



# ISAP 2021

**2021 International Symposium on  
Antennas and Propagation**

Oct. 19-22 | Taipei, Taiwan

# Proceeding Book



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SCIENCE AND TECHNOLOGY



**國立臺灣大學**  
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# Program at a glance

Time	Room A	Room B	Room C	Room D	Room E
October 19, 2021					
13:20-15:00	SPC-1: Radar and Imaging (Room A)				
15:00-15:20	Break				
15:20-17:00	SPC-2: EM Surfaces and Antennas (Room A)				
October 20, 2021					
08:50-09:20	Opening Ceremony (Room A)				
09:20-10:20	Keynote 1 Applying Computational Electromagnetics for Engineering Applications <b>Jin-Fa Lee</b> , <i>The Ohio State University</i> (Room A)				
10:20-10:30	Break				
10:30-11:30	Keynote 2 Millimeter wave planar arrays in "Tokyo Tech Wireless Fiber Project" -B5G Heterogeneous Network and Planetary Exploration- <b>Makoto Ando</b> , <i>Tokyo Institute of Technology</i> (Room A)				
11:30-12:30	Keynote 3 Mobile Antenna Perspectives: From 4G/5G to B5G/6G <b>Kin-Lu Wong</b> , <i>National Sun Yat-sen University</i> (Room A)				

Time	Room A	Room B	Room C	Room D	Room E	
October 20, 2021						
12:30-13:20	Lunch					
13:20-15:00	WE-3-1 SS01: mmWave/sub-THz Antenna Technologies for 6G Communications	WE-3-2 SS02: Innovative Antenna Techniques and Solutions for 5G and B5G	WE-3-3 RFID and Wireless Power Transfer	WE-3-4 SS13: Recent Developments in Dielectric Resonator Based Components	WE-3-5 SS16: Advanced Array Architectures at mmWave and sub-THz for Focused Beam and Beamforming (1/2)	Interactive Forum: WE-IF
15:00-15:20	Break					
15:20-17:20	WE-4-1 SS22: EurAAP Special Session	WE-4-2 SS08: Recent Trial on Novel Ideas of Antennas for Various Applications	WE-4-3 Small Antennas and RF Sensors	WE-4-4 Reconfigurable Antennas and Circuitries	WE-4-5 SS16: Advanced Array Architectures at mmWave and sub-THz for Focused Beam and Beamforming (2/2)	
October 21, 2021						
08:30-10:10	TH-1-1 SS10: Novel Antenna Design Method Utilizing Numerical Simulation	TH-1-2 SS14: Metamaterials/Metasurface-based Antennas for Engineering Applications	TH-1-3 SS17: In-Band Full Duplex Applications	TH-1-4 SS18: Antenna Design and Applications for 5G and Wireless Devices	TH-1-5 Wearable Device Networks and Medical Applications	
10:10-10:30	Break					
10:30-12:20	TH-2-1 SS07: Taiwan-Sweden Joint Research Works toward 6G Mobile Communications	TH-2-2 SS09: Wideband and Multiband Antennas	TH-2-3 SS12: Advanced Antenna Arrays and Their Beamforming for Future Wireless Communications	TH-2-4 SS20: Novel Compact High-Gain Antennas and Their Applications	TH-2-5 Antenna Arrays	

12:20-13:20	Lunch	Interactive Forum: TH-IF
13:20-13:40	Industrial Talk The Latest Simulation Technology and Best Practice in Antenna and Electromagnetic Designs <b>Benson Wei</b> , <i>ANSYS</i> (Room A)	
13:40-14:00	Industrial Talk Novel Diamond CATR Design for B5G and Radar Testing <b>Richard Liu</b> , <i>Wavepro Inc.</i> (Room A)	
14:00-14:10	Break	
14:10-15:10	Keynote 4 Antennas and RF Technologies for 6G <b>Y. Jay Guo</b> , <i>University of Technology Sydney</i> (Room A)	
15:00-15:20	Break	
15:20-16:20	Keynote 5 Millimeter-Wave Antennas for Next Generation Telecommunications Networks <b>Mauro Ettore</b> , <i>Institut d'Electronique et des Technologies du numéRique (IETR), French National Center for Scientific Research (CNRS)</i> (Room A)	
16:20-16:30	Break	
16:30-16:50	Industrial Talk Hardware and Software Solution for Wireless Power Transfer and mmWave <b>Leslie Li</b> , <i>Auden Techno Corp.</i> (Room A)	

**October 22, 2021**

08:30-10:10	FR-1-1 Antennas for Laptops or Handheld Devices	FR-1-2 SS15: Millimeter-wave and sub-6G Antennas for 5G Systems (1/2)	FR-1-3 SS21: Antenna Designs, Solutions, Measurements, and Trends for 5G and Beyond (1/2)	FR-1-4 Antenna Modeling and Measurements	FR-1-5 Radar, DOA, localization and Sensing (1/3)	
10:10-10:30	Break					
10:30-12:20	FR-2-1 SS11: Antenna Technologies Related to Human Monitoring	FR-2-2 SS15: Millimeter-wave and sub-6G Antennas for 5G Systems (2/2)	FR-2-3 SS21: Antenna Designs, Solutions, Measurements, and Trends for 5G and Beyond (2/2)	FR-2-4 Metamaterial- /Metasurface-inspired Antennas	FR-2-5 Radar, DOA, localization and Sensing (2/3)	
12:20-13:20	Lunch					Interactive Forum: FR-IF
13:20-15:00	FR-3-1 SS19: Glide Symmetries and Their Applications for Microwave Devices	FR-3-2 Broadband and Multi-band Antennas	FR-3-3 SS06: Multi-Antenna based Technologies of Open Radio Access Network (O-RAN) for 5G/B5G/6G Applications at Millimeter Wave (1/2)	FR-3-4 EBG, Metamaterials and Periodic Structures	FR-3-5 Radar, DOA, localization and Sensing (3/3)	
15:00-15:10	Break					
15:10-17:10	FR-4-1 SS04: Millimeter-wave, Terahertz Antennas and System	FR-4-2 Millimeter-wave, Terahertz and Optical Antennas	FR-4-3 SS06: Multi-Antenna based Technologies of Open Radio Access Network (O-RAN) for 5G/B5G/6G Applications at Millimeter Wave (2/2)	FR-4-4A Microwave, mmWave, and THz Imaging FR-4-4B Reflectarrays	FR-4-5 SS05: Design Method and Application of Multi-Antenna Systems	
17:10-17:25	Closing Ceremony (Room A)					

# Greetings from General Chair

On behalf of the Organizing Committee, it is my pleasure and privilege to welcome you to attend the 26th International Symposium on Antennas and Propagation, ISAP 2021, to be held virtually at Taipei, Taiwan from October 19 (Tuesday) through 22 (Friday), 2021.

This Symposium is organized by National Taiwan University of Science and Technology and National Taiwan University, co-organized by National Chung-Shan Institute of Science & Technology and the Industrial Technology Research Institute, and is held in cooperation with the Communications Society of the Institute of Electronics, Information and Communications Engineers (IEICE-CS), the Antennas and Propagation Society of the Institute of Electrical and Electronics Engineers (IEEE AP-S), the International Union of Radio Science (URSI), the European Association on Antennas and Propagation (EurAAP), the Antenna Measurement Techniques Association (AMTA), the Korean Institute of Electromagnetic Engineering and Science (KIEES), the ECTI Association (Thailand), the Taiwan Microwave Association, and the Institute of Antenna Engineers of Taiwan (IAET).

ISAP is one of the Asia's largest and most significant antennas and propagation conferences attracting academic and industrial participants at all career stages from all over the world. It is a premier forum for exchanging new technical-scientific achievements, for demonstrating state-of-the-art technology, and for establishing and strengthening professional cooperation and network in antennas, propagation, electromagnetic wave theory, and related fields.

I would like to express my sincere appreciation to all the participants, financial sponsors, exhibitors, supporting organizations and all the committee members who make the ISAP2021 successful. With the strong supports, we believe the ISAP2021 will be beneficial and fruitful to all participants.

Taipei is a beautiful city known for her fusion of cultures around the Asia-Pacific region. Signature sightseeing spots, tasty food, and fashion shopping districts are all in the nearby. Despite we are unable to meet you in person this year, we still sincerely invite you to visit our lovely city after the pandemic!

We are looking forward to meeting you virtually, in October 2021.



Prof. Tzyh-Ghuang Ma  
National Taiwan University of Science and Technology  
General Chair, ISAP2021

# Greetings from Technical Program Committee Chair

Welcome to the 26th International Symposium on Antennas and Propagation, ISAP 2021. We are pleased to continue the tradition of ISAP, the premier AP conference in Asia, in offering a high-quality technical program in a virtual and friendly setting that facilitates close interactions among participants. Initially planned in Taipei, ISAP 2021 will run as a fully virtual web-based event, due to the uncertainty of the unfolding Covid-19 pandemic.

The ISAP 2021 technical program features 198 and 126 scientific papers in 42 oral sessions and 3 poster sessions, respectively. Among the oral papers, 25 invited papers presented by eminent AP researchers are scheduled in different sessions from October 20 through October 22, and 10 papers selected as the finalist of the Student Paper Competition (SPC) will be presented by the leading student authors in the 2 SPC sessions on October 19. In addition, one poster session is scheduled each day from October 20 through October 22.

Keynote speeches are another fundamental part of the technical program. We are honored to have Prof. Jin-Fa Lee (OSU, USA), Prof. Makoto Ando (TIT, Japan), Prof. Kin-Lu Wong (NSYU, Taiwan), Prof. Y. Jay Guo (UTS, Australia), and Dr. Mauro Ettore (CNRS, France), all well-known world-class AP researchers. We are convinced that their talks, which will deal with topics of enormous relevance and novelty, are one of the most attractive parts of our technical program.

We would like to thank the many people who have contributed to this year's ISAP program. Foremost, we wish to thank all the paper authors for choosing ISAP as the channel to present their quality research. We are grateful to the 107 members of the Technical Program Committee for providing timely and quality reviews and the help in the final paper selection process. The program of the conference would not have been possible without their generous work and efforts.

Finally, we would like to welcome all the attendees to the conference and thank them for participating in ISAP 2021. We hope that you will enjoy attending the 2021 online activities, and look forward to meeting you in person in future ISAP conferences!



Prof. Shih-Yuan Chen  
National Taiwan University  
TPC Chair of ISAP 2021

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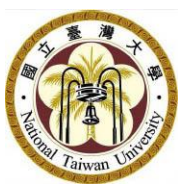
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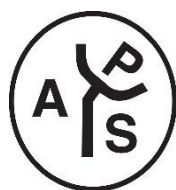
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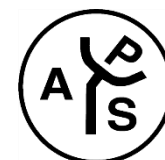
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# Tuesday, October 19

**13:20-15:00**

***Student Paper Competition***

Room A

## SPC-1: Radar and Imaging

**Chairs:** Takeshi Fukusako, *Kumamoto University, Japan*  
Yen-Sheng Chen, *National Taipei University of Technology, Taiwan*

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**220172: Multi-target Monitoring for Distinguishable Range Improvement Using a Hybrid FMCW-FSK 24 GHz Radar**

Ming Hong Li, Kuan Ju Wu, Chin Lung Yang  
*National Cheng Kung University, Taiwan*

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**220212: On Effective Parameter for Human Motion Recognition with MW-MIMO Radar Using CNN**  
Fumiya Sakagami and Hiroyoshi Yamada

*Niigata University, Japan*

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**220321: A C-band 4096-QAM OFDM Data Link for 5G Private Network Applications**

Tian-Wei Huang<sup>1</sup>, Jui-Cheng Hung<sup>1,2</sup>, Chuan-Li Chung<sup>1</sup>  
<sup>1</sup>*National Taiwan University, Taiwan*, <sup>2</sup>*Taiwan Power Company, Taiwan*

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**220343: Experimental Study on 3-Dimensional Imaging Using MW-2D-MIMO Radar**

Tateki Kato<sup>1</sup>, Hiroyoshi Yamada<sup>1</sup>, and Hiroki Mori<sup>2</sup>  
<sup>1</sup>*Niigata University, Japan*, <sup>2</sup>*Toshiba Corporation, Japan*

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**220370: A Study on THz Reflection Imaging of Two Metal Wires Using Compressed Sensing**

Rio Yanagi, Keizo Cho, Hiroaki Nakabayashi, and Koji Suizu  
*Chiba Institute of Technology, Japan*

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**15:20-17:00**

***Student Paper Competition***

Room A

## SPC-2: EM Surfaces and Antennas

**Chair:** Yen-Sheng Chen, *National Taipei University of Technology, Taiwan*

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**220093: A Dual-polarized Electromagnetic Energy Harvesting Surface with A Simple Structure**

Fengshuo Zhang, Wei Li\*, Ying Suo  
*Harbin Institute of Technology, China*

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**220146: Frequency Selective Surface Design by Adaptive Artificial Neural Network**

Jingyue Zhang, Jin-Fa Lee  
*The Ohio State University, United States*

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**220182: Semianalytically Designed, Transverse Magnetic, Printed Circuit Board Metagratings**

Yuval Shklarsh and Ariel Epstein  
*Technion-Israel Institute of Technology, Israel*

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**220187: Bandwidth Enhancement of Printed Monopole Element Quasi-Yagi antenna using a Parasitic Resonator**

Amar D. Chaudhari, and K. P. Ray  
*Defence Institute of Advanced Technology (DIAT), India*

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**220233: Enhancing and Localizing Surface Wave Propagation with Reconfigurable Surfaces**

Zhiyuan Chu, Kai-Kit Wong, and Kin-Fai Tong  
*University College London, United Kingdom*

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# Wednesday, October 20

8:50-12:30

Wednesday, October 20

Room A

Chair: Wen-Jiao Liao, *National Taiwan University of Science and Technology, Taiwan*

08:50-09:20

Opening Ceremony

09:20-10:20

Keynote 1



## Applying Computational Electromagnetics for Engineering Applications

Prof. Jin-Fa Lee, *The Ohio State University, United States*

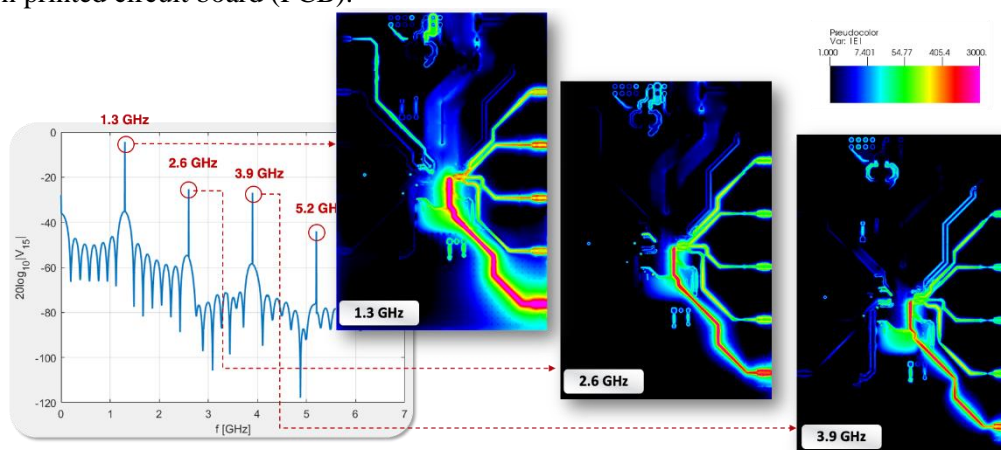
### Abstract:

#### Non-Conformal Numerical Methods

Non-conformal numerical methods, such as non-conformal domain decomposition methods (DDMs) [1], the multi-solver DDM, the integral equations discontinuous Galerkin (IEDG) method [2], and the newly developed embedded domain decomposition methods [3] have been introduced successfully within the computational electromagnetic (CEM) community. I will briefly review these methodologies and highlight some recent advancements that we have made to further enhance their adoption for engineering applications.

#### Engineering Applications

In recent years, we have witnessed many engineering applications benefited from the employment of CEM, such as antenna designs, electromagnetic wave interactions with convoluted 3D platforms, signal integrity analysis in highly complex electronics, just to name a few. The second part of my talk will detail two specific engineering applications: integration of non-conformal numerical methods with the neural network to design frequency selective surface on doubly-curved surfaces, and the co-simulation to conduct emission and vulnerability analyses of analog mixed signal (AMS) chips on printed circuit board (PCB).



### Biography:

Jin-Fa Lee received the B.S. degree from National Taiwan University, in 1982 and the M.S. and Ph.D. degrees from Carnegie-Mellon University in 1986 and 1989, respectively, all in electrical engineering. From 1988 to 1990, he was with ANSOFT Corp., where he developed several CAD/CAE finite element programs for modeling three-dimensional microwave and millimeter-wave circuits. From 1990 to 1991, he was a post-doctoral fellow at the University of Illinois at Urbana-Champaign. From 1991 to 2000, he was with Department of Electrical and Computer Engineering, Worcester Polytechnic Institute. He joined the Ohio State University at 2001 where he is currently a Professor in the Dept. of Electrical and Computer Engineering. Prof. Lee is an IEEE fellow and was serving as an associate editor for IEEE Trans. Antenna Propagation from 2008 to 2013. Prof. Lee is the conference co-Chair of the ACES Conference, 2012, at Columbus. He was an IEEE APS Distinguished Lecturer from 2012 to 2014. Prof. Lee is one of the co-authors of the 2014 Sergei A. Schelkunoff Prize Paper Award and is the recipient of the 2016 Harrington-Mitra CEM award from IEEE AP Society. Prof. Lee received the distinguished scholar award from the Ohio State University for the year 2012.



## Millimeter wave planar arrays in "Tokyo Tech Wireless Fiber Project" -B5G Heterogeneous Network and Planetary Exploration-

**Prof. Makoto Ando**, *Tokyo Institute of Technology, Japan*

### Abstract:

Unique planar waveguide slot arrays have been developed in Tokyo Institute of Technology. The low loss and high gain characteristics stand out in high frequency. The design started from the single layer waveguide with traveling wave excitation with minimized conductor loss and then was extended to multiple layers with corporate feed for wider bandwidth. In 5G and beyond, millimeter and even terahertz frequency will be utilized, and these arrays are promising for it. This talk introduces the proof-of-concept demonstration of the millimeter wave heterogeneous network systems named as "Tokyo Tech Wireless Fiber Project" supported by Ministry of Internal Affairs and Communications, JAPAN. The compact range communication in 60GHz and the direction division duplex system in 40GHz were developed where high gain waveguide planar arrays were fully utilized for big file transfer. Another application is the radial line slot antenna (RLSA) in 32GHz on board of JAXA Asteroid explorer "Hayabusa 2" which came back to earth on 6 December 2020. Latest development of arrays of these types would also be mentioned in the light of the increasing roles of wireless technology in the society.

### Biography:

Makoto Ando received his doctorate of engineering in electrical engineering from Tokyo Institute of Technology in 1979. He subsequently joined NTT and was engaged in the development of antennas for satellite communication. He moved to Tokyo Institute of Technology in 1982 and served as a Professor and 2015-2018 Executive Vice President for Research. In 2018, he moved to National Institute of Technology (KOSEN) where he is currently serving as the senior executive director. His main interests have been field and waves in radio science, especially high frequency diffraction theory, the design of waveguide planar arrays, and millimeter-wave antennas for future wireless communication. He plays a leading role in the promotion of a wide range of applications of millimeter-wave wireless communications in Japan.

His international activities have included service as 2009 president of the IEEE Antennas and Propagation Society, 2018-2019 President of The Institute of Electronics, Information and Communication Engineers (IEICE), Japan and the Chair of the ISAP International Steering Committee and 2017-2020 president of the International Union of Radio Science (URSI). Professor Ando is a fellow of IEEE, URSI and an honorary member of IEICE.

Recognized by the IEICE with the Distinguished Achievement and Contributions Award, he has also received the Inoue Prize for Science, both the Meritorious Award on Radio and the Meritorious Award on Contributions to the Promotion of Computerization from the Minister of Internal Affairs and Communications (MIC) and the 2016 Culture Award from the Japan Broadcasting Corporation (NHK).



## Mobile Antenna Perspectives: From 4G/5G to B5G/6G

**Prof. Kin-Lu Wong**, *National Sun Yat-sen University, Taiwan*

### Abstract:

Based on mobile antenna developments from 4G to 5G communications, mobile antenna perspectives for beyond 5G (B5G) and 6G communications are addressed. The corresponding frequency spectrums including low-band, mid-band and high-band from 1G/2G/3G to 4G/5G are first discussed and their promising evolution to B5G/6G mobile communication are then elaborated. It should be noted that the frequency spectrum from low to high bands are required for wider coverage and higher throughput for mobile communication. To achieve higher throughput such as the multi-Gbps throughput for 5G mobile terminals, the multi-input-multi-output (MIMO) operation in the sub-6GHz band to support at least 4 MIMO streams and the high-gain beamforming operation in the millimeter-wave band have been applied. The corresponding advances in the system throughput testing for the 5G mobile antennas in real environments are introduced. Finally, based on advanced 5G mobile antenna development and the possible frequency spectrum for B5G/6G mobile communication, promising design concepts of the mobile antennas for future user equipment and access points are discussed.

### Biography:

Prof. Kin-Lu Wong is a National Chair Professor of Ministry of Education, a Distinguished Researcher of Ministry of Science and Technology, a Distinguished Chair Professor with National Sun Yat-sen University, Taiwan, a Thomson Reuters Highly Cited Researcher, an Elsevier Most Cited Researcher, and an IEEE Fellow. He has graduated 56 PhD students, published 560 refereed journal papers, and granted over 300 patents, including 101 U.S. patents. Prof. Wong's published articles have been cited over 30,000 times with an H-index of 83 in Google Scholar. He was General Chairs of 2012 APMC, 2014 ISAP, and 2016 APCAP held in Kaohsiung, Taiwan.



**Room A****SS01: mmWave/sub-THz Antenna Technologies for 6G Communications**

**Chair:** Won Bin Hong, *Pohang University of Science and Technology, Korea*

Wen-Jiao Liao, *National Taiwan University of Science and Technology, Taiwan*

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**220357: WiThRay: Versatile 3D Simulator for Intelligent Reflecting Surface-aided MmWave Systems**  
**Hyuckjin Choi, Junil Choi**

*Korea Advanced Institute of Science and Technology  
(KAIST), South Korea*

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**220389: D-band Affordable Phased-Array Antenna-on-Package for 6G Transceivers**

**Seongwoog Oh, Jungsuek Oh**

*Seoul National University, South Korea*

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**220415: Tunable Huygens' Transmission Metasurface on Double-Layer PCB**

**Kd M Raziul Islam, Sang Min Lee, and Sangjo Choi**

*University of Ulsan, South Korea*

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**220198: Realization of an 110GHz Antenna Array Module by Using AiP Technologies for Potential 6G Applications**

**Kuan-Hsun Wu<sup>1</sup>, Hsi-Tseng Chou<sup>1</sup>, Ding-Bing Lin<sup>2</sup>**

*<sup>1</sup>National Taiwan University, Taiwan, <sup>2</sup>National Taiwan University of Science and Technology, Taiwan*

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**220259: Large Scale Characteristics of Millimeter-Wave Propagation Channels in Various Indoor Office Environments**

**Keiichiro Kumakura, Shuaiqin Tang, Hibiki Tsukada, and Minseok Kim**

*Niigata University, Japan*

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**Room B****SS02: Innovative Antenna Techniques and Solutions for 5G and B5G**

**Chairs:** Wei Lin, *University of Technology Sydney, Australia*

Chia-Te Liao, *Air Force Institute of Technology, Taiwan*

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**220039: A Dual-polarized Wideband Reconfigurable Reflected / Transmitted Filter Array Antenna Element**

**Min Wang<sup>1</sup>, Wei Luo<sup>1</sup>, Jianlin Feng<sup>1</sup>, Zhengchuan Chen<sup>2</sup>**

*<sup>1</sup>Chongqing University of Posts and Telecommunications, China, <sup>2</sup>Chongqing University, China*

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**220206: A Highly Compact and Highly Efficient Huygens Antenna Array**

**Wei Lin and Richard W. Ziolkowski**

*University of Technology Sydney, Australia*

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**220418: A Highly-Integrated Low-Sidelobe Monopulse Array with Additive Manufacturing Technique**

**Guan-Long Huang<sup>1</sup>, Rui-Shen Chen<sup>1</sup>, and Sai-Wai Wong<sup>2</sup>**

*<sup>1</sup>Foshan University, China, <sup>2</sup>Shenzhen University, China*

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**220147: Substrate Integrated Waveguide Cavity slot Antenna at millimeter wave for 5G application**  
**Yaqdhan Mahmood Hussain, Mohamad Kamal A. Rahim, Noor Asniza Murad, H. O. Hanoosh, Hussam Hamid Keriee**

*<sup>1</sup>Universiti Teknologi Malaysia, Malaysia*

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## Room C

### RFID and Wireless Power Transfer

**Chairs:** Chien-Hung Chen, *R.O.C. Air Force Academy, Taiwan*

Yaxin Yu, *Chang'an University, China*

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#### **220078: Shorted Four-Element Patch Antenna with High Directivity and Wideband for Small Metal-Tag**

Minh-Tan Nguyen<sup>1</sup>, Yi-Fang Lin<sup>1</sup>, Chin-Cheng Chang<sup>1</sup>, Chien-Hung Chen<sup>2</sup>, and Hua-Ming Chen<sup>1</sup>

<sup>1</sup>National Kaohsiung University of Science and Technology, Taiwan, <sup>2</sup>R.O.C. Air Force Academy, Taiwan

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#### **220133: Multi-Tag Detection Using Multivariate Statistical Analysis for Frequency-Coded Chipless RFID**

Wen-Sen Li, Ko-Chun Liu, Fei-Peng Lai, and Yen-Sheng Chen

*National Taipei University of Technology, Taiwan*

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#### **220139: Chipless Radiofrequency Identification Using Pauli Matrix Decomposition in Unlicensed Bands**

Fei-Peng Lai\*, Han Chang, and Yen-Sheng Chen

*National Taipei University of Technology, Taiwan*

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#### **220345: Development of a Simple and Lightweight Phantom Focusing on RCS at 920 MHz**

Kazuki Sato<sup>1</sup>, Kazuyuki Saito

*Chiba University, Japan*

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#### **220127: A Flux Compensation Structure for Wirelessly Charging the Electric Vehicles**

Yaxin Yu\*, Bo Xu, Yang Dong, Lingyu Xiao

*Chang'an University, China*

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## Room D

### SS13: Recent Developments in Dielectric Resonator Based Components

**Chairs:** Kai Lu, *City University of Hong Kong, Hong Kong SAR*

Shao-Yong Zheng, *Sun Yat-sen University, China*

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#### **220372: (Invited talk) A New Class of Dielectric Resonator Circuit Without Metallic Enclosure**

Shaoyong Zheng

*Sun Yat-sen University, China*

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#### **220315: Design of a Compact Dielectric Resonator Antenna with Flat-top Radiation Pattern**

Shu Yu<sup>1</sup>, Shaoyong Zheng<sup>1</sup>, Yong-Mei Pan<sup>2</sup>

<sup>1</sup>Sun Yat-sen University, China, <sup>2</sup>South China University of Technology, China

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#### **220408: Low-Profile and Broadband Dielectric Resonator Antenna by Using Air Regions**

Ying Liu, Xu Wang Li, Changfei Zhou, Hui Li, and Lei Guo

<sup>1</sup>Dalian University, China

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#### **220409: Wideband Unidirectional Dielectric-Loaded Dipole**

Kai Lu<sup>1</sup>, Zhi-li Su<sup>2</sup>, and Kwok Wa Leung<sup>1,2</sup>

<sup>1</sup>Sun Yat-sen University, Guangzhou, China, <sup>2</sup>City University of Hong Kong, Hong Kong SAR, China

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## Room E

### SS16: Advanced Array Architectures at mmWave and sub-THz for Focused Beam and Beamforming (1/2)

**Chairs:** Mauro Ettore, *University of Rennes 1, France*

Jiro Hirokawa, *Tokyo Institute of Technology, Japan*

#### 220160: (Invited talk) Low-profile CTS Antenna with Circular Polarization for Satcom Applications in PCB technology

Adham Mahmoud<sup>1</sup>, Michele Del Mastro<sup>1</sup>, Thomas Potelon<sup>1</sup>, Ronan Sauleau<sup>1</sup>, Gilles Quagliaro<sup>2</sup>, Anthony Grbic<sup>3</sup>, and Mauro Ettore<sup>1</sup>

<sup>1</sup>Univ. Rennes, CNRS, IETR (Institut d'Electronique et des Technologies du numéRique), France, <sup>2</sup>Thales SIX GTS, France, <sup>3</sup>University of Michigan, USA

#### 220120: A Switchable Linear to Circular Polarization Converter Using PIN Diodes

Reda Madi<sup>1</sup>, Antonio Clemente<sup>1</sup>, Ronan Sauleau<sup>2</sup>

<sup>1</sup>CEA-Leti, Université Grenoble Alpes, France, <sup>2</sup>Univ Rennes, CNRS, IETR (Institut d'Electronique et des Technologies du numéRique), France

#### 220255: Linearly-Polarized and Circularly-Polarized Discrete Lenses for Wideband Applications

Fan Wu<sup>1</sup>, Jingxue Wang<sup>2</sup>, and Zhi Hao Jiang<sup>1</sup>

<sup>1</sup>Southeast University, China, <sup>2</sup>Hohai University, China

#### 220041: Beam-Switching 2-D Butler Matrices Generating a Triangular Lattice of Beams

Jiro Hirokawa<sup>1</sup> and Nelson J. G. Fonseca<sup>2</sup>

<sup>1</sup>Tokyo Institute of Technology, Japan, <sup>2</sup>European Space Agency, The Netherlands

**15:20-17:20**

**Oral Sessions**

## Room A

### SS22: EurAAP Special Session

**Chairs:** Stefania Monni, *The Netherlands Organisation for applied scientific research, The Netherlands*

Chin-Lung Yang, *National Cheng Kung University, Taiwan*

#### 220115: (Invited talk) Recent Achievements on Passive and Beam Steering Transmitarrays at Millimeter Waves

Orestis Koutsos<sup>1,2</sup>, Reda Madi<sup>1,2</sup>, Francesco Foglia Manzillo<sup>1</sup>, Maciek Smierzchalski<sup>1</sup>, Antonio Clemente<sup>1</sup>, and Ronan Sauleau<sup>2</sup>

<sup>1</sup>CEA-Leti, Univ. Grenoble-Alpes, France, <sup>2</sup>Univ Rennes, CNRS, IETR - UMR 6164, France

#### 220360: (Invited talk) Mm-wave antennas in package for 5G applications

Alessandro Garufo<sup>1</sup>, Roland Bolt<sup>1</sup>, E. Suijker<sup>1</sup>, P. Kaminski<sup>1</sup>, M. Geurts<sup>2</sup>, M. Acar<sup>2</sup>, J. W. Bergman<sup>2</sup>, R. Mandamparambil<sup>2</sup>, and S. Monni<sup>1</sup>

<sup>1</sup>TNO Radar Technology, The Netherlands, <sup>2</sup>NXP Semiconductors, The Netherlands

#### 220088: Evaluation of Array Fed Reflector Architectures for Broadband Satellite Missions

Alejandro Baldominos<sup>1</sup>, Alberto Mengali<sup>2</sup>, Nelson J.G. Fonseca<sup>2</sup> and George Goussetis<sup>1</sup>

<sup>1</sup>Heriot-Watt University, U.K., <sup>2</sup>European Space Agency

#### 220089: Realistic Interference Simulations in a Data Center Offering Wireless Communication at Low Terahertz Frequencies

Johannes M. Eckhardt, Christoph Herold, Björn Friebel, Nils Dreyer, and Thomas Kurner

Technische Universität Braunschweig, Germany

#### 220227: Luneburg Lenses for the New Generation of Communication Systems

Oscar Quevedo-Teruel, Oskar Zetterstrom

KTH Royal Institute of Technology, Sweden

## Room B

### SS08: Recent Trial on Novel Ideas of Antennas for Various Applications

**Chairs:** Takeshi Fukusako, *Kumamoto University, Japan*

Chuwong Phongcharoenpanich, *King Mongkut's Institute of Technology Ladkrabang, Thailand*

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#### **220289: (Invited talk) Design Techniques for Conductor-backed Low-profile Antennas**

Takeshi Fukusako\*, Ryuji Kuse and Choei Genka

*Kumamoto University, Japan*

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#### **220067: 1-bit Unit-Cell For Ka-band Reconfigurable Transmitarrays**

Minh Thien Nguyen<sup>1,2</sup>, Binh Duong Nguyen<sup>1,2</sup>

<sup>1</sup>*International University, Vietnam*, <sup>2</sup>*Vietnam National University, Vietnam*

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#### **220307: A High Noise Immunity Monopulse Direction of Arrival Estimation Antenna for Vehicle Tracking**

Yutaka Umeda<sup>1</sup>, Eisuke Nishiyama<sup>1</sup>, Ichihiko Toyoda<sup>1</sup>, Masayuki Miyashita<sup>2</sup>, Kazuma Tomimoto<sup>2</sup>, and Ryo Yamaguchi<sup>2</sup>

<sup>1</sup>*Saga University, Japan*, <sup>2</sup>*SoftBank Corp., Japan*

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#### **220204: Multiband Antenna for Multi-source Ambient RF Energy Harvesting System**

Anh Tuan Le, Dai Duong Nguyen\* and Minh Thuy Le

*Hanoi University of Science and Technology, Vietnam*

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#### **220349: Single-Layer Wideband CP CPW-Fed Antenna based on Staircase-Shape Metasurface**

Nathapat Supreeyattitukul<sup>1</sup>, Prayoot Akkaraekthalin<sup>2</sup>, and Chuwong Phongcharoenpanich<sup>3</sup>

<sup>1</sup>*Civil Aviation Training Center, Thailand*, <sup>2</sup>*King Mongkut's University of Technology North Bangkok, Thailand*,

<sup>3</sup>*School of Engineering, King Mongkut's Institute of Technology Ladkrabang, Thailand*

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## Room C

### Small Antennas and RF Sensors

**Chair:** Ming-Tien Wu, *National Penghu University of Science and Technology, Taiwan*

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#### **(Invited talk) Recent Development of Magneto-electric Dipole Antennas and Arrays**

Kwai Man Luk

*City University of Hong Kong, Hong Kong SAR*

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#### **220168: Design of Dual-Band Miniaturized Loop Antenna for Harmonic Radar Transponder**

Kuan-Ting Chen, Hsiu-Ping Liao and Shih-Yuan Chen

*National Taiwan University, Taiwan*

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#### **220074: Design of 77 GHz Patch Array Antenna with Horn for Industrial Radar Applications**

Da-Wei Li, Wei-Chen Cheng, Jwo-Shiun Sun\*, and Guan-Yu Chen

*National Taipei University of Technology, Taiwan*

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#### **220362: An Electrically Small Top-Loaded Monocone Antenna With Wide Bandwidth**

Kyoseung Keum, Jaehoon Choi

*Hanyang University, Republic of Korea*

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#### **220330: Calibration Factor Pattern for Isotropy Simulation and Measurement of Three-Axis Electric Field Probes**

Haoyan Ma, Zheng Wang, Qiuyi Zhang, Shunli Li, Hongxin Zhao and Xiaoxing Yin

*Southeast University, China*

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## Room D

### Reconfigurable Antennas and Circuitries

**Chair:** Abu Sadat Md Sayem, *University of Technology Sydney, Australia*

**Shih-Cheng Lin**, *National Chung Cheng University, Taiwan*

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#### **220310: Decoupling Design of Quadri-Polarization Overlay Antenna Element**

Shota Takato<sup>1</sup>, Hiroyuki Arai<sup>1</sup>, Young-Chan Moon<sup>2</sup>, Duk-Yong Kim<sup>2</sup>

<sup>1</sup>*Yokohama National University, Japan*, <sup>2</sup>*KMW, Inc.*

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#### **220201: A Robust, Flexible and Frequency Reconfigurable Antenna with Flexible Superstrate and Substrate**

Abu Sadat Md. Sayem and Karu P. Esselle

*University of Technology Sydney, Australia*

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#### **220304: A Planar Direction-Finding Antenna with Reconfigurable Circuit for Scan Range Extension**

Jo Tamura, Hiroyuki Arai

*Yokohama National University, Japan*

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#### **220228: Realization of Broadband Butler Matrix-based Beamforming Network Using Reconfigurable Synthesized Transmission Lines**

The Hop Hoang<sup>1</sup>, Huy Nam Chu<sup>2</sup>, Tzyh-Ghuang Ma<sup>1</sup>

<sup>1</sup>*National Taiwan University of Science and Technology, Taiwan*, <sup>2</sup>*MediaTek, Taiwan*

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## Room E

### **SS16: Advanced Array Architectures at mmWave and sub-THz for Focused Beam and Beamforming (2/2)**

**Chairs:** Mauro Ettorre, *University of Rennes I, France*

**Nan-Wei Chen**, *Yuan Ze University, Taiwan*

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#### **220066: Multi-Beam Geodesic Lens Antenna with Enhanced Aggregate Gain in the Ka-band**

Omar Orgeira<sup>1</sup>, Germán León<sup>2</sup>, Nelson J. G. Fonseca<sup>3</sup>, and Oscar Quevedo-Teruel<sup>1</sup>

<sup>1</sup>*KTH Royal Institute of Technology, Sweden*, <sup>2</sup>*University of Oviedo, Spain*, <sup>3</sup>*European Space Agency, The Netherlands*

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#### **220150: A 30 GHz slot array with artificial dielectrics to enhance radiation characteristics**

Ralph van Schelven<sup>1</sup>, Waqas Syed<sup>2</sup>, Giorgio Carluccio<sup>2</sup>, Kostas Doris<sup>2</sup>, Anton de Graauw<sup>2</sup>, Andrea Neto<sup>1</sup>, Daniele Cavallo<sup>1</sup>

<sup>1</sup>*Delft University of Technology, The Netherlands*, <sup>2</sup>*NXP Semiconductors, The Netherlands*

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#### **220248: A Dual Circularly Polarized Array Antenna for Ka-Band Satellite Communications**

Qiannan Ren, Ashraf Uz Zaman, Jian Yang

<sup>1</sup>*Chalmers University of Technology, Sweden*

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#### **220394: Metal-only Reflecting Luneburg Lens Design for Sub-THz Applications**

C. Bilitos<sup>1</sup>, J. Ruiz-García<sup>1</sup>, R. Sauleau<sup>1</sup>, E. Martini<sup>2</sup>, S. Maci<sup>2</sup> and D. González-Ovejero<sup>1</sup>

<sup>1</sup>*Univ. Rennes, CNRS, IETR (Institut d'Electronique et des Technologies du num'érique) - UMR 6164, France*,

<sup>2</sup>*University of Siena, Italy*

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#### **220117: Electronically Reconfigurable Leaky Cavity Antennas**

Jean-Baptiste Gros, Vladislav Popov, Mikhail Odit, Rémi Faggiani, and Geoffroy Lerosey

*Greenerwave, France*

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**220217: Metamaterial Antenna Analysis using Wave Concept Iterative Process**

Imen Sansa, Abdelkhalek Nasri, and Hassen Zairi

*University of Carthage, Tunisia*

**220312: Feed Antenna Optimization of W Band Active Millimeter Wave Imaging System**

He Zhang, Hua Zong, Jinghui Qiu

*Harbin Institute of Technology, China*

**220375: Evaluation of Radio Reception Environment in Consideration of Surrounding Terrain and Buildings for Temporal Disaster-Broadcasting**

Seitaro Taira\*, Makoto Kobayashi, Koichi Shin, and Masahiro Nishi

*Hiroshima City University, Japan*

**220294: Design of Small Loop Antenna for Detection of Electromagnetic Earthquake Precursors**

Adel Mahfooz, Musa Huda, Annatoma Arif, Ziaul Haq Muhaimin, Jarin Sultana, Ehtesanul Islam

*Ahsanullah University of Science and Technology, Bangladesh*

**220336: High Gain Dual Parasitic Patch Loaded Wideband Antenna for 28 GHz 5G Applications**

Wahaj Abbas Awan<sup>1</sup>, Mohammad Alibakhshikenari<sup>2</sup>, and Ernesto Limiti<sup>3</sup>

<sup>1</sup>Seoul National University of Science and Technology, South Korea, <sup>2</sup>Universidad Carlos III de Madrid, Spain, <sup>3</sup>University of Rome, Italy

**220337: Band Enhancement of a Compact Flexible Antenna for WLAN, Wi-Fi and C-Band Applications**

Wahaj Abbas Awan<sup>1</sup>, Musa Husain<sup>2</sup>, Mohammad Alibakhshikenari<sup>3</sup>, Ernesto Limiti<sup>4</sup>

<sup>1</sup>Seoul National University of Science and Technology, South Korea, <sup>2</sup>Bahria University Islamabad Campus, Pakistan, <sup>3</sup>Universidad Carlos III de Madrid, Spain,

**220297: Null Frequency Scanning Antenna Based on Asymmetric Phase Transforming of Spoof Surface Plasmon Polaritons (SSPPs)**

Hao Shen, Qiuyi Zhang, Shunli Li, Hongxin Zhao and Xiaoxing Yin

*Southeast University, China*

**220309: Phase-less hemispherical near field measurement using initial phase information by PR method**

Yusuke Mitsui and Hiroyuki Arai

*Yokohama National University, Japan*

**220090: Analysis of Pyramidal Horn Antenna for Ku Band Applications**

Adelaida Heiman, Alina Badescu

*University Politehnica of Bucharest, Romania*

**220135: A Double Band-Notched UWB Antenna Based on Complementary ERR-Defected Ground**

Komsan Kanjanasit<sup>1</sup>, Irina B. Vendik<sup>2</sup>, Alexander S. Rusakov<sup>2</sup>

<sup>1</sup>Prince of Songkla University, Thailand, <sup>2</sup>St. Petersburg Electrotechnical University, Russia.

**220413: On the Resonant Electrical Length of Helical Antennas Placed between Metallic Parallel Plates**

Walid Dyab<sup>1</sup>, Mourad Ibrahim<sup>1</sup>, Ahmed Sakr<sup>2</sup>, and Ke Wu<sup>3</sup>

<sup>1</sup>Prince Sultan University, Saudi Arabia, <sup>2</sup>Cairo University, Egypt, <sup>3</sup>Polytechnique Montreal, Canada

**220033: A Low Profile UWB Antenna on a Large Flat Conductor**

Yifan Wang, Wenbin Dou

*Southeast University, China*

**220053: Linear Array of Leaf-Shaped Bowtie Slot Antenna Electromagnetically Fed by Microstrip Line**  
**Mangseang Hor, Takashi Hikage and Manabu Yamamoto**  
*Hokkaido University, Japan*

**220296: Effect on Unloaded Q Factor by a Feeding Structure of a 330-500 GHz Band Reflection-Type Hollow Rectangular Resonator**  
**Yoshiki Hara, Takashi Tomura, and Jiro Hirokawa**  
*Tokyo Institute of Technology*

**220428: 5G Millimeter-Wave Eight-Port MIMO Antenna**  
**Mahnoor Khalid<sup>1</sup>, Abdul Manan<sup>1</sup>, Syeda Iffat Naqvi<sup>1</sup>, Hijab Zahra<sup>2</sup>, Chia-Chan Chang<sup>3</sup>, Syed Muzahir Abbas<sup>2</sup>**  
*<sup>1</sup>University of Engineering & Technology, Pakistan, <sup>2</sup>Macquarie University, Australia, <sup>3</sup>National Chung-Cheng University, Taiwan*

**220334: Machine Learning Based Channel Parameter Estimation for Indoor Environment Utilizing Reflected Rays Information**  
**Inocent Calist, and Minseok Kim**  
*Niigata University, Japan*

**220143: Ultra Wide Band Dual-Feed Millimeter Wave Antenna**  
**J. S. Sun, P. J. Chen, B. Y. Chen,**  
*National Taipei University Technology, Taiwan*

**220359: An Excitation of Millimeter Leaky Wave Antenna by Through-hole Reflector and Waveguide Convertor**  
**Wataru Iida and Hiroyuki Arai**  
*Yokohama National University, Japan*

**220361: Effect of E-Plane End Shape on Ripple Suppression and Focal Arc of 300ghz Band Cylindrical Lens**  
**Derek Gray, and Kunio Sakakibara**  
*Nagoya Institute of Technology, Japan*

**220364: Human Body Shielding Loss Model with Frequency Characteristics for HAPS Communication**  
**Akihiro Sato<sup>1</sup>, Sho Kimura<sup>1</sup>, Hoyu Lin<sup>1</sup>, Shoma Tanaka<sup>1</sup>, Hideki Omote<sup>1</sup> and Takashi Hikage<sup>2</sup>**  
*<sup>1</sup>Softbank Corp., Japan, <sup>2</sup>Hokkaido University, Japan,*

**220153: Wide-Angle Scanning Dielectric Resonator Antennas for Millimeter-Wave Applications**  
**Yafei Ding, Shaoshuai Hou, Guangli Yang**  
*Shanghai University, China*

**220422: Simulation Analysis of a Ka-Band Micro-Coaxial**  
**Shu Lin<sup>1</sup>, Hao Dong<sup>1</sup>, Xiao-bing Wei<sup>1</sup>, Yang Liu<sup>1</sup>, Xu-yao Zhang<sup>1</sup>, and Xingqi Zhang<sup>2</sup>**  
*<sup>1</sup>Harbin Institute of Technology, China, <sup>2</sup>University College Dublin, Ireland*

**220421: Optimized High Gaussicity Smooth Spline-Profile Feed Horns for Terahertz Defog Camera**  
**Qian Song, Jinghui Qiu, Pengcheng Wang, and Nannan Wang**  
*Harbin Institute of Technology*

**220420: Radio Coverage Mapping for Cellular Networks in a High-rise Urban Area using Tuned 9999 Model**  
**Korinne Ella R. Morico\*, Julius M. Judan, and Calvin Artemies G. Hilario**  
*Advanced Science and Technology Institute, Philippines*

**220207: A Novel Planar Perforated Hyperbolic Secant Lens Antenna for Milli-Wave Applications**  
**Wenyi Shao, and Qiang Chen**  
*Tohoku University, Japan*

**220423: A Thin Dual Slot Based Offset-Fed Beam Tilted mmWave 5G AiP Design**  
**M. Idrees Magray<sup>1</sup>, Mohammed Farouk Nakmouche<sup>2</sup> and Jenn-Hwan Tarn<sup>1</sup>**  
*<sup>1</sup>National Yang Ming Chiao Tung University, <sup>2</sup>Izmir University of Economics, Turkey*

**220183: Computer Simulation of 28 GHz Millimeter-wave Propagation in Residential House Environment**  
**Sango Nagamoto and Manabu Omiya**  
*Hokkaido University, Japan*

**220070: A Compact D-band Transition from Rectangular Waveguide to Substrate Integrated Waveguide**  
**Chi-Yu Yang, Guo-Thong Zeng, Huy Nam Chu, Tzyh-Ghuang Ma**  
*National Taiwan University of Science and Technology, Taiwan*

**220317: Research on an Optimized Structure of Terahertz Turbo Encoding and Decoding Technology**  
**Li Sikai, Li Bo, Wang Hong**

*Xi'an University of Posts and Telecommunications, China*

**220344: Experimental Evaluation of a Wave Source Location Estimation Method Using UAVs**

**Hiromu Takarada<sup>1</sup>, Kentaro Nishimori<sup>1</sup>, Shun Takase<sup>1</sup>, Takahiro Matsuda<sup>2</sup>**

*<sup>1</sup>Niigata University, Japan, <sup>2</sup>Tokyo Metropolitan University, Japan*

**220323: Recent Increase in Rain Attenuation Statistics of Ku-Band Satellite Communications Links**  
**Yasuyuki Maekawa**

*Osaka Electro-Communication University, Japan*

**220396: Reception Level in a Touchless Ticket Gate Including the Element Pattern in the Millimeter-Wave Band Waveguide Slot Array Installed on the Sides**

**Mizuki Kurose, Takashi Tomura, Jiro Hirokawa**

*Tokyo Institute of Technology, Japan*

**220380: Modulation Recognition Algorithm of Radar Signal Based on ICanny-CNN**

**Xinrui Mao<sup>1</sup>, Jingpeng Gao<sup>1</sup>, and Junwei Qi<sup>1</sup>**

*<sup>1</sup>Harbin Engineering University, China*

**220186: Passive Microwave Electric Field Display with Neon Light Bulb**  
**Shen Shou Max Chung<sup>1</sup>, Ming-Tien Wu<sup>1</sup>, Chao Chun Ku<sup>1</sup>, Wen-Jie Wang<sup>1</sup>, Meng-Han Shieh<sup>1</sup>, and Shih-Chung Tuan<sup>2</sup>**

*<sup>1</sup>National Penghu University of Science and Technology, Taiwan, <sup>2</sup>Oriental Institute of Technology, Taiwan*

**220154: Universal Complex for Sounding and Estimation of Ionospheric Radio Channels Ranging from 3 kHz to 1 MHz Wide**  
**Dmitry Ivanov, Vladimir Ivanov, Natalya Ryabova, Ruslan Belgibaev, Alexey Elsukov, Vladimir Ovchinnikov**

*Volga State University of Technology, Russia*

**220122: Gain Variation of Phased-Arrays with Normally Distributed Pointing Errors**  
**Yao-Wen Hsu<sup>1</sup>**

*<sup>1</sup>National Space Organization*

**220215: Propagation Delay Time Estimation in Street Cells by Machine Learning**  
**Shinnosuke Hayashi<sup>1</sup>, Mitoshi Fujimoto<sup>1</sup>, Koshiro Kitao<sup>2</sup>, Mitsuki Nakamura<sup>2</sup>, Satoshi Suyama<sup>2</sup>, and Yasuhiro Oda<sup>2</sup>**

*<sup>1</sup>University of Fukui, Japan, <sup>2</sup>NTT DOCOMO, INC., Japan*

**220292: An FDTD Analysis of a Sensing Technique Based on Variation of Reflection Characteristics of an Antenna**  
**Kazuki Shintani<sup>1</sup>, Kenjiro Kubo<sup>1,2</sup>, Hisato Iwai<sup>1</sup>, Shinsuke Ibi<sup>1</sup>, Satoru Shimizu<sup>2</sup>, Takuya Kurihara<sup>2</sup>, and Yoshinori Suzuki<sup>2</sup>**

*<sup>1</sup>Doshisha University, Japan. <sup>2</sup>Advanced Telecommunications Research Institute International, Japan.*

**220388: Research on Maritime Floating Buoys that can be Observed with Synthetic Aperture Radar Satellites**

**Toshiyuki Miyazaki<sup>1</sup>, Fumihiro Takahashi<sup>2</sup>, and Takashi Hosokawa<sup>3</sup>**

*<sup>1</sup>Hokkaido Research Organization, Japan, <sup>2</sup>Green & Life Innovation Inc., Japan, <sup>3</sup>Nitto Seimo Co., Ltd., Japan*

# Thursday, October 21

**08:30-10:10**

*Oral Sessions*

Room A

## **SS10: Novel Antenna Design Method Utilizing Numerical Simulation**

**Chairs:** Takuji Arima, *Tokyo University of Agriculture and Technology, Japan*

Wei-Chung Weng, *National Chi Nan University, Taiwan*

### **220342: (Invited talk) Antenna Design Technique Utilizing Autoregressive Moving Average Techniques**

**Takuji Arima, and Toru Uno**

*Tokyo University of Agriculture and Technology, Japan*

### **220202: One-Port Near-field Antenna Measurement Using a Small Wire Scatterer**

**Seunggyu Yang, Kangwook Kim**

*Gwangju Institute of Science and Technology, South Korea*

### **220282: Detection of Defective Elements in Array Antennas Using Artificial Neural Networks and Eigenmode Currents**

**Keisuke Konno, Xin Wang, and Qiang Chen**

<sup>1</sup>*Tohoku University, Japan*

### **220400: Platform Excitation for Radiation Efficiency Enhancement Using Slot Antenna**

**Takumi Nishime, Hiroshi Hashiguchi, Naobumi Michishita\*, and Hisashi Morishita**

*National Defense Academy, Japan*

Room B

## **SS14: Metamaterials/Metasurface-based Antennas for Engineering Applications**

**Chairs:** Wanchen Yang, *South China University of Technology, China*

Zhihao Jiang, *Southeast University, China*

### **220040: The Design of An All-Metal Low Profile End-Fire Array Antenna with High Gain**

**Min Wang<sup>1</sup>, Jin Zhang<sup>1,2</sup>, Peng Ye<sup>1</sup>, Zhengchuan Chen<sup>3</sup>**

<sup>1</sup>*Chongqing University of Posts and Telecommunications, China,* <sup>2</sup>*Southeast University, China,* <sup>3</sup>*Chongqing University, China.*

### **220064: Researches on Frequency-Reconfigurable Metasurface Antennas Based on VO<sub>2</sub> Films**

**Jinghao Li, Wanchen Yang\*, Quan Xue, and Wenquan Che**

*South China University of Technology, China*

### **220208: High-Efficiency Conformal Transmitarray With Two-layer Ultra-Thin Huygens Elements**

**Li-Zhao Song, Pei-Yuan Qin, and Y. Jay Guo**

*University of Technology Sydney, Australia*

### **220232: Classification and opportunities of metasurfaces for antenna designs**

**Oscar Quevedo-Teruel, Qiao Chen**

*KTH Royal Institute of Technology, Sweden*

## Room C

### SS17: In-Band Full Duplex Applications

**Chair:** Ming-Lin Chuang, *National Penghu University of Science and Technology, Taiwan*

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#### **220059: In-Band Full-Duplex Propagation-Domain Techniques and Applications**

**Kenneth E. Kolodziej**

*MIT Lincoln Laboratory, USA*

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#### **220062: Investigation of NVNA-based IBFD Antenna Test using Spectrally-Overlapped Stimuli**

**Yichi Zhang, Xiao Liu, Hongying Gao, and Zhao He**

*National Institute of Metrology, China*

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#### **220116: Antenna Integrated with Dual-Differential Feeding for In-Band Full-Duplex Applications**

**Maksim Kuznetsov<sup>1,2</sup>, Symon K. Podilchak<sup>2,1</sup> and Mathini Sellathurai<sup>1</sup>**

*<sup>1</sup>Heriot-Watt University, Scotland UK, <sup>2</sup>The University of Edinburgh, Scotland UK*

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#### **220192: (Invited talk) What Can We Learn from Replicating Hertz's Electromagnetic-Wave Experiment?**

**Chen-Pang Yeang<sup>1</sup>, Kai-Hung Cheng<sup>2</sup>, Hong-Yu Tsao<sup>2</sup>, Yun-Ying Chan<sup>3</sup>, and Shih-Yuan Chen<sup>2,3</sup>**

*<sup>1</sup>University of Toronto, Canada, <sup>2</sup>National Taiwan University, Taiwan, <sup>3</sup>National Taiwan University, Taiwan*

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## Room D

### SS18: Antenna Design and Applications for 5G and Wireless Devices

**Chairs:** Wen-Shan Chen, *Southern Taiwan University of Science and Technology, Taiwan*

**Saou-Wen Su, ASUSTeK Computer Inc., Taiwan**

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#### **220075: Printed MIMO antennas for 5G C-band for laptop computer applications**

**Yue Li<sup>1</sup>, Wen-Shan Chen<sup>1</sup>, Yung-Tao Liu<sup>2</sup>, and Hong-Twu Chen<sup>2</sup>**

*<sup>1</sup>Southern Taiwan University of Science and Technology, Taiwan, <sup>2</sup>R.O.C. Military Academy, Taiwan*

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#### **220205: A Uniplanar Multi-Bands Antenna for The Mobile Phone Applications**

**Tsung-Yu Shen<sup>1</sup>, Hsin-Lung Su<sup>1</sup>, and Ming-Lin Chuang<sup>2</sup>**

*<sup>1</sup>National Pingtung University, Taiwan, <sup>2</sup>National Penghu University of Science and Technology, Taiwan*

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#### **220069: Conjoined, Wi-Fi 6E MIMO Antennas for Laptops**

**Saou-Wen Su, Derry Permana Yusuf, and Fang-Hsien Chu**

*Antenna Design Department, Advanced EM & Wireless Communication R&D Center, Taiwan*

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#### **220347: Design of Dual-band Slot Antenna Array for 5G Sub-6GHz CPE**

**Jui-Han Lu, Bo-Ming Chen and Wei-Ren Chuang**

*National Kaohsiung University of Science and Technology, Taiwan*

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## Room E

### Wearable Device Networks and Medical Applications

Chair: Pongphan Leelatien, *Thammasat University, Thailand*

#### 220048: Design of Non-invasively Active Patch Antenna Integrated with Microwave Radiometer for Subcutaneous Temperature Measurement

Bing-Chao Huang<sup>1</sup>, Yu-Jen Chi<sup>2</sup>, Muddineni Raveendra<sup>1</sup>, and Chien-Wen Chiu<sup>1</sup>

<sup>1</sup>National Ilan University, Taiwan, <sup>2</sup>Tamkang University, Taiwan

#### 220079: Characterization of Ultra-Wideband Propagation for Liver-Implant Channel

Min Wang<sup>1</sup>, Yuxin Mo<sup>1</sup>, Ya Liao<sup>1,2</sup>, Zhengchuan Chen<sup>3</sup>

<sup>1</sup>Chongqing University of Posts and Telecommunications, China, <sup>2</sup>Southeast University, China, <sup>3</sup>Chongqing University, China.

#### 220324: Identification of bedsores using electromagnetic waves for a non-contact detection system

Hiroki Kobayashi, Masaharu Takahashi

*Chiba University, Japan*

#### 220348: Relationship between Local Peak SAR and MIMO Performance for 5G Sub-6GHz Antennas

Kun Li<sup>1</sup>, and Kazuhiro Honda<sup>2</sup>

<sup>1</sup>Kagawa University, Japan, <sup>2</sup>Toyama University, Japan

#### 220353: Measurement of Rice factor for In-Body Radios at 950 MHz in Indoor Environment

Ryushun Oka<sup>1</sup>, Kun Li<sup>1</sup>, and Kazuhiro Honda<sup>2</sup>

<sup>1</sup>Kagawa University, Japan, <sup>2</sup>Toyama University, Japan

**10:30-12:20**

*Oral Sessions*

## Room A

### SS07: Taiwan-Sweden Joint Research Works toward 6G Mobile Communications

Chair: Hsi-Tseng Chou, *National Taiwan University, Taiwan*

#### 220339: (Invited talk) Antenna Technologies for Beyond-5G Wireless Communication: Challenges and Opportunities

Marianna Ivashina<sup>1</sup>, Artem Vilenskiy<sup>1</sup>, Hsi-Tseng Chou<sup>2</sup>, Joachim Oberhammer<sup>3</sup>, and M. Ng Mou Kehn<sup>4</sup>

<sup>1</sup>Chalmers University of Technology, Sweden, <sup>2</sup>KTH Royal Institute of Technology, Sweden, <sup>3</sup>National Taiwan University, Taiwan, <sup>4</sup>National Chiao Tung University, Taiwan

#### 220087: An Ultra-Wideband Design of Vivaldi-type antenna for multi-communication applications at millimeter wave frequencies

Yen-Ju Lin, Hsi-Tseng Chou

*National Taiwan University, Taiwan*

#### 220299: Lens-based Multi-Beam Antenna Technologies for Highly Efficient Dual-Polarized Radiations at Sub-THz Frequencies

Hsi-Tseng Chou, Zhi-Da Yan

*National Taiwan University, Taiwan*

#### 220340: A 55-105 GHz PIN Diode SPDT Switch

Vessen Vassilev<sup>1</sup>, Artem Vilenskiy<sup>1</sup>, Hsi-Tseng Chou<sup>2</sup>, Marianna Ivashina<sup>1</sup>, Herbert Zirath<sup>1</sup>

<sup>1</sup>Chalmers University of Technology, Sweden, <sup>2</sup>National Taiwan University, Taiwan

#### 220425: Millimeter Wave Antennas Using Gap Waveguides with Beam Steerability at Fixed Frequencies for Beyond 5G Mobile Communications

Teng-Hsiang Ko<sup>1</sup>, Wei-Min Hsu<sup>1</sup>, Pei-Lun Kao<sup>1</sup>, M. Ng Mou Kehn<sup>1</sup>, Hsi-Tseng Chou<sup>2</sup>, and Marianna Ivashina<sup>3</sup>

<sup>1</sup>National Yang Ming Chiao Tung University, Taiwan, <sup>2</sup>National Taiwan University, Taiwan, <sup>3</sup>Chalmers University of Technology, Sweden

## Room B

### SS09: Wideband and Multiband Antennas

**Chairs:** Takafumi Fujimoto, *Nagasaki University, Japan*  
Hsin-Lung Su, *National Pingtung University, Taiwan*

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**220254: (Invited talk) A Printed-Inverted F Antenna Combined with Two L-Shaped Elements for Dual Band Circular Polarization**

Takafumi Fujimoto and Chai-Eu Guan  
*Nagasaki University, Japan*

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**220129: One-sided directional wideband slot array antenna for 28 GHz application**

Shunsuke Yamamoto, and Haruichi Kanaya  
*Kyushu University, Japan*

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**220305: Parameter Study of Dual-Band Array Antenna for Stacked Differential Rectenna Arrays**

Kento Saito, Eisuke Nishiyama, and Ichihiko Toyoda  
*Saga University, Japan*

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**220121: Array Design of Broadband Circularly Polarized Patch Antenna Using Metasurface**

Uganbayar Purevdorj, Ryuji Kuse, Takeshi Fukusako  
*Kumamoto University, Japan*

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**220142: An Experimental Study on Half-Shaped Printed UWB Monopole Antenna with Short Stub**

Nobuyasu Takemura and Chikayo Hata  
*Nippon Institute of Technology, Japan*

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## Room C

### SS12: Advanced Antenna Arrays and Their Beamforming for Future Wireless Communications

**Chairs:** Pei-Yuan Qin, *University of Technology Sydney, Australia*  
Haihan Sun, *University of Technology Sydney, Australia; Nanyang Technological University, Singapore*

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**220234: (Invited talk) 1-Bit Reconfigurable Huygens Element for Beam-Steering Transmitarrays**

Xuan Wang<sup>1,2</sup>, Pei-Yuan Qin<sup>2</sup>, and Y. Jay Guo<sup>2</sup>  
<sup>1</sup>Shanghai Jiao Tong University, China, <sup>2</sup>University of Technology Sydney, Australia

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**220279: The Design of A Single-Layer High-Gain Reflectarray Antenna with Polarization Conversion**

Min Wang<sup>1</sup>, Yuxin Mo<sup>1</sup>, Ya Liao<sup>1,2</sup>, Zhengchuan Chen<sup>3</sup>  
<sup>1</sup>Chongqing University of Posts and Telecommunications, China, <sup>2</sup>Southeast University, China, <sup>3</sup>Chongqing University, China.

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**220118: Element-Rotated Linear, Planar, and Conformal Arrays with Shaped Patterns**

Ming Li<sup>1,2</sup>, Yanhui Liu<sup>1</sup>, Peiyuan Qin<sup>2</sup>  
<sup>1</sup>University of Electronic Science and Technology of China, China, <sup>2</sup>University of Technology Sydney (UTS), Australia

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**220148: Spiral Choking Method for Scattering Suppression in 4G and 5G Base Station Antenna Arrays**

Hai-Han Sun<sup>1,2</sup>, He Zhu<sup>1</sup>, Can Ding<sup>1</sup>, Bevan Jones<sup>1</sup>, and Y. Jay Guo<sup>1</sup>  
<sup>1</sup>University of Technology Sydney, Australia, <sup>2</sup>Nanyang Technological University, Singapore

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**220149: Conformal Dielectric Linear-to-Circular Polarization Converter With Broadband Bandwidth and High Angular Stability**

Xi-Bei Zhao, Xiao-Yu Tong, and Feng Wei  
*Xidian University, China*

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## Room D

### SS20: Novel Compact High-Gain Antennas and Their Applications

**Chairs:** Danai Torrungrueng, *King Mongkut's University of Technology North Bangkok, Thailand*

Nonchanutt Chudpooti, *King Mongkut's University of Technology North Bangkok, Thailand*

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**220393: (Invited talk) A Low-Cost Partially Reflective Surface with Corner Reflector Antenna for Gain Enhancement**

Nonchanutt Chudpooti, Kittisak Phaebua, Titipong Lertwiriaprapa, Prayoot Akkaraekthalin, and Danai Torrungrueng

*King Mongkut's University of Technology North Bangkok, Thailand*

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**220131: Indoor Radio Wave Coverage by Phased Arrays of Antennas at Millimeter Wave Frequencies**  
Chen-Yi Chang and Hsi-Tseng Chou

*National Taiwan University, Taiwan*

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**220132: Contoured Beamforming of Reflectarray Antennas for 5G Indoor Coverage at Sub-6 GHz Band**

Chen-Yi Chang<sup>1</sup>, Chang-Lun, Liao<sup>2,3</sup>, and Hsi-Tseng Chou<sup>1</sup>

<sup>1</sup>National Taiwan University, Taiwan, <sup>2</sup>National Taiwan University of Science and Technology, Taiwan,

<sup>3</sup>Telecommunication Laboratories Chunghwa Telecom Co., Ltd.

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**220414: THz Photo-Polymeric Lens Antennas for Potential 6G Beamsteering Frontend**

Nonchanutt Chudpooti<sup>1</sup>, Nattapong Duangrit<sup>2</sup>, Sukanya Chudpooti<sup>1</sup>, Prayoot Akkaraekthalin<sup>1</sup>, Ian D. Robertson<sup>3</sup>, and Nutapong Somjit<sup>3</sup>

<sup>1</sup>King Mongkut's University of Technology North Bangkok, Thailand, <sup>2</sup>Rajamangala University of Technology Lanna, Thailand, <sup>3</sup>University of Leeds, U.K.

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**220392: Gain Enhancement of Compact Parabolic Reflector Antennas Using Partially Reflective Surfaces**

Kittisak Phaebua, Nonchanutt Chudpooti, Titipong Lertwiriaprapa and Danai Torrungrueng

*King Mongkut's University of Technology North Bangkok, Thailand.*

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## Room E

### Antenna Arrays

**Chair:** Ding Bing Lin, *National Taiwan University of Science and Technology, Taiwan*

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**220214: (Invited talk) Wideband Phased Arrays with Large Scan Range and Low Profile**

Shi-Wei Qu\* and Shiwen Yang

*University of Electronic Science and Technology (UESTC), China*

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**220288: Feasibility Study of a Wide Coverage Dual-Polarized Phased Array Antenna at 10 GHz**

Prabhat Khanal, Jian Yang, Marianna Ivashina

*Chalmers University of Technology, Sweden*

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**220301: A Series-Fed Patch Antenna Array for Biomedical Radar Applications**

Yi-Jie Ye, Hui-Yu Chueh, Wei-Chan Chang, and Wen-Jiao Liao

*National Taiwan University of Science and Technology, Taiwan*

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**220203: Demonstration of Radial Line Helical Phased Array with Antenna Elements Rotated by Motors**

Narihiro Nakamoto, Yusuke Suzuki, Satoshi Yamaguchi, Toru Fukasawa, Yoshio Inasawa, and Hiroaki Miyashita

*Mitsubishi Electric Corporation, Japan*

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**220166: Low-Cost AiP Array Design Using Machine Learning for mmWave Mobile Systems**

Mohammed Farouk Nakmouche<sup>1</sup>, M. Idrees Magray<sup>2</sup>, A.M.M.A. Allam<sup>3</sup>, Diah E. Fawzy<sup>1</sup>, Ding Bing Lin<sup>4</sup>, Jenn-Hwan Tarng<sup>2</sup>

<sup>1</sup>Izmir University of Economics, Turkey, <sup>2</sup>National Chiao Tung University, Taiwan, <sup>3</sup>German University in Cairo, Egypt, <sup>4</sup>National Taiwan University of Science and Technology, Taiwan

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**13:20-16:20**

***Keynotes & Industrial Talks***

**Room A**

**Chair: Chow-Yen-Desmond Sim, Feng Chia University Taiwan**

**13:20-13:40**

**Industrial Talk 1**



**The Latest Simulation Technology and Best Practice in Antenna and Electromagnetic Designs**

**Benson Wei**

*Ansys Taiwan*

**Abstract:**

Ansys is the largest engineering simulation company in the world and very focusing on simulation technologies. ANSYS uses multiple advanced solver technologies that allow users to match the appropriate solver to any simulation. For Antenna designs, each solver in ANSYS HFSS is an automated, powerful solution processor for which the user dictates the geometry, properties of the material and the required range of solution frequencies.

In this session you can learn about how Ansys drive new simulation technology in Antenna and Electromagnetic designs that will help engineers increase the efficiency for variant antenna and EMI designs.

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**13:40-14:00**

**Industrial Talk 2**



**Novel Diamond CATR Design for B5G and Radar Testing**

**Richard Liu**

*Wavepro Inc., Taiwan*

**Abstract:**

CATR being used for satellite and military radar testing for years. Recently even being widely used for 5G and automotive radar testing. A normal accuracy would be enough for 5G. B5G, so called LEO, or military radar would require a highly accurate CATR to calibrate their EUTs. WavePro developed an novel and innovative CATR design to meet the requirements.

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## Antennas and RF Technologies for 6G

**Prof. Y. Jay Guo**, *University of Technology Sydney, Australia*

### Abstract:

As the fifth generation (5G) mobile and wireless communications networks are being rolled out globally, research on the sixth generation (6G) networks has started in earnest. 6G is expected to deliver a number of features different from 5G. These include greater cost, energy and spectral efficiency, higher data rates to support such applications as virtual reality and augmented reality, universal coverage provided by integrated terrestrial, airborne and spaceborne networks, high level of intelligence in both the user terminals and networks enabled by advance in machine learning, and enhanced security and privacy. These new features call for innovation in air interfaces and transmission technologies, many of which subsequently translate into challenges in antennas and radio frequency (RF) technologies.

In this talk, we shall discuss our 6G vision and present some main challenges of 6G to antennas and RF technologies. In particular, we shall cover technologies for integrated space and terrestrial networks, in-band full duplex and multiple beam-forming antennas. Recent research progress made by our group in those areas will be presented. These range from reconfigurable beam scanning antennas, low-cost analogue multiple beam-forming, and conformal antenna arrays, to radio frequency interference cancellation circuits for in-band full duplex MIMO systems.

### Biography:

Dr Y. Jay Guo is a Distinguished Professor and the Director of Global Big Data Technologies Centre (GBDTC) at the University of Technology Sydney (UTS), Australia. Prior to this appointment in 2014, he served as a Director in CSIRO for over nine years. Before joining CSIRO, he held various senior technology leadership positions in Fujitsu, Siemens and NEC in the U.K. His research interest includes antennas, mm-wave and THz communications and sensing systems as well as big data technologies. He has published five books and over 550 research papers including 280 transaction papers, and he holds 26 patents.

Prof Guo is a Fellow of the Australian Academy of Engineering and Technology, a Fellow of IEEE and a Fellow of IET. He has won a number of most prestigious Australian Engineering Excellence Awards and CSIRO Chairman's Medal. He was named one of the most influential engineers in Australia in 2014 and 2015, respectively, and one of the top researchers across all fields in Australia in 2020.

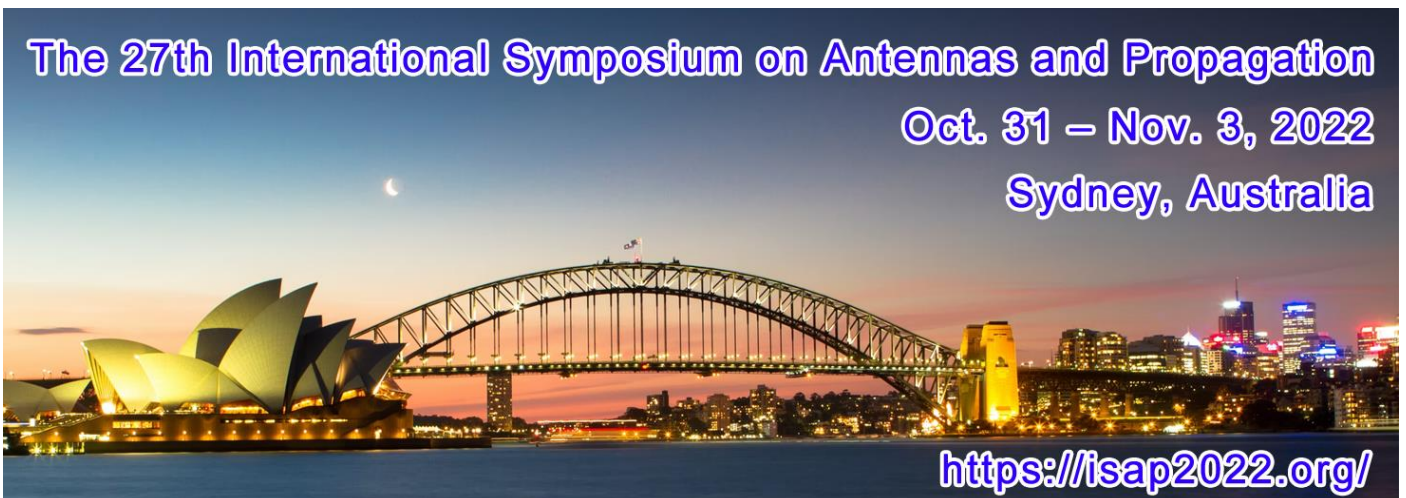
Prof Guo has chaired numerous international conferences and served as guest editors for a number of IEEE publications in various technical societies. He is currently the Chair of International Steering Committee, International Symposium on Antennas and Propagation (ISAP).

**The 27th International Symposium on Antennas and Propagation**

**Oct. 31 – Nov. 3, 2022**

**Sydney, Australia**

<https://isap2022.org/>







## Millimeter-Wave Antennas for Next Generation Telecommunications Networks

**Dr. Mauro Ettore**, *Institut d'Electronique et des Technologies du numéRique (IETR),  
French National Center for Scientific Research (CNRS), Rennes, France*

### Abstract:

In this talk, I will describe the current research efforts of my group at IETR in millimeter-wave antennas for next generation telecommunications networks for high data-rate communication links. Millimeter-wave antennas are key to deploying next generation 5G networks and beyond and satellite systems that promise broad bandwidths and smart data links for mobile users. In collaboration with major industrial and academic partners, I recently proposed quasi-optical planar systems as efficient beam formers for multi-beam, wide scanning antennas. Such an approach overcomes the loss and prohibitive cost associated with phased arrays in the millimeter wave range, while preserving the agility of the radiating unit. Implementations of the proposed system in the millimeter and subterahertz frequency range will be presented in different technologies such as substrate integrated waveguide (SIW), low temperature co-fired ceramic (LTCC) and silicon micromaching. For satellite links in Ka-band, I will show that these quasi-optical planar systems can be used to drive the focal array of a multi-reflector system. Such a configuration reduces the phase aberrations of multi-reflector configurations for high-data rates and wide coverage. For terminal users, I will present some recent activities on wideband wide-angle continuous stub arrays. I will introduce the unique scanning and bandwidth capabilities of such arrays and their implementation in low-cost printed circuit board technology.

### Biography:

Dr. Mauro Ettore received a Laurea degree “summa cum laude” in Electrical Engineering and a Ph.D. in Electromagnetics from the University of Siena, Italy, in 2004 and 2008, respectively. Part of his Ph.D. work was developed at the Netherlands Organisation for Applied Scientific Research (TNO), The Netherlands, where he later worked as an Antenna Researcher. From 2008 to 2010, Dr. Ettore was a Postdoctoral Fellow at the IETR, University of Rennes 1, France. In October 2010, he joined IETR as CNRS Research Scientist. In 2010 and 2016, he was a Visiting Scholar in the Radiation Laboratory, University of Michigan, Ann Arbor, USA. In 2015, he was an invited professor at Tokyo Institute of Technology, Japan. From 2014 until 2020, he assumed responsibilities for the multi-beam antenna activity for satellite applications in the joint laboratory (MERLIN) between IETR and Thales Alenia Space, France. From 2016 until 2021, he was a member of the French National Committee for Scientific Research, Section 08, CNRS, Paris, France. Dr. Ettore’s research interests include the analysis and design of leaky-wave antennas, periodic structures, millimeter-wave antennas, non-diffractive radiation, near-field focusing techniques, and wireless power transfer systems.

Since 2017, Dr. Ettore serves as Associate Editor of the IEEE Transactions on Antennas and Propagation. In 2020 and 2021 he was appointed European Association on Antennas and Propagation (EurAAP) ambassador. From 2017 until 2020 he was a member of the Selection Committee for the Best Paper Award, IEEE Transactions on Terahertz Science and Technology. In 2020, he co-founded the open access journal Reviews on Electromagnetics of EurAAP for which he serves as Associate Editor.

Dr. Ettore received or was co-recipient of several awards among them the Innovation Award at 2018 ESA Antenna Workshop in the Netherlands, the Best Paper Award in Electromagnetics and Antenna Theory at EuCAP 2018, London, UK and the Best Antennas Paper Award at EuCAP 2021, Düsseldorf, Germany.



## **Hardware and Software Solution for Wireless Power Transfer and mmWave**

**Leslie Li**

*Auden Techno Corp.*

### **Abstract:**

SPEAG's SEMCAD X 5G Toolkit is tested for its efficiency and user-friendliness in order to design and optimize on-device phased-array antennas for 5G applications. In this video, an industrial power-user demonstrates how the 5G toolkit allows engineers to boost the development process of two phased-array antennas. Moreover, it is outlined how the 5G Toolkit empowers to perform compliance evaluations based on surface-averaged power density within short time and how to obtain the worst-case power density to fulfill regulatory compliance requirements.

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**220098: Development of MACKEY II type M miniaturized using multiple slits**

Kota Hakamata, Keisuke Miyashita, Yokoe Keito, Shigeru Makino, Kenji Itoh

*Kanazawa Institute of Technology, Japan*

**220130: On the use of a Microstrip Antenna for Moisture Content Evaluation of Pharmaceutical Tablets**

Pongphan Leelatien

*Thammasat University, Thailand*

**220319: Design of a Miniaturized Annular Ring Metamaterial Microstrip Antenna**

Bei Zhang, and Xiaofei Xu

*Shanghai University, China*

**220134: Improving Antenna Efficiency of Low-height-printed IFA Using SRR for Narrow-Bezel Applications**

Jang Hwan Bae, Young Joong Yoon

*Yonsei University, Republic of Korea*

**220071: A Millimetre-Wave Tri-Band Antenna Embedded on Smart Watch for Wearable Applications**

Sarosh Ahmad<sup>1</sup>, Adnan Ghaffar<sup>2</sup>, Xue Jun Li<sup>2</sup>, and Nabil Cherif<sup>3</sup>

<sup>1</sup>Government College University (GCUF), Pakistan, <sup>2</sup>Auckland University of Technology, New Zealand, <sup>3</sup>Mustapha Stambouli University, Algeria

**220378: Experimental Investigation of Planar Frequency Dispersive Phase Shifter for Base Station Antennas**

Toshiki Soma<sup>1</sup>, Keizo Cho<sup>1</sup>, Naobumi Michishita<sup>2</sup>, Ichiro Oshima<sup>3</sup>, and Hiroaki Nakabayashi<sup>1</sup>

<sup>1</sup>Chiba Institute of Technology, Japan, <sup>2</sup>National Defense Academy, Japan, <sup>3</sup>DKK Co., Ltd., Japan

**220338: Development of cable antenna for UHF-RFID identification**

Tomohiro Osaki, Yoshinobu Okano

*Tokyo City University, Japan*

**220045: A Simple and Tunable Reflective Polarization Converter Based on Vanadium Oxide Built-in Metamaterial Structure**

Fuyuan Yu, Cheng Wang, Xiang Liu Jiabing Zhu, and Xiaobo Shen

*Huainan Normal University, China*

**220190: Wideband Planar Microstrip Antenna Inspired by Metamaterial for Mid Band 5G Applications**

Hussam Keriee<sup>1,2</sup>, Mohamad Kamal A. Rahim<sup>1</sup>, Nawres Abbas Nayyef<sup>3</sup>, and Osman Ayop<sup>1</sup>

<sup>1</sup>Universiti Teknologi Malaysia, Malaysia, <sup>2</sup>Al-Hadi University College, Iraq, <sup>3</sup>Universiti Teknikal Malaysia Melaka, Malaysia

**220424: A Very Compact and High Efficient Rectenna for RF Energy Harvesting Applications**

Zongyu Zhang, Jiawang Li

*Southeast University, China*

**220163: Metamaterial Minkowski Fractal Antenna With Defective Ground Structure**

Arshad Karimbu Vallappil<sup>1</sup>, Mohamad Kamal A. Rahim<sup>1</sup>, Bilal A. Khawaja<sup>2,3</sup>, Noor Asniza Murad<sup>1</sup>

<sup>1</sup>Universiti Teknologi Malaysia, Malaysia, <sup>2</sup>Islamic University of Madinah, Saudi Arabia, <sup>3</sup>National University of Sciences and Technology (NUST), Pakistan

**220311: Compact Circularly Polarized Disc Patch Antenna Designed with Sector Mushroom Structures**

Hao Lu, Guoxiang Dai, and Xiaofei Xu

*Shanghai University, China*



**220056: A Broadband 8-Antenna Array Design for 5G MIMO Smartphone Applications**

Jayshri Kulkarni<sup>1</sup>, Jia-Yu Chen<sup>2</sup>, Tong-Yu Zhang<sup>2</sup>, and Chow-Yen-Desmond Sim<sup>2</sup>

<sup>1</sup>Vishwakarma Institute of Information Technology, India, <sup>2</sup>Feng Chia University, Taichung, Taiwan

**220356: Orthogonal Polarized Antenna Composed of Halo Antenna with Parasitic Elements and Sleeve Antenna**

Tomokazu Mizutani<sup>1</sup>, Naobumi Michishita<sup>1</sup>, Hiroshi Sato<sup>2</sup>, Yoshio Koyanagi<sup>2</sup>, Hisashi Morishita<sup>1</sup>

<sup>1</sup>National Defense Academy, Japan, <sup>2</sup>Panasonic Corporation, Japan

**220082: Design of ultra-wideband TEM horn antenna for life detection**

Ying Suo, Feixiang Qi, Wei Li

Harbin Institute of Technology, China

**220391: A Design of Circular Polarization Antenna Array using Sequential Rotation for SATCOM**

Hamed Alsuraisry<sup>1</sup>, Hsin-Chia Lu<sup>2</sup>, Tian-Wei Huang<sup>2</sup>

<sup>1</sup>King Abdulaziz City for Science and Technology (KACST), Saudi Arabia,

<sup>2</sup>National Taiwan University Taiwan

**220247: Smith Chart Based Method for Rapid Design of Wideband and Multiband Quasi-Yagi Antennas**

Nai-Chen Liu<sup>1</sup>, Ching-Cheng Tien<sup>2</sup>, and Jenn-Hwan Tarng<sup>1</sup>

<sup>1</sup>National Yang Ming Chiao Tung University, Taiwan, <sup>2</sup>Sigurd Microelectronics Corp., Taiwan

**220028: FDTD Simulation of DC Plasma Antenna**

Shen Shou Max Chung<sup>1</sup>, and Shih-Chung Tuan<sup>2</sup>

<sup>1</sup>National Penghu University of Science and Technology, Taiwan,

<sup>2</sup>Oriental Institute of Technology, Taiwan

**220063: A Novel CPW Wideband Circularly Polarized Antenna for 5G Millimeter-wave System**

X.M. Chen, Junlin Wang, Xin Wang, and Rui Shao

Inner Mongolia University, China

**220057: Design of Laptop Antenna for WLAN and Wi-Fi 6E Applications**

Tuan-Yung Han<sup>1</sup>, Wei-Tzu Hsieh<sup>2</sup>, Kai-Hong Jheng<sup>2</sup>, Shih-Hua Wang<sup>2</sup> and Chow-Yen-Desmond Sim<sup>2</sup>

<sup>1</sup>National Taitung Junior College, Taiwan, <sup>2</sup>Feng Chia University, Taichung, Taiwan

**220144: Design of Multifunctional Reflectarray Elements Based on the Switchable Ground Plane**

Xianbo Cao and Qiang Chen

Tohoku University, Japan

**220065: Dual-Band Circularly Polarized Helical Antenna for Satellite Buoy**

Wei-Zhi Xiao, Wei-Chen Cheng, Jwo-Shiun Sun, and Guan-Yu Chen

National Taipei University of Technology, Taiwan

**220081: Design of exponential gradient TEM horn antenna for ground penetrating radar**

Ying Suo, Feixiang Qi, Wei Li

Harbin Institute of Technology, China

**220162: Frequency Reconfigurable Complementary Electric LC Resonator Antenna**  
Arrauzah Razak<sup>1</sup>, Mohamad Kamal A. Rahim<sup>1</sup>, Noor Asniza Murad<sup>1</sup>, Mohd Fairus Mohd Yusoff<sup>1</sup>, Huda A Majid<sup>2</sup>

<sup>1</sup>Universiti Teknologi Malaysia, Malaysia, <sup>2</sup>Universiti Tun Hussein Onn Malaysia, Malaysia

**220171: Simulation Design of Cavity-Backed Self-Phased Polarization-Reconfigurable Antenna Based on Liquid Metal**  
Yuwei Zhang<sup>1</sup>, Shu Lin<sup>2</sup>, Qun Ding<sup>1</sup>, Jiaxuan Li<sup>3</sup>, and Xingqi Zhang<sup>3</sup>

<sup>1</sup>Heilongjiang University, China,

<sup>2</sup>Harbin Institute of Technology,

China, <sup>3</sup>University College Dublin, Ireland.

**220058: A Circularly Polarized UHF RFID Tag Antenna Design**  
Chow-Yen-Desmond Sim, Tzu-Wei Huang, Yu-Chieh Hsuan, Shun-Yu Tsai, and Chuan-Kuei Weng

*Feng Chia University, Taiwan*

**220080: A Wideband Planar Array Antenna Using Both-Sided MIC and Leaf-Shaped Bowtie Slot Elements**  
Naoya Yamamoto, Mangseang Hor, Takashi Hikage, and Manabu Yamamoto

*Hokkaido University, Japan*

**220049: A Pattern Reconfigurable Antenna Design for 5G Communication System**  
Tuan-Yung Han<sup>1</sup>, Zhi-Kai Hsieh<sup>2</sup>, Jeng-Jr Lo<sup>2</sup>, and Chow-Yen-Desmond Sim<sup>2</sup>

<sup>1</sup>National Taitung Junior College,

Taiwan, <sup>2</sup>Feng Chia University,

Taiwan

**220042: A 4×4 Planar Dual-Polarization Retrodirective Array**  
Xiao-Fei Li and Yong-Ling Ban  
*University of Electronic Science and Technology of China, China*

**220101: Adaptation of Reflectarray Antenna to Yield Scanning-Spot Beam**  
Yusuke Kaimori, Shigeru Makino, Shota Takino, Sanshiro Shigemitsu  
*Kanazawa Institute of Technology, Japan*

**220188: Wide-Multi-Narrowband Reconfigurable Antenna**  
Izni Husna Idris<sup>1</sup>, Mohamad Rijal Hamid<sup>1</sup>, Kamilia Kamardin<sup>2</sup>, and Mohamad Kamal A. Rahim<sup>1</sup>  
<sup>1</sup>Universiti Teknologi Malaysia, Johor Bahru, Malaysia, <sup>2</sup>University Teknologi Malaysia, Kuala Lumpur, Malaysia

**220043: Independent Dual-LP Reflectarray Unit Cell Based on Crossed Dipoles with Split Rings**  
Yun-Ying Chan and Shih-Yuan Chen  
*National Taiwan University, Taiwan*

**220125: A Substrate Integrated Waveguide Planar Slot Array Antenna with Low Sidelobe Level**  
Yun-Ting Tsai, Yu-Chen, Hsu, HuyNam Chu, Tzyh-Ghuang Ma  
*National Taiwan University of Science and Technology, Taiwan*

**220368: Correction Method of Element Phase Error in Multi-Feed Beam Scanning Reflectarray for Radio Astronomy Observation**  
Takumi Kato<sup>1</sup>, Kentaro Murata<sup>1</sup>, Naoki Honma<sup>1</sup>, Osamu Kameya<sup>2</sup>, Tomoaki Oyama<sup>2</sup>, and Mareki Honma<sup>2</sup>  
<sup>1</sup>Iwate University, Japan, <sup>2</sup>National Astronomical Observatory of Japan, Japan

**220051: Design of 24 GHz Antenna Array for Powder Materials Flow Measurement Applications**  
Wei-Chen Cheng, Da-Wei Li, Wei-Zhi Xiao, Guan-Yu Chen, Chu-Hsien Cheng, and Jwo-Shiun Sun  
*National Taipei University of Technology, Taiwan*

**220241: Design of Optimized Multiple Frequency Shaped Beam Reflectarray Antenna**  
Sanshiro Shigemitsu, Mei Fukaya, Shigeru Makino, Shota Takino  
*Kanazawa Institute of Technology, Japan*

**220266: Design of a Slot Array Antenna on Alternating-phase Feed Parallel-plate Waveguide**  
Yuta Ishikawa, Takashi Tomura, and Jiro Hirokawa

*Tokyo Institute of Technology, Japan*

**220351: Planar Sleeve Antenna with Choke Structure Composed of Zeroth-Order Resonator**  
Keisuke Sakakibara, Hiroshi Hashiguchi, Naobumi Michishita\*, and Hisashi Morishita

*National Defense Academy, Japan*

**220020: A Broadband Reflectarray Based on Multi-Resonance Unit**

Tao Liao<sup>1</sup>, Yong-Chang Jiao<sup>2</sup>

*<sup>1</sup>Beijing Institute of Radio Measurement, China, <sup>2</sup>Xidian University, China*

**220269: Compact Dual-Polarized 5GHz WiFi Stacked patch Antenna Array**

Aimé Levavasseur, Gildas Bengloan, Julien Harel, Eduardo Motta Cruz,

*<sup>1</sup>Univ Nantes, France*

**220280: A New Approach to Design Microstrip Patch Antenna with Wideband Harmonic Suppression**

Hao Zhang, Feng Huang, Ye Han

*Nanjing University of Posts and Telecommunications, China.*

**220354: Dual-Band Decoupling for Two PIFAs Using Linear Parasitic Elements and Bridge Line**

Quang Quan Phung<sup>1</sup>, Naobumi Michishita<sup>1</sup>, Hiroshi Sato<sup>2</sup>, Yoshio Koyanagi<sup>2</sup>, Hisashi Morishita<sup>1</sup>

*<sup>1</sup>National Defense Academy, Japan*

*<sup>2</sup>Panasonic Corporation, Japan*

**220073: Microstrip Array Antenna Fed by a Slotted Waveguide**

D. R. Shachrur<sup>1</sup>, U. Nissanov<sup>2</sup>, E. Levine<sup>3</sup> and H. Matzner<sup>1</sup>

*<sup>1</sup>HIT, Israel, <sup>2</sup>University of Johannesburg, South-Africa, <sup>3</sup>Afeka College of Engineering, Israel*

**220169: Millimeter Wave Linear Array Microstrip Antenna with Circular CSRR**

Norsaidah Muhamad Nadzir<sup>1</sup>, Mohamad Kamal A. Rahim<sup>1</sup>, Noor Asniza. Murad<sup>1</sup>, Osman Ayop<sup>1</sup>, and Mohamed. Himdi<sup>2</sup>

*<sup>1</sup>Universiti Teknologi Malaysia, Malaysia, <sup>2</sup>Université de Rennes I, France*

**220287: A WLAN/WiFi-6E MIMO Antenna Design for Handset Devices**

Chun-An Cai, Kuo-Yu Kai, and Wen-Jiao Liao

*National Taiwan University of Science and Technology, Taiwan*

**220355: Design of a Circularly Polarized Slot Array on a Parallel-plate Waveguide fed by Longitudinal Coupling Slots with Posts**

Yuki Tomori Tianyu Wang Jiro Hirokawa Takashi Tomura

*Tokyo Institute of Technology, Japan*

**220035: A High Gain Narrowband Microstrip Antenna Array for Wireless Applications**

Budhadeb Maity and Sisir Kumar Nayak

*Indian Institute of Technology Guwahati, India*

**220300: V-band Array Antenna Made of Liquid Crystal Polymer**

Yuta Hasegawa<sup>1</sup>, Masayuki Ota<sup>1</sup>, Toshiya Iwamura<sup>2</sup>, Yusuke Nakatani<sup>1</sup>, Daisuke Awaji<sup>1</sup>, and Ning Guan<sup>1</sup>

*<sup>1</sup>Fujikura Ltd., Japan, <sup>2</sup>Tohoku Fujikura Ltd., Japan*

**220358: Simulation Results of a Foldable Reflectarray Composed of Four Triangular Notched Patches**

Takashi Tomura, Masato Machida, and Hiraku Sakamoto

*Tokyo Institute of Technology, Japan*

**220091: Dual-Polarized Microstrip Array Antenna Fed by Cavity Slots**

U. Nissanov<sup>1</sup>, E. Levine<sup>2</sup>, and H. Matzner<sup>3</sup>

*<sup>1</sup>University of Johannesburg, South-Africa, <sup>2</sup>Afeka College of Engineering, Israel, <sup>3</sup>HIT, Israel*

# Friday, October 22

**08:30-10:10**

*Oral Sessions*

**Room A**

## Antennas for Laptops or Handheld Devices

**Chair: Chien-Pai Lai, HP, Taiwan**

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### **220083: Asymmetrical, Self-Isolated Laptop Antenna in the 2.4/5/6 GHz Wi-Fi 6E Bands**

**Saou-Wen Su\* and Che-Chi Wan**

*Antenna Design Department, Advanced EM & Wireless Communication R&D Center, Taiwan*

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### **220110: Wideband Self-decoupled Dual Antennas for 5G MIMO Operation in Smartphone**

**C. Y. Tsai and H. Y. Wang**

*Huawei Technologies, United Kingdom*

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### **220285: LTE-band Slot Antenna Design for Laptops with Metal Enclosure**

**Hui-Yu Chueh, Yan-Jun Lin, and Wen-Jiao Liao**

*National Taiwan University of Science and Technology, Taiwan*

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### **220290: A Multiband LTE/WWAN Antenna Design for Tablet and Laptop Devices**

**Chen-Yi Ho, Yu-Hsien Chang, and Wen-Jiao Liao**

*National Taiwan University of Science and Technology, Taiwan*

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### **220298: A Two-Antenna System for LTE MIMO Uses on Laptops with Metal Covers**

**Yu-Xiang Wang, Hung-I Lin, and Wen-Jiao Liao**

*National Taiwan University of Science and Technology, Taiwan*

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**Room B**

## SS15: Millimeter-wave and sub-6G Antennas for 5G Systems (1/2)

**Chairs: Hang Wong, City University of Hong Kong, Hong Kong SAR, China**

**Yang Yang, University of Technology Sydney, Australia**

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### **220213: Conductive and Dielectric Fully-Integrated 3D Printed Dual-Band Millimeter-Wave Fresnel Zone Plate Lens**

**Jianfeng Zhu<sup>1</sup>, Xiaopeng Li<sup>2</sup> and Yang Yang<sup>1</sup>**

*<sup>1</sup>University of Technology Sydney, Australia, <sup>2</sup>The University of New South Wales (UNSW Sydney), Australia*

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### **220112: Wideband MIMO Antenna for 5G Smartphone Applications**

**Xiao-Ting Yuan<sup>1</sup>, Zhe Chen<sup>1</sup>, Tianqi Gu<sup>2</sup>, Yangping Zhao<sup>1</sup> and Tao Yuan<sup>1</sup>**

*<sup>1</sup>Shenzhen University, China, <sup>2</sup>Beijing Smartchip Microelectronics Technology Company Limited, China*

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### **220176: A Transparent MMW Liquid Fresnel Lens Antenna for 5G Communication**

**HanZhen Cai, KaiXu Wang**

*Harbin Institute of Technology, China*

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### **220055: (Invited talk) A wideband millimeter-wave magneto-electric dipole array with pillbox-distributed network**

**Guang-Hua Sun\* and Hang Wong**

*City University of Hong Kong, Hong Kong*

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## Room C

### SS21: Antenna Designs, Solutions, Measurements, and Trends for 5G and Beyond (1/2)

**Chairs:** Cheng-Nan Hu, *Oriental Institute of Technology, Taiwan*  
Huan Chu Huang, *National Yang Ming Chiao Tung University, Taiwan*

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**220047: Band-Notched Reconfigurable Ultra-wideband Antenna Based on Square Ring Slot**  
Xinyu Wang, Wenmei Zhang, Liping Han, Xinwei Chen  
*Shanxi University, China*

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**220104: LTCC End-Fire Array Antenna with Dual-Band and Dual-polarization for Mobile**  
Daisuke Yamashita  
*NGK SPARK PLUG CO., LTD., Japan*

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**220251: The Effects of Array Element Number on 28 GHz Propagation**  
Shen Shou Max Chung<sup>1</sup> and Shih-Chung Tuan<sup>2</sup>  
<sup>1</sup>*National Penghu University of Science and Technology, Taiwan*, <sup>2</sup>*Oriental Institute of Technology, Taiwan*

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**220037: The Hybrid Over-the-Air (OTA) Test Method**  
Cheng-Nan Hu, Jiaquan Wu, P. X. Wang, Jacobi Chen, and Dau-Chyrh Chang  
*Oriental Institute of Technology, Taiwan*

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**220038: Coherent Phase Calibration of the 5G Massive MIMO Devices Using CATR OTA Test Method**  
Cheng-Nan Hu, Jacobi Chen, Zong-Ting Csai, P. X. Wang, and Jiaquan Wu  
*Oriental Institute of Technology, Taiwan*

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## Room D

### Antenna Modeling and Measurements

**Chairs:** Wen-Jiao Liao, *National Taiwan University of Science and Technology, Taiwan*  
Prof. Jia-Shiang Fu, *National Central University, Taiwan*

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**(Invited Talk) Time Domain Equivalent Circuit for the Characterization of Pulsed Photoconductive Antennas**  
Andrea Neto  
*Delft University of Technology, Netherlands*

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**(Invited Talk) Surrogate Targets Developments for Automobile Radar Testing**  
Chi-Chih Chen  
*Ohio State University, USA*

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**220274: Vehicular MIMO Antenna Measurements in Outdoor Environments using Coherent Base Station Scanner with Real-time Demodulation**  
Kazuma Tomimoto<sup>1,2</sup>, Ryo Yamaguchi<sup>1</sup>, and Takeshi Fukusako<sup>2</sup>  
<sup>1</sup>*Softbank Corp., Japan*, <sup>2</sup>*Kumamoto University, Japan*

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**220184: Evaluation of Automotive Antenna Over the Air Performance**  
M. Mercier<sup>1\*</sup>, F. Mioc<sup>1°</sup>, K. Rutkowski<sup>1+</sup>, A. Scannavini<sup>1°</sup>, and T. Nowack<sup>2</sup>, C. Bornkessel<sup>2</sup>, and M. A. Hein<sup>2</sup>  
<sup>1</sup>*Microwave Vision Group (MVG)*, <sup>\*</sup>*Hong Kong*, <sup>°</sup>*Italy*, <sup>+</sup>*France*, <sup>2</sup>*TU Ilmenau, Germany*

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**Room E**

**Radar, DOA, localization and Sensing (1/3)**

**Chairs:** Yi-Hsin Pang, *National University of Kaohsiung, Taiwan*

**Takeshi Amishima**, *Mitsubishi Electric Corporation, Japan*

**220034: Recursive geolocation of unknown emitters using TDOAs of three GEOs**

**Takeshi Amishima and Ryuhei Takahashi**

*Mitsubishi Electric Corporation, Japan*

**220099: Analysis of an Interferometric AOA Antenna with Ground Plane in a Rician Fading Channel**

**Kaito Otsubo and Kazuhiro Honda**

*University of Toyama, Japan*

**220210: DOA Estimation by Synthetic Aperture Measurement with Compressed Sensing and Neural Network**

**Tomonori Ikeda<sup>1</sup>, Mitoshi Fujimoto<sup>1</sup>, Kazuma Tomimoto<sup>2</sup>, and Ryo Yamaguchi<sup>2</sup>**

<sup>1</sup>*University of Fukui, Japan*, <sup>2</sup>*SoftBank Corp, Japan*

**220237: Direction-of-Arrival Estimation Using Reference Beacon in The Presence of Strong Reflected Wave**

**Takashi Katsumata<sup>1</sup>, Kazuki Onodera<sup>1</sup>, Naoki Honma<sup>1</sup>, Kentaro Murata<sup>1</sup>, Mari Takeda<sup>2</sup>, Atsushi Takei<sup>2</sup>, Kazuhiro Matsumoto<sup>2</sup>, Nobuyuki Shibano<sup>2</sup> and Tetsuya Hishikawa<sup>2</sup>**

<sup>1</sup>*Iwate University, Japan*, <sup>2</sup>*Panasonic Corporation, Japan*

**220219: Multi Port Single Patch Antenna for DNN based Direction Finding**

**Seung Gook Cha<sup>1</sup>, Donghyun Kim<sup>1</sup>, Dongwook Lee<sup>1</sup>, Young Joong Yoon<sup>1</sup>, Hyungrak Kim<sup>2</sup>**

<sup>1</sup>*Yonsei University, Republic of Korea*, <sup>2</sup>*Daelim College, Republic of Korea*

**10:30-12:20**

**Oral Sessions**

**Room A**

**SS11: Antenna Technologies Related to Human Monitoring**

**Chair:** Naoki Honma, *Iwate University, Japan*

**220327: (Invited talk) A State-Machine-Based Approach for Human Activity Classification Using MIMO Radar**

**Naoki Honma<sup>1</sup>, Dai Sasakawa<sup>1</sup>, Nobuyuki Shiraki<sup>1</sup>, Kentaro Murata<sup>1</sup>, Takeshi Nakayama<sup>2</sup>, and Shoichi Iizuka<sup>2</sup>**

<sup>1</sup>*Iwate University, Japan*, <sup>2</sup>*Panasonic Corporation, Japan*

**220076: Detecting locations and vital signs of multiple humans with MIMO FMCW radar**

**Kawon Han<sup>1</sup>, and Songcheol Hong<sup>1</sup>**

<sup>1</sup>*KAIST, Republic of Korea*

**220036: Adaptive Array Processing for Radar Measurements of Pulse Wave Propagation**

**Takehito Koshisaka<sup>1</sup> and Takuya Sakamoto<sup>1,2</sup>**

<sup>1</sup>*Kyoto University, Japan*, <sup>2</sup>*Japan Science and Technology Agency, Japan*

**220152: Switch-based Self-injection-locked Radar with Data Fusion Algorithm**

**De-Ming Chian, Chao-Kai Wen, Wei-Chih Huang, Chun-Wei Liu, Fu-Kang Wang, and Tzyy-Sheng Horng**

*National Sun Yat-sen University, Taiwan*

**220374: Multipath Tracking of On-Body Tag in Linear and Spin Motions**

**Xiaochen Liu<sup>1</sup>, Ibrahim Bilal<sup>2</sup>, Yang Miao<sup>1</sup>**

<sup>1</sup>*University of Twente, the Netherlands*, <sup>2</sup>*Xsens, The Netherlands*

## Room B

### SS15: Millimeter-wave and sub-6G Antennas for 5G Systems (2/2)

Chair: Shu Chuan Chen, *National Defense University, Taiwan*

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#### 220318: (Invited talk) A Filtering Hemisphere Dielectric Resonator Antenna

Xiyao Liu<sup>1,2</sup>, Kwok Wa Leung<sup>1,2</sup>, and Nan Yang<sup>3</sup>

<sup>1</sup>City University of Hong Kong, Hong Kong SAR, China, <sup>2</sup>CityU Shenzhen Research Institute, China

<sup>3</sup>Sun Yat-sen University, China

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#### 220179: QMSIW Cavities for Compact Dual-Frequency Millimeter-Wave 5G Antenna Array Design

Yu-Xiang Sun<sup>1,2</sup> and Di Wu<sup>1</sup>

<sup>1</sup>Shenzhen University, China, <sup>2</sup>Southeast University, China

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#### 220046: Design & Optimization Procedure of 5G Millimeter-Wave Antenna Integrated in Mobile Devices

Tung Nguyen

ANSYS JAPAN K.K, Japan

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#### 220270: Compact Multi-Input Multi-Output Loop Antenna System for 5G Laptops

Shu-Chuan Chen, Chih-Kuo Lee, and Sheng-Min Li

*National Defense University,, Taiwan*

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## Room C

### SS21: Antenna Designs, Solutions, Measurements, and Trends for 5G and Beyond (2/2)

Chair: Huan Chu Huang, *National Yang Ming Chiao Tung University, Taiwan*

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#### 220306: Reconfigurable Cavity-Backed Slot Antennas using Fluid Dielectric

Rui-Sen Chen<sup>1</sup>, Sai-Wai Wong<sup>1</sup>, Guan-Long Huang<sup>2</sup>, and Kam-Weng Tam<sup>3</sup>

<sup>1</sup>Shenzhen University, China, <sup>2</sup>Foshan University, China, <sup>3</sup>University of Macau, Macau SAR, China.

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#### 220138: Modified Half-Mode Substrate Integrated Waveguide Antenna Design for 5G NR mmWave Applications

Chia-Mei Peng<sup>1</sup>, Ting-Ren Li<sup>1</sup>, and I-Fong Chen<sup>2</sup>

<sup>1</sup>Feng Chia University, Taiwan, <sup>2</sup>Jinwen University of Science and Technology, Taiwan

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#### 220291: Broadband Vortex Beam Generation Using a Pancharatnam-Berry Metasurface

Yangdong Zhang<sup>1</sup>, Qingsheng Zeng<sup>1</sup>

<sup>1</sup>Nanjing University of Aeronautics and Astronautics, China

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#### 220417: Relationships between Mobile Phones' Metal Exteriors and Millimeter-Wave Antennas

Huan-Chu Huang

Etheta Communication Technology Co., Ltd., China

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#### 220128: Design of MIMO Antennas for WiFi/5G Small Cell Applications

Chin-Cheng Chang<sup>1</sup>, Yi-Fang Lin<sup>1</sup>, Minh-Tan Nguyen<sup>1</sup>, Yi-Xiao Liu<sup>1</sup>, Hong-Twu Chen<sup>2</sup>, and Hua-Ming Chen<sup>1</sup>

<sup>1</sup>National Kaohsiung University of Science and Technology, Taiwan, <sup>2</sup>R.O.C. Military Academy, Taiwan

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## Room D

### Metamaterial-/Metasurface-inspired Antennas

Chair: Malcolm Ng Mou Kehn, *National Yang Ming Chiao Tung University, Taiwan*

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#### 220021: (Invited talk) Circularly Polarized Conical Radiation from a Metaspiral Antenna

Hisamatsu Nakano, Tomoki Abe, Junji Yamauchi

*Hosei University, Japan*

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#### 220096: Feasibility study of an unbalanced MACKEY type R with enhanced robustness on metal

Keisuke Miyashita, Shigeru Makino, Kenji Itoh

*Kanazawa Institute of Technology, Japan*

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#### 220308: Development of Circular Polarization MACKEY

Keito Yokoe, Keisuke Miyashita, Kota Hakamata, Shigeru Makino, Kenji Itoh

*Kanazawa Institute of Technology, Japan*

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#### 220346: Mantle Cloak Antenna Using Strip Conductors for Mutual Coupling Reduction at Frequency Lower Than Operating Frequency

Thanh Binh Nguyen<sup>1</sup>, Hiroshi Hashiguchi<sup>1</sup>, Naobumi Michishita<sup>1</sup>, Hisashi Morishita<sup>1</sup>, Teruki Miyazaki<sup>2</sup>, and Masato Tadokoro<sup>2</sup>

<sup>1</sup>National Defense Academy, Japan, <sup>2</sup>Yokohama Rubber Co., Ltd., Japan

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#### 220399: Optimization of a Metasurface Antenna Composed of Dual T-shaped Antenna Elements Based On Machine Learning

Li Zhang, Lijia Chen, Zhuli Yuan, and Shengchang Lan

*Harbin Institute of Technology, China*

## Room E

### Radar, DOA, localization and Sensing (2/3)

Chairs: Hiroyoshi Yamada, *Niigata University, Japan*

Masahiko Nishimoto, *Kumamoto University, Japan*

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#### 220231: Number of Antenna Elements Characteristics of Heart Rate Estimation Accuracy Using Arctangent Demodulation

Yuta Ogawa<sup>1</sup>, Kota Sasaki<sup>1</sup>, Naoki Honma<sup>1</sup>, Morio Iwai<sup>1</sup>, Koichiro Kobayashi<sup>1</sup>, Atsushi Sato<sup>2</sup>, and Kentaro Murata<sup>1</sup>

<sup>1</sup>Iwate University, Japan, <sup>2</sup>EQUOS Research Co., Ltd, Japan

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#### 220236: Indoor Localization Method Using PDR and RSSI Distribution Generated by Two Antennas

Kohei Uchisawa, Naoki Honma, and Kentaro Murata

*Iwate University, Japan*

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#### 220267: Room Geometry Estimation based Device-Free Localization Method

Yuto Miyake, Minseok Kim, Takeshi Tasaki

*Niigata University, Japan*

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#### 220382: Phase Parameter Extraction from UWB Radar Response for Non-destructive Inspection

Masahiko Nishimoto<sup>1</sup>, Budiman P.A. Rohman<sup>1,2</sup>, and Kohichi Ogata<sup>1</sup>

<sup>1</sup>Kumamoto University, Japan, <sup>2</sup>Indonesian Institute of Sciences, Indonesia

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#### 220256: Measurement and Analysis of Building Entry Loss in High Base Station Environment

Sho Kimura, Hoyu Lin, Shoma Tanaka, Akihiro Sato and Hideki Omote

*Softbank Corp., Japan*



**Room A****SS19: Glide Symmetries and Their Applications for Microwave Devices**

**Chairs:** Oscar Quevedo-Teruel, *KTH Royal Institute of Technology, Sweden*

Carlos Molero, *Universidad de Granada, Spain*

**220244: (Invited talk) Overview on glide-symmetric periodic structures**

Oscar Quevedo-Teruel

*KTH Royal Institute of Technology, Sweden*

**220044: Analysis of Glide-Symmetric FSS Structures from a Circuit Model Standpoint**

Antonio Alex-Amor<sup>1</sup>, Francisco Mesa<sup>2</sup>, Ángel Palomares-Caballero<sup>1</sup>, Carlos Molero<sup>1</sup>, and Pablo Padilla<sup>1</sup>

<sup>1</sup>Universidad de Granada, Spain, <sup>2</sup>Universidad de Sevilla, Spain

**220178: Multimodal Transfer Matrix Method Applied to 3-D Periodic Structures**

Federico Giusti<sup>1</sup>, Francisco Mesa<sup>2</sup>, Qiao Chen<sup>1</sup>, Guido Valerio<sup>3,4</sup>, Oscar Quevedo-Teruel<sup>1</sup>

<sup>1</sup>KTH Royal Institute of Technology, Sweden, <sup>2</sup>Universidad de Sevilla, Spain, <sup>3</sup>Sorbonne Université, France, <sup>4</sup>Univ. Paris-Saclay, France

**220387: Dispersion Analysis of Glide-Symmetric Periodic Structures with Coaxial Holes**

Marko Bosiljevac<sup>1</sup>, Nafsika Memeletzoglou<sup>2</sup>, Zvonimir Sipus<sup>1</sup>—I, and Eva Rajo-Iglesias<sup>2</sup>

<sup>1</sup>University of Zagreb, Croatia, <sup>2</sup>University Carlos III of Madrid, Spain

**Room B****Broadband and Multi-band Antennas**

**Chairs:** Jeen-Sheen Row, *National Changhwa University of Education, Taiwan*

Xingqi Zhang, *University College Dublin, Ireland*

**220156: Design and Experimental Verification of an Ultra-Wideband Ridged TEM Horn Antenna for Partial Discharge Detection**

Shu Lin<sup>1</sup>, Xiaobing Wei<sup>1</sup>, Jiaxuan Li<sup>2</sup>, Shoulan Liu<sup>1</sup>, Hongjun Zhang<sup>1</sup>, and Xingqi Zhang<sup>2</sup>

<sup>1</sup>Harbin Institute of Technology, China, <sup>2</sup>University College Dublin, Ireland.

**220273: Ultrawideband dual-layer Magnetoelectric Dipole with Circular Polarization**

Ganyu Liu<sup>1</sup>, Hailiang Zhu<sup>1</sup>, Yuwei Qiu<sup>1</sup>, Kai Wang<sup>1</sup>, Pei Zheng<sup>2</sup> and Zhiye Jiang<sup>2</sup>

<sup>1</sup>Northwestern Polytechnical University, China, <sup>2</sup>National Key Laboratory of Science and Technology on Test Physics and Numerical Mathematics, China

**220095: A High Gain Broadband Circularly Polarized Antenna with Sector Dipole**

Fengshou Zhang, Wei Li, Ying Suo

*Harbin Institute of Technology, China*

**220332: Compact Triple-Band Wearable Circular Patch Antenna for WLAN/WiMAX Applications**

Haiyan Li, Jinxin Du, Xue-Xia Yang

*Shanghai University, China*

**220119: A Compact and Flexible Dual-Band Antenna for Near-Body Applications**

Gildas Bengloan<sup>1</sup>, João M. Felício<sup>2</sup>, Carlos A. Fernandes<sup>2</sup>, Anne Chousseaud<sup>1</sup>, Bruno Froppier<sup>1</sup> and Eduardo Motta Cruz<sup>1</sup>

<sup>1</sup>Univ Nantes, France, <sup>2</sup>Instituto de Telecomunicações, Portugal

## Room C

### **SS06: Multi-Antenna based Technologies of Open Radio Access Network (O-RAN) for 5G/B5G/6G Applications at Millimeter Wave (1/2)**

**Chair:** Ding-Bing Lin, *National Taiwan University of Science and Technology, Taiwan*

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#### **220235: A Low-Profile Dual-band Circularly Polarized Cavity Antenna for Satellite Communications**

**Hao-Hsiang Yang and Cheng-Nan Chiu**

*Yuan Ze University, Taiwan*

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#### **220243: A High-Gain and Wideband Circularly-Polarized Horn-like Antenna for Low Orbit Satellite Communication Systems**

**Jia-Cheng Liang and Cheng-Nan Chiu**

*Yuan Ze University, Taiwan*

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#### **220313: 79GHz Antenna Gain Enhancement by Using Planar Dielectric Lens on the Housing**

**Ding-Bing Lin<sup>1</sup>, Nien-Chih Tsai<sup>1</sup>, and Yi-Ju Lee<sup>2</sup>**

*<sup>1</sup>National Taiwan University of Science and Technology, Taiwan, <sup>2</sup>Alpha Inc., Taiwan*

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#### **220366: Path Loss, Diffraction and Attenuation for 38 GHz Millimeter-Wave Channel**

**Chi-Min Li<sup>1</sup>, Po-Yu Lee<sup>1</sup>, Pao-Jen Wang<sup>2</sup>, and Shun-Zhong Zheng<sup>2</sup>**

*<sup>1</sup>National Taiwan Ocean University, Taiwan, <sup>2</sup>Ming Chi University of Technology, Taiwan*

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#### **220407: Tunable Frequency Selective Surface (FSS) based on LC Material for mmWave Communications**

**Cheng-Chung Lin<sup>1</sup>, Guo-Sheng Lin<sup>1</sup>, Guan-Jhou Ke<sup>2</sup>, and Hsi-Hsir Chou<sup>2</sup>**

*<sup>1</sup>National Chung-Shan Institute of Science and Technology, Taiwan, <sup>2</sup>National Taiwan University of Science and Technology, Taiwan*

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## Room D

### **EBG, Metamaterials and Periodic Structures**

**Chairs:** Rakesh Kshetrimayum, *Indian Institute of Technology Guwahati, India*

**Mohammad Kamal A Rahim, *Universiti Teknologi Malaysia, (UTM), Malaysia***

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#### **220175: Polarization and Beam Regulation of Electromagnetic Wave Based on Metasurface**

**Xinyu Liu, Beijia Liu, and Jinghui Qiu**

*Harbin Institute of Technology, China*

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#### **220181: 3D Printed Periodic Structures for RF Packaging of Integrated Array Module at sub-6GHz Band**

**Ashraf Uz Zaman and Marianna Ivashina**

*Chalmers University of Technology, Sweden*

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#### **220158: Dual Band Horn Antenna Using Frequency Selective Surface Superstrate**

**Muhammad Naeem Iqbal, Mohd Fairus Mohd Yusoff, Mohammad Kamal A Rahim, Mohamad Rijal Hamid and Zaharah Johari**

*Universiti Teknologi Malaysia, (UTM), Malaysia*

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#### **220397: UWB Monopole Antenna Miniaturization and Gain Enhancement using FSS Reflector**

**Abdenasser Lamkaddem, Ahmed El Yousfi, Kerlos Atia Abdalmalak, and Daniel Segovia-Vargas**

*Carlos III University of Madrid, Spain*

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#### **220260: A Unidirectional Ku-band Antenna With a High Front-to-Back ratio by Integration of Cylindrical DRA With Cylindrical SSPP Structure**

**Sonu Kumar, Rakesh Singh Kshetrimayum**

*Indian Institute of Technology Guwahati, India*

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Room E

### Radar, DOA, localization and Sensing (3/3)

Chair: Liang-Yu Ou Yang, *National Central University, Taiwan*

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#### 220258: Calibrating Living-Body MIMO Radar Having Miniaturised Array with Imperfect Radiation Patterns

Tomonori Ito<sup>1</sup>, Teppei Hayashi<sup>1</sup>, Nobuyuki Shiraki<sup>1</sup>, Naoki Honma<sup>1</sup>, Abudusaimi Abuduaini<sup>1</sup>, Kentaro Murata<sup>1</sup>, Takeshi Nakayama<sup>2</sup>, And Shoichi Iizuka<sup>2</sup>

<sup>1</sup>Iwate University Japan, <sup>2</sup>Panasonic Corporation, Japan

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#### 220322: Detection of buried targets under limited number of scans with a synthetic aperture radar

Akihisa Uematsu, and Toshiyuki Nishibori

*Japan Aerospace Exploration Agency, Japan*

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#### 220105: Robust Beamforming for Antenna Arrays with Source Location Probability Density Function

Jiahao Wang, Koen Mouthaan

*National University of Singapore, Singapore*

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#### 220314: An Attempt of Underwater Position Estimation in Pseudo-Scale Model Using Cross-Dipole Array

Ryota Sase, and Nozomu Ishii

*Niigata University, Japan*

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#### 220369: Estimation of 1090MHz Signal Types Used in Aircraft Surveillance System

Junichi Honda, Yasuyuki Kakubari, and Takuya Otsuyama

*Electronic Navigation Research Institute (ENRI), Japan*

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**15:20-17:10**

**Oral Sessions**

Room A

### SS04: Millimeter-wave, Terahertz Antennas and System

Chair: Dongquan Sun, *Xidian University, China*

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#### 220023: (Invited talk) A Novel Wideband Quasi-Optical Monopulse Antenna at Terahertz Band

Huan Guo, Wenbin Dou

*Southeast University, China*

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#### 220167: A D-band H-plane Hard-Soft Horn Antenna

Dongquan Sun<sup>1</sup>, Yong Yang<sup>2</sup>, and Xiang Chen<sup>3</sup>

<sup>1</sup>Xidian University, China, <sup>2</sup>Nanjing University of Science and Technology, China, <sup>3</sup>China Academy of Space Technology, China

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#### 220086: A Solution for Simulation of the Electrically Large Reflectarray

Jiapeng Yuan, Huan Guo, Wenbin Dou

*Southeast university, China*

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#### 220123: Design of Wideband Dielectric Resonator Antenna for D-Band Applications

Teng Li<sup>1,2</sup>, Karina Schneider<sup>2</sup>, Alexander Haag<sup>2</sup>, Akshay Visweswaran<sup>3</sup>, Akanksha Bhutani<sup>2</sup> and Thomas Zwick<sup>2</sup>

<sup>1</sup>Southeast University, China, <sup>2</sup>Karlsruhe Institute of Technology, Germany, <sup>3</sup>IMEC, Belgium

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#### 220140: Reflective Beamforming Metasurface Using Exact Incident Phase

Si Yu Miao, and Feng Han Lin

*Shanghai Tech University, China*

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## Room B

### Millimeter-wave, Terahertz and Optical Antennas

Chair: Yu-Hsiang Cheng, *National Taiwan University, Taiwan*

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#### (Invited talk) Recent Advances in Shorted Patch Antennas

Zhang Yue Ping

*Nanyang Technological University, Singapore*

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#### 220068: Measurement of Far Field Radiation Pattern of 300GHz-band Cassegrain Antenna

Ken Watanabe<sup>1</sup>, Akihiko Hirata<sup>1</sup>, Issei Watanabe<sup>2</sup>, Norihiko Sekine<sup>2</sup>, and Akifumi Kasamatsu<sup>2</sup>

<sup>1</sup>Chiba Institute of Technology, Japan, <sup>2</sup>National Institute of Information and Communications Technology, Japan

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#### 220405: A Filtering Antenna And Its Sub-Array Based On The Self-Shielded Coupling Feeding Structure

Wei Ling, Yu-jin Zhou, De-si-fan Gao, Chong-hu Cheng

*Nanjing University of Posts and Telecommunications, China*

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#### 220200: Millimeter-Wave Conformal Antenna Array Concept for Metal-Covered 5G Mobile Handsets

Jihoon Bang, Sunwoo Kim, and Jaehoon Choi

*Hanyang University, Seoul, Republic of Korea*

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#### 220170: Automatic Deployment Planning of 300-GHz-Band Wireless Fronthaul Link in Metropolitan Areas

Akihiko Hirata

*Chiba Institute of Technology, Japan*

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## Room C

### SS06: Multi-Antenna based Technologies of Open Radio Access Network (O-RAN) for 5G/B5G/6G Applications at Millimeter Wave (2/2)

Chair: Prof. Ding-Bing Lin, *National Taiwan University of Science and Technology, Taiwan*

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#### 220199: (Invited talk) Antenna-in-Packages for Array Modularization at Millimeter-wave Frequencies and its Applications in 5G O-RAN

Hsi-Tseng Chou<sup>1</sup>, Kuan-Hsun Wu<sup>1</sup>, Zhao-He Lin<sup>1</sup>, Zhi-Da Yan<sup>1</sup>, Ding-Bing Lin<sup>2</sup>

<sup>1</sup>National Taiwan University, Taiwan, <sup>2</sup>National Taiwan University of Science and Technology, Taiwan

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#### 220250: Side-lobes Suppression for 5G Millimeter Wave Sparse Array Antenna

Shih Chung Tuan<sup>1</sup>, Chia Hung Chang<sup>2</sup>

<sup>1</sup>Oriental Institute of Technology, Taiwan, <sup>2</sup>National Yunlin University of Science and Technology, Taiwan

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#### 220165: Beam Switchable Antenna Array Design by Rotman Lens with SIW Feeding Lines for Vehicular Applications

Chia-Hung Chou<sup>1</sup>, Shih-Kai Ho<sup>2</sup>, Ding-Bing Lin<sup>1</sup>, Hsi-Tseng Chou<sup>2</sup>

<sup>1</sup>National Taiwan University of Science and Technology, Taiwan, <sup>2</sup>National Taiwan University, Taiwan

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#### 220173: Polarization-Tunable Phased Antenna Array Module at 28 GHz Band for 5G Applications

Zhao-He Lin, Hsi-Tseng Chou

<sup>1</sup>National Taiwan University, Taiwan

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#### 220174: Dual-Polarized Antenna Array Modularization by LTCC Process at Millimeter Wave Frequencies for 5G Applications

Sheng Ju Chou<sup>1</sup>, Hsi-Tseng Chou<sup>2</sup>, Joseph D. S. Deng<sup>1</sup>, and Zhi-Da Yan<sup>2</sup>

<sup>1</sup>Cyntec Co., Ltd., Taiwan, <sup>2</sup>National Taiwan University, Taiwan

## Room D

### Microwave, mmWave, and THz Imaging

**Chair: Hiroyasu Sato**, *Tohoku University, Japan*

**Pei-Ling Chi**, *National Yang Ming Chiao Tung University, Taiwan*

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**220365: Imaging of Object in Front of Human Body Phantom Using Leaky-Wave Focusing Antenna**

**Kevin Kipruto Mutai, Hiroyasu Sato, and Qiang Chen**

*<sup>1</sup>Tohoku University, Japan*

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**220383: Accurate Reconstruction Algorithm of Millimeter Wave Holography**

**Hua Zong, He Zhang, Jinghui Qiu**

*Harbin Institute of Technology, China*

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### Reflectarrays

**220209: A Broadband Single-Layer Reflectarray Antenna Using Multiresonance Elements**

**Ming-Che Li, Po-Lin Huang, Tzyh-Ghuang Ma**

*National Taiwan University of Science and Technology, Taiwan*

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**220102: One Layer of Reflectarray Antenna Changing Beam Direction by Polarization**

**Shota Takino, Shigeru Makino, Sanshiro Shigemitsu, Yusuke Kaimori**

*Kanazawa Institute of Technology, Japan*

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**220333: Design of A 2-Bit Dual Linearly Polarized Reconfigurable Reflectarray Element**

**Min Wang<sup>1</sup>, Kunyang Shan<sup>1,2</sup>, Wei Luo<sup>1</sup>, Zhengchuan Chen<sup>3</sup>**

*<sup>1</sup>Chongqing University of Posts and Telecommunications, China, <sup>2</sup>Southeast University, China, <sup>3</sup>Chongqing University, China.*

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## Room E

### SS05: Design Method and Application of Multi-Antenna Systems

**Chairs: Hui Li**, *Dalian University of Technology, China*

**Tamami Maruyama**, *National Institute of Technology, Japan*

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**220111: (Invited talk) An Eight-port MIMO Antenna for Mobile Handsets**

**Wencong Li and Hui li**

*Dalian University of Technology, China*

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**220027: Ten-Element MIMO Array Using Stable Current Nulls for 5G smartphones**

**Aidi Ren<sup>1</sup>, Zhanhao Zhang<sup>1</sup>, Haoran Yu<sup>1</sup>, Hong-Wei Yu<sup>2</sup>**

*<sup>1</sup>Anhui University, China, <sup>2</sup>38th Research Institute of China Electronic Technology Corporation, China*

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**220430: Wideband MIMO Antenna with Decoupling Slots for 5G Smartphone Applications**

**C. F. Zhou, J. X. Sun, H. Li**

*Dalian University of Technology, China*

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**220402: Novel Circuit-Shape Leaky Wave Waveguide for Microwave Snow melting**

**Tamami Maruyama<sup>1</sup>, Shunta Kasai<sup>1</sup>, Koki Shibata<sup>1</sup>, Manabu Omiya<sup>2</sup>, Masashi Nakatsugawa<sup>1</sup> and Yashiro Tamayama<sup>3</sup>**

*<sup>1</sup>National Institute of Technology, Japan, <sup>2</sup>Hokkaido University, Japan, <sup>3</sup>Nagaoka University of Technology, Japan*

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**220242: Electromagnetic Analysis of Thin Film with Periodic Metal**

Hironori Shibagaki, Seiya Kishimoto, Yoshito Ashizawa, Katsuji Nakagawa, Shinichiro Ohnuki

*Nihon University, Japan*

**220411: FDTD Algorithms for Modeling Cold Plasmas**

Yarong Cao, Lingyu Xiao, and Yaxin Yu

*Chang'an University, China*

**220416: Thermal Enhanced modelling of 6-energy-level system**

Yaxin Yu, Yang Dong and Lingyu Xiao

*Chang'an University, China*

**220426: Study on Radar Cross-section Characteristics of Quadrocopter group flight**

Kun-Cheng, Cai<sup>1,3</sup>, Chia-Te, Liao<sup>1</sup>, Chien-Hung, Chen<sup>2</sup>, and Hua-Ming, Chen<sup>3</sup>  
<sup>1</sup>R.O.C. Air Force Institute of Technology, Taiwan, <sup>2</sup>ROC Air Force Academy, Taiwan, <sup>3</sup>National Kaohsiung University of Science and Technology, Taiwan

**220295: Low-SCS Microstrip Thinned Array**

Peng-Fa Li, Shi-Wei Qu, and Shiwen Yang

*University of Electronic Science and Technology of China, China*

**220072: Analysis of Truncation Error in 3-D Microwave Holographic Imaging**

Hsu-Chi Chen and Shih-Yuan Chen

*National Taiwan University, Taiwan*

**220155: ISAR Image Inpainting Algorithm Based on DCGAN**

Tingfei Wang<sup>1</sup>, Jingpeng Gao<sup>1</sup>, and Zhiye Jiang<sup>2</sup>  
<sup>1</sup>Harbin Engineering University, China, <sup>2</sup>Beijing Institute of Space Long March Vehicle, China

**220410: Low-Frequency Electromagnetic Characterization of Layered Media Using Deep Neural Network**

M. Shifatul Islam<sup>1</sup>, Sadman Shafi<sup>1</sup>, and Mohammad Ariful Haque<sup>2</sup>

<sup>1</sup>Anyeshan Limited, Bangladesh, <sup>2</sup>Bangladesh University of Engineering and Technology, Bangladesh

**220376: A microstrip patch antenna design based on ANN**

Haizhuo He, Shengchang Lan, Beijia Liu and Lijia Chen

*Harbin Institute of Technology, China*

**220097: Mode-matching Analysis and Genetic Algorithm Optimization for a Two-plane Coupler by Changing the Cross-sectional Shape of the Coupling Region**

Shota Yamakawa, Takashi Tomura, and Jiro Hirokawa

*Tokyo Institute of Technology, Japan*

**220151: A Reconfigurable Balanced Dual-Band Bandpass Filter Using Asymmetric Short Stub-Loaded Resonators**

Chi Yuan Zhang, Bo Liu, and Feng Wei

*Xidian University, China*

**220363: Design of Amplitude-Modulated Transponder with Liquid Metal**

Jian-Bo Liao, Meng-Hsuan Lin, and Chia-Chan Chang

*National Chung-Cheng University, Taiwan*

**220412: Single-Layer Wide-band  
45 Degree Phase Shifter with  
Filter Function**

**Duo Xu, Yiming Tang**

*Nanjing University of Posts and  
Telecommunications, China*

**220325: A Millimeter-Wave  
Bandpass Filter Based on  
Substrate Integrated Dielectric  
Resonator**

**Wei Sheng Tang<sup>1</sup>, Shao Yong  
Zheng<sup>1</sup>, and Yong Mei Pan<sup>2</sup>**

*<sup>1</sup>Sun Yat-sen University, China, <sup>2</sup>South  
China University of Technology, China*

**220054: Millimeter-Wave  
Bandpass Filter on Printed  
Circuit Board with Conventional  
Microstrip Line Structure**

**Yu-Chen Lin<sup>1</sup>, Szu-Cheng Lin<sup>2</sup>, Yun-  
Jhang Lee<sup>2</sup>, and Ting-Yi Huang<sup>2</sup>**

*<sup>1</sup>Feng Chia University, Taiwan,  
<sup>2</sup>Compal Electronics, INC., Taiwan*

**220239: Gain Enhancement of  
the Millimeter Wave Radar  
Sensor Using a Composite  
Metamaterial Radome**

**Tianmeng Cui<sup>1</sup>, Chen-Pang Chao<sup>1</sup>,  
Teng-Yu Lo<sup>1</sup>, Chang-Fa Yang<sup>1</sup>, Wen-  
Hsiung Lin<sup>2</sup>, Hsin-Wei Wang<sup>2</sup>,  
Chun-Yi Chai<sup>3</sup>, Ike Lin<sup>4</sup>, Bryan  
Chu<sup>4</sup>**

*<sup>1</sup>National Taiwan University of  
Science and Technology, Taiwan,*

*<sup>2</sup>Jorjin Technologies Inc., Taiwan*

*<sup>3</sup>XMMSE Co., Ltd, Taiwan,*

*<sup>4</sup>WaveFidelity Inc., Taiwan*

**220108: Influence of Mutual  
Coupling and Surrounding  
Objects on Base Station  
Antennas in ITS**

**Kaito Nishimura<sup>1</sup>, Mitoshi  
Fujimoto<sup>1</sup>, Katsutoshi Kawai<sup>2</sup>, and  
Toshinori Iinuma<sup>2</sup>**

*<sup>1</sup>University of Fukui, Japan,*

*<sup>2</sup>KYOCERA Corporation, Japan*

**220211: A Study on Location of  
Vehicle-mounted Antennas for  
Single-Frequency Full-Duplex  
Communication**

**Kohei Nono<sup>1</sup>, Mitoshi Fujimoto<sup>1</sup>,  
Ryo Yamaguchi<sup>2</sup>, And Kazuma  
Tomimoto<sup>2</sup>**

*<sup>1</sup>University of Fukui, Japan, <sup>2</sup>SoftBank  
Corp, Japan*

**220271: New Microwave  
Generator for 28 GHz band of  
5G mobile communication using  
an Optical High-order Harmonic  
Generation for LiNbO<sub>3</sub> Optical  
Intensity Modulator**

**Satoru Kurokawa<sup>1, 2</sup>, Michitaka  
Ameya<sup>1</sup>, and Masanobu Hirose<sup>2</sup>**

*<sup>1</sup>National Institute of Advanced  
Industrial Science and Technology,  
Japan, <sup>2</sup>7G aa Co. Ltd., Japan*

**220092: An Over 100 Gbps  
Large-Scale MIMO Antenna  
with Double-Helix Array**

**Kazuhiro Honda**

*Toyama University, Japan*

**220100: Automatic Over-The-Air  
Evaluation of a Large-Scale  
MIMO Antenna Using a Switch  
Circuit**

**Rio Kitamura and Kazuhiro Honda**

*University of Toyama, Japan*

**220386: Numerical Simulation of  
Aircraft Position Verification  
using AOA and TDOA for ADS-B**

**Junichi Naganawa, Hiromi  
Miyazaki, Hirohisa Tajima, Tadashi  
Koga, Jun Kitaori**

*National Institute of Maritime, Port  
and Aviation Technology, Japan*

**220085: Reception  
Characteristics Improvement by  
Polarization MIMO Gap-filler on  
Long-distance Transmission in  
Terrestrial TV Broadcasting**

**Kentaro Tanaka, Mitoshi Fujimoto**

*<sup>1</sup>University of Fukui, Japan*

**220286: UE selection method  
using determinant in  
Coordinated MU-MIMO**

**Shotaro Sasaki, Mitoshi Fujimoto**

*University of Fukui, Japan*



**220329: High Isolation MIMO Antenna using Electromagnetic Band Gap - EBG Structure**  
M. F. Ismail<sup>1</sup>, M. K. A. Rahim<sup>2</sup>,  
Noor Asmawati Samsuri<sup>2</sup>, Noor  
Asniza Murad<sup>2</sup> and Adya A  
Pramudita<sup>3</sup>

<sup>1</sup>Universiti Tun Hussein Onn Malaysia  
Pagoh Campus, Malaysia, <sup>2</sup>Universiti  
Teknologi Malaysia, <sup>3</sup>Telkom  
University, Indonesia

**220189: A Study of Multiple Folding Array Antennas on Satellite Installation and Radiation Characteristics after Deployment**  
Daiki Hosaka<sup>1</sup>, Tadashi Takano,  
Kenji Saegusa  
Nihon University, Japan

**220240: A Compact Frequency-Selective Shielding Enclosure Design for Wireless Applications**  
Chen-Ying Hsieh, Chien-Ju Chen,  
and Cheng-Nan Chiu  
Yuan Ze University, Taiwan

**220341: Evaluation of Channel Capacity Characteristics for Asymmetric LoS-MIMO**  
Takanobu Watanabe, Kentaro  
Nishimori  
Niigata University, Japan

**220320: Study of Characteristic Impedance of Near-Field Antenna in Coupled State as Transmission Line**  
Takanori Washiro  
Nippon Telegraph and Telephone  
Corporation, Japan

**220403: Measurement of 4 GHz Radio Altimeter Interference Path Loss Including 5G Sub-6 Frequency Bands Using Beechcraft B300 Aircraft**  
Shunichi Futatsumori<sup>1</sup>, Norihiko  
Miyazaki<sup>1</sup>, Ai Sato<sup>2</sup>, Ryunosuke  
Ozaki<sup>2</sup>, Takashi Hikage<sup>2</sup>, and Toshio  
Nojima<sup>2</sup>  
<sup>1</sup>Electronic Navigation Research  
Institute, Japan, <sup>2</sup>Hokkaido University,  
Japan

**220107: Implementation of 8 Channels Phase Conjugation on FPGA for Microwave Power Transmission**  
Taewoo Yu<sup>1</sup>, Joon-Hong Kim<sup>2</sup> and  
Sangwook Nam<sup>3</sup>  
<sup>1,3</sup>Seoul National University, Korea,  
<sup>2</sup>Samsung Research, Korea

**220094: IRS Aided OAM-MIMO Communication**  
Yang Wang, Ndagijimana Cyprien,  
Tao Hu, Xi Liao  
Chongqing University of Posts and  
Telecommunications, China

**220061: RF Front-end of ISDB-T Receiver for High Mobility Applications**  
Wen-Cheng Lai  
National Yunlin University of Science  
and Technology, Taiwan

**220177: High Output DC Power Rectenna Arrays Using Densely Arranged Antenna Elements**  
Takuma Kichiji, Eisuke Nishiyama  
and Ichihiko Toyoda  
Saga University, Japan

**220145: Miniaturized and Wideband Chipless RFID Tag Antenna**  
Mohd Ezwan Bin Jalil, Mohamad  
Kamal A. Rahim, Noor Asmawati  
Samsuri, Noor Asniza Murad  
Universiti Teknologi Malaysia,  
Malaysia

**220252: Lumped Reflection-type Phase-shifter for Sub-6 GHz application**  
Chia-Hung Chang<sup>1</sup>, Shih-Chung  
Tuan<sup>2</sup>, and Tse Sheng Tai<sup>3</sup>  
<sup>1</sup>National Yunlin University of Science  
and Technology, Taiwan, <sup>2</sup>Oriental  
Institute of Technology, Taiwan, <sup>3</sup>Feng-  
Chia University, Taiwan

**220257: Broadband  
Measurement of Dielectric  
Constant on FR-4 PCB by Using  
Discontinuous Microstrip Lines**  
Yao-Wen Hsu, Shao-Jie Shen, Chia-  
An Chen, Shi-Han Qiu and Hao-Hui  
Chen

*National Kaohsiung University of  
Science and Technology, Taiwan*

**220390: Design of a Printed  
Monopole Antenna with Periodic  
Patch Director on the Laminated  
Window Glass for Autonomous  
Vehicles**

Sangwoon Youn<sup>1</sup>, Doyoung Jang<sup>1</sup>,  
Kong Nak Kyung<sup>2</sup>, and Hosung  
Choo<sup>1</sup>

*<sup>1</sup>Hongik University, Korea, <sup>2</sup>Hyundai,  
Korea*

## ----- Special Cluster on Antennas and Propagation Technologies 2021 -----

The IEICE Communications Express (ComEX) announces that it will publish a special section entitled “Special Cluster on Antennas and Propagation Technologies 2021” in June 2022. The objective of this special section is to report the advanced technologies on the antenna and propagation related to progressing technologies for next-generation mobile communication systems, MIMO, PAN/BAN, and wireless power transmission and so on. In 2021, several conferences (The IEICE Society Conference 2021 and ISAP2021 in Taipei, etc.) will be held, which aim at providing an international forum for exchanging information on such progress of research and development in antennas, propagation, electromagnetic wave theory, and the related fields. By taking this opportunity, the special section has been planned to publish letters in cluster fashion, which aims to raise the interest of researchers in the field of antennas, propagation, and the related topics.

### 1. Scope

This special section aims at the timely dissemination of research in these areas. Possible topics include but are not limited to antennas and propagation technologies related to progressing technology for next-generation mobile communication systems, MIMO, PAN/BAN, and wireless power transmission, so forth. The topics also include electromagnetic wave theory and its related topics, including emerging topics for metamaterial, nano-electromagnetics, and its antenna application.

### 2. Submission Deadline

Two submission periods are prepared for this special cluster, and the deadlines are set as:

- **First deadline: November 19th, 2021 (JST)** (The submission site will open on October 22nd, 2021.)
- **Second deadline: January 7th, 2022 (JST)** (The submission site will open on December 14th, 2021.)

### 3. Submission Instructions

The maximum number of words is 1500; the maximum number of items (Figures plus Tables) is 3. Manuscripts should be prepared according to the guideline in the “Information for Authors.” The latest version is available at the web site, [https://www.ieice.org/publications/comex/data/for\\_authors.html](https://www.ieice.org/publications/comex/data/for_authors.html). In particular, please refer to the paragraph on novelty. The review process will begin immediately after submission. The notification of review evaluation for the letter submitted in the first submission period and that in the second one will be sent by December 13th, 2021, and January 31st, 2022, respectively. It is allowed that authors submit a revised version of the letter, which is rejected in the first submission period, in the second submission period. All the accepted papers will appear on the IEICE ComEX website immediately as a pre-print version of the manuscripts posterior to the notification of acceptance. The publication date of the special cluster is fixed on June 1st, 2022. ComEX will accept only the letter type of manuscripts by electronic submission using one of the officially approved formats (LaTeX style file or Microsoft Word template). Submit a manuscript and electronic source files (LaTeX/Word files, figures) via the IEICE Web site [https://review.ieice.org/regist/regist\\_baseinfo\\_e.aspx](https://review.ieice.org/regist/regist_baseinfo_e.aspx). In this regard, authors should choose the Special Cluster on Antennas and Propagation Technologies 2021 as a “Journal/Section” on the online screen. Do not choose [Regular-XB].

**Contact Person:** Eisuke Nishiyama, Saga University

**Phone:** +81-952-28-8660

**Email:** ap\_ac-comex2021@mail.ieice.org

### 4. Special Section Editorial Committee

**Guest Editor-in-Chief:** Hiroyoshi Yamada (Niigata University)

**Guest Editors:** Yen-Sheng Chen (National Taipei University of Technology), Eisuke Nishiyama (Saga University), Kentaro Saito (Tokyo Denki University),

**Guest Associate Editors:** Shih-Yuan Chen (National Taiwan University), Toru Fukasawa (Mitsubishi Electric Corporation), Takeshi Fukusako (Kumamoto University), Hisato Iwai (Doshisha University), Satoru Kurokawa (AIST), Wen-Jiao Liao (National Taiwan University of Science and Technology), Takayuki Sasamori (Hokkai-Gakuen University), Hidehisa Shiomi (Osaka University), Shigeki Takeda (Ibaraki University), Ryo Yamaguchi (SoftBank)

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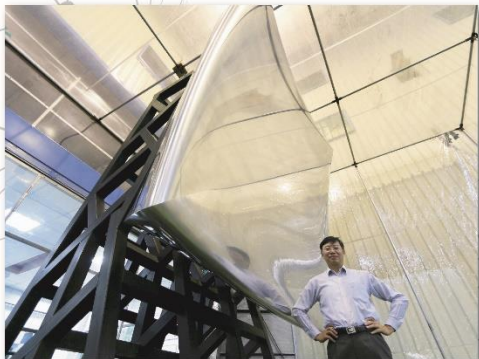
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## Precision CATR



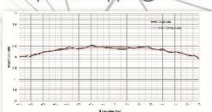
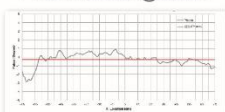
### Compact Antenna Test Range

- ◆ Superior Performance Over Serrated Edge Reflectors
- ◆ QZ Size 20 cm x 20 cm to 600 cm x 600 cm
- ◆ Minimum 55% quiet zone
- ◆ Quiet Zone Shape: Circular Cylindrical
- ◆ Frequency Range: 500MHz to 300GHz

Amplitude taper	Amplitude ripple	Phase variation	X-Pol level
1dB	±0.5dB, <40GHz	<10°, <40GHz	30dB
Model	Reflector Size	Quiet Zone	Frequency Range
RCR-60	60cm*50cm	30cm*30cm	10-300GHz
RCR-120	120cm*120cm	60cm*60cm	5-300GHz
RCR-150	150cm*150cm	75cm*75cm	5-300GHz
RCR-180	180cm*180cm	90cm*90cm	4-300GHz
RCR-240	240cm*240cm	120cm*120cm	3-300GHz
RCR-300	300cm*300cm	150cm*150cm	2-200GHz
RCR-360L	360cm*360cm	180cm*180cm	1-200GHz
RCR-600	610cm*610cm	300cm*300cm	0.7-110GHz
RCR-900	915cm*915cm	450cm*450cm	0.5-110GHz
RCR1200	1200cm*1200cm	600cm*600cm	0.5-100GHz

RCR300 Quiet Zone  
Phase Variation@39GHz

RCR300 Quiet Zone  
Amplitude Ripple@39GHz

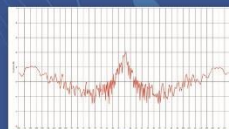
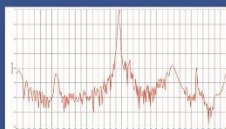


## Automotive Radar Simulation CATR



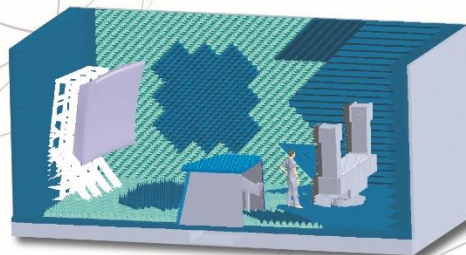
## Swing Arm Spherical NF AMS

- ◆ Dual Pol /Single Pol Probe Antenna
- ◆ Scanning Diameter: 40cm to 250 cm
- ◆ Frequency Range: 400MHz - 110 GHz



## 5G BSA OTA CATR

- ◆ Sub-6 & mmWave 5G NR
- ◆ Frequency Range: 1.7GHz - 110GHz
- ◆ Quiet Zone Size :1.8m\*1.2m
- ◆ Compliance with 3GPP OTA Test



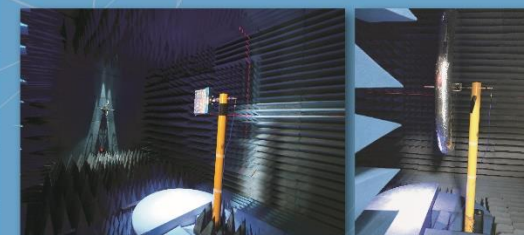
## 5G mmWave Mini-CATR

- ◆ Applications: 5G NR, 11ad, 11ay,
- ◆ Automotive Radar
- ◆ High Precision 3D Positioner
- ◆ QZ Size: 30cm diameter
- ◆ Frequency Range: 10GHz - 110GHz

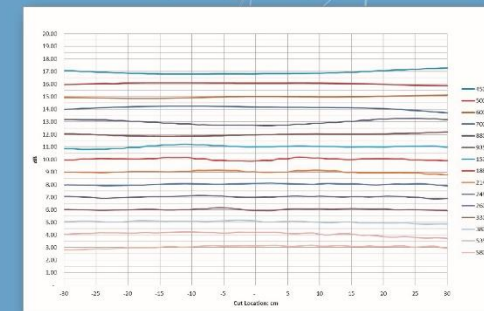


## Patented Broadband Low Frequency Anechoic Chamber

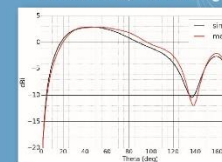
- ◆ Taper Chamber Replacement
- ◆ Superior Low Frequency Quiet Zone
- ◆ Frequency Range: 300MHz to mmWave
- ◆ Broadband Easy and Stable Feeding
- ◆ Ultra-low Depolarization



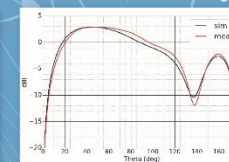
FFC-744SL Quiet Zone  
V-Pol, X-cut @Y=15cm,Z=+0cm



Antenna Gain  
at 400 MHz, Phi = 0 Deg



Antenna Gain  
at 400 MHz, Phi = 90 Deg





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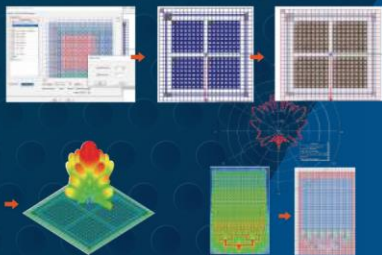
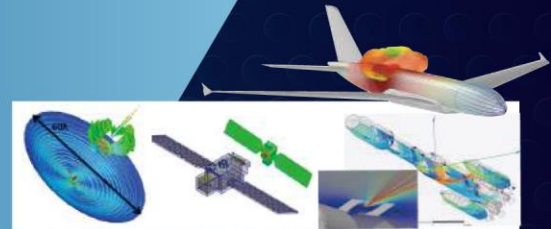
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## 5G Antenna Array Analysis

3D component array provides a means of combining different unit cells in one array, and it will copy the converged unit cell mesh to the other same component. This method will help designers to solve large and complex antenna array problems effectively.

## Ansys Toolkit

Ansys HFSS offers an antenna design toolkit, a standalone utility which automates the geometry creation, solution setup, and post-processing reports for 50 popular antenna elements.



## ADAS Radar

Ansys HFSS provides complete radar simulation tools to solve electromagnetic problems, such as passive IC components, dynamic Link with circuit and ADAS radar.

# 5G



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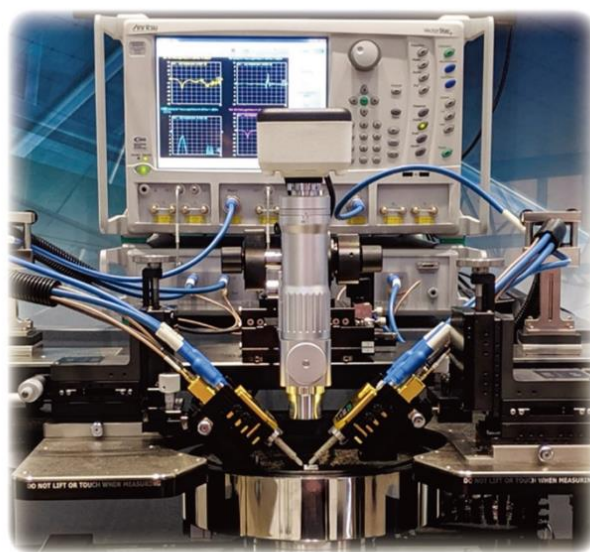




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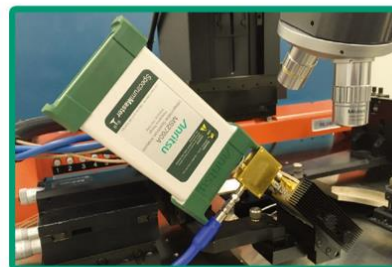


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