshiba Corporation, Japan), Takeo Fujii (The University of Electro-Communications, Japan) .....	396
<i>Propagation Loss and Position Estimation of Capsule Antenna Through Human Body Phantom</i>	
Hiroyasu Sato (Tohoku University, Japan) .....	400
<i>Changes of Electric Current on a Normal-Mode Helical Antenna inside a Human Body</i>	
Rasyidah Hanan Mohd Baharin (Universiti Teknologi Malaysia, Malaysia), Yoshihide Yamada (Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Malaysia), Kamilia Kamardin (Universiti Teknologi Malaysia, Malaysia), Naobumi Michishita (National Defense Academy, Japan) .....	403

## Novel Measurement Techniques

<i>Modifications of Cavity Resonance-Free Wheeler Cap Method</i> Nozomu Ishii (Niigata University, Japan), Takumi Kato (Niigata University, Japan) .....	407
<i>Improvement of Measurement by S-Parameter Method using Transmission Line Theory</i> Takayuki Sasamori (Hokkai-Gakuen University, Japan), Teruo Tobana (Akita Prefectural University, Japan), Yoji Isota (Akita Prefectural University, Japan) .....	411
<i>Measurement of Magnetic Field from Radio-frequency Identification Antenna for Use in Operation Room</i> Kaori Kusuda (Tokyo Women's Medical University, Japan), Kazuhiko Yamashita (Osaka University, Japan), Michitaka Ameya (NMIJ/AIST, Japan), Satoru Kurokawa (National Institute of Advanced Industrial Science and Technology, Japan), Yuji Ohta (Ochanomizu University, Japan), Ken Masamune (Tokyo Women's Medical University, Japan), Yoshihiro Muragaki (Tokyo Women's Medical University, Japan) .....	414
<i>Electromagnetic Shielding Assessment In Rolling Stock Control Cabs</i> Tarik Hammi (SNCF, France), Noël Haddad (SNCF, France), Zineb Bouharras (SNCF, France) .....	416
<i>Late-time Ringing Characterization of Cavity-Backed UWB Printed Monopole Antenna</i> Achmad Munir (Institut Teknologi Bandung, Indonesia), Roy B. V. B. Simorangkir (Macquarie University, Australia), Farohaji Kurniawan (Chiba University & Indonesian National Institute of Aeronautics and Space, Japan) .....	419