2020 IEEE 3rd International Conference on Electronic Information and Communication Technology

ICEICT 2020

Shenzhen, China • November 13-15, 2020
http://www.iceict.org/

Conference Program

Sponsors:

Co-sponsors:

Contents

Venue

Conference Venue and Hotel: Sentosa Hotel (Feicui)

Address: Villa 3, Tiansha Feicui Mingzhu Garden Community, Jinji Road (Jinji Lu)

Online Platform

Saturday, November 14, 2020

邀请您参加腾讯会议
会议主题：ICEICT2020 线上会议
会议时间：2020/11/14 13:00-19:00

点击链接直接加入会议：https://meeting.tencent.com/s/L2dwH2oo79Yi

会议 ID：759 880 355

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Sunday, November 15, 2020

邀请您参加腾讯会议
会议主题：ICEICT2020 线上会议-15 日
会议时间：2020/11/15 07:30-13:30

点击链接直接加入会议：https://meeting.tencent.com/s/TL3lPOwsH0dQ

会议 ID：264 211 330

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Program at a Glance

Friday, November 13, 2020

Receive meal ticket on 4 Floor of Sentosa Hotel (Feicui)		
18:00-21:00	**Welcome Buffet**	**1 Floor Western Restaurant 1 层西餐厅**

Saturday, November 14, 2020

08:00-12:00	**Registration**	**1F Hall of Sentosa Hotel (Feicui)**
12:00-13:00	**Lunch**	**1 Floor Western Restaurant**
13:30-14:20	**Opening Ceremony**	**4F Jade Room-2 4 层翡翠二厅 邀请您参加腾讯会议 会议主题： ICEICT2020 线上会议 会议时间： 2020/11/14 13:00-19:00 点击链接直接加入会议： https://meeting.tencent.com /s/L2dwH2oo79Yi 会议 ID：759 880 355**
14:20-15:20 Chair: Kwok L. Chung	**Keynote Speech I *Qing-Xin Chu***	
15:20-16:00 Chair: Botao Feng	**Keynote Speech II *Zhengfang Qian***	
16:00-16:20	**Coffee break**	**4 Floor**
16:20-17:00 Chair: Xiaoming Chen	**Keynote Speech III *Zhimeng Zhong***	**4F Jade Room-2 4 层翡翠二厅 邀请您参加腾讯会议 点击链接直接加入会议： https://meeting.tencent.com /s/L2dwH2oo79Yi 会议 ID：759 880 355**
17:00-17:40 Chair: Yingsong Li	**Keynote Speech IV *Yuantao Gu***	
18:30-20:30	**Welcoming Dinner**	**4 Floor Jade Room-2 4 层翡翠二厅**

Sunday, November 15, 2020

08:00-09:00	Invited Talk (SS7): *Tao Jiang* Special Session 7 Special Session 9	4 Floor Agate Room 4 层玛瑙厅
08:00-09:00	Oral Session 2 Topic 2 Session Chair: *Yingsong Li*	4 Floor Pearl Room 4 层珍珠厅
08:00-09:00	Oral Session 3: Topic 3 & Topic 4 Session Chair: *Mingchun Tang*	4 Floor Jade Room-1B 4 层翡翠一厅 B
08:00-09:00	Invited Talk (SS1): *Zhengpeng Wang* Invited Talk (SS2): *Jiahao Zhang* Speech from EM-Testing	4 Floor Jade Room-3A 4 层翡翠三厅 A
08:00-09:00	Oral Session 1 Topic 1 Session Chair: *Fang Ye*	4 Floor Jade Room-3B 4 层翡翠三厅 B
09:00-10:00	Special Session 5 Oral Session: Topic 1 & Topic 2	4 Floor Agate Room 4 层玛瑙厅
09:00-10:00	Invited Talk (SS10) *Bian Wu & Xiangru Wang* Special Session 10	4 Floor Pearl Room 4 层珍珠厅
09:00-10:00	Invited Talk (SS20) *Zhao Yao* Special Session 20	4 Floor Jade Room-1B 4 层翡翠一厅 B
09:00-10:00	Special Session 1 Special Session 2	4 Floor Jade Room-3A 4 层翡翠三厅 A
09:00-10:00	Invited Talk (SS11) *Tong Cai & Xiaoming Chen* Special Session 11	4 Floor Jade Room-3B 4 层翡翠三厅 B
08:00-10:00	Poster Session I	4 Floor
10:00-10:20	Coffee break	4 Floor

Sunday, November 15, 2020

10:20-11:20	Invited Talk (SS12): *Shichao Chen & Ming Liu* Special Session 12	4 Floor Agate Room 4 层玛瑙厅
10:20-11:20	Invited Talk (SS19) *Hongxing Zheng & Qiang Ren* Invited Talk: *Mingchun Tang*	4 Floor Pearl Room 4 层珍珠厅
10:20-11:20	Invited Talk (SS14): *Hui Li* Special Session 14	4 Floor Jade Room-1B 4 层翡翠一厅 B
10:20-11:20	Invited Talk (SS17): *Laxmisha Rai* Special Session 17	4 Floor Jade Room-3A 4 层翡翠三厅 A
10:20-11:20	Invited Talk (SS11): *Xiangkun Kong* Special Session 15	4 Floor Jade Room-3B 4 层翡翠三厅 B
11:20-12:40	Invited Talk (SS12) *Yan Huang & Yifei Fan* Special Session 12	4 Floor Agate Room 4 层玛瑙厅
11:20-12:40	Special Session 19	4 Floor Pearl Room 4 层珍珠厅
11:20-12:40	Invited Talk (SS14): *Changjiang Deng* Special Session 14	4 Floor Jade Room-1B 4 层翡翠一厅 B
11:20-12:40	Special Session 16	4 Floor Jade Room-3A 4 层翡翠三厅 A
11:10-12:40	Special Session 18	4 Floor Jade Room-3B 4 层翡翠三厅 B
10:20-12:20	Poster Session II	4 Floor
13:00-14:00	Lunch After lunch, get together in the hall	1 Floor Western Restaurant 1 层西餐厅

Online Presentation

邀请您参加腾讯会议

会议主题：ICEICT2020 线上会议-15 日

会议时间：2020/11/15 07:30-13:30

Chair: Dawei Zhang, Kuang Zhang

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Invited Talk (SS7)
Dawei Zhang

Invited Talk (SS11)
Kuang Zhang

Invited Talk (SS14)
Changfei Zhou

Invited Talk (SS1)
Xiong Chen

Invited Talk (SS5)
Yujian Chen

Invited Talk (SS14)
Yu Luo

Online Presentation (Papers)

Visit Arrangement
(on the afternoon of November 15th)

15:30	**Get together in the hall of Sentosa Hotel (Feicui)**
16:00-20:00	**Visit Shenzhen University** **Farewell Dinner**

Organizing Committee

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Botao FENG	Shenzhen University, China
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Wenxing AN	Tianjin University, China
Weijun HONG	Beijing University of Posts and Telecommunications, China

Special Session Chairs

Special session 1: EMC and OTA Testing for the Next Generation Communication Devices	
Xiaoming Chen	Xi'an Jiaotong University
Qian Xu	Nanjing University of Aeronautics and Astronautics
Special session 2: Wearable Antennas and Biomedical Circuits	
Sen Yan	Xi’an Jiaotong University
Zhihao Jiang	Southeast University
Special session 3: Resource Allocation for the Next-generation Wireless Communications	
Yongjun Xu	Chongqing University of Posts and Telecommunications
Special session 4: Metasurface based Spatial Coding: Theory and Applications	
Shitao Zhu	Xi’an Jiaotong University
Kuang Zhang	Harbin Institute of Technology
Special session 5: Waveguide and Antenna Design for mmWave and THz Applications	
Qingfeng Zhang	Southern University of Science and Technology
Linghui Kong	Soochow University
Special session 6: Intelligence Signal Processing in Communication Navigation System	
Fang Ye	Harbin Engineering University
Special session 7: Electromagnetic Environment Effects and Adaptability Analysis	
Tao Jiang	Harbin Engineering University
Dawei Zhang	Harbin Engineering University
Special session 8: Computational Methods for Advanced/Complex/Artificial Materials/Surfaces	
Qingfeng Zhang	Southern University of Science and Technology

Kai Wang	Peng Cheng Lab, Shenzhen, China
Special session 9: Advanced Channel Coding and Encryption Techniques for Beyond 5G Networks Member	
Guangfu Wu	Jiangxi University of Science and Technology
Yong Li	Chongqing University
Jiguang He	University of Oulu
Special session 10: Advanced Electromagnetic Materials for Millimeter-Wave and THz Applications	
Longzhu Cai	Southeast University
Qiang Cheng	Southeast University
Special session 11: Metamaterials, Metasurfaces, and Their Electromagnetic Applications	
Ke Chen	Nanjing University
Weiren Zhu	Shanghai Jiao Tong University
Special session 12: Artificial Intelligence in Radar Signal Processing	
Tao Mingliang	Northwestern Polytechnical University
Su Jia	Northwestern Polytechnical University
Special session 13: Emerging Trends in Space, Air, Ground, and Sea Information Networks towards B5G	
Chao Zhang	Xi'an Jiaotong University
Guinian Feng	Innovation Academy for Microsatellite of CAS
Special session 14: Antenna Techlologies for 5G/B5G Communications	
Xiaoming Chen	Xi'an Jiaotong University
Hui Li	Dalian University of Technology
Special session 15: Antennas and Arrays for Diverse Applications	
Li Deng	Beijing University of Posts and Telecommunications
Weijun Hong	Beijing University of Posts and Telecommunications

Special session 16: Special Session on Cloud Computing in Smart Cities and 5G/B5G/6G Antenna	
Botao Feng	Shenzhen University
Qinglong Dai	Beijing University of Posts and Telecommunications
Special session 17: Special session on 5G and Artificial Intelligence	
Yuan Ye	Chongqing University of Post and Telecommunications
Laxmisha Rai	Shandong University of Science and Technology
Special session 18: Electromagnetic Resonators for Emerging Monitoring Applications	
Kwok L. Chung	Qingdao University of Technology
Jun Zhang	Guangdong University of Technology
Special session 19: Time Domain and Frequency Domain Methods and Their Applications	
Hongxing Zheng	Hebei University of Technology
Yuanguo Zhou	Xi'an University of Science and Technology
Special session 20: Recent Progress on Artisitic Antennas and Hidden Antennas	
Kwok L. Chung	Qingdao University of Technology
Yao Zhao	Qingdao University
Yingsong Li	Harbin Engineering University

General Chair's Welcome

On behalf of the Organizing Committee of the 2020 IEEE 3rd International Conference on Electronic Information and Communication Technology (ICEICT2020), it is my great honor and pleasure to welcome you to this conference, to be held in Shenzhen, China, November 13 to 15, 2020.

ICEICT 2020 is sponsored by Shenzhen University and IEEE Harbin Section, technical sponsored by IEEE Guangzhou Section, co-sponsored by Institute of Next Generation Network, Chongqing University of Posts and Telecommunications. It is also supported by IEEE Harbin AP/MTT/EMC Joint Chapter and other research institutes and universities, including Key Laboratory of Data link Technology of China Electronics Technology Group Corporation, Shenzhen South Star Technology Co. LTD, Shenzhen Zhongke Wireless Technology Co. LTD, and Shanghai EM-Testing Electromagnetic Technology Co. LTD, etc.

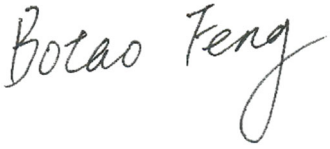
The technologies in Electronics Information, Communications have been playing important roles in our modern civilization and expected to stay as main characters in the future. The ICEICT2020 intends to provide a platform for researchers, engineers, academicians as well as industrial professionals from all over the world to present their research results and development activities in these field. The conference welcomes contributions that could enhance the collision of excellent ideas and generate sparkle of wisdom between researchers all over the world.

Shenzhen is the first special economic zone of China, serving as a window for China's reform and openness. Now, Shenzhen has developed into an international city with great influence, creating the "Shenzhen Speed" that attracts worldwide attention. Meanwhile, Shenzhen enjoys the good fame of City of Design, City of scientific and technological innovation, and City of financial capital.

Shenzhen University (SZU) was founded in 1983. The Central Government, the Ministry of Education, and the local government attached great importance to higher education in Shenzhen University. Moreover, SZU is an important base for talent cultivation and scientific research in the fields of architecture, computer science and technology, economics, management and information and communications as well. She impresses everyone on her beautiful campus and culture. I hope that you will find the conference and your stay in Shenzhen both valuable and enjoyable.

This conference has received enthusiastic responses, with approximately 365 submitted papers from nearly 90 university and regions. The Technical Program Committee consists of over 60 international specialists in the paper review and selection process. Based on careful peer review, approximately 218 papers were accepted, the conference also invited keynote speeches from renowned researchers in the field.

At last, I wish the conference a great success, and wish you all pleasant stay in Shenzhen.



Shenzhen University
General Chair, ICEICT2020

Keynote Speakers

Keynote Speaker I: Qing-Xin Chu

Speaker's bio:
Qing-Xin Chu is the professor with the School of Electronic and Information Engineering, South China University of Technology, the vice-chair of China Electronic Institute (CEI) Antenna Society, the vice-chair of CEI Propagation Society, IEEE Fellow and CEI Fellow. He has published one book and more than 600 papers in journals and conferences with over 4000 SCI citations. He has been elected as the highly cited scholar by Elsevier in the field of Electrical and Electronic Engineering since 2013. He has authorized more than 70 invention patents of China. He was the recipient of the Science Awards by CEI in 2018 and 2016, the Science Award by Guangdong Province of China in 2013, the Science Awards by the Education Ministry of China in 2008 and 2002. His current research interests include antennas and RF techniques in 5G communication.

Title: Decoupling for MIMO antennas

Abstract:
MIMO is the key technology of 5G mobile communications. In MIMO arrays, a lot of antenna elements are tightly installed with a common reflector and a radome, resulting in strong coupling between the elements. The coupling deteriorates the matching and isolation of antennas, and also affects the radiation patterns. In this talk, a number of decoupling principles and methods are introduced including several methods proposed by Prof Qing-Xin Chu's group in South China University of Technology.

Keynote Speaker II: Zhengfang Qian

Speaker's bio:
Zhengfang Qian received his Ph.D. degree from Chongqing University, China, in 1991. He is currently Chair Professor in College of Physics and Optoelectronic Engineering, Shenzhen University. His current research interests include optoelectronic devices and wireless communications.

Title: RF Properties of Graphene and its Applications to Antennas for 5G/6G Communications

Abstract:
This talk presents a review of RF properties of graphene, including its dynamic conductivity and dielectric property. Its RF properties can be utilized for reconfigurable antennas and phased arrays, specifically, for applications to mmw (5G) and THz (6G) applications. We will also present recent progress in the CVD growth of high quality and large-scale graphene, the property measurement by Terahertz time-domain spectroscopy, and the THz plasmonics of graphene.

Keynote Speaker III: Zhimeng Zhong

Speaker's bio:
Zhimeng Zhong received the B.E., M.S., and Ph.D. degrees from Xi'an Jiaotong University, Xi'an, China, in 2002, 2005, and 2008, respectively, all in electronic engineering.

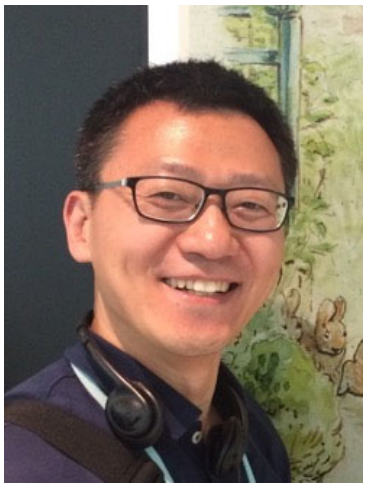
He joined Huawei Technologies CO., LTD from 2009, and about 11 years experiences on wireless communication system research and development.

Dr. Zhong is a senior member of the IEEE. In these years, he mainly focused on wireless channel measurement, channel modelling, and MIMO algorithm & system design. He is the team leader of wireless channel research in Huawei. Especially, he was in charge of the 3GPP 5G channel model standardization work in Huawei, and gave contributions on 3GPP mm-wave channel model, V2V channel model, and IIOT Channel model standardization. Recently, he also focused on Massive MIMO algorithm design based on some special channel characteristics and machine learning technologies.

Title: Wireless channel model evolution from 5G to beyond 5G

Abstract:
For every wireless communication generation, it will have new requirements for channel model. The channel model evolution driving forces are mainly from three parts: 1) new spectrums; 2) new physical layer technologies; 3) new scenarios. From 5G to B5G (beyond 5G), the frequency bands will be extended from 100G Hz to terahertz (THz), and the THz bands' applications will be highly depended on these frequency bands' channel characteristics, such as path loss, penetration loss, etc. From new physical layer technologies point of view, the massive MIMO structure has been widely used on 5G base station in recent years, so the ultra massive MIMO system with more antennas will be one promising new massive MIMO structure. Moreover, the intelligent reflecting surface (IRS) has been one popular topic which can be deployed to change wireless environments. Moreover, 5G enables communication with unprecedented reliability, very low latencies, and massive connectivity, many applications in different vertical domains, including the automotive, healthcare, agriculture, and manufacturing, have been thus considered in 5G networks. As the foundation of the communication system design and evaluation, the reasonable wireless channel characteristics and model are needed for these new scenarios. In this talk, we will introduce the recent channel model research results are given, and future research challenges are pointed out as well.

Keynote Speaker IV: Yuantao Gu



Speaker's bio:
Yuantao Gu received the B.E. degree from Xi'an Jiaotong University in 1998, and the Ph.D. degree with honor from Tsinghua University in 2003, both in Electronic Engineering. He joined the faculty of Tsinghua University in 2003 and is now a professor with Department of Electronic Engineering. He was a visiting scientist at Research Laboratory of Electronics at Massachusetts Institute of Technology during 2012 to 2013 and Department of Electrical Engineering and Computer Science at the University of Michigan in Ann Arbor during 2015. His research interests include high-dimensional signal processing, dimensionality reduction, optimization, sparse signal recovery, temporal-space and graph signal processing. He is a Senior Area Editor for IEEE Transactions on Signal Processing and an Elected Member of both IEEE Machine Learning for Signal Processing (MLSP) Technical Committee and IEEE Signal Processing Theory and Methods (SPTM) Technical Committee. He received the Best Paper Award of IEEE GlobalSIP in 2015, the Award for Best Presentation of Journal Paper of IEEE ChinaSIP in 2015, and Zhang Si-Ying (CCDC) Outstanding Youth Paper Award (with his student) in 2017.

Title: Communication-efficient Decentralized Signal Detection

Abstract:
Distributed systems like Wireless Sensor Network (WSN) and Internet of Things (IoT) have been applied in various fields such as quality control and environment monitoring. In these systems, change-point detection (CPD) is a fundamental component, which monitors whether a system is in its normal state and detects promptly when the system catastrophically drops into abnormal states. Such a component naturally entails operating with energy-limited sensors in a distributed manner. Due to this energy limitation, how to detect change-points efficiently becomes a key issue. In this keynote, we will first review the basic ingredients of change-point detection, including the problem formulation, online algorithms, and applications. Then we will introduce our recent work, an energy-efficient change-point detection algorithm based on the request-response and censoring scheme. These two schemes help sensors extract the most useful information from their neighbors and avoids radiating inessential information. In this way, the new algorithm greatly reduces energy cost resulting from communication without deteriorating the detection performance. Finally, we will demonstrate the efficiency and validity of the new algorithm by applying it on a real-world task of physical activity detection.

Invited Talks

Invited Talk: Zhengpeng Wang, Beihang University

Special session 1: EMC and OTA Testing for the Next Generation Communication Devices

Short Bio:
Zhengpeng Wang was born in Shandong, China, in 1981. He received the B.Sc. degree in electronic science and technology from Shandong University, Jinan, China, in 2004, and the M.Sc. and Ph.D. degrees in electromagnetic field and microwave technology from Beihang University, Beijing, China, in 2007 and 2012, respectively.
He was a Visiting Researcher with the Antenna and Applied Electromagnetic Laboratory, University of Birmingham, Birmingham, U.K., in 2009 and 2010. From 2013 to 2015, he was a Research Fellow with the University of Kent, Canterbury, U.K., and the University of Science and Technology Beijing, Beijing, China. He is currently an Associate Professor with the Beihang University. His current research interests include Over the Air (OTA) test, reconfigurable antennas, filtering antennas, and antenna measurement.

Title: Fast Phased Array Calibration Method Based on Multiple Measuring Probes

Abstract:
Fast Phased Array Calibration Method Based on Multiple Measuring Probes This paper presents a fast phased array calibration method which significantly reduces the number of antenna under test (AUT) amplitude and phase setting states. Multiple measuring probes are introduced to record transmission coefficients as AUT works at different states. A coefficient matrix with a small condition number is constructed to calculate the initial excitation coefficients of each antenna element. Simulation results show that the coefficient matrix condition number can be reduced to 1 by optimizing the geometry of the measurement system. When the signal-to-noise ratio is higher than 18dB, the amplitude error of the calibration result is less than 0.5dB and the phase error is less than 20 degrees in the optimal conditional number configuration. This method effectively reduces the measurement time for the phased array calibration and improves the stability of the calibration system.

Invited Talk: Xiong Chen, Tianjing University

Special session 1: EMC and OTA Testing for the Next Generation Communication Devices

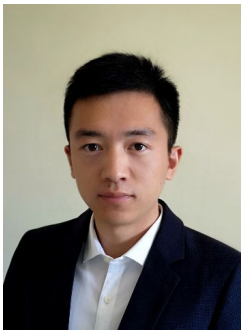
Short Bio:
Xiong Chen received his Ph.D. degree in electrical engineering from Xi'an Jiaotong University in 2018, and then joined Tianjin University, China, as assistant Professor in 2019. From 2017 to 2018, he visits the EMC Lab of Missouri S&T for high power EMC/EMI related researches. Since 2020, he has served as the group secretary for the IEEE proposal standard of P2717, Advanced Passive Intermodulation Test and System in Low Noise Circumstance. As the first author, Dr. Chen has authored dozens MW/RF publications and patents (includes US patent) about MW/RF design and reliability. His current research interests include but not limit to MW/RF circuit, high power MW/RF device, MW/RF nonlinear distortion effect in wireless communication with its OTA measurements.

Title: Overview of PIM test calibrations with its improvement by tunable PIM standard

Abstract:
The traditional calibration method for passive intermodulation (PIM) measurement, also as IEC 62037 recommended, is realized using a tested low PIM load or several PIM fixed value standards to check if the PIM test loop (excluded DUT) has a low PIM status or equal PIM response. This method works in most cases. However, as the potential nonlinearities are widely spread in all kinds of microwave devices, the PIM calibration just based on the low PIM statue of whole test loop is not sufficient. For example, when the test PIM values are higher than the residual PIM level or the to-be-calibrated PIM level is not equal to the reference levels, the PIM test cannot be calibrated, much less the fake low PIM statue caused by the cancelling effect by multiple nonlinear sources. All these makes the traditional PIM test method has the potential to un-observably lose the test confidence or cause un-observable test error. In contrast, a tunable PIM source based calibration method arose, this method can provide a series of continual PIM references to verify all the test values in the testable ranges, the test accuracy can be ensured accordingly. Together with the PIM amplitude calibration, this work proposes a solution to realize the PIM phase tuning and calibration, which can ensure the test accuracy for the phase information of PIM sources. Under this technical background, this work introduces several kinds of techniques to generate tunable PIM amplitude. Targeted to PIM measurement, all the reported techniques would be able to provide weak PIM level that smaller than -112 dBm @ 2x43 dBm. Further, some improvements for several specific application scenes are introduced, these improvements cover increasing tunable dynamic range, bi-directional propagation, wideband PIM response, and PIM phase tuning.

Invited Talk: Jiahao Zhang, National Key Laboratory of Science and Technology on Vessel Integrated Power System

Special session 2: Wearable Antennas and Biomedical Circuits



Short Bio:
Jiahao Zhang was born in Hubei, China, in 1990. He received the B.S. degree in communication engineering from Huazhong University of Science and Technology, Wuhan, China, in 2012, the second B.S. degree in psychology from Central China Normal University, Wuhan, China, also in 2012, and the Ph.D. degree in electrical engineering from Katholieke Universiteit Leuven, Leuven, Belgium, in 2019.
From 2017 to 2018, he was with Norwegian University of Science and Technology, Trondheim, Norway, as a Visiting Researcher. In April 2019, he joined Lund University, Lund, Sweden, as a Visiting Researcher. Since late 2019, he has been an Assistant Researcher with National Key Laboratory of Science and Technology on Vessel Integrated Power System, Naval University of Engineering. His current research interests include electromagnetic compatibility, wireless body area networks, metamaterials, antennas, massive MIMO, and wireless power transfer.

Title: A Metamaterial Inspired Button Antenna for Wireless Power and Data Transfer

Abstract:
A novel metamaterial inspired button antenna topology is proposed, integrating two working modes to transfer power and data, respectively. An omni-directional radiation is obtained in the 3.5 GHz WiMAX band to support on-body communication, while a circular polarized broadside radiation is achieved in the 5 GHz WLAN band to harvest power. An Artificial Magnetic Conductor (AMC) metamaterial structure is used to achieve a low-profile design. A wide bandwidth and high efficiency are observed. All these features make the proposed antenna suitable for on-body data transmission and off-body energy harvesting. A prototype has been fabricated. The measurement results are in good agreement with the simulation results.

Invited Talk: Yu Jian Cheng, University of Electronic Science and Technology of China

Special session 5: Waveguide and Antenna Design for mmWave and THz Applications

Short Bio:
Yu Jian Cheng received the B. S. degree from University of Electronic Science and Technology of China, in 2005 and the Ph.D. degree without going through the conventional Master's degree at Southeast University, Nanjing, China, in 2010. Since 2010, he has been with the School of Electric Engineering, University of Electronic Science and Technology of China, and is currently a Professor. From 2012 to 2013, he was a research staff in the Department of Electrical and Computer Engineering, National University of Singapore. His current research interests include microwave and millimeter-wave antennas, integrated arrays and circuits. He has authored or coauthored more than 100 papers in journals and conferences, as well as a book-Substrate Integrated Antennas and Arrays, (CRC press, 2015). Dr. Cheng was the recipient of the National Science Fund for Excellent Young Scholars in 2016, and National Excellent Doctorate Dissertation of China in 2012. He is currently the vice president of the joint IEEE Chapters of APS/EMCS, Chengdu, China. He is the Senior Member of the Chinese Institute of Electronics. Now, Cheng has served as the Associate Editor for IEEE antennas and wireless propagation letters, and on review boards of various technical journals.

Title: SIW Slot Array Antenna with Non-Alternating Slot Placement for Impedance Bandwidth Enhancement

Abstract:
This paper presents a substrate integrated waveguide (SIW) array antenna with non-alternating etched longitudinal slots to realize the impedance bandwidth enhancement. Due to the non-alternating slot placement, the impedance bandwidth of the slot array antenna can be expanded much more compared with that of a conventional slot array antenna, which has a distance of a half waveguide wavelength between two adjacent slots. Considering the dielectric filled in the SIW, the distance between two adjacent slots etched on the same side of the SIW is still less than one wavelength in air. Thus, it can guarantee the good performance. The measured linear array exhibits the enhanced impedance bandwidth of 2.29 times at a return loss of 10 dB when compared to the conventional slot array antenna with the same radiating aperture. A stable radiation pattern bandwidth of 2.27% is also obtained with a gain of 17 dBi at the central frequency of 94 GHz.

Invited Talk: Tao Jiang, Harbin Engineering University

Special session 7: Electromagnetic Environment Effects and Adaptability Analysis

Short Bio:
Tao Jiang was born in Heilongjiang Province, China. He received the B.S. degree in Electronic Engineering and the M. S. degree in Signal & Information Processing, Ph. D. degree in Communication & Information System from Harbin Engineering University in 1994, 1999 and 2002, respectively. Since 2008, he worked in the College of Information and Communication Engineering, Harbin Engineering University, China, as a professor. His research interests include Electromagnetic environment effect evaluation, radio propagation modeling, EMC. He serves as a member of editorial board for Chinese Journal of Ship Research and a reviewer for several journals.

Title: Research on Electromagnetic Pulse Prediction for Sensitive Equipment on Ship

Abstract:
This paper is aiming at the propagation modeling of electromagnetic pulse waveform in complex ocean environment, based on the multi-path theory of random bridge process, the prediction of electromagnetic pulse signal from the antenna of platform equipment at ultra-low altitude on the sea surface was studied. A strong electromagnetic pulse propagation model under the background of dynamic sea surface is established. The contribution of sea surface to the power density of the received signal in the region of the platform is effectively predicted. A method to accurately calculate the signal waveform at the port of the sensitive device is proposed. It is of great theoretical and practical significance for the research and design of anti-strong electromagnetic pulse of the platform system.

Invited Talk: Dawei Zhang, Harbin Engineering University

Special session 7: Electromagnetic Environment Effects and Adaptability Analysis

Short Bio:
Dawei Zhang was born in Heilongjiang Province, China. He received the B.S. degree in Electronic Information Science and Technology and the M. S. degree in Radio Physics from University of Electronic Science and Technology of China (UESTC), Chengdu, Sichuan, China, in 2011 and 2014, respectively, and the Ph. D. degree in Information and Communication Engineering from Harbin Institute of Technology (HIT), Harbin, Heilongjiang, China, in 2019. In 2019, he joined the College of Information and Communication Engineering, Harbin Engineering University, China, as an assistant professor. His research interests include metamaterials, spoof surface plasmon polaritons and microwave passive devices. He serves as a reviewer for several journals, including Optics Letters, Optics Express, and Optical Materials Express.

Title: Spoof Surface Plasmon Polaritons Supported by Substrate Integrated Waveguide with Arrays of Holes

Abstract:
This work presents an approach to develop spoof surface plasmon polaritons (SSPPs) in substrate integrated waveguides (SIWs) with simple geometries (arrays of rectangular holes). Dispersion properties of both SSPPs supported by a SIW with a rectangular hole and the traditional SSPPs based on a single-conductor metallic strip with the same hole are compared. Moreover, a smooth transition built by stepped impedance transmission lines with gradient holes is designed for high-efficiency mode conversion. Consequently, an SSPP waveguide is constructed by a SIW with uniform holes and the proposed transition, and the transmission characteristics of the waveguide are simulated for validation. The simulated bandwidth can reach as high as 100.1% covering a range from 4.34 to 13.05 GHz, which shows a good agreement with the results in the dispersion diagram.

Invited Talk: Bian Wu, Xidian University

Special session 10: Advanced Electromagnetic Materials for Millimeter-Wave and THz Applications

Short Bio:
Bian Wu (Member, IEEE) was born in Xianning, Hubei, China, in 1981. He received the B.S. and Ph.D. degrees in electromagnetic fields and microwave technology from Xidian University, Xi'an, China, in 2004 and 2008, respectively. Since 2008, he was with Xidian University, where he is currently a Professor with the National Key Laboratory of Antennas and Microwave Technology. From March 2013 to February 2014, he was a Post-Doctoral Visitor with the Queen Mary University of London, London, U.K. He has authored or coauthored over 80 journal publications. His research interests include microwave circuits and devices, filtering antennas, metamaterials, and graphene-based devices.

Title: Graphene-based Beam Steering Antenna

Abstract:
In this paper, two kinds of graphene-based beam steering millimeter wave antennas presented by our group are summarized. Firstly, a pattern reconfigurable antenna consists of a pair of back-to-back modified Vivaldi antennas and a power dividing feed line loaded with graphene nanoplate pads is presented. By varying the resistance of two graphene pads, the radiation pattern of the antenna can be manipulated from two opposite beams to a single beam. In addition, a multi-beam array antenna based on flexible multilayer graphene film (MGF) with high conductivity and small thickness fed by the substrate integrated waveguide butler matrix is realized, which can offer a wider impedance bandwidth and large beam scanning range.

Invited Talk: Xiangru Wang, University of Electronic Science and Technology of China

Special session 10: Advanced Electromagnetic Materials for Millimeter-Wave and THz Applications

Short Bio:
Xiangru Wang graduated from the University of Electronic Science and Technology of China (UESTC) in 2006. and obtained a PhD in optics in 2012, From 2009 to 2011, he worked at the US Top3 optical center CREOL University of Central Florida as Visiting Research Scientist. During the scientific research work in the United States, he participated as the main researcher in the US Department of Defense's DARPA and JTO projects "High Power Laser Beam Combining Technology", "Large Mode Field High Power Fiber Laser Technology" and other major US defense projects, achieving 400 for the first time in the world. After joining in the UESTC in 2012, he has been principle investigator of the PHI group and a number of national, provincial and ministerial projects such as 863, and the National Natural Science Foundation of China, and took the lead in breaking through the key technology of optical phased array rapid response in microseconds. In recent years, he has published more than 40 papers indexed by SCI and EI and nearly 20 academic speaks, and obtained more than 20 patents. Research interests include: "Liquid crystal Microwave Phased Array Technology", "Satellite Interconnection Network Technology", "Wireless Energy Transmission Technology", "Satellite-to-ground Energy Transmission Technology", "Broad Spectrum Dielectric Control Technology" and other microwave/laser cutting-edge technologies. He is currently a member of IEEE and OSA, as well as a special reviewer for Optics Letters, J. Soc. Am. B, Applied Physics: B, J. Quan. Elect. and other internationally well known journals.

Title: Reconfigurable Microwave Phase Shifter Based on Nematic Liquid Crystal: Design and Experimental Validation

Abstract:
In this paper, a low-cost microstrip line structure microwave phase shifter based on nematic liquid crystal materials is discussed. The device is built on a glass substrate: the two ports of this device have the coplanar waveguides (CPWs) with 50Ω impedance structure to feed the energies or extract signals at both ends of the phase shifter. The simulation validate the phase shift can reach 360 degrees, and the S21 parameter reaches -4.5dB in the frequency band 28-30Ghz.The practical device shows S21 insertion loss is -12~-15dB, the phase shift can reach 360 degrees, and it works well between +10℃~+65℃.The phase-shifting repetition accuracy is less than 1 degree.

Invited Talk: Tong Cai, Air Force Engineering University

Special session 11: Metamaterials, Metasurfaces, and Their Electromagnetic Applications

Short Bio:
Tong Cai received the B.S. and Ph.D. degrees in electrical engineering from the Air Force Engineering University, Xi'an, China, in 2012, and 2017, respectively. He was with Air Force Engineering University, where he became a Lecturer in 2017 and an associate professor in 2020. He has been a Post-Doctoral Researcher with Zhejiang University since 2019. His research interests include metamaterials, metasurfaces and their applications to novel antennas and multifunctional devices. He obtained the support of Postdoctoral Innovation Talents Support Program of China in 2019. He has authored over 40 peer-reviewed first author articles in Advanced Photonics, Advanced Optical Materials, IEEE Transactions on Antennas and Propagations, Physical Review Applied, and so on.

Title: High-efficiency Receiver-Transmitter Metasurfaces with Independent Control of Polarization, Amplitude and Phase

Abstract:
Polarization, amplitude and phase are three critical characteristics of electromagnetic waves as known. In this article, a general method with high efficiency and low complexity is proposed to realize simultaneously independent control of polarization, amplitude and phase of electromagnetic waves by receiver-transmitter integrated meta-atoms in transmissive geometry. The amplitude modulation is controlled by the rotation angle of top receiver patch, while the phase delay is determined by the rotation angle of bottom transmitter patch without affecting the amplitude. In addition, the polarization is controlled by the polarization of both receiver and transmitter. As a proof of concept, a metasurface with multiple diffraction orders is designed, fabricated and measured in microwave reigonnnogier. The measured results are in excellent agreement with the simulated ones. Our finding offers an alternative way to synthesize arbitrary wavefront shapes of EM waves, and we are looking forward to more high- performance photonic metadevices by applying this approach.

Invited Talk: Xiaoming Chen, Xi'an Jiaotong University

Special session 11: Metamaterials, Metasurfaces, and Their Electromagnetic Applications

Short Bio: Xiaoming Chen received the B.Sc. degree in electrical engineering from Northwestern Polytechnical University, Xi'an, China, in 2006, and M.Sc. and PhD degrees in electrical engineering from Chalmers University of Technology, Gothenburg, Sweden, in 2007 and 2012, respectively. From 2012 to 2014, he was a postdoctoral researcher at Chalmers University of Technology. From 2014 to 2017, he was an antenna specialist at Qamcom Research & Technology AB, Gothenburg, Sweden. Since 2017, he has been a professor at Xi'an Jiaotong University, Xi'an, China. His research areas include MIMO antennas, over-the-air testing, reverberation chambers, and dirty RF. Prof. Chen received a prestigious national grant in 2018. He serves as an Associate Editor (AE) for IEEE Antennas and Wireless Propagation Letters (AWPL) and received the outstanding AE awards in 2018, 2019 and 2020, and the Young Scientist Awards from URSI GASS 2017 and AT-RASC 2018.

Title: Investigation of OAM Multiplexing in Multipath Environment

Abstract:
Due to the orthogonality of its modes, orbital angular momentum (OAM) has found various applications. The majority of previous communication works assumed line-of-sight (LOS) scenarios, whereas the more realistic multipath (scattering) environments were considered only in a few works. It was generally believed that multipath had adverse effect on OAM multiplexing in that multipath tends to introduce crosstalk between different OAM modes while the conventional OAM detection relies on the orthogonality of OAM modes. Actually, the crosstalk caused by the multipath can be readily mitigated by the conventional multiple-input multiple-output (MIMO) equalizations. It was shown very recently in that, by combining with a conventional MIMO equalizer, OAM multiplexing could be extended to multipath environments. This finding was verified experimentally in a reverberation chamber. However, the reverberation chamber represents a rich isotropic scattering environment, where the propagation waves are statistically isotropically distributed over the three-dimensional angular domain, whereas typical multipath environments are usually non-isotropic, i.e., the propagation waves are confined within certain angular range (spread). This motivates us to study the angular spread effect on OAM multiplexing in this work. It is well known that there is a null (divergence) in the center of the OAM beam, which limits the OAM communication range in LOS environment. Nevertheless, as will be shown later in this work, as long as the angular spread in the multipath environment is comparable to or larger than the divergence angle of the OAM beam, OAM multiplexing is feasible in multipath environments.

Invited Talk: Kuang Zhang, Harbin Institute of Technology

Special session 11: Metamaterials, Metasurfaces, and Their Electromagnetic Applications

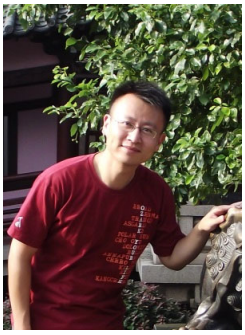
Short Bio:
Prof. Kuang Zhang received the B.S. degree, M.S. degree and Ph.D. degree of Information and Communication Engineering from Harbin Institute of Technology, Harbin, China in 2005, 2007 and 2011, respectively. He is currently an associate professor of Department of Microwave Engineering, Harbin Institute of Technology since Dec. 2014. His current research interests are in the areas of metamaterials & metasurfaces, transform optics, microwave lenses and optical force.
In recent years, he has published more than 30 papers indexed by SCI, which are published in journals *Nature Communications*, *Advanced Materials, Advanced Science*, *IEEE Transactions on Antennas and Propagation*, *ACS Applied Materials & Interfaces*, *Photonics Research*, etc. The total citation is more than 1300 times in Google Scholar.

Title: Phase-modulated metasurface for independent manipulation of full circular polarization channels

Abstract:
Geometric-phase metasurfaces are utilized for controlling wavefronts of circular polarized (CP) electromagnetic waves. Combining geometric with propagation phase allows to further control the co-polarized output channel. However, the full CP channels still cannot be completely manipulated. In this report, the concept of chirality-assisted phase as an extra degree of freedom is firstly introduced into the metasurface construction for decoupling the inherent consistence between two co-polarized channels under the light-handed and right-handed CP incidences. Benefiting from the combination of chirality-assisted phase, geometric phase and propagation phase, the all four CP channels can be simultaneously and independently manipulated to generate arbitrary wave-fronts and functionalities. This compound phase addressing mechanism will lead to new components, ranging from broadband achromatic devices to the multiplexing of wavefronts for application in reconfigurable-beam antenna and wireless communication systems.

Invited Talk: Xiangkun Kong, Nanjing University of Aeronautics and Astronautics

Special session 11: Metamaterials, Metasurfaces, and Their Electromagnetic Applications



Short Bio:
Xiangkun Kong received the Ph.D. degree in communication and information systems from the Nanjing University of Aeronautics and Astronautics (NUAA) in 2015. He has been an associate professor in NUAA since his promotion in July 2015. He used to work at the University of St. Andrews in the UK as an academic visitor supported by China Scholarship Council. His main research interests include the electromagnetic properties of frequency selective surface, metamaterial and metasurface application, plasma photonic crystal, and computational electromagnetics. He has published more than 100 papers in different academic journals, including Applied Physics Letters, Optics Express, and Transactions on Antennas and Propagation, and has been cited 1600 times.

Title: Broad Band Metamaterial Absorber and Reconfigurable Frequency Selective Rasorber Designs for Radar Stealth

Abstract:
The design of future aircraft puts higher and higher requirements on radar stealth requirements. This work gives some recent reports on broadband microwave absorber or reconfigurable frequency selective rasorber design. Two kinds of broadband metamaterial radar absorbers are given to achieve microsatellite stealth. Among them, the multi-layer ultra-wideband absorber uses a high-resistance surface to design a coupling-type structure, which is suitable for the microsatellite body and the back of the solar cell array. The broadband absorber based on light transmitted hybrid structure uses high-transmittance indium tin oxide (ITO) to design the wave-absorbing structure. Furthermore, some reconfigurable frequency selective rasorbers are also designed to realize EM waves' asymmetric transmission and energy isolation. Finally, a new kind of water-based reconfigurable FSR with a thermally tunable absorption band and an RCS reduction of patch antenna using 3-bit coding linear polarization conversion elements are also discussed.

Invited Talk: Shichao Chen, Xi'an Modern Control Technology Research Institute

Special session 12: Artificial Intelligence in Radar Signal Processing

Short Bio:
Shichao Chen received the B.S. degree in Electronic Information Engineering from Xidian University in 2009, and received the Ph.D. degree in Signal and Information Processing from the National Laboratory of Radar Signal Processing (Xidian University) in 2014. Currently, he is a senior engineer in Xi'an Modern Control Technology Research Institute. He has been awarded the "Top Young Scholar" title of Shaanxi province. He is the principal investigator of several projects. He has authored more than 60 journal and conference papers, and has applied or granted more than 15 invention patents. His research interests include radio frequency imaging, radio frequency target recognition and millimeter wave (MMW) seeker technology.

Title: A Target Selection Method for the MMW Seeker Based on Tracking Preserving

Abstract:
Focusing on the problem of target selection under complex land battlefield, a method using tracking preserving is proposed in this paper. Firstly, target position obtained by the fire control system is stored by the missile-borne computer. And then, target pointing of the MMW seeker is calculated in real time during the missile flight to improve target capturing probability. In the end, target position obtained by the seeker will be compared to the one obtained by the fire-control system, realizing accurate choice of the threatening target for the MMW seeker. Experimental results have verified the effectiveness of the proposed method.

Invited Talk: Ming Liu, Shaanxi Normal University

Special session 12: Artificial Intelligence in Radar Signal Processing

Short Bio:
Ming Liu received the B.S. degree in Electronic Information Engineering and the Ph.D. degree in Pattern Recognition and Intelligence System from Xidian University, Xi'an, China, in 2009 and 2015, respectively.
She is currently a lecturer in the School of Computer Science, Shaanxi Normal University. She has been awarded the young talent fund of university association for science and technology in Shaanxi. She is the principal investigator of several projects, including the national natural science foundation of China (NSFC), natural science foundation of Shaanxi province. She has published more than 50 papers, and has been authorized 4 invention patents. Her research interest includes SAR target recognition and SAR image processing.

Title: A Target Detection Method in SAR Images Based on Superpixel Segmentation

Abstract:
A synthetic aperture radar (SAR) target detection method based on the fusion of multiscale superpixel segmentations is proposed in this paper. SAR images are segmented between land and sea firstly by using superpixel technology in different scales. Secondly, image segmentation results together with the constant false alarm rate (CFAR) detection result are coalesced. Finally, target detection is realized by fusing different scale results. The effectiveness of the proposed algorithm is tested on Sentinel-1A data.

Invited Talk: Yan Huang, Southeast University

Special session 12: Artificial Intelligence in Radar Signal Processing

Short Bio:
Yan Huang received the B.S. degree in electrical engineering, and the Ph. D. degree in signal and information processing, both from Xidian University, Xi'an, China, in 2013 and 2018, respectively. He was studying as a visiting Ph.D. student in Electrical and Computer Engineering department at University of Florida from Sep. 2016 to July 2017, and in Electrical and Systems Engineering department at the Washington University in St. Louis from July 2017 to Aug. 2018. He is currently an assistant professor at the State Key Laboratory of Millimeter Waves, Southeast University. His research interests include machine learning, synthetic aperture radar, image processing, remote sensing.

Title: Density-Based Vehicle Detection Approach for Automotive Millimeter-Wave Radar

Abstract:
Automotive radars, along with other sensors, generate the backbone of self-driving vehicles. Herein, automotive radars, especially the millimeter-wave (MMW) radar, have already reached a market penetration that leads to tens of million units being used. The MMW radar has been rapidly expanded and developed for the past a few years, and it has found its own way into nearly all car manufacturers' plans in the world. In this paper, we focus on the classic signal processing problem, vehicle detection, based on the MMW radar. It is a new area for MMW radar signal processing and requires a both effective and efficient solution for practical applications, like the advanced driver assistant system (ADAS). We first generate high-resolution point cloud image based on radar signal processing steps and develop two kinds of density-based approaches for vehicle detection tasks on this point cloud image. The article outlines the processing steps and presents some experimental results.

Invited Talk: Yifei Fan, Northwestern Polytechnical University

Special session 12: Artificial Intelligence in Radar Signal Processing

Short Bio:
Yifei Fan received the B.S. degree in Information confrontation technology from Xidian University in 2011, and received the Ph.D. degree in signal and information processing from the National Laboratory of Radar Signal Processing (Xidian University, Xi'an, China) in 2016. Currently, he is an assistant researcher in School of Electronics and Information, Northwestern Polytechnical University (NWPU). He is the principal investigator of several projects, including the national natural science foundation of China (NSFC), natural science foundation of Shaanxi province. His research interests include radar signal processing, weak target detection and radar sea clutter analysis.

Title: Weak Target detection based on deep neural network under sea clutter background

Abstract:
To upgrade the performance of the traditional radar target detecting method based on one certain threshold, this paper applies the deep learning network into target detection field, which regards radar target detection as a binary signal classification question. Since sea clutter exhibits non-stationary characteristics with high sea state condition, fractal properties of sea clutter are considered for target detection. In addition, fractal parameters of autoregressive (AR) spectrum are regarded as the feature inputs for deep learning network. Finally, real radar sea clutter data are applied for training the deep learning neutral network, and several datasets are selected to test the detecting performance of the network. From the binary classification results, the proposed method based on deep learning network performs a better detecting performance than traditional CFAR and fractal methods.

Invited Talk: Hui Li, Dalian University of Technology

Special session 14: Antenna Techlologies for 5G/B5G Communications

Short Bio:
Hui Li (S'08-M'13-SM'19) received the B.E. degree in Optical Engineering from Tianjin University (TJU), China, in 2007 and Ph. D degree in Electrical Engineering from the Royal Institute of Technology (KTH), Sweden, in 2012. From 2012 to 2015, she was a post-doc researcher at the Department of Electrical and Information Technology, Lund University. Since 2015, she joined Dalian University of Technology and is now an Associate Professor. Her current research interests include compact antennas in MIMO systems, theory of characteristic mode, RFID antennas, mobile terminal antenna, antenna-user interactions, wearable antennas, reconfigurable antennas in wireless communications. Dr. Li is an Associate Editor for IEEE Antenna and Wireless Propagation Letters. She is a member of the Education Committee within the IEEE Antennas and Propagation Society (AP-S), where she has served as the final judge for IEEE AP-S Student Design Contest. She was also the TPC Member of several conferences, including EUCAP, APCAP, IEEE VTC and LAPC.

Title: Wideband Patch Antenna Array for 5G Terminal Devices

Abstract:
Wide band and multi-band antennas are highly in demand for mm-wave communications, as different frequency spectrums have been allocated according to different standards. In this communication, a simple and low-profile patch antenna with a relative bandwidth of 59.6% is designed for mobile terminals. An elliptical slot is etched in the wide patch antenna, creating new modes and leading to broadband operation. A U-shaped strip is added in the slot as a parasitic element, which improves the impedance matching at the higher band and further enlarge the bandwidth. With all the resonances, the antenna operates from 27.7 GHz to 51.2 GHz, with the gains varying between 5.8 dBi and 7.8 dBi over the operating band. Antenna arrays are then built from four patch elements, and integrated with the longer frames of the mobile handset.

Invited Talk: Changjiang Deng, Beijing Institute of Technology

Special session 14: Antenna Techlologies for 5G/B5G Communications

Short Bio:
Changjiang Deng received the B.S. degree in communication engineering from Beijing University of Posts and Telecommunications (BUPT), Beijing, China, in 2011, and the Ph.D. degree in electrical engineering from Tsinghua University, Beijing, China, in 2016. He was a visiting scholar in the radiation lab of University of Michigan from 2018 to 2019. He is currently an assistant professor in school of information and electronics at Beijing Institute of Technology. His research interests include mobile phone antennas, dual polarized antennas, circularly polarized antennas, and MIMO antennas. He is an associate editor of IET Microwaves, Antennas & Propagation. He also serves as a reviewer for several journals, including IEEE Transactions on Antennas and Propagation.

Title: Millimeter-Wave Dual-Polarized Frame-Integrated Patch Antenna Array for 5G Mobile Handsets

Abstract:
A dual-polarized frame-integrated four-element patch antenna array is presented for 5G millimeter-wave (mmwave) mobile handsets applications. Two types of dualpolarized excitation schemes, namely exciting vertical/horizontal polarizations or ±45° polarizations, are evaluated and compared. The latter has better stability of the resonant frequency and higher port isolation. The proposed ±45° polarized array is then integrated with the metal frame and fed with a set of 2×4 feedlines. Metallic fences are used to further improve the resonance performance and decrease the crosspolarization level (XPL). The proposed design can cover a -10 dB impedance bandwidth of 7.9%, with the port isolation above 14 dB and 3 dB beam steering range of 108°.

Invited Talk: Changfei Zhou, Dalian University of Technology

Special session 14: Antenna Techlologies for 5G/B5G Communications

Short Bio:
Changfei Zhou received the B.S. and M.S. degrees in communication engineering from Harbin Institute of Technology, Harbin, China, in 2012 and 2014, and the PhD degree from the University of Hong Kong, Hong Kong, China, in 2018. From 2018 to 2019, he was an antenna engineer in LSCM research centre of Hong Kong. Since 2019, he has been a lecture with the Dalian University of Technology. His current research interests include multiband and wideband antennas, RFID, and metasurface design.

Title: A Wideband L-probe Fed Antenna Based on Metasurface with High Efficiency

Abstract:
A metasurface (MS)-based wideband antenna is presented in this paper. The proposed antenna consists of an MS, an L-probe and a ground plane. The MS is formed with an array of 4 × 4 periodic metal patches and fed by the L-shaped probe for a wideband operation. Simulated results show that proposed antenna exhibits an impedance bandwidth of 24.6% (2.78-3.56 GHz). Also, a peak gain of 8.4 dBi at 3.15 GHz is achieved. The simulated radiation patterns of the proposed antenna are stable over the operating band.

Invited Talk: Yu Luo, Tianjing University

Special session 14: Antenna Techlologies for 5G/B5G Communications

Short Bio:
Yu Luo (S'13–M'15) received the B.S. and the Ph.D. degree in electronic engineering from the South China University of Technology, Guangzhou, China, in 2010 and 2015, respectively. He worked as a Research Assistant with the University of Macau, Macau, from April 2014 to September 2014, a Post-Doctoral Fellow with the University of Victoria, BC, Canada, from September 2015 to August 2016, and a Research Fellow with the National University of Singapore, Singapore, from September 2016 to September 2018. He currently works as a Professor with the School of Microelectronics, Tianjin University, Tianjin, China. He has authored or coauthored more than 30 technical articles. His research interest focuses on antennas in new generation mobile communications systems, such as SIW antennas, base-station antennas, circularly polarized antennas, MIMO antennas, Yagi-Uda antennas, and mmW/THz antennas.

Title: Integration of antennas and solar cells for green Communication

Abstract:
A patch antenna operating in dual compressed high-order mode integrated with solar cells is proposed for green communication. The solar cell antenna is proposed for enhanced gain, wideband communication and optical energy harvesting. To prevent direct-current loop of solar cell interfering with radio-frequency loop of antenna, the antenna is design with two feeding schemes, proximity-coupled and aperture-coupled feeding method, respectively. To further isolation, the proximity-coupled antenna use differentially-fed mode and vias are employed in antenna substrate, which also make the patch antenna bandwidth wider. The prototype experimentally validates the principle and the design approach in the proximity-coupled antenna. Over the desired operating band of 4.8-5 GHz of 5G communication networks, the measurement in proximity-coupled antenna and simulation in aperture-coupled antenna show that the gain of proposed solar cell antennas are higher than 9.27 dBi and 10.13 dBi, respectively. The optical experiment is conducted to verify its abilities of optical energy harvesting.

Invited Talk: Laxmisha Rai, Shandong University of Science and Technology

Special session 17: Special session on 5G and Artificial Intelligence

Short Bio:

Laxmisha Rai received Ph.D degree majoring in Information and Communication from Kyungpook National University, South Korea in 2008. From 2008 to 2009, he worked as a Post-Doctoral Researcher at Soongsil University of South Korea. Dr. Rai has significant teaching, industry and research experience of over 17 years in the fields of Information Technology (IT), Communication, Software engineering and Bilingual Education in China, India, and South Korea. Currently he is a Professor, at College of Electronic and Information Engineering, Shandong University of Science and Technology, Qingdao, China. His research interests include software engineering, real-time systems, embedded systems, autonomous mobile robots, expert systems, wireless sensor networks, MOOC, and Bilingual Education. He has published over 60 research papers in peer-reviewed international conferences, and journals. He is author two patents, and three books. For his research, he has won three best paper awards at prestigious international conferences held in South Korea, and USA. He is a Senior Member of IEEE, and Member of ACM. He is currently serving as an Associate Editor for the IEEE Access journal.

Title: Knowledge-Based Systems and Machine Vision: Applications in Gesture Generation and Recognition

Abstract:

In the first part of talk, the experiments on generating intelligent gestures using knowledge-based system (KBS) is described. The Jess expert system is used as the knowledge-based tool and different gestures are generated autonomously using different rules. The KBS guarantees the predictability of the behaviors and supports to analyze the non-determinism in robot operation. With this approach, any user can generate any purposeful behaviors using simple facts and rules to demonstrate different robot action sequences. In the second part of talk, the experiments conducted on hand gesture recognition system for parking applications based on machine vision is described. Here, the best features of image recognition is combined along with embedded control system. The system completes the image preprocessing and recognizes the gesture information. For the choice of gestures, five different gestures to control the vehicle's movements are identified. Afterwards, the BP neural network identifies the recognition results, the embedded system converts the recognition results into control instructions to control the vehicles' movement.

Invited Talk: Qiang Ren, Beihang University

Special session 19: Time Domain and Frequency Domain Methods and Their Applications

Short Bio:
Qiang Ren received the B.S. degree in electrical engineering from Beihang University, Beijing, China, in 2008, the M.S. degree in electrical engineering from the Institute of Acoustics, Chinese Academy of Sciences, Beijing, in 2011, and the Ph.D. degree in electrical engineering from Duke University, Durham, NC, USA, in 2015. From 2016 to 2017, he was a Post-Doctoral Researcher with the Computational Electromagnetics and Antennas Research Laboratory (CEARL), Pennsylvania State University, University Park, PA, USA. In September 2017, he joined the School of Electronics and Information Engineering, Beihang University, as an "Excellent Hundred" Associate Professor.
His current research interests include numerical methods for multiscale and multiphysics modeling, inverse scattering, and parallel computing. Dr. Ren was a recipient of the Young Scientist Award of the 2018 International Applied Computational Electromagnetics Society (ACES) Symposium in China.

Title: Adaptive DGTD method with hierarchical vector basis functions

Abstract:
An adaptive DGTD algorithm based on hierarchical vector basis functions is proposed in this work. This newly proposed scheme can adjust the order of the basis functions in each element dynamically during the simulation. Several numerical examples demonstrate its accuracy and efficiency.

Invited Talk: Hongxing Zheng, Hebei University of Technology

Special session 19: Time Domain and Frequency Domain Methods and Their Applications

Short Bio:

Hong-Xing Zheng (M'01-SM'18) was born in Yinchuan, Ningxia Hui Autonomous Region, China. He received the B.S. degree in physics from Shaanxi Normal University, Xi'an, Shaanxi, China, in 1985, and the M.S. degree in physics and Ph.D. degree in electronics engineering from Xidian University, Xi'an, Shaanxi, China, in 1993 and 2002, respectively.

From 1985 to 1989 and 1993 to 1998, he was a Lecturer with the Ningxia Institute of Technology, Yinchuan, Ningxia Hui Autonomous Region, China. From 2001 to 2002 and 2004 to 2005, he was a Research Assistant and Research Fellow with the Department of Electronics Engineering, City University of Hong Kong, Kowloon, Hong Kong, respectively. In 2003, he was an Associate Professor with the College of Precision Instrument and Opto-Electronics Engineering, Tianjin University. He is currently a Professor with the School of Electronics and Information Engineering, Hebei University of Technology, Tianjin, China. He has authored six books and book chapters and over 400 journal papers and 100 conference papers. He holds 45 China patents issued in 2019. His recent research interests include modeling of microwave circuit and antenna and computational electromagnetics.

Dr. Zheng is a Senior Member of the Chinese Institute of Electronics (CIE). He was the recipient of the 2008 Young Scientists Awards presented by the Tianjin Municipality, China. He has been invited to give numerous invited talks and plenary speeches at various international conferences and forums. He is listed in Who's Who in the World and in Who's Who in the Science and Engineering in the World.

Title: Spherical Truncation in Cartesian Coordinate System for the FDTD Solver

Abstract:

To improve the efficiency of numerical simulation in computational electrodynamics, a spherical-shaped boundary strategy for finite-difference time-domain (FDTD) method in Cartesian coordinate system with cubic cell is proposed, which has been implemented via making use of the impedance-matched layer and uniaxial perfectly matched layer. These boundaries are used for truncating the computational domain to absorb outward electromagnetic waves. A staircase approach is used to approximate the spherical-shaped boundary so that it is directly compatible with the commonly used Yee's lattice. Most importantly, about a quarter grids are free from calculation when circular truncating boundary is used in two-dimensional case, and it can be reduced about a half compared to the conventional cubic boundary in three-dimensional simulation. Moreover, based on the proposed strategy, we can simplify the calculations and maintain the original target calculation unchanged. So that the computer simulation resource is saved significantly, and computational efficiency is enhanced a lot, compared to the conventional FDTD.

In this report, the convolutional perfectly matched layer has been optimized in non-physical division and enhanced weakly ability in absorbing evanescent wave. From the radiation simulation, we found that the wave profile only according to simulation time, which leads to spherical outline in three dimensional cases. We reconstruct regular cubic Yee cells in three-dimensional, and restricts computation domain in the spherical truncation boundary. This is an essentially efficient modeling strategy, which is suitable for the FDTD method in solving three dimensional problems. Several numerical experiments have been implemented to verify the practicability of the proposed boundary in two- and three-dimensional cases. Obtained results show this algorithm suitability, with higher efficiency than conventional cubic boundary.

Invited Talk: Dr. Jianing Yang (First Author) and Prof. Ming-Chun Tang (Second Author)

Short Bio:

Ming-Chun Tang (S'12–M'13–SM'16) received the Ph. D. degree in radio physics from the University of Electronic Science and Technology of China (UESTC), in 2013. From August 2011 to August 2012, he was also with the Department of Electrical and Computer Engineering, The University of Arizona, Tucson, AZ, USA, as a Visiting Scholar. He is currently a full Professor in the School of Microelectronics and Communication Engineering, Chongqing University, China. His research interests include electrically small antennas, RF circuits, metamaterial designs and their applications.

Prof. Tang is the Senior Member of the Chinese Institute of Electronics. He was a recipient of the National Science Fund for Excellent Young Scholars in 2019. He was a recipient of the Best Student Paper Award in the 2010 International Symposium on Signals, Systems and Electronics (ISSSE2010) held in Nanjing, China. His Ph.D. students received Best Student Paper Awards from the IEEE 7th Asia-Pacific Conference on Antennas and Propagation (2018 IEEE APCAP) held in Auckland, New Zealand, 2019 IEEE International Applied Computational Electromagnetics Society (ACES) Symposium, Nanjing, China, 2019 IEEE International Workshop on Electromagnetics: Applications and Student Innovation Competition, Qiangdao, China, and 2019 Cross Strait Quad-Regional Radio Science and Wireless Technology Conference, Taiyuan, China. He is the founding Chair of the IEEE AP-S / MTT-S Joint Chongqing Chapter. He serves on the Editorial Boards of several journals, including IEEE Access, Electronics Letters and IET Microwaves, Antennas & Propagation. He has also served on the review boards of various technical journals, and many international conferences as a General Chair, TPC Member, Session Organizer, and the Session Chair.

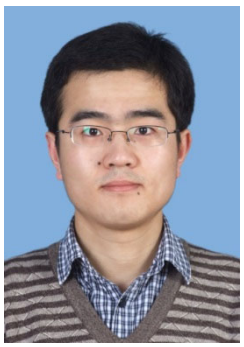
Title: Transmission-reflection-integrated metasurfaces for manipulating the electromagnetic waves

Abstract:

In this talk, two kinds of transmission-reflection-integrated metasurfaces developed by our group are summarized. On the one hand, a cascaded metasurface that integrates the resonant and geometrical phase cells is introduced to control the transmitted and reflected waves simultaneously. The metasurface not only can control the reflected beam at any LP modes, but also behaves the diversified electromagnetic (EM) responses under different incident polarizations in the transmitted mode. We further employed this metasurface to design a low-scattering lens antenna. As a result, the gain of a conventional patch antenna has been enhanced about 6.4 dB, and the significant RCS reduction performance has been realized in X band. On the other hand, an electrically tunable metasurface that can dynamically manipulate the reflection magnitude and realize high-efficient transmission at two distinctive frequency bands is demonstrated. By electrically controlling the sheet resistance of the graphene capacitor, we have experimentally verified that the developed metasurface can shift the reflection magnitude from -5 to -20 dB over a wide frequency band of 5~15 GHz, and meanwhile realize a high transparent EM window with 3-dB transmission band covering from 23 to 25 GHz.

Invited Talk: Zhao Yao, Qingdao University

Special session 20: Recent Progress on Artisitic Antennas and Hidden Antennas



Short Bio:
Zhao Yao (S'12-M'16) received the MS and PhD degrees in Electronic Engineering from Kwangwoon University (Korea) in 2014 and 2016, respectively. In 2016, he worked as research professor in Kwangwoon University. In 2017, he joined the College of Micro-& Nano-technology, Qingdao University, China, as an assistant professor, where he became an associate professor in 2019. He has been engaged in the research of Micro&Nano electronic devices and Radio Frequency Integrated Circuits for more than 10 years. He has published more than 30 SCI papers, published 1 book, and authorized 16 patents registered in South Korea and China. His research group is supported by National Natural Science Foundation of China and Shandong Provincial Natural Science Foundation of China. His major interests include RFIC design, high-k material, semiconductor fabrication, MEMS and RF biosensors. Recently, he focused on re-usable RF biosensor combined with microfluidics for high sensitivity and quick response.

Title: High-Performance Chinese character-shaped Patch Antenna for 5G Mobile Communications

Abstract:
An artistic antenna shaped like Chinese character 'Shan' was proposed in this work. 'Shan' served as a radiation patch and the feed point was placed on the right side of the re-radiation patch. The transmission zero of the proposed antenna was at 3.51 GHz and the impedance bandwidth was 25 MHz (3.495 GHz-3.520 GHz). The simulation maximum gain of the antenna was 5.735 dBi. In addition, the proposed antenna could also be redesigned as a dual-band antenna. Thus, the proposed antenna shaped like 'Shan' has a promising potential for the application of 5G communication.

Oral Session and Special Session

4F Agate Room
08:00-09:00, Sunday, November 15, 2020

08:00-08:20
Invited Talk: Tao Jiang, Harbin Engineering University
Special session 7: Electromagnetic Environment Effects and Adaptability Analysis
Title: Research on Electromagnetic Pulse Prediction for Sensitive Equipment on Ship
Abstract:
This paper is aiming at the propagation modeling of electromagnetic pulse waveform in complex ocean environment, based on the multi-path theory of random bridge process, the prediction of electromagnetic pulse signal from the antenna of platform equipment at ultra-low altitude on the sea surface was studied. A strong electromagnetic pulse propagation model under the background of dynamic sea surface is established. The contribution of sea surface to the power density of the received signal in the region of the platform is effectively predicted. A method to accurately calculate the signal waveform at the port of the sensitive device is proposed. It is of great theoretical and practical significance for the research and design of anti-strong electromagnetic pulse of the platform system.

Special session 7: Electromagnetic Environment Effects and Adaptability Analysis
Tao Jiang, Dawei Zhang

Special session 9: Advanced Channel Coding and Encryption Techniques for Beyond 5G Networks Member
Guangfu Wu (Jiangxi University of Science and Technology)
Yong Li (Chongqing University)
Jiguang He (University of Oulu)

Paper Information

SS7-1 08:20-08:32	Polarization Sensitive Array Beamforming Algorithm for Multipath Mitigation in GNSS *Xiaojian Wang, Jianxing Li, Ming Zhang, Wenchao Chen, Xiaoming Chen* Xian Jiaotong University	5450
SS9-1 08:32-08:44	CRC-Aided Belief Propagation with Permutated Graphs Decoding of Polar Codes *Liyun Dai, Li Huang, Yaohui Bai, Yanqing Liu, Zhibin Liu* Jiangxi University of Finance and Economics	5723
SS9-2 08:44-08:56	Design of McEliece Cryptosystem Based on QC-MDPC Codes *Guangfu Wu, Rui Yang* School of Information Engineering	5698

4F Pearl Room 08:00-09:00, Sunday, November 15, 2020		
Topic 2: Signal Processing (SP) and Information Technology **Session chair: *Yingsong Li***		
Paper Information		
OS2-1 08:00-08:12	Experiments on Blind Speech Separations *Yan Zhang, Lixin Ran* Zhejiang University	5699
OS2-2 08:12-08:24	Respiratory Frequency Estimation Method Based on Periodic Features Using UWB Radar *Boning Guo, Zhaocheng Yang, Yige Cheng* Shenzhen University	5686
OS2-3 08:24-08:36	Energy and Width Features-Based SVM for Vehicles Classification Using Low Power Consumption Radar *Haotai Liang, Zhaocheng Yang, Ruimin Yang, Fengyuan Shi* Shenzhen University	5611
OS2-4 08:36-08:48	Joint Sparse Representation of Hyperspectral Image Classification Based on Optimized Dictionary *Yueying Zhang, Ming Zhang, Haibo Zhang, Wenwen Chen, Yu Zheng* Henan Key Laboratory of Spatial Information Application on Eco-environmental Protection	5580
OS2-5 08:48-09:00	Frequent Pattern Mining Based On Occupation and Correlation *Kai Zhang, Yongping Zhang, Zhigang Wang* Key Laboratory of Technology on Data link China Electronics Technology Group Corporation CETC, 20th Institute,	5739

4F Jade Room-1B 08:00-09:00, Sunday, November 15, 2020		
Topic 3: Antennas, Propagation, and Scattering **Topic 4: Microwave Systems, Radar, RF** **Session chair: *Mingchun Tang***		
Paper Information		
OS3-1 08:00-08:12	A Space Borne Self-Organizing Phased Array Antenna System *HongMou Zhang, GuoXiang Shi, ZhuJun Li, Yan Li, Kai Zhang* Academy of Space Electronic Information Technology CAST Xi'an	5652
OS3-2 08:12-08:24	Design of a Ka-Band intelligent antenna *Mao Long, Biao Li, HongMou Zhang, Lin Li, Yan Li, Kai Zhang* Academy of Space Electronic Information Technology CAST Xi'an	5582
OS3-3 08:24-08:36	A Joint Calibration Method for Array Gain-phase Errors and Mutual Coupling Errors *Wencan Peng, Yan Qu, Min Tian*, *Weihua Zuo, Caipin Li, Chongdi Duan* Academy of Space Information SystemCASC Xian	5581
OS3-4 08:36-08:48	Research on A High-Precision Pattern Prediction Method of Reflector Antenna with Phased Array Feed *Yan Qu, Kai Zhang, Wencan Peng, Lin Li, Heng Liu, Yang Jing* Academy of Space Information SystemCASC Xian	5542
OS4-1 08:48-09:00	Ka-band GaAs MMIC Driver Amplifier Design *Lin Peng, Jiajin Li, Gary Zhang, Shaoxin Lin, Jianqiang Chen* School of Information Engineering, Guangdong University of Technology	5567

4F Jade Room-3A
08:00-09:00, Sunday, November 15, 2020

08:00-08:20
Invited Talk: Zhengpeng Wang, Beihang University
Special session 1: EMC and OTA Testing for the Next Generation Communication Devices
Title: Fast Phased Array Calibration Method Based on Multiple Measuring Probes
Abstract:
Fast Phased Array Calibration Method Based on Multiple Measuring Probes This paper presents a fast phased array calibration method which significantly reduces the number of antenna under test (AUT) amplitude and phase setting states. Multiple measuring probes are introduced to record transmission coefficients as AUT works at different states. A coefficient matrix with a small condition number is constructed to calculate the initial excitation coefficients of each antenna element. Simulation results show that the coefficient matrix condition number can be reduced to 1 by optimizing the geometry of the measurement system. When the signal-to-noise ratio is higher than 18dB, the amplitude error of the calibration result is less than 0.5dB and the phase error is less than 20 degrees in the optimal conditional number configuration. This method effectively reduces the measurement time for the phased array calibration and improves the stability of the calibration system.

08:20-08:40
Invited Talk: Jiahao Zhang, National Key Laboratory of Science and Technology on Vessel Integrated Power System
Special session 2: Wearable Antennas and Biomedical Circuits
Title: A Metamaterial Inspired Button Antenna for Wireless Power and Data Transfer
Abstract:
A novel metamaterial inspired button antenna topology is proposed, integrating two working modes to transfer power and data, respectively. An omni-directional radiation is obtained in the 3.5 GHz WiMAX band to support on-body communication, while a circular polarized broadside radiation is achieved in the 5 GHz WLAN band to harvest power. An Artificial Magnetic Conductor (AMC) metamaterial structure is used to achieve a low-profile design. A wide bandwidth and high efficiency are observed. All these features make the proposed antenna suitable for on-body data transmission and off-body energy harvesting. A prototype has been fabricated. The measurement results are in good agreement with the simulation results.

08:40-09:00
Title: Antenna Measurement System for 5G Application
Talk: Jiaying Zhang, SHANGHAI EM-TESTING CO., LTD
Abstract: Antenna measurement system for 5G application will be discussed by using CATR and multiple-probe near-field range respectively. The CATR system design, quite-zone performance evaluation, diagnostic methods, OTA path loss calibration, and test examples will be summarized. The multiple-probe near-field method is also an important test solution for 5G antennas, especially for terminal antennas. The multiple-probe system design, calibrations, and some post-processing techniques will be discussed.

4F Jade Room-3B 08:00-09:00, Sunday, November 15, 2020		
Topic 1: Communications and Network **Session chair: *Fang Ye***		
Paper Information		
OS1-1 08:00-08:12	Use OFDM In OAM communication to Redcuce Multi-path Effects *Jingyue Shu, Li Deng, Shufang Li, Botao Feng* Beijing Laboratory of Advanced Information Networks Beijing Key Laboratory of Network System Architecture and Convergence Beijing University of Posts and Telecommunications	5682
OS1-2 08:12-08:24	Wireless Channel Modeling, Simulation and Analysis for Electronic Registration Identifcation of Vehicles *Tingxiao Cai, Wenmin Fan, Jing Feng, Weijun Hong* China Electronics Standardization Institute	5655
OS1-3 08:24-08:36	Performance and Capacity Consistency Analysis of A Wireless UAV-Blockchain System *Zebing Feng, Yang Jiao* China Academy of Information and Communications Technology CAICT	5649
OS1-4 08:36-08:48	RLS-DPD Algorithm for Hybrid Precoding Architecture in MIMO-OFDM Systems *Tingyu Huang, Weijun Hong, Tingxiao Cai, Huanhuan Lin* Beijing University of Posts and Telecommunications	5555
OS1-5 08:48-09:00	Analysis of Ground Station Network Resources for Giant Constellation TT&C Service *Zhiyuan Li, Ming Wang, Jianping Liu, Bo Ren, Han Lei* State Key Laboratory of Astronautic Dynamics	5488

4F Agate Room 09:00-10:00, Sunday, November 15, 2020		
Special session 5: Waveguide and Antenna Design for mmWave and THz Applications Qingfeng Zhang (Department of electrical and electronic engineering, Southern University of Science and Technology) Linghui Kong (School of Electronics and Information Engineering, Soochow University) **Topic 1: Communications and Network** **Topic 2: Signal Processing (SP) and Information Technology**		
Paper Information		
SS5-1 09:00-09:12	A Ka-band Filter Based on the Quater-height Pin Gap Waveguide with Improved Reliability *Minjie Shu, Wenxuan Wu, Cheng Guo, Jianzhong Chen, Anxue Zhang, Qian Yang* Xi'an Jiaotong University	5599
OS1-1 09:12-09:24	Research On Wireless Local Area Network In Large Scale Manned Spacecraft *Zhuang Tian* The Institute of Spacecraft System Engineering	5637
OS1-2 09:24-09:36	Performance Analysis of Single Link OAM Communication System *Boyu Zhang, Li Deng, Shufang Li, Botao Feng* School of Information and Communication Engineering BUPT	5426
OS2-1 09:36-09:48	UAV Attitude Angle Estimation Based on Door Frame Deformation in Image *Guobao Hui, Junfeng Hu, Xi Zhao* CETC Key Laboratory of Data Link Technology	5741
OS2-2 09:48-10:00	An Improved Simplified Soft Demodulation Algorithm for 64QAM Signal *Di Mao, Chilian Chen, Baoming Bai* Key Laboratary of Technology on Datalink China Electronics Technology Group Corporation CETC, 20th Institute, Xidian University	5738
Coffee Break 10:00-10:20		

4F Pearl Room
09:00-10:00, Sunday, November 15, 2020

09:00-09:20
Invited Talk: Bian Wu, Xidian University
Special session 10: Advanced Electromagnetic Materials for Millimeter-Wave and THz Applications
Title: Graphene-based Beam Steering Antenna
Abstract:
In this paper, two kinds of graphene-based beam steering millimeter wave antennas presented by our group are summarized. Firstly, a pattern reconfigurable antenna consists of a pair of back-to-back modified Vivaldi antennas and a power dividing feed line loaded with graphene nanoplate pads is presented. By varying the resistance of two graphene pads, the radiation pattern of the antenna can be manipulated from two opposite beams to a single beam. In addition, a multi-beam array antenna based on flexible multilayer graphene film (MGF) with high conductivity and small thickness fed by the substrate integrated waveguide butler matrix is realized, which can offer a wider impedance bandwidth and large beam scanning range.

09:20-09:40
Invited Talk: Xiangru Wang, University of Electronic Science and Technology of China
Special session 10: Advanced Electromagnetic Materials for Millimeter-Wave and THz Applications
Title: Reconfigurable Microwave Phase Shifter Based on Nematic Liquid Crystal: Design and Experimental Validation
Abstract:
In this paper, a low-cost microstrip line structure microwave phase shifter based on nematic liquid crystal materials is discussed. The device is built on a glass substrate: the two ports of this device have the coplanar waveguides (CPWs) with 50Ω impedance structure to feed the energies or extract signals at both ends of the phase shifter. The simulation validate the phase shift can reach 360 degrees, and the S21 parameter reaches -4.5dB in the frequency band 28-30Ghz.The practical device shows S21 insertion loss is -12~-15dB, the phase shift can reach 360 degrees, and it works well between +10℃~+65℃.The phase-shifting repetition accuracy is less than 1 degree.

Special session 10: Advanced Electromagnetic Materials for Millimeter-Wave and THz Applications
Longzhu Cai, Qiang Cheng (Southeast University)

Paper Information

SS10-1 09:40-09:52	Magnetically controlled THz three-routing switch based on magnetic photonic crystals Changyi Wu, Junxing Fan, Guohua Wen Shenzhen University	5631

Coffee Break 10:00-10:20

4F Jade Room-1B
09:00-10:00, Sunday, November 15, 2020

09:00-09:20
Invited Talk: Zhao Yao, Qingdao University
Special session 20: Recent Progress on Artisitic Antennas and Hidden Antennas
Title: High-Performance Chinese character-shaped Patch Antenna for 5G Mobile Communications
Abstract:
An artistic antenna shaped like Chinese character 'Shan' was proposed in this work. 'Shan' served as a radiation patch and the feed point was placed on the right side of the re-radiation patch. The transmission zero of the proposed antenna was at 3.51 GHz and the impedance bandwidth was 25 MHz (3.495 GHz-3.520 GHz). The simulation maximum gain of the antenna was 5.735 dBi. In addition, the proposed antenna could also be redesigned as a dual-band antenna. Thus, the proposed antenna shaped like 'Shan' has a promising potential for the application of 5G communication.

Special session 20: Recent Progress on Artisitic Antennas and Hidden Antennas
Kwok L. Chung (Qingdao University of Technology)
Yao Zhao (Qingdao University)
Yingsong Li (Harbin Engineering University)

Paper Information

SS20-1 09:20-09:32	Investigation into Mutual Coupling Between Artistic Chinese-Character-Shaped Patch Antennas *Aiqi Cui, Kwok L. Chung, Liangying Li, Botao Feng* Qingdao University of Technology	5625
SS20-2 09:32-09:44	A High-Gain and Broadband Dipole Antenna optimized by Partially Reflective Metasurface *Chenqi Li, Yu Zheng, Zhongsen Sun, Zhao Yao, Lu Liu, Tian Liu* Qingdao University	5605
SS20-3 09:44-09:56	A Triple-Band Printed Monopole Antenna for WLAN/WiMAX/5G Applications *Yu Wang, Chi-lian Chen* Key Laboratory of Technology on Datalink China Electronics Technology Group Corporation CETC, 20th Institute	5737
SS20-4 09:56-10:08	Characteristic Mode Design of Chanel-Logo Shaped Antenna *Wen Li, Kwok L. Chung, Yingsong Li* Harbin Engineering University; Qingdao University of Technology	5745

Coffee Break 10:00-10:20

4F Jade Room-3A 09:00-10:00, Sunday, November 15, 2020		
Special session 1: EMC and OTA Testing for the Next Generation Communication Devices Xiaoming Chen (Xi'an Jiaotong University) Qian Xu (Nanjing University of Aeronautics and Astronautics) **Special session 2: Wearable Antennas and Biomedical Circuits** Sen Yan, Zhihao Jiang		
Paper Information		
SS1-1 09:00-09:12	A Wideband Open TEM cell to Measure the Frequency Response of a Frequency Selective Surface *Xuemeng Wang, Xiangkun Kong, Shunliu Jiang, Lingqi Kong, Weihao Lin, Borui Bian* Nanjing University of Aeronautics and Astronautics Laboratory of Radar Imaging and Microwave Photonics, Ministry of Education	5619
SS1-2 09:12-09:24	A Method Based on Metasurface to Reduce the Measurement Uncertainty in Reverberation Chamber *Jiazhi Tang, Xiaoming Chen, Guoxiang Dong, Anxue Zhang* Xi'an Jiaotong University	5494
SS1-3 09:24-09:36	Statistical Estimation of Measured Antenna Efficiency Using Non-reference Antenna Methods *Wei Xue, Xiaoming Chen, Anxue Zhang* Xi'an Jiaotong University	5456
SS1-4 09:36-09:48	High-sensitivity Planar Microfluidic Sensor Based on Zeroth-Order Resonance *Xinyue Song, Sen Yan* Xi'an Jiaotong University	5597
SS2-1 09:48-10:00	A Dual-band Smartwatch Antenna with Polarization Diversity *Buyun Wang, Sen Yan* Xi'an Jiaotong University	5546
Coffee Break 10:00-10:20		

4F Jade Room-3B
09:00-10:00, Sunday, November 15, 2020

09:00-09:20
Invited Talk: Tong Cai, Air Force Engineering University
Special session 11: Metamaterials, Metasurfaces, and Their Electromagnetic Applications
Title: High-efficiency Receiver-Transmitter Metasurfaces with Independent Control of Polarization, Amplitude and Phase
Abstract:
Polarization, amplitude and phase are three critical characteristics of electromagnetic waves as known. In this article, a general method with high efficiency and low complexity is proposed to realize simultaneously independent control of polarization, amplitude and phase of electromagnetic waves by receiver-transmitter integrated meta-atoms in transmissive geometry. The amplitude modulation is controlled by the rotation angle of top receiver patch, while the phase delay is determined by the rotation angle of bottom transmitter patch without affecting the amplitude. In addition, the polarization is controlled by the polarization of both receiver and transmitter. As a proof of concept, a metasurface with multiple diffraction orders is designed, fabricated and measured in microwave reigonnnogier. The measured results are in excellent agreement with the simulated ones. Our finding offers an alternative way to synthesize arbitrary wavefront shapes of EM waves, and we are looking forward to more high- performance photonic metadevices by applying this approach.

09:20-09:40
Invited Talk: Xiaoming Chen, Xi'an Jiaotong University
Special session 11: Metamaterials, Metasurfaces, and Their Electromagnetic Applications
Title: Investigation of OAM Multiplexing in Multipath Environment
Abstract:
Due to the orthogonality of its modes, orbital angular momentum (OAM) has found various applications. The majority of previous communication works assumed line-of-sight (LOS) scenarios, whereas the more realistic multipath (scattering) environments were considered only in a few works. It was generally believed that multipath had adverse effect on OAM multiplexing in that multipath tends to introduce crosstalk between different OAM modes while the conventional OAM detection relies on the orthogonality of OAM modes. Actually, the crosstalk caused by the multipath can be readily mitigated by the conventional multiple-input multiple-output (MIMO) equalizations. It was shown very recently in that, by combining with a conventional MIMO equalizer, OAM multiplexing could be extended to multipath environments. This finding was verified experimentally in a reverberation chamber. However, the reverberation chamber represents a rich isotropic scattering environment, where the propagation waves are statistically isotropically distributed over the three-dimensional angular domain, whereas typical multipath environments are usually non-isotropic, i.e., the propagation waves are confined within certain angular range (spread). This motivates us to study the angular spread effect on OAM multiplexing in this work. It is well known that there is a null (divergence) in the center of the OAM beam, which limits the OAM communication range in LOS environment. Nevertheless, as will be shown later in this work, as long as the angular spread in the multipath environment is comparable to or larger than the divergence angle of the OAM beam, OAM multiplexing is feasible in multipath environments.

Special session 11: Metamaterials, Metasurfaces, and Their Electromagnetic Applications
Ke Chen (Nanjing University)
Weiren Zhu (Shanghai Jiao Tong University)

Paper Information

SS11-1 09:40-09:52	Harmonic Manipulation of Microwave by Time-Varying Polarization-Converting Metasurface *Hu Qi, Zhang Na, Qu Kai, Ding Guowen, Chen Ke, Zhao Junming, Feng Yijun* Nanjing University	5603
SS11-2 09:52-10:04	Reconfigurable Absorptive Frequency-Selective Reflection Structure Based on Magnetic Material *Shunliu Jiang, Xiangkun Kong, Lingqi Kong, Xuemeng Wang, Weihao Lin, Borui Bian* Nanjing University of Aeronautics and Astronautics	5593
Coffee Break 10:00-10:20		

4F Agate Room
10:20-11:20, Sunday, November 15, 2020

10:20-10:40
Invited Talk: Shichao Chen, Xi'an Modern Control Technology Research Institute
Special session 12: Artificial Intelligence in Radar Signal Processing
Title: A Target Selection Method for the MMW Seeker Based on Tracking Preserving
Abstract:
Focusing on the problem of target selection under complex land battlefield, a method using tracking preserving is proposed in this paper. Firstly, target position obtained by the fire control system is stored by the missile-borne computer. And then, target pointing of the MMW seeker is calculated in real time during the missile flight to improve target capturing probability. In the end, target position obtained by the seeker will be compared to the one obtained by the fire-control system, realizing accurate choice of the threatening target for the MMW seeker. Experimental results have verified the effectiveness of the proposed method.

10:40-11:00
Invited Talk: Ming Liu, Shaanxi Normal University
Special session 12: Artificial Intelligence in Radar Signal Processing
Title: A Target Detection Method in SAR Images Based on Superpixel Segmentation
Abstract:
A synthetic aperture radar (SAR) target detection method based on the fusion of multiscale superpixel segmentations is proposed in this paper. SAR images are segmented between land and sea firstly by using superpixel technology in different scales. Secondly, image segmentation results together with the constant false alarm rate (CFAR) detection result are coalesced. Finally, target detection is realized by fusing different scale results. The effectiveness of the proposed algorithm is tested on Sentinel-1A data.

Special session 12: Artificial Intelligence in Radar Signal Processing
Tao Mingliang (Northwestern Polytechnical University)
Su Jia (Northwestern Polytechnical University)

Paper Information

SS12-1 11:00-11:12	A Novel Weighted Spatial Smoothing DOA Estimation Algorithm for Coherent Signals *Jiaqiang Peng, Guimei Zheng, Qinyu Zhu* Air Force Engineering University	5474

4F Pearl Room
10:20-11:20, Sunday, November 15, 2020

Invited Talk: Hongxing Zheng, Hebei University of Technology [10:20-10:40]
Special session 19: Time Domain and Frequency Domain Methods and Their Applications
Title: Spherical Truncation in Cartesian Coordinate System for the FDTD Solver
Abstract: To improve the efficiency of numerical simulation in computational electrodynamics, a spherical-shaped boundary strategy for finite-difference time-domain (FDTD) method in Cartesian coordinate system with cubic cell is proposed, which has been implemented via making use of the impedance-matched layer and uniaxial perfectly matched layer. These boundaries are used for truncating the computational domain to absorb outward electromagnetic waves. A staircase approach is used to approximate the spherical-shaped boundary so that it is directly compatible with the commonly used Yee's lattice. Most importantly, about a quarter grids are free from calculation when circular truncating boundary is used in two-dimensional case, and it can be reduced about a half compared to the conventional cubic boundary in three-dimensional simulation. Moreover, based on the proposed strategy, we can simplify the calculations and maintain the original target calculation unchanged. So that the computer simulation resource is saved significantly, and computational efficiency is enhanced a lot, compared to the conventional FDTD. In this report, the convolutional perfectly matched layer has been optimized in non-physical division and enhanced weakly ability in absorbing evanescent wave. From the radiation simulation, we found that the wave profile only according to simulation time, which leads to spherical outline in three dimensional cases. We reconstruct regular cubic Yee cells in three-dimensional, and restricts computation domain in the spherical truncation boundary. This is an essentially efficient modeling strategy, which is suitable for the FDTD method in solving three dimensional problems. Several numerical experiments have been implemented to verify the practicability of the proposed boundary in two- and three-dimensional cases. Obtained results show this algorithm suitability, with higher efficiency than conventional cubic boundary.

Invited Talk: Qiang Ren, Beihang University [10:40-11:00]
Special session 19: Time Domain and Frequency Domain Methods and Their Applications
Title: Adaptive DGTD method with hierarchical vector basis functions
Abstract: An adaptive DGTD algorithm based on hierarchical vector basis functions is proposed in this work. This newly proposed scheme can adjust the order of the basis functions in each element dynamically during the simulation. Several numerical examples demonstrate its accuracy and efficiency.

11:00-11:20
Invited Talk: Dr. Jianing Yang (First Author) and Prof. Ming-Chun Tang (Second Author)
Title: Transmission-reflection-integrated metasurfaces for manipulating the electromagnetic waves
Abstract:
In this talk, two kinds of transmission-reflection-integrated metasurfaces developed by our group are summarized. On the one hand, a cascaded metasurface that integrates the resonant and geometrical phase cells is introduced to control the transmitted and reflected waves simultaneously. The metasurface not only can control the reflected beam at any LP modes, but also behaves the diversified electromagnetic (EM) responses under different incident polarizations in the transmitted mode. We further employed this metasurface to design a low-scattering lens antenna. As a result, the gain of a conventional patch antenna has been enhanced about 6.4 dB, and the significant RCS reduction performance has been realized in X band. On the other hand, an electrically tunable metasurface that can dynamically manipulate the reflection magnitude and realize high-efficient transmission at two distinctive frequency bands is demonstrated. By electrically controlling the sheet resistance of the graphene capacitor, we have experimentally verified that the developed metasurface can shift the reflection magnitude from -5 to -20 dB over a wide frequency band of 5~15 GHz, and meanwhile realize a high transparent EM window with 3-dB transmission band covering from 23 to 25 GHz.

4F Jade Room-1B
10:20-11:20, Sunday, November 15, 2020

10:20-10:40
Invited Talk: Hui Li, Dalian University of Technology
Special session 14: Antenna Techlologies for 5G/B5G Communications
Title: Wideband Patch Antenna Array for 5G Terminal Devices
Abstract:
Wide band and multi-band antennas are highly in demand for mm-wave communications, as different frequency spectrums have been allocated according to different standards. In this communication, a simple and low-profile patch antenna with a relative bandwidth of 59.6% is designed for mobile terminals. An elliptical slot is etched in the wide patch antenna, creating new modes and leading to broadband operation. A U-shaped strip is added in the slot as a parasitic element, which improves the impedance matching at the higher band and further enlarge the bandwidth. With all the resonances, the antenna operates from 27.7 GHz to 51.2 GHz, with the gains varying between 5.8 dBi and 7.8 dBi over the operating band. Antenna arrays are then built from four patch elements, and integrated with the longer frames of the mobile handset.

Special session 14: Antenna Techlologies for 5G/B5G Communications
Xiaoming Chen (Xi'an Jiaotong University)
Hui Li (Dalian University of Technology)

Paper Information

SS14-1 10:40-10:52	Microstrip Phased Array Antenna With Small Element Space for 5G Millimeter-Wave Applications *Zhewei Zhao, Yuqing Zhu, Changjiang Deng* Beijing Key Laboratory of Millimeter Wave and Terahertz Technology, School of Information and Electronics, Beijing Institute of Technology, Beijing, China	5644
SS14-2 10:52-11:04	Impact of Front-to-Rear Ratio, Side Lobe Level, and Beam Orientation of Base Station Antennas on MIMO Performance *Huiling Pei, Quan Li, Xiaoming Chen* School of Information and Communications Engineering, Xi'an Jiaotong University	5595
SS14-3 11:04-11:16	A Multiple-Input Multiple-Output Antenna Array with Low Mutual Coupling Using Baffle Structures *Mengting Li, Xiaoming Chen, Anxue Zhang* Xian Jiaotong University	5561

4F Jade Room-3A
10:20-11:20, Sunday, November 15, 2020

10:20-10:40
Invited Talk: Laxmisha Rai, Shandong University of Science and Technology
Special session 17: Special session on 5G and Artificial Intelligence
Title: Knowledge-Based Systems and Machine Vision: Applications in Gesture Generation and Recognition
Abstract:
In the first part of talk, the experiments on generating intelligent gestures using knowledge-based system (KBS) is described. The Jess expert system is used as the knowledge-based tool and different gestures are generated autonomously using different rules. The KBS guarantees the predictability of the behaviors and supports to analyze the non-determinism in robot operation. With this approach, any user can generate any purposeful behaviors using simple facts and rules to demonstrate different robot action sequences. In the second part of talk, the experiments conducted on hand gesture recognition system for parking applications based on machine vision is described. Here, the best features of image recognition are combined along with embedded control system. The system completes the image preprocessing and recognizes the gesture information. For the choice of gestures, five different gestures to control the vehicle's movements are identified. Afterwards, the BP neural network identifies the recognition results, the embedded system converts the recognition results into control instructions to control the vehicles' movement.

Special session 17: Special session on 5G and Artificial Intelligence
Yuan Ye (Chongqing University of Post and Telecommunications)
Laxmisha Rai (Shandong University of Science and Technology)

Paper Information

SS17-1 10:40-10:52	Multi-Feature Extraction and Fusion Method for Pedestrian Re-identification *Xu Zhang, Laxmisha Rai* Shandong University of Science and Technology	5716
SS17-2 10:52-11:04	Apple Leaf Disease Identification and Classification using ResNet Models *Xin Li, Laxmisha Rai* Shandong University of Science and Technology	5633
SS17-3 11:04-11:16	Hand Gesture Recognition System for Parking Applications based on Machine Vision *Jie Wang, Laxmisha Rai* Shandong University of Science and Technology	5615
SS17-4 11:16-11:28	Analysis of a Trembling Hand Game on Parallel Machines *Zhiyan Cheng, Pei Zhao, Sheng Zhou, Peng Gao* China Mobile Group Design Institute Co., Ltd.	5627

4F Jade Room-3B
10:20-11:20, Sunday, November 15, 2020

10:20-10:40
Invited Talk: Xiangkun Kong, Nanjing University of Aeronautics and Astronautics
Special session 11: Metamaterials, Metasurfaces, and Their Electromagnetic Applications
Title: Broad Band Metamaterial Absorber and Reconfigurable Frequency Selective Rasorber Designs for Radar Stealth
Abstract:
The design of future aircraft puts higher and higher requirements on radar stealth requirements. This work gives some recent reports on broadband microwave absorber or reconfigurable frequency selective rasorber design. Two kinds of broadband metamaterial radar absorbers are given to achieve microsatellite stealth. Among them, the multi-layer ultra-wideband absorber uses a high-resistance surface to design a coupling-type structure, which is suitable for the microsatellite body and the back of the solar cell array. The broadband absorber based on light transmitted hybrid structure uses high-transmittance indium tin oxide (ITO) to design the wave-absorbing structure. Furthermore, some reconfigurable frequency selective rasorbers are also designed to realize EM waves' asymmetric transmission and energy isolation. Finally, a new kind of water-based reconfigurable FSR with a thermally tunable absorption band and an RCS reduction of patch antenna using 3-bit coding linear polarization conversion elements are also discussed.

Special session 15: Antennas and Arrays for Diverse Applications
Li Deng (Beijing University of Posts and Telecommunications)
Weijun Hong (Beijing University of Posts and Telecommunications)

Paper Information

SS15-1 10:40-10:52	Ultra-Wideband MIMO Array Antenna New Decoupling Structure *Shaoying Li, Benzheng Shi, Laxmisha Rai* Shandong University of Science and Technology	5607
SS15-2 10:52-11:04	A Wide-Beamwidth Magneto-Electric Dipole Antenna with Low Cross-Polarization and High Front-to-Back Ratio *Li Liangying, Yan Wei, Feng Botao, Deng Li* College of Physics and Optoelectronic Engineering, Shenzhen University	5679
SS15-3 11:04-11:16	An Omni-directional Antenna with High Gain for WiFi-6 Applications *Yang Baifa, Huang Haixuan, Feng Botao, Deng Li* College of Electronics and Information Engineering, Shenzhen University	5677
SS15-4 11:16-11:28	An Omni-directional Array Antenna with a Feeding Structure in Series *Liu YaQi, Feng Botao, Deng Li* College of Electronics and Information Engineering, Shenzhen University	5676

4F Agate Room
11:20-12:40, Sunday, November 15, 2020

11:20-11:40
Invited Talk: Yan Huang, Southeast University
Special session 12: Artificial Intelligence in Radar Signal Processing
Title: Density-Based Vehicle Detection Approach for Automotive Millimeter-Wave Radar
Abstract:
Automotive radars, along with other sensors, generate the backbone of self-driving vehicles. Herein, automotive radars, especially the millimeter-wave (MMW) radar, have already reached a market penetration that leads to tens of million units being used. The MMW radar has been rapidly expanded and developed for the past a few years, and it has found its own way into nearly all car manufacturers' plans in the world. In this paper, we focus on the classic signal processing problem, vehicle detection, based on the MMW radar. It is a new area for MMW radar signal processing and requires a both effective and efficient solution for practical applications, like the advanced driver assistant system (ADAS). We first generate high-resolution point cloud image based on radar signal processing steps and develop two kinds of density-based approaches for vehicle detection tasks on this point cloud image. The article outlines the processing steps and presents some experimental results.

11:40-12:00
Invited Talk: Yifei Fan, Northwestern Polytechnical University
Special session 12: Artificial Intelligence in Radar Signal Processing
Title: Weak Target Detection Based on Deep Neural Network Under Sea Clutter Background
Abstract:
To upgrade the performance of the traditional radar target detecting method based on one certain threshold, this paper applies the deep learning network into target detection field, which regards radar target detection as a binary signal classification question. Since sea clutter exhibits non-stationary characteristics with high sea state condition, fractal properties of sea clutter are considered for target detection. In addition, fractal parameters of autoregressive (AR) spectrum are regarded as the feature inputs for deep learning network. Finally, real radar sea clutter data are applied for training the deep learning neutral network, and several datasets are selected to test the detecting performance of the network. From the binary classification results, the proposed method based on deep learning network performs a better detecting performance than traditional CFAR and fractal methods.

Special session 12: Artificial Intelligence in Radar Signal Processing
Tao Mingliang (Northwestern Polytechnical University)
Su Jia (Northwestern Polytechnical University)

Paper Information

SS12-1 12:00-12:12	DOA Estimation for Electromagnetic Vector-Sensors Array Based on Biquaternion *Qin Yu ZHU, Gui Mei ZHENG, Jiaqiang Peng* Air Force Engineering University	5587
SS12-2 12:12-12:24	Small Target Detection in Sea Clutter by Time-Fequency Tri-Feature based SVM Detector *Dan Fang, Jia Su, Haojiang Li, Xiang Zhang, Yifei Fan, Tao Li* Northwestern Polytechnical University	5719

4F Pearl Room 11:20-12:40, Sunday, November 15, 2020		
Special session 19: Time Domain and Frequency Domain Methods and Their Applications Hongxing Zheng (Hebei University of Technology) Yuanguo Zhou (Xi'an University of Science and Technology)		
Paper Information		
SS19-1 11:20-11:32	Posture Recognition Based on the Improved Optical Diffractive Neural Network *Hongyi Zhang, Shan Shui, Yuwen Wu, Qiang Yang, Yijun Cai* Xiamen University of Technology	5734
SS19-2 11:32-11:44	An Efficient DGTD Method for High-order Conformal PML *Lujie Wang, Xuan Wei, Yuanguo Zhou* Xi'an University of Science and Technology	5473
SS19-3 11:44-11:56	Inverse Design of Dual-Resonant Absorption Photonic Structure Based on Deep Learning *Baiping Li, Kehao Feng* Xi'an University of Science and Technology	5733
SS19-4 11:56-12:08	Design of Parallelly Concatenated Spatially Coupled RA Codes *Yang Liu, Xin Liu, Shuangyi Cheng* Xian University of Science and Technology	5730
SS19-5 12:08-12:20	Spherical Convolution Matched Layer in Cartesian Coordinate System for the FDTD Solver Jinhang Wang, Lu Wang, Hongxing Zheng Hebei University of Technology	5709

4F Jade Room-1B
11:20-12:40, Sunday, November 15, 2020

11:20-11:40
Invited Talk: Changjiang Deng, Beijing Institute of Technology
Special session 14: Antenna Techlologies for 5G/B5G Communications
Title: Millimeter-Wave Dual-Polarized Frame-Integrated Patch Antenna Array for 5G Mobile Handsets
Abstract:
A dual-polarized frame-integrated four-element patch antenna array is presented for 5G millimeter-wave (mmwave) mobile handsets applications. Two types of dualpolarized excitation schemes, namely exciting vertical/horizontal polarizations or ±45° polarizations, are evaluated and compared. The latter has better stability of the resonant frequency and higher port isolation. The proposed ±45° polarized array is then integrated with the metal frame and fed with a set of 2×4 feedlines. Metallic fences are used to further improve the resonance performance and decrease the crosspolarization level (XPL). The proposed design can cover a -10 dB impedance bandwidth of 7.9%, with the port isolation above 14 dB and 3 dB beam steering range of 108°.

Special session 14: Antenna Techlologies for 5G/B5G Communications
Xiaoming Chen (Xi'an Jiaotong University)
Hui Li (Dalian University of Technology)

Paper Information

SS14-5 11:40-11:52	Broadband Dual-polarization Dual-dipole Filter Antenna Applied to Base Station *Bingyi Qian, Peng Hu, Bo Liu, Juan Chen, Xiaoming Chen* Xian Jiaotong University	5464
SS14-6 11:52-12:04	A Dual-Polarized Antenna Array For Base Station Applications *Yiran Da, Teng Li, Qinlong Li, Xiaoming Chen, Anxue Zhang* Xian Jiaotong University	5443
SS14-7 12:04-12:16	U-shaped Decoupling Structure for MIMO Antenna Array *Quanxin Ren, Xiaoming Chen, Bo Liu, Yipeng Wang* Xi'an Jiaotong University	5437

4F Jade Room-3A 11:20-12:40, Sunday, November 15, 2020		
Special session 16: Special Session on Cloud Computing in Smart Cities and 5G/B5G/6G Antenna Botao Feng (Shenzhen University) Qinglong Dai (Beijing University of Posts and Telecommunications)		
Paper Information		
SS16-1 11:20-11:32	An one-dimensional holographic antenna for RFID reader *Xiaokui Ren, Li Deng, Shufang Li, Chen Zhang, Botao Feng* Beijing University of Posts and Telecommunications	5586
SS16-2 11:32-11:44	Reflective Metasurface for Controlling the Beam Divergence Angles of Dual-mode OAM Waves *Xiaoyuan He, Li Deng, Botao Feng* Beijing University of Posts and Telecommunications	5544
SS16-3 11:44-11:56	Highly Efficient Generation of Non-diffraction Bessel Beams with Metasurface *Ting Zeng, Li Deng, Shufang Li, Botao Feng* Beijing Laboratory of Advanced Information Networks Beijing Key Laboratory of Network System Architecture and Convergence, Beijing University of Posts and Telecommunications	5482
SS16-4 11:56-12:08	A Dual-Polarized Omnidirectional Antenna with High Isolation for 2G/3G/LTE/5G Scenarios *Li Haoming, Cao Wenhua, Feng Botao, Deng Li* College of Electronics and Information Engineering, Shenzhen University	5674
SS16-5 12:08-12:20	A Metasurfaced Circularly-Polarized Antenna for Electronic Toll Collection System *Chung Kwok L., Chen Junlong, Feng Botao, Deng Li* Civionics Research Laboratory, Qingdao University of Technology	5668
SS16-6 12:20-12:32	A Distributed Stream Data Processing Platform Design and Implementation in Smart Cities *Qinglong Dai, Jin Qian* Beijng Union University	5632

4F Jade Room-3B 11:20-12:40, Sunday, November 15, 2020		
Special session 18: Electromagnetic Resonators for Emerging Monitoring Applications Kwok L. Chung (Qingdao University of Technology) Jun Zhang (Guangdong University of Technology)		
Paper Information		
SS18-1 11:20-11:32	A Tri-band Wilkinson Power Divider Based on Triple Section Step-Impedance Resonator *Chenglong Liu, Mi Wu, Jingkai Yuan, Kwok L Chung, Yansheng Li* Qingdao University of Technology	5707
SS18-2 11:32-11:44	Smart Coating based on Frequency-Selective Spoof Surface Plasmon Polaritons for Crack Monitoring *Chutian Huang, Xionghui Zhou, Kang Rong, Jie Cao, Jun Zhang, Kun Wang* Guangdong University of Technology	5573
SS18-3 11:44-11:56	A Quantitative Study of Crack Monitoring for Electromagnetic Resonators by Perturbation Method *Jun Zhang, Jie Cao, Yao Li, Chutian Huang, Kun Wang* Guangdong University of Technology	5572
SS18-4 11:56-12:08	CP-Patch-Based Strain Sensor With High Sensitivity for Structural Health Monitoring *Lingling Wang, Kwok Chung, Jianlin Luo* Qingdao University of Technology	5457

Online (Virtual) Presentation

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Session chair: Dawei Zhang, Kuang Zhang

Invited Talk: Dawei Zhang, Harbin Engineering University
Special session 7: Electromagnetic Environment Effects and Adaptability Analysis
Title: Spoof Surface Plasmon Polaritons Supported by Substrate Integrated Waveguide with Arrays of Holes
Abstract:
This work presents an approach to develop spoof surface plasmon polaritons (SSPPs) in substrate integrated waveguides (SIWs) with simple geometries (arrays of rectangular holes). Dispersion properties of both SSPPs supported by a SIW with a rectangular hole and the traditional SSPPs based on a single-conductor metallic strip with the same hole are compared. Moreover, a smooth transition built by stepped impedance transmission lines with gradient holes is designed for high-efficiency mode conversion. Consequently, an SSPP waveguide is constructed by a SIW with uniform holes and the proposed transition, and the transmission characteristics of the waveguide are simulated for validation. The simulated bandwidth can reach as high as 100.1% covering a range from 4.34 to 13.05 GHz, which shows a good agreement with the results in the dispersion diagram.

Invited Talk: Kuang Zhang, Harbin Institute of Technology
Special session 11: Metamaterials, Metasurfaces, and Their Electromagnetic Applications
Title: Phase-Modulated Metasurface for Independent Manipulation of Full Circular Polarization Channels
Abstract:
Geometric-phase metasurfaces are utilized for controlling wavefronts of circular polarized (CP) electromagnetic waves. Combining geometric with propagation phase allows to further control the co-polarized output channel. However, the full CP channels still cannot be completely manipulated. In this report, the concept of chirality-assisted phase as an extra degree of freedom is firstly introduced into the metasurface construction for decoupling the inherent consistence between two co-polarized channels under the light-handed and right-handed CP incidences. Benefiting from the combination of chirality-assisted phase, geometric phase and propagation phase, the all four CP channels can be simultaneously and independently manipulated to generate arbitrary wave-fronts and functionalities. This compound phase addressing mechanism will lead to new components, ranging from broadband achromatic devices to the multiplexing of wavefronts for application in reconfigurable-beam antenna and wireless communication systems.

Invited Talk: Changfei Zhou, Dalian University of Technology
Special session 14: Antenna Techlologies for 5G/B5G Communications
Title: A Wideband L-probe Fed Antenna Based on Metasurface with High Efficiency
Abstract:
A metasurface (MS)-based wideband antenna is presented in this paper. The proposed antenna consists of an MS, an L-probe and a ground plane. The MS is formed with an array of 4 × 4 periodic metal patches and fed by the L-shaped probe for a wideband operation. Simulated results show that proposed antenna exhibits an impedance bandwidth of 24.6% (2.78-3.56 GHz). Also, a peak gain of 8.4 dBi at 3.15 GHz is achieved. The simulated radiation patterns of the proposed antenna are stable over the operating band.

Invited Talk: Xiong Chen, Tianjing University
Special session 1: EMC and OTA Testing for the Next Generation Communication Devices
Title: Overview of PIM test calibrations with its improvement by tunable PIM standard
Abstract:
The traditional calibration method for passive intermodulation (PIM) measurement, also as IEC 62037 recommended, is realized using a tested low PIM load or several PIM fixed value standards to check if the PIM test loop (excluded DUT) has a low PIM status or equal PIM response. This method works in most cases. However, as the potential nonlinearities are widely spread in all kinds of microwave devices, the PIM calibration just based on the low PIM statue of whole test loop is not sufficient. For example, when the test PIM values are higher than the residual PIM level or the to-be-calibrated PIM level is not equal to the reference levels, the PIM test cannot be calibrated, much less the fake low PIM statue caused by the cancelling effect by multiple nonlinear sources. All these makes the traditional PIM test method has the potential to un-observably lose the test confidence or cause un-observable test error. In contrast, a tunable PIM source based calibration method arose, this method can provide a series of continual PIM references to verify all the test values in the testable ranges, the test accuracy can be ensured accordingly. Together with the PIM amplitude calibration, this work proposes a solution to realize the PIM phase tuning and calibration, which can ensure the test accuracy for the phase information of PIM sources. Under this technical background, this work introduces several kinds of techniques to generate tunable PIM amplitude. Targeted to PIM measurement, all the reported techniques would be able to provide weak PIM level that smaller than -112 dBm @ 2x43 dBm. Further, some improvements for several specific application scenes are introduced, these improvements cover increasing tunable dynamic range, bi-directional propagation, wideband PIM response, and PIM phase tuning.

Invited Talk: Yu Jian Cheng, University of Electronic Science and Technology of China
Special session 5: Waveguide and Antenna Design for mmWave and THz Applications
Title: SIW Slot Array Antenna with Non-Alternating Slot Placement for Impedance Bandwidth Enhancement
Abstract:
This paper presents a substrate integrated waveguide (SIW) array antenna with non-alternating etched longitudinal slots to realize the impedance bandwidth enhancement. Due to the non-alternating slot placement, the impedance bandwidth of the slot array antenna can be expanded much more compared with that of a conventional slot array antenna, which has a distance of a half waveguide wavelength between two adjacent slots. Considering the dielectric filled in the SIW, the distance between two adjacent slots etched on the same side of the SIW is still less than one wavelength in air. Thus, it can guarantee the good performance. The measured linear array exhibits the enhanced impedance bandwidth of 2.29 times at a return loss of 10 dB when compared to the conventional slot array antenna with the same radiating aperture. A stable radiation pattern bandwidth of 2.27% is also obtained with a gain of 17 dBi at the central frequency of 94 GHz.

Invited Talk: Yu Luo, Tianjing University

Special session 14: Antenna Techlologies for 5G/B5G Communications

Title: Integration of antennas and solar cells for green Communication

Abstract:

A patch antenna operating in dual compressed high-order mode integrated with solar cells is proposed for green communication. The solar cell antenna is proposed for enhanced gain, wideband communication and optical energy harvesting. To prevent direct-current loop of solar cell interfering with radio-frequency loop of antenna, the antenna is design with two feeding schemes, proximity-coupled and aperture-coupled feeding method, respectively. To further isolation, the proximity-coupled antenna use differentially-fed mode and vias are employed in antenna substrate, which also make the patch antenna bandwidth wider. The prototype experimentally validates the principle and the design approach in the proximity-coupled antenna. Over the desired operating band of 4.8-5 GHz of 5G communication networks, the measurement in proximity-coupled antenna and simulation in aperture-coupled antenna show that the gain of proposed solar cell antennas are higher than 9.27 dBi and 10.13 dBi, respectively. The optical experiment is conducted to verify its abilities of optical energy harvesting.

Paper Information

OP-1	Efficient Suppression of Average Sidelobe Level for Millimeter-Wave Antenna Array by Using Iterative FFT *Yin Rui, Jingjing Bai, Zhiming Bao, Yanhui Liu* Institute of Electromagnetics and Acoustics, Xiamen University.	5642
OP-2	Permittivity Optimization of Lens Based on Multibeam Planar Luneberg Lens Antenna *Changbin Liu, Anxue Zhang, Siming Liu* Xian Jiaotong University	5584
OP-3	Ray-Tracing Based Multi-Frequency Large-Scale Channel Characterization for Indoor Millimeter Wave Communications *Yu Zhou, Yuan Dong, Yuanyuan Liu, Xiangqian Sun* China Academy of Information and Communications Technology	5554
OP-4	Methods and Chanllenges of RF Conformance Test for 5G Millimeter Wave Terminals *Yu Zhou, Yuanyuan Liu, Yuan Dong, Xiangqian Sun* China Academy of Information and Communications Technology	5553
OP-5	The Information Integration Platform for Satellite Earth Station based on The Dynamic Workflow Model *Junying Xu, Shuai Chen, Yi Qiao, Lei Tong, Wenqiang Chen, Xiaofang Wu* Beijing Aerospace Control Center	5498
OP-6	A New Beam-Scanning Mechanism for Leaky Wave Antenna Based on Metagratings *Odai Hassan Raheem Al Soad, Jiahui Fu, Qun Wu* Harbin Institute of Technology	5600
OP-7	Design of a Compact Base Station Antenna for 5G N78-Band Application Y*ali Chen, Qianqian Liu, Ying Zhang, Hongfei Li, Weihua Zong* Qingdao University	5596
OP-8	A Wide-Angle Beam Steering Parasitic Antenna *Qianqian Liu, Yali Chen, Ying Zhang, Hongfei Li, Weihua Zong* Qingdao University	5606
OP-9	Dual band Millimeter Wave Phased Array Antenna for 5G Mobile Communications *Muhammad Usman Raza, Sen Yan* Xi'an Jiaotong University	5657

OP-10	Image Based Localization Algorithm Using Similarity Measurements and Back-Propagation Neural Network *Jun Yan, Zhu Hongliu* NJUPT	5570
OP-11	Weak Signal Detection Based on WT-LSTM *Chunyan Wei, Lin Qi* Harbin Engineering University	5687
OP-12	Digital Modeling Simulation System of Agile Satellite Operation State *Li Liu, Dong Yan, Hongqiang Wang, Ying Lu, Yao Chen, Xiaoke Wei* Space Star Technology Co.,LTD.	5452
OP-13	Terahertz Antenna Characterization by the Josephson Effect for Superconducting Terahertz Detectors *Yu Mei, Xu Weiwei, Shi Jin, Kong Linghui* Nantong University	5551
OP-14	Design of Non-uniform Flexible Meta-surface for Antenna Beam-steering *Yuwei Qiu, Zhiye Jiang, Pei Zheng* Northwestern Polytechical University	5499
OP-15	Compact Dual-Band Circularly-Polarized Four-Element Sequential-Rotation Array Antenna Jiahui Fu, Jihong Wang, Wan Chen Harbin Institute of Technology	5671
OP-16	A Flexible Wearable Linear-to-Circular Polarizer for GNSS Application *Hidayath Mirza, Ping Jack Soh, Rais Ahmad Sheikh, Azremi Abdullah Al-Hadi, Toufiq M Hossain, Sen Yan* Jazan University	5661
OP-17	Flexible Resistive Film Broadband FSS Absorber Suitable for a Variety of Curved Surfaces *Ziying Yu, Bin Cao, Jiajun Lu, Jingyi Wang* Marine Design Research of China	5705
OP-18	Design of Frequency Selective Radome Based on Truss Structure *Hanyu Shan, Jiahe Mei, Kangkang Gao, Xin Wang, Jiangnan Xing, Tao Jiang* Harbin Engineering University	5608
OP-19	A Navigation Satellite Selection Method Based on Tabu Search Artificial Bee Colony Algorithm *Jiechen Xia, Yansong Wang, Yibing Li* Harbin Engineering University	5710
OP-20	Unmanned Noise Reduction Method of Micro- Electro-Mechanical System Inertial Measurement Unit Based on Improved EMD *Zhenpeng Zhang, Qian Sun, Yuan Tian* Harbin Engineering University	5666
OP-21	Penetration Path Planning Of Stealthy UAV Based on Improved Sparse A-Star Algorithm *Zitang Zhang, Chunrui Tang, Yibing Li* Harbin Engineering University	5636
OP-22	Unmanned Vehicle Positioning Method in Satellite-jamming Environment Based on Improved Factor Graph *Hangyu Chen, Chunrui Tang, Yibing Li* Harbin Engineering University	5610
OP-23	Taylor-Grey Rider based Deep Recurrent Neural Network using feature level fusion for cryptography enabled biometric system *Ankit Arora, Rohit Miri* Dr. C V Raman Institute of Science and Technology	5743

Poster Session I

08:00-10:00, Sunday, November 15, 2020 **Session chair: *Yingsong Li*, *Xiaoming Chen***	
A Segment CRC Scheme for Polar Codes Daolong WU, Ying LI, Chilian CHEN Key Laboratory of Technology on Datalink China Electronics Technology Group Corporation CETC, 20th Institute	5736
Broadband Power Amplifiers Behavioral Modeling Method Based on Instantaneous Input Power Wei Li, Hongwei Bian, Jin Meng, jiahao zhang, Yi Li National Key Laboratory of Science and Technology on Vessel Integrated Power System	5718
Channel Model for RFID based Electronic Registration Identification of the motor vehicle in Practical Open Transportation Scenario Jing Feng, Wenmin Fan, Weijun Hong, Tingxiao Cai, Chunteng Shi, Jitianbai Zhou China Electronics Standardization Institute	5656
Satellite Requirement Preference Driven TT&C Resources Scheduling Algorithm for Time Sensitive Missions Bo Ren, Jianping Liu, Zhiyuan Li, Jiayang Wu, Zhihai Yao Xi'an Satellite Control Center	5504
A Novel Imaging Algorithm Based on Keystone Transform for Heli-borne Forward-moving RoSAR System Wen-jun Li, Guisheng Liao, Jingwei Xu National Laboratory of Radar Signal Processing	5720
An efficient method for ground maneuvering target refocusing based on DPT-MFP Mingming Tian, Guisheng Liao, Shengqi Zhu, Xiongpeng He, Yongjun Liu, Yunpeng Li Xidian University	5717
An Early Fault Diagnosis Method of Rolling Element Bearings Based on MED, DFA, and Improved KNN Sifang Zhao, Qiang Song, Mingsheng Wang Beijing Institute of Technology	5588
Local path planning of intelligent vehicle based on improved artificial potential field Zhiyong Chen, Qiong Gao, Xiaolan Wang, Xiang Liu TongJi Universtiy	5566
The Research on Propagation Characteristics of Acoustic Emission Signals at the Coupling Interface of Components Xiaomin Wang, Cong Han, Li Qiu, Guoan Yang School of mechanical and electrical engineering Beijing University of Chemical Technology	5541
Robust Multi-kernel Generalized Maximum Correntropy Filters Qiaona Sun, Tao Zhang, Xuewei Huang, Shiyuan Wang SouthWestUniversity	5539
Real-Valued DOA Estimation for Impulsive Noise MengYa Guo, HeKun Shang, Zheng Cao Jiangsu University	5509

Circular Polarization Microstrip Antenna using Truncated Square Patches for IR-UWB Localization System Wei Huang, Wenmin Zhao, Shaoyu Meng, Xiaozhang Zhu Kunchen Technology Co. Ltd	5489
Dual-sleeve Monopole Antenna With Inductance Coil-loaded For Airborne Simin Li, Chenhao Zhang, Weiping Cao Guilin University of Electronic Technology	5486
X-Band Omnidirectional High Gain Biconical Array Antenna Weiping Cao, Longjun Lian Guilin University of Electronic Technology	5485
A compact Microstrip duplexer Simin Li, Li Luo, Weiping Cao School of Information and Communication, Guilin University of Electronic Technology	5483
Reconfigurable Miniaturized Microstrip Antenna Based on Liquid Crystal Weiping Cao, Zijuan Hong, Shunlan Zhang Guilin University of Electronic Technology	5476
A miniatured hexagon-shaped UWB antenna Simin Li, Baojie Fu, Weiping Cao Guilin University of Electronic Technology	5466
The Accurate Actual-feed Illumination Technique for the Reflector Antenna Xinhua Yu, Jiawen Sun, Niekang Yin, Hao Zeng, Jinjun Mo, Yiying Wang Key Laboratory of Cognitive Radio and Information Processing, Ministry of Education, Guilin University of Electronic Technology	5458
A novel miniaturization method for microstrip filter Fatao Tong, Yannan Jiang, Weiping Cao Key Laboratory of Cognitive Radio and Information Processing (Guilin University of Electronic Technology) Ministry of Education Guilin, China	5727
A low profile wideband absorption structure based on metasurface embed with lumped resistance Yaping Jin, Weijun Hong, Jiaqi Cai Beijing Key Laboratory of Network System Architecture and Convergence	5703
Design and simulation of high-power RF power supply for ICP based on Simulink Yang Zhou, Xuesong Xie, XiaoLing Zhang, Kunkun Huang Beijing University of technology	5583
Prediction Analysis of the Signal Coverage From Multi-antenna System Linghui Kong, Zihan Xu, Changrong Liu, Yi Liu, Xueguan Liu School of Electronic and Information Engineering, Soochow University	5491
Design and Analysis of Microwave Energy Transmission System Based on 5.8GHz Linlin Jiang, Juan Chen Xian Jiaotong University	5445
Improving Field Uniformity Using Beam Deflection with Metasurface in a Reverberation Chamber Chen Yu, Yongjiu Zhao, Wenjun Qi, Qian Xu Nanjing University of Aeronautics and Astronautics	5629
Design and Implementation of Test System for Power 5G Communication Module Base on Cloud Computing Architecture Sihua Zhao, xiaoke Tang, Yubo Wang, Dongyan Zhao, Haiyan Xie, Xu Zhao Beijing Smart-Chip Microelectronics Technology Co., Ltd.	5508

Missile-borne Near-field Radar Coincidence Imaging Using a Uniform Circular Array Zhidong Liu, Kaiming Li, Rui Li, Guojian Jiang, Zilong Song Air Force Engineering University	5626
Reinforcement Learning based Waveform Design for Cognitive Imaging Radar Shichao Xiong, Kaiming Li, Qun Zhang, Ying Luo Institute of Telecommunication Engineering of AFEU	5616
A Method for Space TT&C Resources Scheduling Based on Auction Mechanism Jian Bai, Xiaosong Gu, Hongze Pan, Anliang Li, Yuanyuan Li, Zixing Yang Xi'an Satellite Control Center	5478
Inter-Satellite Broadcast Topology Planning Method for Walker Constellation Using TDMA Link Xiaosong Gu, Jian Bai, Hongze Pan, Jun Wei, Hui Yuan, Yutong Chang Xi'an Satellite Control Center	5477
Resource Allocation for Task Groups in MEC IoT Networks via Reinforcement Learning Chidiebere Chidume, Qianyue Qi, Chao Zhang Xi'an Jiaotong University	5459
A Compact Ultra-Wideband Microstrip patch Antenna for 5G and WLAN Shihe Chen, Yannan Jiang, Weiping Cao Guilin University of Electronic Technology	5579
A Holographic Metasurface for Microwave Power Transmission Applications Cheng Jiang, Songcen Wang, Xiaokang Wu, Chuankai Yang China Electric Power Research Institute	5689
Dual Polarized OAM Multibeams Metasurface for Terahertz Applications Teng Huang, Li Deng, Shufang Li, Botao Feng Beijing University of Posts and Telecommunications	5639
A Sparsely Six-arm Spiral Phased array antenna for W-band applications Jiang Mei, Han Rubing, Xuan Xiaobo, Gu Wangping, Zhu Lili Shanghai Radio Equipment Research Institute	5638
Novel Polarization Conversion Metasurface for Circularly Polarized Fabry-Perot Cavity Antenna Peng Xie, Guangming Wang, Xiaojun Zou, Hao Bai, Chiben Zhang Air force Engineering University	5594
Ku-band omnidirectional high gain antenna Weiping Cao, Yawei Ma Guilin University of Electronic Technology	5497
A Wideband Omni-directional Antenna Based on Printed Log-Periodic Element Li Liangying, Yan Wei, Feng Botao, Deng Li College of Physics and Optoelectronic Engineering, Shenzhen University	5680

Poster Session II

10:20-12:20, Sunday, November 15, 2020 **Session chair: *Yingsong Li, Xiaoming Chen***	
An Omnidirectional Antenna with Wide Bandwidth and High Gain for WiFi-5 and WiFi-6 Applications Yang Baifa, Huang Haixuan, Feng Botao, Deng Li College of Electronics and Information Engineering, Shenzhen University	5678
A Compact Dual-Polarized Differentially-Fed Antenna with High Gain for 5G Microcells Li Haoming, Cao Wenhua, Feng Botao, Deng Li College of Electronics and Information Engineering, Shenzhen University	5675
A Novel Omni-directional Antenna with Low Gain Variations for WiFi Communications Deng Wucai, Feng Botao, Deng Li College of Electronics and Information Engineering, Shenzhen University	5673
A Metasurface Antenna with Dual Circularly Polarization for 5G Millimeter-Wave Applications Chen Junlong, Feng Botao, Zeng Qingsheng, Deng Li College of Electronics and Information Engineering, Shenzhen University	5672
Architecture, Challenges and Prospect of Digital Power Grid Peiming Zhang, Jiajia Fu, Yijie Li Ltd. Power Dispatching Control Center, Guangdong Power Grid Co.	5614
Research on 5G Network Slicing for Digital Power Grid Weijian Li, Zanhong Wu, Peiming Zhang Ltd. Power Dispatching Control Center, Guangdong Power Grid Co.	5590
Deep Learning based Short Term Load Prediction in Smart Grids Wenhong Zhu, Ying Zeng, Zhongmiao Kang, Jiajia Fu Ltd. Power Dispatching Control Center, Guangdong Power Grid Co.	5547
An Edge Computing Framework for Digital Grid Jiajia Fu, Zhan Shi, Zhengfeng Zhang Ltd. Power Dispatching Control Center, Guangdong Power Grid Co.	5521
Optimal Control Design for Load Frequency Control with Network-induced Delays Heng Wang, Zhuwei Wang, Yifan Sun, Yuehui Guo, Chao Fang, Meng Li, Yang Sun Beijing University of Technology	5453
The BERT-BiLSTM-CRF question event information extraction method Jiming Liu, Cheng Sun, Ye Yuan Key Laboratory of E-commerce and Modern Logistics Chongqing University of Posts and Telecommunications	5577
Evolutionary Game Analysis of Harmful Information Governance in Social Networks with Public Participation Zifu Fan, Kexin Fan, Yiyu Tian, Wei Zhang School of Economics and Management, Chongqing University of Posts and Telecommunications	5576
Research on Frontier Issues of New Generation Artificial Intelligence Yuxiang Tao, Chaonan Wu, Jingying Li, Ye Yuan Key Laboratory of E-commerce and Modern Logistics Chongqing University of Post and Telecommunications	5574

Design of High cost performance Airborne Particle Detection Circuit Xindong Huang, Xin Lv, Shengzhe Ye, Leimeng Shi, Ben Zhou Xiamen University of Technology	5732
Continuous Wavelength Characterization of 1.3μm Quantum Dot Mesa Diode Yufei Huang, Subin Wang, Lingying Wang Xiamen University of Technology	5731
A New H-plane T-junction Waveguide Power Divider Covering The Full W-band Lijian Zhang, Tian Liu Xi'an Polytechnic University XI'AN, China	5706
A absorbing structure design of planar spiral antenna for improving multipath effect Ruilin Li, Zhongsen Sun, Wenpeng Zhao, Tian Liu, Zhao Yao, Zongtao Chi Qingdao University	5623
A Chinese Character-Shaped Patch Antenna Array: Zhong-Guo-Meng Jingkai Yuan, Aiqi Cui, K.L. Chung, Yansheng Li Qingdao Uni of Tech	5440
Reconfigurable Miniaturized Microstrip Antenna Based on Liquid Crystal Weiping Cao, Zijuan Hong Shunlan ZhangGuilin University of Electronic Technology	5468
An improved genetic algorithm for the Traveling Salesman Problem Jiashan Zhang, Xiaoqun Lin Chongqing Vocational Institute of Engineering	5471
Solution to the Traveling Salesman Problem: genetic algorithm Jiashan Zhang Chongqing Vocational Institute of Engineering	5472
Underlying communication model of joint test environment based on publish-subscribe mechanism zhihua dong, xiaodong jiang, heng liu research centre	5493
EMI Analysis among LEO Satellites Based on Space Conjunction Theory Bin CAO, Kangkang Gao, Jiangnan XING, tao JIANG Harbin Engineering University	5506
Joint transmit beamforming and subarray partition method for interference mitigation in MIMO scheme Junnan Shi, xuan Zhang, Yajun Li, pengfei Wang, aihua Liu Shanghai Radio Equipment Research Institute	5548
An Empirical Study on the Impact of Social Presence on Customer Citizenship Behavior in E-business Hanyang Luo Shenzhen University	5557
Research on the Influence of Logistics Service Quality on Post-purchase Behavior in E-business Hanyang Luo Shenzhen University	5558
Frequency-Diverse Hybrid Bunching Metasurface Antenna for Coincidence Imaging Mengran Zhao, Huilin Huang, Shitao Zhu, Juan Chen, Anxue Zhang Xi'an Jiaotong University	5565
Broadband Fractal Tree Metamaterial Absorber for P and L Bands Applications Qi Li, Jian Dong, Tong Li, Xiangyu Cao System Innovation Center China Academy of Space Technology	5617

Exhibitors

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