



IEEE Hong Kong Section AP/MTT Joint Chapter

NEWSLETTER

12/2020

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Chapter Website:

<http://www.ee.cityu.edu.hk/skltmw/apmtt/>

Chapter Chair Speech

2020 is the most challenging year since the establishment of our chapter. Due to Covid-19, we need to avoid social activities and keep social distancing in order to ensure everyone's health and safety. Therefore, our chapter cancelled all seminars or visits in the first half of the year, but thanks to the support by all members, we restarted some events using online format. We hold three seminars, one postgraduate conference, and a large-scale event, 2020 Asia Pacific Microwave Conference (APMC 2020). All of them has been successfully completed, and I would like to highlight the opening ceremony of APMC 2020, it has come with over 500 participants. I would also like to thank you all the contribution from every member, and especially acknowledge the tough preparation work contributed by APMC 2020 organizing committee.

- Dr. Ka Fai CHAN

Seminars

Seminar 1



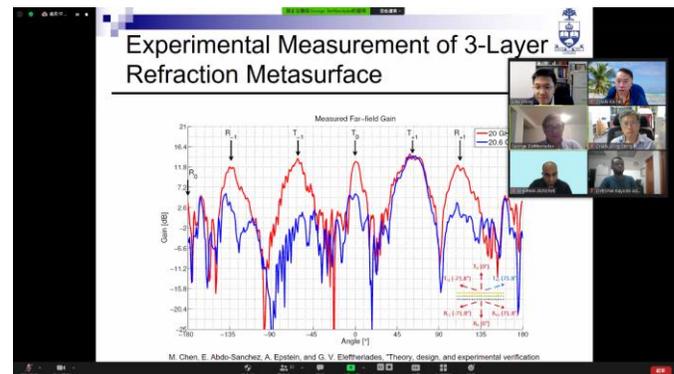
Title	Huygens' Metasurfaces for Controlling Electromagnetic Waves
Speaker	Prof. George V. Eleftheriades Department of Electrical and Computer Engineering, University of Toronto, Canada
Date	23 July 2020
Time	09:00 am to 10:00 am
Format	Online Seminar
Registration	53 participants

Abstract

We will describe the concept of the Huygens' metasurface which comprises co-located electric and magnetic dipoles forming an electrically dense array of Huygens' sources or scatterers. These engineered surfaces can be designed to control electromagnetic waves at will. Both passive and active Huygens' metasurfaces can be envisioned. Unlike traditional antenna transmitarrays, Huygens' metasurfaces can be made sub-wavelength thin and devoid of spurious Floquet modes, while preserving excellent matching characteristics. Huygens' metasurfaces can be used to manipulate the phase, magnitude and polarization of incident electromagnetic waves, including those from nearby elementary antennas, for a variety of applications. For example, Huygens' omega bi-anisotropic metasurfaces enable wave refraction at extreme angles without any reflections. They also allowed the demonstration of generalized flat reflectors having arbitrary angles of incidence and reflection and with 100% theoretical efficiency. Examples of Huygens' metasurface applications include 'perfect' wavefront refraction, focusing and lensing, polarization control including chirality, active cloaking, high-aperture efficiency/low-profile antennas, and antenna aperture beamforming with simultaneous magnitude and phase control.

Biography

George V. Eleftheriades earned his Ph.D. and M.S.E.E. degrees in Electrical Engineering from the University of Michigan, Ann Arbor, in 1993 and 1989 respectively. Currently he is a Professor at the Department of Electrical and Computer Engineering at the University of Toronto where he holds the Velma M. Rogers Graham Endowed Chair in Engineering. Prof. Eleftheriades introduced some of the early concepts in using transmission lines to realize negative-index metamaterials. Together with his graduate students he has produced the first experimental demonstration of focusing beyond the diffraction limit with a Veselago-Pendry lens and invented a number of novel and practical antenna/microwave/optical devices. Prof. Eleftheriades is the recipient of the 2008 IEEE Kiyo Tomiyasu Technical Field Award. He also received the 2015 John Kraus Antenna Award and the 2019 Distinguished Achievement Award from the IEEE Antennas and Propagation Society. He is an IEEE Fellow and a Fellow of the Royal Society of Canada. He has been the general chair of the 2010 IEEE Intl. Symposium on Antennas and Propagation and CNC/USNC/URSI Radio Science Meeting in Toronto and the TPC co-chair of the 2020 IEEE/URSI Intl. Symposium on Antennas and Propagation (virtual).



Seminar 2



Title	Are We Alone? NASA Technologies to Find Life Beyond Earth and Answers to Other Science Questions
Speaker	Dr. Goutam Chattopadhyay NASA-Jet Propulsion Laboratory, California Institute of Technology, USA
Date	8 August 2020
Time	11:00 am to 12:00 noon
Format	Online Seminar
Registration	75 participants

Abstract

NASA's Jet Propulsion Laboratory, which completed eighty years of its existence in 2016, builds instruments for NASA missions. Exploring the universe and our own planet Earth from space has been the mission of NASA. Robotics missions such as Voyager, which continues to go beyond our solar system, missions to Mars and other planets, exploring the stars and galaxies for astrophysics missions, exploring and answering the question, "are we alone in this universe?" has been the driving force for NASA scientists for more than six decades.

Fundamental science questions drives the selection of NASA missions. We develop instruments to make measurements that can answer those science questions. In this presentation, we will present an overview of the state of the art instruments that we are currently developing and layout the details of the science questions they will try to answer. Rapid progress on multiple fronts, such as commercial software for component and device modeling, low-loss circuits and interconnect technologies, cell phone technologies, and submicron scale lithographic techniques are making it possible for us to design and develop smart, low-power yet very powerful instruments that can even fit in a SmallSat or CubeSat. We will also discuss the challenges of the future generation instruments in addressing the needs for critical scientific applications.

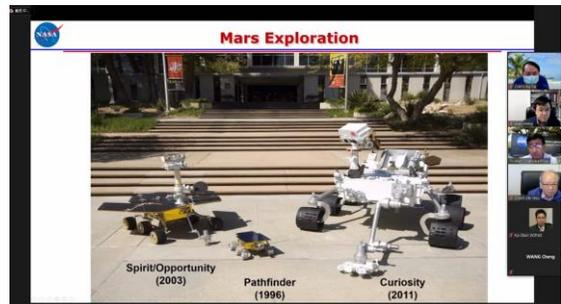
The research described herein was carried out at the Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, USA, under contract with National Aeronautics and Space Administration.

Biography

Goutam Chattopadhyay is a Senior Scientist at the NASA's Jet Propulsion Laboratory, California Institute of Technology and a Visiting Professor at the Division of Physics, Mathematics, and Astronomy at the California Institute of Technology, Pasadena, USA. He received the Ph.D. degree in electrical engineering from the California Institute of Technology (Caltech), Pasadena, in 2000. He is a Fellow of IEEE (USA) and IETE (India) and an IEEE Distinguished Lecturer.

His research interests include microwave, millimeter-wave, and terahertz receiver systems and radars, and development of space instruments for the search for life beyond Earth.

He has more than 350 publications in international journals and conferences and holds more than fifteen patents. He also received more than 35 NASA technical achievement and new technology invention awards. He received the IEEE Region-6 Engineer of the Year Award in 2018, Distinguished Alumni Award from the Indian Institute of Engineering Science and Technology (IIST), India in 2017. He was the recipient of the best journal paper award in 2013 by IEEE Transactions on Terahertz Science and Technology, best paper award for antenna design and applications at the European Antennas and Propagation conference (EuCAP) in 2017, the best journal paper award in 2020 by IEEE Transactions on Terahertz Science and Technology, and IETE Prof. S. N. Mitra Memorial Award in 2014.



Seminar 3



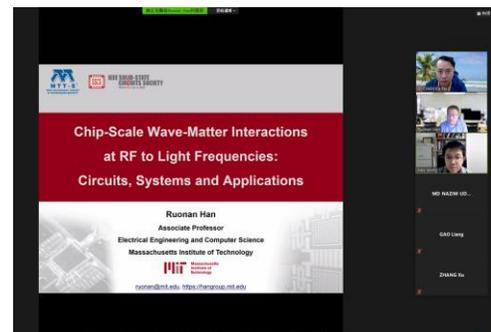
Title	IEEE MTT Chapter Distinguished Microwave Lecture Talk Chip-Scale Wave-Matter Interactions at RF-to-Light Frequencies: Circuits, Systems and Applications
Speaker	Prof. Ruonan Han Department of Electrical Engineering and Computer Science, Massachusetts Institute of Technology (MIT), USA
Date	6 October 2020
Time	10:00 am to 11:00 am
Format	Online Seminar
Registration	60 participants

Abstract

Traditional electromagnetic (EM) spectral sensors using integrated circuit technologies (e.g. automotive radars, security imagers, cameras, etc.) are normally based on wave scattering or absorption by macroscopic objects at remote distance; the operations are also not specific in wave frequencies. In the past couple of years, a new paradigm of chip-scale EM spectral sensing emerges with features complementary to the above: they utilize various modalities of interactions between EM waves with high-precision frequency control and microscopic particles (molecules, atoms, etc.) in close proximity to the chip. This progress is enabled by the recent advances of silicon devices and processes, especially the increase of circuit operation frequencies into the terahertz regime. Chip-scale sensing and metrology systems with new capabilities, higher performance and unprecedented affordability now become possible. Examples include THz gas spectroscopy sensors, on-chip “atomic-clock-grade” frequency references, room-temperature CMOS-quantum magnetometers, etc. This talk will present the basic physics of a few types of wave-matter interactions, key enabling technologies, as well as the designs and prototypes of chip systems. We will also discuss their potential applications in bio-chemical analysis, wireless networks, PNT (positioning, navigation & timing), security and so on.

Biography

Ruonan Han received the B.Sc. degree in microelectronics from Fudan University, in 2007, the M.Sc. degree in electrical engineering from the University of Florida in 2009, and the Ph.D. degree in electrical and computer engineering from Cornell University in 2014. He has been with the Department of Electrical Engineering and Computer Science, MIT, since July 2014, and is now an associate professor. His research group at MIT focuses on RF-to-photonics integrated circuits and systems for spectroscopy, metrology, imaging, quantum sensing/processing, broadband/secure communication, etc. He was the recipient of the Cornell ECE Directors Ph.D. Thesis Research Award, Cornell ECE Innovation Award, and two Best Student Paper Awards of the IEEE Radio-Frequency Integrated Circuits Symposium (2012 and 2017). He was also the recipient of the IEEE Microwave Theory and Techniques Society (MTT-S) Graduate Fellowship Award, and the IEEE Solid-State Circuits Society (SSC-S) Predoctoral Achievement Award. He is an associate editor of IEEE Transactions on Very-Large-Scale Integration System and IEEE Transactions on Quantum Engineering, a guest associate editor of IEEE Transactions on Microwave Theory and Techniques (2019), and also serves on the Technical Program Committee (TPC) of IEEE RFIC Symposium (2017-present) and the Steering Committee and TPC of 2019 IEEE International Microwave Symposium. He is the IEEE MTT-S Distinguished Microwave Lecturer (2020-2022). He won the Intel Outstanding Researcher Award in 2019 and the National Science Foundation (NSF) CAREER Award in 2017.



Postgraduate Conference

The 21st IEEE (HK) AP/MTT Postgraduate Conference

Date	21 November 2020
Time	10:00 am to 11:00 am
Format	Virtual Conference, Shenzhen & Hong Kong
Submitted Papers	20 papers (13 Hong Kong, 5 Mainland, 2 Malaysia)

Introduction

IEEE (HK) AP/MTT Postgraduate Conference is a dedicated local non-peer-review and non-publication conference for postgraduate students in the fields of Microwave and Antennas. This year is the 21th anniversary postgraduate conference and will be held virtually on 21st November, 2020. The conference is jointly organized by IEEE Hong Kong Section AP/MTT Joint Chapter, The Chinese University of Hong Kong (Shenzhen) and The Chinese University of Hong Kong. The main purpose is to enhance the communications between the postgraduate students in the region and to provide a platform for ideas exchange. This unique occasion will help our students to gain a deeper understanding on the current research focus of the related fields.

Conference Co-Chairs:

Dr. Liang Wu, *The Chinese University of Hong Kong (Shenzhen)*

Prof. Ke-Li Wu, *The Chinese University of Hong Kong*

Antenna and Propagation (AP) Session

Session Co-Chairs:

Dr. Yunfei Cao, *South China University of Technology, P. R. China*

Dr. Kai Xu Wang, *Harbin Institute of Technology Shenzhen, P. R. China*

Microwave Theory and Techniques (MTT) Session

Session Co-Chairs:

Dr. Liang Wu, *The Chinese University of Hong Kong, Shenzhen, P.R. China*

Dr. Jun Yin, *University of Macau, P. R. China*

Antenna and Propagation Student Paper Awards

First prize



Shangcheng Kong

A Terahertz On-Chip Antenna with Wide Impedance and Gain Bandwidths

Shangcheng Kong, Kam Man Shum, Chi Hou Chan
City University of Hong Kong, Hong Kong SAR, P.R. China

Second prize



Yuan-long Li

Terahertz High-gain Open Resonator Antenna Based on Silicon-Etching and Imprinting

Yuan-Long Li, Kwai-man Luk, Shu-yan Zhu, Stella W. Pang
City University of Hong Kong, Hong Kong SAR, P.R. China

Third prize



Yat-Sing TO

A Dual-Polarized Lens Antenna Using Gradient Refractive Index (GRIN) Metasurface

Yat-Sing TO, Quen-Wei LIN, Hang WONG
City University of Hong Kong, Hong Kong SAR, P.R. China

Third prize



Xin Feng Xiao

A 3-D Printed Dual Circularly Polarized Bidirectional Antenna of the Same Sense

Xin Feng Xiao, Zi Long Ma
South China University of Technology, Guangzhou, P.R. China

Microwave Theory and Techniques Student Paper Awards

First prize



Yuliang Chen

A Dual-mode Monoblock Dielectric Resonator Based on Two Dissimilar Modes

Yuliang Chen, Ke-Li Wu
The Chinese University of Hong Kong, Hong Kong SAR, P.R. China

Second prize

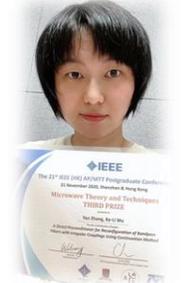


Ye YANG

Highly Reconfigurable Dual-band Coupler with Independently Tunable Frequency and Coupling Coefficient at the Lower Band

Ye YANG¹, Y. F. PAN¹, W. S. CHAN¹, S. Y. Zheng²
¹*City University of Hong Kong, Hong Kong SAR, P.R. China*
²*Sun Yat-Sen University, Guangzhou, P.R. China*

Third prize

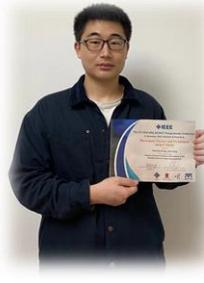


Yan Zhang

A Direct Preconditioner for Reconfiguration of Bandpass Filters with Irregular Couplings Using Continuation Method

Yan Zhang, Ke-Li Wu
The Chinese University of Hong Kong, Hong Kong SAR, P.R. China

Merit prize

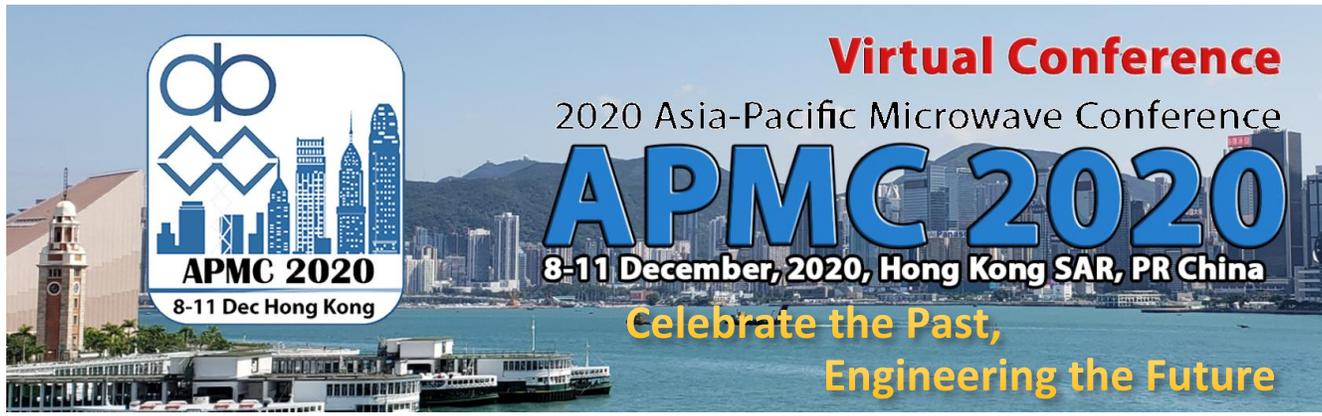


Yanming Zhang

Analysis of Electromagnetic Vortex Beams using Modified Dynamic Mode Decomposition

Yanming Zhang, Lijun Jiang
The University of Hong Kong, Hong Kong SAR, P.R. China

2020 Asia-Pacific Microwave Conference



Website: <http://www.apmc2020.org>

The 2020 Asia-Pacific Microwave Conference (APMC 2020) was held virtually from 8-11 December, 2020. It is organized by the IEEE AP/MTT Hong Kong Chapter, technically co-sponsored by the State Key Laboratory of Terahertz and Millimeter Waves (City University of Hong Kong), the Department of Electrical Engineering (City University of Hong Kong), the Department of Electronic Engineering (The Chinese University of Hong Kong), the IEEE AP-S, the IEEE MTT-S and the European Microwave Association. It is also supported by the Hong Kong Science and Technology Parks Corporation, IEEE Hong Kong Section, IEEE CES and IEEE OES. A broad forum will be provided for participants from both academia and industry to exchange research results and discuss collaborations in the fields of microwaves, millimeter waves, terahertz waves, infrared and optical waves during APMC 2020; such exchanges are key to accelerating the technology development in the Asia Pacific region.

Thanks to the active support from all participants, APMC 2020 has received more than 530 papers from 28 countries (Special session: 79 papers; invited paper: 57 papers; regular paper: 394 papers), and among them, 402 papers has been accepted and reviewed by 203 reviewers.

The program of this conference included 4 plenary talks, 2 workshops, 2 lecture, 15 special sessions, 54 regular sessions and 2 industrial talks.

Organizer



Technical Sponsors



Supporters



Organizing Committee

General Co-Chairs		General Chair		General Co-Chairs		
						
<p>Hang WONG City University of Hong Kong</p>		<p>Kwai Man LUK City University of Hong Kong</p>		<p>Quan XUE South China University of Technology</p>		
Honorary Chairs			International Steering Committee Chair	Technical Program Committee		
						
<p>Edward Kai Ning YUNG City University of Hong Kong</p>	<p>Peter Tin Chung YEUNG Hong Kong Science and Technology Corporation</p>	<p>Stella W. PANG City University of Hong Kong</p>	<p>Chi Hou CHAN City University of Hong Kong</p>	<p>Ming YU (Chair) The Chinese University of Hong Kong</p>	<p>Lijun JIANG (Co-Chair) The University of Hong Kong</p>	
Technical Program Committee		Best Student Paper Award Committee		Best Paper Award Committee	Convened Session Committee	
						
<p>Alex Man Hon Wong (Vice-Chair) City University of Hong Kong</p>	<p>Shao Yong Zheng (Vice-Chair) Sun Yat-Sen University</p>	<p>Kwok Wa LEUNG (Chair) City University of Hong Kong</p>	<p>Yong Mei PAN (Vice-Chair) South China University of Technology</p>	<p>Kin-Fai (Kenneth) TONG (Chair) University College London</p>	<p>Xiu Yin ZHANG (Chair) South China University of Technology</p>	
Convened Session Committee			Workshop/Tutorial	Finance Chair	Publication Co-Chairs	
						
<p>Yejun HE (Co-Chair) Shenzhen University</p>	<p>Ying LIU (Co-Chair) Xidian University</p>	<p>Yujian LI (Vice-Chair) Beijing Jiaotong University</p>	<p>Lei GE (Chair) Shenzhen University</p>	<p>Kwok Kan SO City University of Hong Kong</p>	<p>Jie SUN City University of Hong Kong</p>	
Publication Co-Chairs	Publicity Chair	Exhibition & Sponsorship Chair		Local Arrangement Chair		
						
<p>Wai Ho YU City University of Hong Kong</p>	<p>Ka Fai CHAN City University of Hong Kong</p>	<p>Kam Man SHUM City University of Hong Kong</p>	<p>Wing Chi MOK City University of Hong Kong</p>			

Plenary Talks



Recent Advances and Promise of Metasurface for Microwave Applications

Tatsuo Itoh

Member of National Academy of Engineering, UCLA



On Electromechanical Coupling Problems in Large Phased Array Microwave Antennas

Baoyan Duan

Academician of Chinese Academy of Engineering, Xidian University



Emerging Deep Integration and Topological Cohabitation of Front-End Circuit and Antenna for Future Wireless Systems

Ke Wu

Fellow of the Royal Society of Canada, University of Montreal



Extreme Metastructures

Nader Engheta

H. Nedwill Ramsey Professor, University of Pennsylvania

Special Session



Commemorating the beginning of antenna research by Prof. Kai Fong Lee four decades ago in Hong Kong

Organizers:

Kwai Man Luk

City University of Hong Kong

Kin-Fai Kenneth Tong

University College London

APMC 2020 Prize

Antennas	Liquid Aerosol Detection Based on Sub-THz Portable Doppler Radars Davi V. Q. Rodrigues, Daniel Rodriguez, Changzhi Li <i>Texas Tech University</i>
Microwaves	A High Output Power 1 – 150 GHz Distributed Power Amplifier in InP HBT Technology ¹ Nguyen L. K. ¹ Nguyen, Duy P. Nguyen, ² Alexander Stameroff, ¹ Anh-Vu Pham ¹ University of California, Davis ² Keysight Technologies
Systems	See-Through-Wall (STW) Life Detector Using Self-Injection-Locked (SIL) Technology Fu-Kang Wang, Tzyy-Sheng Jason Horng, Ju-Yin Shih, Zhi-Jie Hsu, Wei-Chih Su, Pin-Hsun Juan <i>National Sun Yat-sen University</i>

APMC 2020 Student Prize

Antennas	Grating Lobe Mitigation in Linear Phased Array Antennas Using Leaky-Mode of Bed of Nails Wasim Alshrafi, Dirk Heberling <i>RWTH Aachen University</i>
Microwaves	A 28 GHz and 38 GHz Dual-Band LNA Using Gain Peaking Technique for 5G Wireless Systems in 22 nm FD-SOI CMOS Xin Xu, Songhui Li, Laszlo Szilagyi, Corrado Carta, Frank Ellinger <i>Technische Universität Dresden</i>
Systems	Behavioral Modeling and Digital Predistortion for Fully-Connected Hybrid Beamforming Massive MIMO Transmitters Xin Liu, Wenhua Chen, Jiaming Chu <i>Tsinghua University</i>



Opening Ceremony



Closing Ceremony



Special Session: Commemorating the beginning of antenna research by Prof. Kai Fong Lee four decades ago in Hong Kong