

2015
IMWS Bio
TAIPEI

IEEE MTT-S

Taipei / Taiwan

*International Microwave Workshop Series on
RF and Wireless Technologies for Biomedical
and Healthcare Applications*



亞東技術學院
Oriental Institute of Technology



長庚大學
Chang Gung University



江蘇師範大學
JIANGSU NORMAL UNIVERSITY

ISBN:978-1-4799-8543-2

TABLE OF CONTENTS

CHAIR'S MESSAGE.....	1
IMWS-BIO2015 ORGANIZING COMMITTEE.....	2
INTERNATIONAL ADVISORY COMMITTEE.....	2
TECHNICAL PROGRAM COMMITTEE	3
IMWS-BIO 2015 TAIPEI SPONSORS	5
IMWS-BIO 2015 TAIPEI EXHIBITORS	5
VENUE	7
SPECIAL EVENTS	7
IMWS-BIO 2015 ONLINE.....	7
SESSION INFORMATION.....	8
MAP OF CONFERENCE SITE	9
GENERAL INFORMATION	10
CONFERENCE PROGRAM	
SESSION TABLE-September 21 (MON)	11
SESSION TABLE-September 22 (TUE).....	12
SESSION TABLE-September 23 (WED).....	13
KEYNOTE SPEECH	
Keynote Speech – Monday Morning September 21	14
Keynote Speech – Monday Afternoon September 21.....	18
Keynote Speech – Tuesday Morning September 22	23
Keynote Speech –Tuesday Afternoon September 22.....	26
Keynote Speech –Wednesday Morning September 23	30
Keynote Speech –Wednesday Afternoon September 23.....	33
ORAL SESSION	
Oral Session-Monday Morning September 21,11:20-13:00	36
Oral Session-Tuesday Morning September 22,11:00-12:40	83
Oral Session-Tuesday Afternoon September 22,16:50-18:30.....	126
Oral Session-Wednesday Afternoon September 23,16:00-17:40.....	170
POSTER SESSION	
Poster Session-Monday Afternoon September 21,16:50-18:30.....	224
Poster Session-Wednesday Morning September 23,11:00-12:40	246
AUTHOR INDEX	300

CHAIR'S MESSAGE

On behalf of the Organizing Committee, it is a great pleasure to welcome you to the 2015 IEEE MTT-S International Microwave Workshop Series on RF and Wireless Technologies for Biomedical and Healthcare Applications (IEEE MTT-S IMWS-Bio 2015), from 21th to 23th, September 2015.

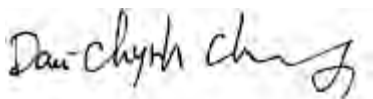
After over two years' preparation, IMWS-Bio 2105 has successfully invited more than 14 keynote speakers, 130 technical papers for 7 special oral sessions, 9 regular oral sessions, and 2 interactive post sessions. The 150 delegates present for 18 countries from leading research centers, academia, institutes and industries to exchange ideas and recent advances in the fields of biomedical and healthcare applications. In order to encourage the best papers from 35 student papers, IET and IMWS-Bio 2015 provide total 6 prizes for the Best Student Papers Awards.

Apart from a series of paper presentations, IMWS-Bio2015 also includes the industrial exhibition, which will provide many opportunities for networking and interacting for researchers and professionals in a wide spectrum of fields.

As you all come a long way, we can guarantee your visit in late September is going to be a memorial one. Taiwan has been referred to as "Formosa", which means a beautiful island, and we welcome your visit to enjoy our unique natural resources and cultural activities. In Taipei, you will find a variety of cultural and enjoyable activities, including visiting the National Palace Museum, the most treasures of Chinese Culture, the Taipei 101 Observation Tower, CKS memorial hall, and Evergreen Maritime Museum, etc.,... We wish you enjoy the venue of conference, Evergreen Maritime Museum, during the conference.

The Organizing Committee appreciates your generous support and sincerely wishes your visit a memorable one.

Best wishes,



Dau-Chyrh Chang

General Chair

IEEE MTT-S IMWS-Bio 2015

Oriental Institute of Technology



International Microwave Workshop Series on RF and Wireless Technologies
for Biomedical and Healthcare Applications

September 21-23, 2015

Taipei

IMWS-Bio2015 ORGANIZING COMMITTEE

General Chair

Dau-Chyrh Chang
Oriental Institute of Technology, Taiwan

General Co-Chair

Ke Wu
University of Montreal, Canada

General Co-Chair

Yao Shieh
University of California Irvine, USA

Awards Committee Chair

Ding-Bing Lin
National Taipei University of Technology

Conference Secretary

Jung-Hao Huang
Oriental Institute of Technology, Taiwan

Program Chair

Hsiao-Chih George Lee
Oriental Institute of Technology, Taiwan

Exhibition Chair

Hsien-Chin Chiu
Chang Gung University, Taiwan

Local Arrangements Chair

Hui-Hsiang Tung
Oriental Institute of Technology, Taiwan

Publicity Chair

Li-Lin Chen
Oriental Institute of Technology, Taiwan

Publication/Web Chair

Chien-Nan Lee
Oriental Institute of Technology, Taiwan

Finance Chair

Ocean Lee
Chinese Microwave Association, Taiwan

INTERNATIONAL ADVISORY COMMITTEE

Chair

Yongxin Guo
National University of Singapore, Singapore

Members

Amin M. Abbosh
University of Queensland, Australia

Akram Alomainy
Queen Mary University of London, UK

Hiroyuki Arai
Yokohama National University, Japan

Co-Chairs

Yang Hao
Queen Mary University of London, UK

Vincent C. Lee
National University of Singapore, Singapore

Qing Huo Liu
Duke University, USA

Chin-Chun Meng
National Chiao Tung University, Taiwan

Jean-Charles Bolomey

SUPELEC, France

Xudong Chen

National University of Singapore, Singapore

Jung-Chih Chiao

University of Texas at Arlington, USA

Wen-Shan Chen

Southern Taiwan University of Science and
Technology, Taiwan

Jaehoon Choi

Hanyang University, Korea

Eric Chow

Cyberonics, Inc., USA

Hsi-Tseng Chou

Yuan Ze University, Taiwan

Karu Esselle

Macquarie University, Australia

Mona Jarrahi

University of California at Los Angeles, USA

Minkyu Je

Daegu Gyeongbuk Institute of Science and
Technology, Korea

Vikass Monebhurrn,

CentraleSupelec, France

Chul Soon Park

Korea Advanced Institute of Science and
Technology, Korea

Dominique Schreurs

ESAT-TELEMIC, Belgium

Kin-Fai (Kenneth) Tong

University College London, UK

Din Ping Tsai

National Taiwan University, Taiwan

Zhigong Wang

Southeast University, China

Tzong-Lin Wu

National Taiwan University, Taiwan

Wenhua Yu

2COMU, Inc., USA

Thomas Ußmüller

University of Innsbruck, Austria

Zhihua Wang

Tsinghua University, China

TECHNICAL PROGRAM COMMITTEE

Chair**Ching-Wen Hsue**

National Taiwan University of Science and
Technology, Taiwan

Co-Chairs**Ruey-Bing Hwang**

National Chiao Tung University, Taiwan

Ching-Sung Wang

Oriental Institute of Technology, Taiwan

Members**Amin M. Abbosh**

University of Queensland, Australia

Akram Alomainy

Queen Mary University of London, UK

Hiroyuki Arai

Yokohama National University, Japan

Franklin Bien

UNIST, Korea

Feipei Lai

National Taiwan University, Taiwan

Yingsong Li

Harbin Engineering University, China

Ding-Bing Lin

National Taipei University of Technology, Taiwan

Shien-Fong Lin

National Chiao Tung University, Taiwan

Sheng-fuh Chang

National Chung Cheng University, Taiwan

Robert H. Caverly

Villanova University, USA

Hong-Twu Chen

R.O.C Military Academy, Taiwan

Xudong Chen

National University of Singapore, Singapore

Yi-Chyun Chiang

Chang Gung University, Taiwan

Jung-Chih Chiao

University of Texas at Arlington, USA

Jaehoon Choi

Hanyang University, Korea

Eric Chow

Cyberonics, Inc., USA

Zhaoyun Duan

University of Electronic Science and Technology of
China, China

R. P. S Gangwar

Govind Ballabh Pant University of Agriculture &
Technology, India

Jason Horng

National Sun Yat-sen University, Taiwan

Sheng-Ta Hsieh

Oriental Institute of Technology, Taiwan

Cheng-Nan Hu

Oriental Institute of Technology, Taiwan

Chi-Fang Huang

Tatung University, Taiwan

Shao Ying Huang

Singapore University of Technology and Design,
Singapore

Jean-Fu Kiang

National Taiwan University, Taiwan

Qing Huo Liu

Duke University, USA

Benjamin Loader

National Physical Laboratory, UK

Tian Hong Loh

National Physical Laboratory, UK

Chin-Chun Meng

National Chiao Tung University, Taiwan

Dominique Schreurs

ESAT-TELEMIC, Belgium

Chow-Yen-Desmond Sim

Feng Chia University, Taiwan

Hsien-Chiao Ten

R.O.C Military Academy, Taiwan

Kin-Fai (Kenneth) Tong

University College London, UK

Din Ping Tsai

National Taiwan University, Taiwan

Shih-Chung Tuan

Oriental Institute of Technology, Taiwan

Zhi-Gong Wang

Southeast University, Nanjing, China

Qun Wu

Harbin Institute of Technology, China

Tzong-Lin Wu

National Taiwan University, Taiwan

Xiao-Ling Zhao

Monash University, Australia

Lei Zhao

Jiangsu Normal University, Xuzhou, China

Yuanjin Zheng

Nanyang Technological University, Singapore

Organizer



亞東技術學院
Oriental Institute of Technology



長庚大學
Chang Gung University

Co-Organizer



江蘇師範大學
JIANGSU NORMAL UNIVERSITY

Financial Co-Sponsors

科技廳



中華民國微波學會



NAR Labs 國家實驗研究院
儀器科技研究中心
Instrument Technology Research Center



遠東關係企業
財團法人徐有庠先生紀念基金會



IEEE AP-S
Taipei

Technical Co-Sponsors



Exhibitors



ROHDE & SCHWARZ

auden

WavePro

CST



IMWS-Bio 2015 TAIPEI SPONSORS

FINANCIAL CO-SPONSORS

Far Eastern Y. Z. Hsu Science and Technology Memorial Foundation (<http://yzhsu.feg.com.tw/en/index.aspx>)
IEEE Microwave Theory and Techniques Society (<http://www.mtt.org/>)
Antennas and Propagation Society (AP03) (http://www.ieee.org.tw/chapters/index.php?web_class=3)
Microwave Association of Republic of China (<http://www.microwave.org.tw/>)
Ministry of Science and Technology, R.O.C. (<https://www.most.gov.tw/>)
Ministry of Education, Republic of China (Taiwan) (<http://english.moe.gov.tw/>)
National Applied Research Laboratories Instrument Technology Research Center (<http://www.itrc.narl.org.tw/>)
The Bureau of Foreign Trade (<http://www.trade.gov.tw/English/>)

TECHNICAL CO-SPONSORS

Institute of Electrical and Electronics Engineers (<http://www.ieee.org/>)
IEEE Instrumentation and Measurement Society (<http://ieee-ims.org/>)
Microwave Theory and Techniques Society (MTT17) (http://www.ieee.org.tw/chapters/index.php?web_class=24)
Instrumentation & Measurement Society (IM09) (http://www.ieee.org.tw/chapters/index.php?web_class=47)
Taiwan Electromagnetic Industry-Academia Consortium (<http://temiac.ee.ntu.edu.tw/main.php>)
The Institution of Engineering and Technology (<http://www.theiet.org/>)

IMWS-Bio 2015 TAIPEI EXHIBITORS

Rohde & Schwarz (<http://www.rohde-schwarz.com.tw/PrecompiledWeb/Index.aspx>)
ART-FI (<http://www.art-fi.eu/>)
Auden Techno Corp. (<http://www.auden.com.tw/Auden/eng/about.asp>)
CST Computer Simulation Technology (<https://www.cst.com/>)
WavePro Inc. (<http://www.wavepro.com.tw/>)

VENUE

The 2015 International Microwave Workshop Series on RF and Wireless Technologies for Biomedical and Healthcare Applications will be held on September 21-23, 2015, in CHANG YUNG-FA FOUNDATION International Convention Center, Taipei.

SPECIAL EVENTS

RECEPTION

On Monday, September 21, from 18:30 to 20:00, the reception will take place at the CHANG YUNG-FA FOUNDATION International Convention Center, Room1010,10F. For registered IMWS-Bio 2015 participant, the reception is free.

BANQUET

On Tuesday, September 22, from 19:00 to 21:00, the banquet is planned for IMWS-Bio 2015 participants and their guests. A limited number of banquet tickets will be available. For all participants, the price is USD 35 per person. Please make reservation and pay in advance.

IMWS-Bio 2015 ONLINE

Information on IMWS-Bio 2015 Taipei is posted at <http://www.imws2015.org/>

SESSION INFORMATION

INSTRUCTIONS FOR AUTHORS IN ORAL SESSIONS

Speakers are requested to be in their respective session rooms at least 10 minutes prior to the commencement of each session. The duration of the paper presentation is 20 minutes. This includes 15 minutes for the presentation itself and 5 minutes for questions from the audience. We could appreciate it if all presenters can adhere strictly to this time limit.

Presentation slides must be prepared using Microsoft PowerPoint or Adobe Acrobat. Speakers should bring their files on a thumb-drive and upload their file at least 10 minutes before the commencement of each session as well as report to their respective Session Chairs. A standard LCD projector (connected to a local PC) will be provided in each conference room.

All papers must be presented in person at the conference in order to be included in the proceedings published in IEEE Xplore®.

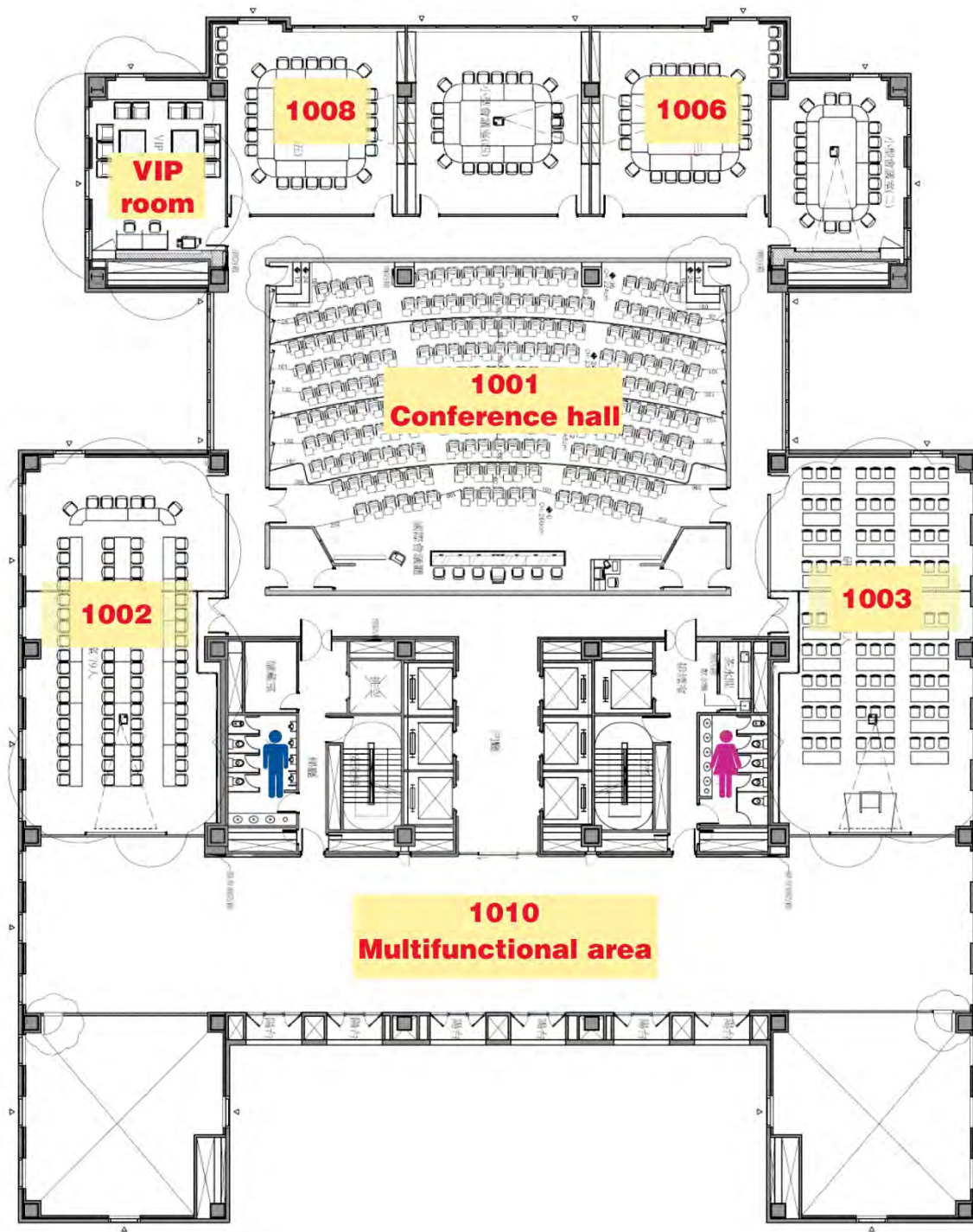
INSTRUCTIONS FOR AUTHORS IN POSTER SESSIONS

For Poster presentation, the maximum size will be w:90cm x h:150cm and the minimum size will be A1 (w:59.4cm x h:84.1cm). It is advisable that your poster be readable from 1.5 to 2 m away.

Please set up your poster at least 10 minutes before the start of the session. Speakers (presenting authors) are requested to stay at their posters during the poster session. After the session, posters must be removed by the speaker him/herself. Any remaining posters will be removed by conference staff when the session concludes.

All papers must be presented in person at the conference in order to be included in the proceedings published in IEEE Xplore®.

MAP OF CONFERENCE SITE



GENERAL INFORMATION

LANGUAGE

Although the local language is Mandarin, the conference language is English.

CURRENCY AND CREDIT CARDS

The local currency is the New Taiwan Dollar (NTD\$) and the exchange rate is 1 USD for about NT\$30. The credit cards and cash are acceptable for payments. The credit cards are also acceptable in most large shopping centers and hotels.

TAX AND TIP

In Taipei tips are not necessary but it is possible to tip hotel porters and for restaurant service. A 10% service charge and a 5% value-added tax are added to room rates and meals. Bargaining is necessary on buying merchandise especially from markets.

TAXI

Usually, a taxi is available along the roadsides, while you wave for it or right in front of a hotel.

ELECTRICITY

In Taipei, the standard outlets provide AC of 110V/60Hz.

CONFERENCE PROGRAM

SESSION TABLE-September 21 (MON)

September 21 (MON)	08:00-09:00	Registration, Room1010,10F			
	MK2 09:00-10:40 Keynote Speech Room1001, 10F	09:00-09:50	Dr. Kuan-Ming Chiu	Minimally invasive cardiac surgery	Chaired by Prof. Yao Shieh, University of California Irvine, USA
		09:50-10:40	Prof. Yang Hao	Antennas and Propagation for Body-Centric Wireless Communications at Millimeter-wave Frequencies	
	10:40-11:00	Opening Ceremony,Room1001, 10F			
	11:00-11:20	Coffee Break- Room1010,10F			
	Session	Room1002,10F	Room1003,10F	Room1006,10F	Room1008,10F
	11:20-13:00	MA1 Wearable Devices and Body-Centric Communications(1)	MA2 Antennas and Wireless Power for Biomedical Applications	MA3 Human-body Phantoms for Evaluation of Microwave Antennas and Devices	MA4 Biomedical and Healthcare Applications (1)
		Chaired by Prof. Chi-Fang Huang Co-Chair by Prof. Zhihua Wang	Chaired by Prof. Yongxin Guo Co-Chair by Prof. Jaehoon Choi	Chaired by Prof. Koichi Ito Co-Chair by Dr. Yuan-Chih Lin	Chaired by Prof. John L. Volakis Co-Chair by Dr. Hsiao-Chih George Lee
	13:00-14:00	Lunch-7F			
	MK3 14:00-16:30 Keynote Speech Room1001, 10F	14:00-14:50	Prof. Niels Kuster	Latest Technology and Procedures on Safety Evaluations of On-Body and Implanted Wireless Biomedical and Healthcare Applications	Chaired by Prof. Yongxin Guo, National University of Singapore, Singapore
		14:50-15:40	Prof. Koichi Ito	Advanced Physical Phantoms for Evaluation of Microwave Antennas	
		15:40-16:00	Coffee Break- Room1010,10F		
		16:00-16:50	Prof. John L. Volakis	Fully-Passive Wireless Neurosensing System for Unobtrusive Brain Signal Monitoring	
MPos1 16:50-18:30	Poster Session and Best Student Papers Contest Room1010,10F Chaired by Prof. Ding-Bing Lin				
18:30-20:00	Reception, Room1010,10F				

SESSION TABLE-September 22 (TUE)

Septembe 22 (TUE)	<u>TK1</u> 09:00-10:40 Keynote Speech Room1001, 10F	09:00-09:50	Prof. J.C. Bolomey	Microwave Imaging for Medical Applications: a Thirty Years Pursuit Toward Clinical Acceptance	Chaired by Prof. Ding-Bing Lin, National Taipei University of Science and Technology, Taiwan
	09:50-10:40	Prof. Paul M. Meaney	Paradigm shifting innovations move microwave breast tomography closer to clinical relevance		
	10:40-11:00				
	Session	Room1002,10F	Room1003,10F	Room1006,10F	Room1008,10F
	11:00-12:40	<u>TA1</u> Wearable Devices and Body-Centric Communications(2)	<u>TA2</u> RF, Antenna, and Body Channel Modeling(1)	<u>TA3</u> Radar and Sensor Applications (1)	<u>TA4</u> Numerical Methods in Biomedical Imaging
		Chaired by Prof. Choon Sik Cho Co-Chair by Prof. Chia-Tai Chan	Chaired by Prof. Amin Abbosh Co-Chair by Prof. Ching-Wen Tang	Chaired by Prof. Tzyy-Sheng Jason Horng Co-Chair by Prof. Yi-Chyun Chiang	Chaired by Dr. Krishna Agarwal Co-Chair by Dr. Zhiru Yu
		12:40-14:00			
	<u>TK2</u> 14:00-16:30 Keynote Speech Room1001, 10F	14:00-14:50	Prof. Jenshan Lin	Noncontact Vital Sign Detection Using Microwave Radar: Applications in Biology, Medicine, and Beyond	Chaired by Prof. Hiroyuki Arai, Yokohama National University, Japan
		14:50-15:40	Prof. Jung-Chih Chiao	Implantable Wireless Medical Devices and Systems	
		15:40-16:00	Coffee Break- Room1010,10F		
		16:00-16:50	Prof. Hoi-Jun Yoo	WBAN Circuits and Systems	
	Session	Room1002,10F	Room1003,10F	Room1006,10F	Room1008,10F
	16:50-18:30	<u>TP1</u> Biomedical and Healthcare Applications (2)	<u>TP2</u> Radar and Sensor Applications (2)	<u>TP3</u> RF, Antenna, and Body Channel Modeling (2)	<u>TP4</u> Imaging for Medical Applications
		Chaired by Prof. Feipei Lai Co-Chair by Prof. Franklin Bien	Chaired by Prof. Jean-Fu Kiang Co-Chair by Prof. Ruey-Bing Hwang	Chaired by Prof. Din-Pin Tsai Co-Chair by Dr. Wen Cheng Lai	Chaired by Prof. Jean-Charles Bolomey Co-Chair by Prof. Lluís Jofre
		19:00-21:00			

SESSION TABLE-September 23 (WED)

Septembe 23 (WED)	<u>WK1</u> 09:00-10:40 Keynote Speech Room1002, 10F	09:00-09:50	Prof. Reza Zoughi,	Diagnosis of Human Skin Lesions (Cancer and Burns) Using High-Frequency Techniques – A Review	Chaired by Prof. Hsien-Chin Chiu, Chang Gung University, Taiwan
		09:50-10:40	Prof. Mona Jarrahi	New Frontiers in Terahertz Technology	
	10:40-11:00	Coffee Break- Room1010,10F			
	<u>WPos1</u> 11:00-12:40	Poster Session Room1010,10F Chaired by Prof. Ruey-Bing Hwang,			
	12:40-14:00	Lunch-B1			
	<u>WK2</u> 14:00-15:40 Keynote Speech Room1002, 10F	14:00-14:50	Dr. Yen-Wen Wu	Telemedicine and structured patient support program in cardiovascular care: a single medical center experience in Taiwan	Chaired by Prof. Ruey-Bing Hwang, National Chiao Tung University, Taiwan
		14:50-15:40	Prof. Yahya Rahmat-Samii	Modern Healthcare Systems Relying on Advances in Wireless Antenna Technology: At no Times in History have Antennas come so close to the Humans!	
	15:40-16:00	Coffee Break- Room1010,10F			
	Session	Room1002,10F	Room1003,10F	Room1006,10F	Room1008,10F
	16:00-17:40	<u>WP1</u> Antenna and Measurement for Body Communication and Sensing	<u>WP2</u> Intelligent Electronics for Healthcare Applications	<u>WP3</u> Biological Effects	<u>WP4</u> The Development and Characterization of Medical Diagnostic Devices
Chaired by Prof. Hiroyuki Arai Co-Chair by Dr. Nozomu Ishii		Chaired by Prof. Chien-Nan Lee Co-Chair by Prof. Zhaoyun Duan	Chaired by Dr. Lei Zhao Co-Chair by Dr. Hui-Hsiang Tung	Chaired by Dr. Tsung Chih Yu Co-Chair by Dr. Ming-Hui Cheng	

KEYNOTE SPEECH

Keynote Speech – Monday Morning September 21

Keynote Speech 1 (09:00-10:40) [MK2](#)

Chair: Prof. Yao Shieh, University of California Irvine, USA

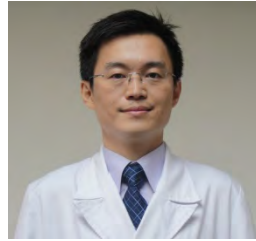
Room: 1001 10F

- 09:00 – 09:50 **Minimally invasive cardiac surgery**
Dr. Kuan-Ming Chiu
Far Eastern Memorial Hospital, New Taipei City, Taiwan
- 09:50-10:40 **Antennas and Propagation for Body-Centric Wireless Communications at Millimeter-wave Frequencies**
Prof. Yang Hao
Queen Mary University of London, UK

Keynote Speech – Monday Morning September 21

MK2-1, 09:00 – 09:50

Minimally invasive cardiac surgery



Prof. Kuan-Ming Chiu

Far Eastern Memorial Hospital, New Taipei City, Taiwan

Objectives: Cardiac surgery as other specialties has moved toward less invasiveness as global trend and probably the last surgical discipline to adopt endoscope in surgical practices. Although there comes alternative, percutaneous valve repair or replacement technologies, majority of valve disease patients will probably not benefit from these soon. The endeavor in less invasive valve surgery has focused on decreasing surgical trauma by limiting the surgical trauma and trying to eliminating the heart lung machine. Our approaches are to avoid sternotomy, reduce the length of incision, eliminate mechanical rib spreader and apply endoscope as possible. All these consist of, so called, minimally invasive cardiac surgery (MICS).

Methods: Along with the development of enabling technologies, techniques were changed accordingly. Endoscope had been applied in graft vessel harvest, including saphenous vein, radial artery and internal mammary artery for coronary artery bypass grafting (CABG). By using robot, coronary artery anastomosis could be performed as well. CABG could be performed in off-pump fashion and sternum-sparing approaches. For mitral valve procedures, cosmetic mini-thoracotomy is the incision of choice. Starting from right thoracotomy, then the rib spreader was eliminated, the vision and illumination were enhanced by videoscope. Thereafter, the incision could be reduced to an acceptable level of truly minimal invasiveness. Peripheral cannulation, usually femoral approach, is applied for cardiopulmonary bypass. Aortic crossclamp, cardioplegia delivery and surgical exposure are achieved by specialized, extended-length instruments. Repair or replacement of mitral/tricuspid/or some congenital defects are then carried out. Some cases were finished by robotic assistance. For those patients with aortic valve involvement, parasternal approach is our choice. Videoscope assisted aortic valve replacement could be performed.

Results: Our experience shows the bypass time and ischemic time for sternumsparing valve surgery are compatible with full-sternotomy approach. They may be longer for videoscopic and robotic approaches. Endoscopic cardiac surgery offers great illumination and exposure of intracardiac structures and is extremely helpful in teaching and promoting MICS. Anesthetic preparation takes more time in sternum-sparing approach. The limited incisions help us to minimize operative and postoperative bleeding, pain and wound complications. Stable sternoclavicular joints could facilitate early and aggressive activity of upper extremities. These are particularly valuable in redo procedures after previous sternotomy and even previous thoracotomy. Parasternal approach is performed in a routine basis in our institute. However, the prevalence of sternum-sparing CABG is limited due to the gold standard of bilateral internal mammary artery and the consideration of complete revascularization. In our series, the perfusion time, post-op ventilation time and overall mortality are reduced. The enthusiasm for robotic cardiac surgery is tempered by technique demanding, resource and time consuming.

Conclusions: Reviewing our MICS series of more than 1500 cases, these approaches are safe and effective. Stepwise evolution is required for the whole team members to move forward. Equivalent operative time can be accomplished once the learning curve is negotiated. And the surgical trauma could be minimized by the adaption of videoscope. It provides better illumination and chances of broadcasting, recording and post-op review. Then non-rib spreading operation could be performed in mitral, aortic and some congenital defects. Besides, the mitral valve repair rate is not compromised. All these approaches are reproducible and are not only the cutting-edge or state-of-art techniques, they should be important treatment options in cardiac surgical practices.

Keynote Speech – Monday Morning September 21

MK2-2, 09:50 – 10:40

Antennas and Propagation for Body-Centric Wireless Communications at Millimeter-wave Frequencies



Prof. Yang Hao

Queen Mary University of London, UK

Body-centric wireless communications refer to human-self and human-to-human networking with the use of wearable and implantable wireless sensors. It is a subject area combining wireless body-area networks (WBANs), Wireless Sensor Networks (WSNs) and Wireless Personal Area Networks (WPANs). Body-centric wireless communications has abundant applications in personal healthcare, smart home, personal entertainment and identification systems, space exploration and military.

So far, many studies and applications have been developed in a range of frequencies that extend from 400 MHz up to 10 GHz. However, many advantages can be found in operating such systems at millimeter-wave frequencies. For example, compact antennas suitable for body-centric applications can be obtained together with other benefits, such as higher data rates and reduced interference and "observability". Meanwhile, numerical modeling of antennas and propagation at millimeter-wave frequencies represents a major challenge in terms of efficiency and accuracy.

This talk presents a review of some current work conducted at Queen Mary University of London, related to antennas and propagation for body-centric wireless communications. Aspects related to measurement setup, numerical modelling, channel characteristics are briefly discussed. Applications and future trend of this research will be also presented, specifically in the field of body-centric communication at frequencies of 60 GHz and 94 GHz.

Keynote Speech – Monday Afternoon September 21

Keynote Speech 2 (14:00-16:30) [MK3](#)

Chair: Prof. Yongxin Guo, National University of Singapore, Singapore

Room: 1001 10F

- 14:00-14:50 **Latest Technology and Procedures on Safety Evaluations of On-Body and Implanted Wireless Biomedical and Healthcare Applications**
Prof. Niels Kuster
ETH Zurich School and IT'IS Foundation, Switzerland
- 14:50-15:40 **Advanced Physical Phantoms for Evaluation of Microwave Antennas**
Prof. Koichi Ito
Chiba University, Japan
- 16:00-16:50 **Fully-Passive Wireless Neurosensing System for Unobtrusive Brain Signal Monitoring**
Prof. John L. Volakis
Ohio State University, USA

Keynote Speech – Monday Afternoon September 21

MK3-1, 14:00 – 14:50

Latest Technology and Procedures on Safety Evaluations of On-Body and Implanted Wireless Biomedical and Healthcare Applications



Prof. Niels Kuster

ETH Zurich School and IT'IS Foundation, Switzerland

Theodoros Samaras, Aristotle University of Thessaloniki, Greece

It is widely accepted that wireless biomedical and healthcare applications are currently the most promising technologies for increasing the quality of health services while, simultaneously, decreasing their cost [1]. This is mainly achieved by registering or monitoring the physical and physiological status of patients, in order to prevent critical health situations. However, the design of such applications is very challenging in terms of engineering, since it enforces the operation of transmitters in the immediate vicinity or even inside the electromagnetically most complex natural setting, that of the human body. In addition, the devices have to be wirelessly charged in many cases. An efficient application necessitates the design of antennas integrated into small devices capable to deliver reliably the appropriate information from and to the patient, and, in several cases, also directly to health care centers using minimal spatial volume at minimal power consumption. Moreover, all regulation requirements must be met, including the specific absorption rate (SAR) and over-the-air (OTA) performance. There are a number of engineering tools required to achieve this multifunctional optimization: (i) realistic computational human phantoms that allow for a comprehensive representation of the application use, including experimental phantoms; (ii) powerful and reliable computational electromagnetic solvers; (iii) fast experimental SAR methods; (iv) traceable near-field EMI/EMC techniques to reliably test interference and unintended radiation effects; and (v) assessment of the OTA performance.

The computational human models should be able to simulate the entire variability of usage, i.e., represent the different detailed anatomies from children to adults for both sexes, as well as different postures. An example of such computational phantoms is the Virtual Population (ViP) [2].

These models consist of several hundreds of irregular structures and, therefore, millions of surface elements. Specialized solvers need to be integrated to effectively perform electromagnetic optimizations from ELF to optical frequencies within these models. Great progress has been achieved in recent years with respect to simulation technology, such as (i) effective subgridding; (ii) dispersive tissue and material handling for broadband sources; (iii) compartmentalization of the computational domain with the Huygens source; (iv) high performance computing, including GPU-accelerated solvers and visualization tools; (v) coherent or incoherent combination of the induced electric field distributions in the body, or the resulting SAR

distributions, to study the effect of multiple exposure; multiphysics coupled models for (vi) bioheat transfer in tissues, and (vii) neural stimulation, in order to directly determine potential health risks [3].

During the last two years great progress has also been achieved in automatization and acceleration of SAR testing [4]. New technologies for traceable very close near-field scanning have become lately available [5] that can be extended with novel and fast near-to-far-field transformations to determine both intended and unintended radiation of wireless devices and step up their safety evaluation process.

References

- [1] S. Movassaghi, M. Abolhasan, J. Lipman, D. Smith, A. Jamalipour, “Wireless Body Area Networks: A Survey,” *IEEE Communications Surveys & Tutorials*, vol. 16, no. 3, pp. 1658-1686, 2014
- [2] M.-C. Gosselin, E. Neufeld, H. Moser, E. Huber, S. Farcito, L. Gerber, ..., N. Kuster, “Development of a new generation of high-resolution anatomical models for medical device evaluation: the Virtual Population 3.0,” *Physics in Medicine and Biology*, vol. 59, no. 18, pp. 5287-5303, 2014
- [3] E. Neufeld, D. Szczerba, N. Chavannes, N. Kuster, “A novel medical image data-based multi-physics simulation platform for computational life sciences,” *Interface Focus*, vol. 3, no. 2, art. 20120058, 6 Apr 2013
- [4] M.G. Douglas, N. Kuster, “Novel fast SAR methods for compliance testing of wireless devices,” *Proceedings of the 2014 International Symposium on Electromagnetic Compatibility, Tokyo (EMC'14/Tokyo)*, pp. 654-657, 12-16 May 2014
- [5] S. Kühn, M. Wild, M. Gomez, E. Grobbelaar, P. Sepan, B. Kochali, A. Fuchs, J. Lienemann, N. Kuster, “EMC/EMI near-field testbed for EM phasor measurements using active optical sensors,” *Proceedings of the 2015 Asia-Pacific Symposium on Electromagnetic Compatibility (APEMC)*, pp. 402-405, 26-29 May 2015

Keynote Speech – Monday Afternoon September 21

MK3-2, 14:50 – 15:40

Advanced Physical Phantoms for Evaluation of Microwave Antennas



Prof. Koichi Ito

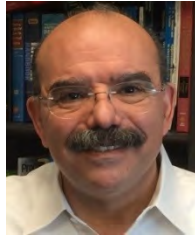
Chiba University, Japan

It is essential to evaluate interactions between the human body and electromagnetic (EM) waves radiated from antennas for mobile terminals or other wireless equipments to be used in the vicinity of the human body. The "interactions" mean two ways: an influence of the human body on the performance of the antenna as well as an influence of EM waves on the human body. Such interactions are estimated by numerical simulation and/or experimental evaluation. Today, computational simulation with numerical human-body phantoms is a very powerful tool and many commercial softwares are available. However, results of numerical simulation should be validated with other techniques such as an experiment with physical phantoms. As conventional physical phantoms, tissue-equivalent liquid, gel, semi-hard or solid phantoms have usually been employed according to the purposes or situations. In our laboratory, we have studied and developed different types of semi-hard phantoms. This presentation introduces some examples of advanced physical phantoms including (a) inhomogeneous phantom to simulate different internal organs, (b) UWB phantom which covers ultra-wide band (3.1-10.6 GHz) frequency range, and (c) dynamic phantom to simulate the movement of the human body.

Keynote Speech – Monday Afternoon September 21

MK3-3, 16:00 – 16:50

Fully-Passive Wireless Neurosensing System for Unobtrusive Brain Signal Monitoring



Prof. John L. Volakis

Ohio State University, USA

Brain implant technology has the potential to improve the individual's well-being. Applications include epilepsy monitoring and early seizure detection, prosthetic control, trauma and addiction assessment, among others. However, current/in-research brain implants has yet to overcome the challenges of (a) wired connections to the implant that pose infection risks and hinder natural lifestyle, (b) heat generated by the implant's battery, and (c) losses within the implant that limit the implant capability to read low-level neuropotentials. In this talk, we will present an electronic brain-machine interface system capable of reading most of the neurological brain signals in a care-free manner and while the person is carrying out normal activity. This game-changing neurological sensor is based on a fully-passive and wireless neurosensing system for acquiring very-low-power brain signals, as low as $50\mu\text{Vpp}$ in frequency-domain. The system is able to wirelessly detect neuropotentials down to $28\mu\text{Vpp}$ in the frequency band of 100 Hz to 5 kHz. This is a 90-fold sensitivity improvement as compared to previous fully-passive implementations, in addition to allowing detection of most neural signals generated by the human brain. The proposed neurosensing system brings forward a new possibility of wireless neural signal detection using fully-passive technology.

Keynote Speech – Tuesday Morning September 22

Keynote Speech 3 (09:00-10:40) [TK1](#)

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

Room: 1001 10F

- 09:00 – 09:50 **Microwave Imaging for Medical Applications: a Thirty Years Pursuit Toward Clinical Acceptance**
Prof. J.C. Bolomey

Supelec, France
- 09:50-10:40 **Paradigm shifting innovations move microwave breast tomography closer to clinical relevance**
Prof. Paul M. Meaney
Thayer School of Engineering at Dartmouth College, USA

Keynote Speech – Tuesday Morning September 22

TK1-1, 09:00 – 09:50

Microwave Imaging for Medical Applications: a Thirty Years Pursuit Toward Clinical Acceptance



Prof. Jean-Charles Bolomey
Supelec, France

This presentation retraces from the beginning the development of the microwave imaging technology dedicated to medical applications. Started thirty years ago with experiments on isolated animal organs, microwave imaging techniques were rapidly oriented for targeting clinical applications where, as compared to other existing modalities, microwaves were supposed to bring some undisputable advantages such as favorable specific contrasts between healthy and pathological tissues, harmlessness of examination, low cost of equipment, easiness to use, etc. However, there is no choice but to accept that, except for very few exceptions, the initial expectations had to be seriously tempered, mainly for having underestimated the complexity of severe scattering phenomena inside human body and the difficulty in compensating them, by means of the available microwave and computer technologies, for extracting the desired information from non-invasive measured data. Still today, microwave imaging faces difficulties to get a noticeable clinical acceptance, as demonstrated by the extremely low number of relevant publications in medical journals. The aim of this presentation is not really to update the long list, already available in the literature, of supposed clinical applications for which microwaves are claimed to constitute a “good candidate”, as the saying goes. Rather, it aims providing a chronological perspective for a better understanding of the reasons why most of these applications have not been transferred yet into the clinical practice. It will be shown that beyond well-known difficulties, shared by any technology transfer to clinics in terms of prototype duplication, trial management, operator training, etc. some others are specific to microwaves. Analyzing these difficulties leads to the encouraging conclusion that there is still some room to improve the performances of imaging systems, either from the available, but not yet fully exploited, microwave technology or from the expected short/mid-term increase of computing power. However, it also appears that a necessary, even if not sufficient, condition for boosting the transfer toward clinics, requires changing the currently practiced “technology-push” strategy for a “clinical-pull” one. Practically, this means that the projects should be initiated and interactively focused with end-users toward well-identified clinical needs, rather than started without a clear understanding of the medical challenge. Such a change in strategy, supported by the experience gained during the last decades, should allow either identifying the most microwave-friendly imaging configurations of confirmed clinical relevance, or possibly opening the door to other non-imaging microwave-based diagnostic modalities. An accurate and early identification of an application is crucial for reducing the research and development effort and its related cost. In addition, it should allow quantifying the effective market whose knowledge is necessary to translating the “clinical-pull” in a “market-pull” approach, a key issue as soon as investment considerations come on the stage. Finally, to summarize the situation, the conclusion could be that, at the moment, it is probably an industrial investment whose microwave imaging has the greatest need to consolidate its clinical acceptance.

Keynote Speech – Tuesday Morning September 22

TK1-2, 09:50 – 10:40

Paradigm shifting innovations move microwave breast tomography closer to clinical relevance



Prof. Paul M. Meaney

Thayer School of Engineering at Dartmouth College, USA

Microwave tomography has been discussed and studied for multiple decades with only minimal penetration into the clinic – primarily for breast cancer imaging. Most studies have stalled at the simulation phase and have been thwarted by problems including massively excessive computation times, debilitating multi-path signals and unwieldy system configurations requiring large coupling baths and many, expensive antennas and measurement channels. In contrast, we have developed a synergistic concept that incorporates seemingly counterintuitive designs which directly address these demanding challenges. For instance, while our monopole antennas in conjunction with a very lossy coupling bath can appear as poor choices for this application, they actually prove radically beneficial in terms of shrinking the bath size, reducing the number of antennas and dramatically reducing the computation time. Most importantly, our imaging algorithm is no longer prone to convergence to unwanted, local minima solutions which would only be exasperating in any clinical environment. These advances have allowed us to make considerable advances in the clinic. We have performed well over 500 patient exams for a number of indications including exams in a diagnostic setting as well as for monitoring tumor progression during neoadjuvant chemotherapy. We are also the first team to integrate a microwave imaging device within an MR system for simultaneous imaging which exploits the exquisite spatial resolution of MR and the excellent specificity of the recovered microwave dielectric property maps. This paper will provide a short summary of the history of our system development and focus on the more recent chemotherapy monitoring studies with a short discussion exploring other applications.

Keynote Speech –Tuesday Afternoon September 22

Keynote Speech 4 (14:00-16:30) [TK2](#)

Chair: Prof. Hiroyuki Arai, Yokohama National University, Japan

Room: 1001 10F

- 14:00-14:50 **Noncontact Vital Sign Detection Using Microwave Radar: Applications in Biology, Medicine, and Beyond**
Prof. Jenshan Lin
University of Florida, Gainesville, Florida, USA
- 14:50-15:40 **Implantable Wireless Medical Devices and Systems**
Prof. Jung-Chih Chiao
University of Texas at Arlington, USA
- 16:00-16:50 **WBAN Circuits and Systems**
Prof. Hoi-Jun Yoo
Korea Advanced Institute of Science and Technology, Korea

Keynote Speech –Tuesday Afternoon September 22

TK2-1, 14:00 – 14:50

Noncontact Vital Sign Detection Using Microwave Radar: Applications in Biology, Medicine, and Beyond



Prof. Jenshan Lin

University of Florida, Gainesville, Florida, USA

Microwave radars have been used in many applications covering long distance (e.g., Doppler weather radar and airplane radar) to short distance (e.g., automobile radar and motion-sensing security radar). Stimulated by successful demonstrations of new system architectures and detection methods from many research groups, recently a new interest of detecting personal vital signs emerged. In the near future, personal radar integrated in smartphone might no longer be science fiction. In this talk, I will review different vital sign radars and their detection methods, and describe how the simple single-tone continuous wave (CW) radar can detect very small cardiorespiratory movements without being affected by the high $1/f$ noise in electronic circuits. Several examples of handheld low-power micro-radars will be presented, and recent improvements to enhance the accuracy and shorten the acquisition time in real-time measurement will be described. A nonlinear Doppler phase demodulation technique that enables simultaneous measurement of frequency and displacement of both respiration and heartbeat movements will be presented. Last but not the least, I will also discuss the various applications including emergency rescue, human and animal healthcare, biology, and biometrics.

Keynote Speech –Tuesday Afternoon September 22

TK2-2, 14:50 – 15:40

Implantable and Wearable Wireless Medical Devices and Systems



Prof. Jung-Chih Chiao

University of Texas at Arlington, USA

Wireless technologies bring promising solutions to many quality and cost issues in healthcare. Low-cost portable wireless electronics have made significant impacts to our societies. Recent advances in micro- and nano-technologies provide unique interfacing functionalities to human tissues. Advantages from miniaturization and low power consumption enable novel applications in medicine and biological studies. Quantitative measurement and documentation of behavior, physiological and biochemical parameters present more accurate assessment of patients. The interfaces also provide direct control or modification of cells, tissues, or organs by the electrical circuits making it possible to manage chronic diseases with a closed loop between biological objects and computers. With wireless communication, implantable and wearable devices and systems make the interfacing possible for freely behaving animals or patients without constraints, discomfort or limits in mobility. This increases diagnosis accuracy in realistic environments as well as permits remote synthesis of physiological functions and delivery of therapeutic treatment. Wireless communication enables networking for ubiquitous access to physiological information at various system levels either within one's body or within a group of patients for better deterministic and statistical understanding of issues in complex systems.

The talk discusses the development of wireless micro devices and systems for clinical applications. The systems are based on technology platforms such as wireless energy transfer for batteryless implants, miniature electrochemical sensors, nanoparticle modified surfaces, microelectromechanical system devices and microwave communication. In this talk, several implantable and wearable wireless diagnosis and therapeutic treatment systems will be discussed. These applications enable new medicines to improve human welfare and assist better living.

Keynote Speech –Tuesday Afternoon September 22

TK2-3, 16:00 – 16:50

WBAN Circuits and Systems



Prof. Hoi-Jun Yoo

Korea Advanced Institute of Science and Technology, Korea

Recently, wireless body area network (WBAN) is getting more and more attention in the emerging portable applications which combines healthcare and consumer electronics working around the human body. The major design challenge associated with the WBAN is to extend the lifetime of the WBAN devices under limited energy source. Since the most power hungry IP in the electronic portable devices is the wireless communication, the low power communication PHY becomes essential. Compared with the antenna based communication including narrow band (NB) PHY or ultra-wide-band (UWB) PHY, body channel communication (BCC) which uses the human body as a communication channel is considered as a power-efficient wireless communication solution of the WBAN because high conductivity of the human body in a low frequency band enables low power communication. In addition, BCC has the lower signal loss through the communication because it is not affected by the body shadowing effect which largely increases the signal loss to the NB or UWB. Since the BCC was firstly presented in 1995, a variety of power efficient BCC transceivers have been presented, and eventually 2012, the BCC was included in IEEE 802.15.6 which is for WBAN.

In this presentation, we prepare two parts: First one is about low-power BCC transceiver design. More than seven BCC transceivers which were presented in ISSCC and several Journals will be explained with its subjects and circuit design techniques. Also, the body channel analysis will be included to help attendees understand. Second, the application SoCs with BCC transceivers will be introduced. Several healthcare SoCs adopted the BCC transceivers for wireless communication due to its low power consumption, and those SoCs will be explained in detail. Through this presentation, we can discuss the use of BCC transceivers and its future applications.

Keynote Speech –Wednesday Morning September 23

Keynote Speech 5 (09:00-10:40) [WK1](#)

Chair: Prof. Hsien-Chin Chiu Chang Gung University, Taiwan

Room: 1002 10F

- 09:00 – 09:50 **Diagnosis of Human Skin Lesions (Cancer and Burns) Using High-Frequency Techniques**
– A Review
Prof. Reza Zoughi,
Missouri University of Science and Technology, USA
- 09:50-10:40 **New Frontiers in Terahertz Technology**
Prof. Mona Jarrahi
University of California at Los Angeles, USA

Keynote Speech –Wednesday Morning September 23

WK1-1, 09:00 – 09:50

Diagnosis of Human Skin Lesions (Cancer and Burns) Using High-Frequency Techniques –

A Review



Prof. Reza Zoughi

Missouri University of Science and Technology, USA

According to the American Cancer Society (ACS) “Cancer of the skin is by far the most common of all cancers. Melanoma accounts for less than 2% of skin cancers cases but causes a large majority of skin cancer deaths”. The ACS estimates that in 2014 in the United States about 76,100 new cases of melanoma will have been diagnosed and approximately 9,710 people are expected to die from melanoma. If diagnosed in their early stages, 95% skin cancers are curable. Visual inspection using size, shape, color, border irregularities, ulceration, tendency to bleed and whether the lesion is raised, hard or tender are common approaches to diagnosis. Visual inspection is subjective and susceptible to human error. Malignant skin tumors have different biological properties than the surrounding healthy skin, which enables distinction between these two types of skin using a proper inspection technique. A noninvasive method producing reliable and real-time information about a suspected skin malignancy, that enables dermatologists to obtain a real-time diagnosis of the likelihood of a lesion being cancerous, would be of great clinical and diagnostic value. Burn injury represents a wide range of tissue damage. The classification and treatment of thermal injuries are determined based on the depth of invasion into the underlying tissue. The postoperative management of skin and skin-substitute grafts is complicated by the need to stabilize the grafts with dressings, which introduces some limitations for readily removing it to monitor the grafted wound for correctible problems. When it comes to burned skin, comprehensive diagnosis refers to detection as well as evaluation of critical parameters, the most critical of which is the depth of invasion. A diagnostic tool allowing for real-time qualitative and quantitative evaluation of a burn through desiccated skin or optically-opaque dressings represents a significant addition to the medical toolbox used by physicians and first responders caring for burned patients. Microwave and millimeter wave signals (~300 MHz - 300 GHz) are non-ionizing and can readily interact with human skin and respond to changes in its properties. This interaction is dependent upon the biophysical (i.e., dielectric and thickness) properties of skin, as well as electromagnetic parameters such as the frequency of operation and specific characteristics of the probe used. There are several technical and practical beneficial features that make high-frequency evaluation of human skin quite attractive as a potential medical diagnostics tool. A historical and technical review of high-frequency inspection techniques, used for evaluating skin cancer and burned skin, will be presented. Issues related to technical advances in developing real-time imaging systems as well as the potential future possibilities in this realm will be presented.

Keynote Speech –Wednesday Morning September 23

WK1-2, 09:50 – 10:40

New Frontiers in Terahertz Technology



Prof. Mona Jarrahi

University of California at Los Angeles, USA

Although unique potentials of terahertz waves for chemical identification, material characterization, biological sensing, and medical imaging have been recognized for quite a while, the relatively poor performance, higher costs, and bulky nature of current terahertz systems continue to impede their deployment in field settings. In this talk, I will describe some of our recent results on developing fundamentally new terahertz electronic/optoelectronic components and imaging/spectrometry architectures to mitigate performance limitations of existing terahertz systems. In specific, I will introduce new designs of high-performance photoconductive terahertz sources that utilize plasmonic antennas to offer terahertz radiation at record-high power levels of several milliwatts – demonstrating more than three orders of magnitude increase compared to the state of the art. I will describe that the unique capabilities of these plasmonic antennas can be further extended to develop terahertz detectors and heterodyne spectrometers with single-photon detection sensitivities over a broad terahertz bandwidth at room temperatures, which has not been possible through existing technologies. To achieve this significant performance improvement, plasmonic antennas and device architectures are optimized for operation at telecommunication wavelengths, where very high power, narrow linewidth, wavelength tunable, compact and cost-effective optical sources are commercially available. Therefore, our results pave the way to compact and low-cost terahertz sources, detectors, and spectrometers that could offer numerous opportunities for e.g., medical imaging and diagnostics, atmospheric sensing, pharmaceutical quality control, and security screening systems. And finally, I will briefly highlight our research activities on development of new types of high-performance terahertz passive components (e.g., modulators, tunable filters, and beam deflectors) based on novel reconfigurable meta-films.

Keynote Speech –Wednesday Afternoon September 23

Keynote Speech 4 (14:00-15:40) [WK2](#)

Chair: Prof. Ruey-Bing Hwang, National Chiao Tung University, Taiwan

Room: 1002 10F

- 14:00-14:50 **Telemedicine and structured patient support program in cardiovascular care: a single medical center experience in Taiwan**
Dr. Yen-Wen Wu
Far Eastern Memorial Hospital, New Taipei City, Taiwan
- 14:50-15:40 **Modern Healthcare Systems Relying on Advances in Wireless Antenna Technology:
At no Times in History have Antennas come so close to the Humans!**
Prof. Yahya Rahmat-Samii
University of California at Los Angeles, USA, USA

Keynote Speech –Wednesday Afternoon September 23

WK2-1, 14:00-14:50

Telemedicine and structured patient support program in cardiovascular care: a single medical center experience in Taiwan



Prof. Yen-Wen Wu

Far Eastern Memorial Hospital, New Taipei City, Taiwan

Cardiovascular disease remains a significant chronic healthcare problem in this century, with considerable associated economic and quality-of-life challenges worldwide and in Taiwan. Telehealth technologies provide opportunities to meet the rapidly growing needs of consumers and healthcare practitioners. However, the effectiveness of telemedicine depends on patients' ability to adhere to schedules of case management. In addition, many in need of services have limited access to high-end technologies. In order to provide comprehensive medical care and improve the post-discharge care quality, we initiated a patient support program during hospitalization in patients after acute myocardial infarction (AMI) or heart failure (HF) since January 2014 in the cardiovascular medical center of Far Eastern Memorial Hospital. Under participating physicians' supervision, health educators provide initial face to face health education 1-2 days before the discharge. The telemedicine, "Health+" App system developed by Far EasTone Telecommunications Co. Ltd is incorporated after patients agreed. After the discharge, the case managers periodically assess the clinical conditions (including the symptoms related to sodium and fluid intake, physical activity), medication and adherence, and also remind the follow-up by phone. Patients or family could consult by phone in the working hours. Between January 2014 and The January 2015, service fee of first month was supported by the research projects of Far Eastern Memorial Hospital (FEMH-2013-HHC-002, FEMH-2014-HHC-002). Patients could continue the service thereafter. In order to evaluate the acceptability and satisfaction of the telehealth technologies among cardiac patients, the patient satisfaction was scored from 1 (very unsatisfied) to 5 (very satisfied) after the end of the first month. The reasons to decline the extended service were also analyzed. A total 533 participants were enrolled in the first year. Half (53%) were 50 - 70 year-old, and 34% had smart phones. Six subjects (1.13%) expired within 1 month and were excluded for subsequent analysis. Patient interviews indicated that telephone follow-up was helpful and the App system was acceptable to patients and their families. The majority of patients were very (28%) or satisfied (53%) the service. However, a quantity of elderly patients had difficulties to use smart phone. The utilization rate of App function was low. Most patients agreed the 1-month service was good and helpful, but only 35 extended the service (6.6%), and 15 (42%) declined App function. The most common reason to decline the extended service was good self-care/family support (56.5%). 15 % subjects questioned about value or refuse for personal economic concerns. In conclusion, the cardiac patient support program demonstrated good acceptance and satisfaction. However, high-end technologies posed significant barrier, especially in elderly patients. Although the telemedicine-enabled patient centered care approach, there is substantial room for improvement, such as friendly designed user interfaces and cost. Working closely with government and industry, it is possible for us to develop a system to support the use of this technology in the clinical practice and to expand application to patient education and continuing medical education.

Keynote Speech –Wednesday Afternoon September 23

WK2-2, 14:50-15:40

Modern Healthcare Systems Relying on Advances in Wireless Antenna Technology:

At no Times in History have Antennas come so close to the Humans!



Prof. Yahya Rahmat-Samii

University of California at Los Angeles, USA

In my previous plenary talks I conjectured, “The next big paradigm in health care systems will be connecting patients to their doctors and hospitals at any time, any location and with any amount of monitoring and diagnostics data”. We are now in the midst of this new paradigm to becoming a reality. Global research organizations, including academia, and giant health care companies are spending huge amount of money in making this next big dream of mankind to become a household reality. History has shown that it typically takes about a quarter of century to bring any out-to-the-box ideas into the mainstream. The current pace that wireless health care systems are advancing should certainly fulfil this quarter of century projection. Perhaps Einstein’s quotation, namely, “If at first an idea does not sound absurd then there is no hope for it”, fits this emerging paradigm very well.

Broadly speaking, one may categorize the research efforts in wireless healthcare arena into three complimentary areas: (a) Patient diagnostics and sensing, (b) Patient connectivity and identification, and (c) Patient monitoring and compliance. Each of these areas requires tailored electronics and most importantly customized and body compatible low profile, flexible, on body and in body antenna designs. This plenary talk will address many fascinating aspects of customized antenna designs addressing all the three mentioned categories. Attempts will be made to highlight the fundamental design aspects of these classes of antennas including human interactions, simulation techniques, performance characterizations, representative examples from RFID, wearables, implantables, all the way to brain machine interfaces. Unique challenges and future outlook of wireless healthcare will be discussed.

ORAL SESSION

Oral Session-Monday Morning September 21-11:20-13:00

Date September 21 (MON)
Room Room1002,10F
Session [MA1](#)
Session Wearable Devices and Body-Centric Communications(1)
Topic
Chair Prof. Chi-Fang Huang
Co-Chair Prof. Zhihua Wang

MA1-1 On the Development of Magnetic Induction Heating for Hyperthermia and Ablation of Tumors (invited)

1120-1140 C. Huang, Tatung University, Taipei, Taiwan

MA1-2 A Coplanar Waveguide Printed-IFA for Biotelemetry Device Aimed at Body Centric Wireless Communication Applications

1140-1200 B. Basari, F. Y. Zulkifli, E. T. Rahardjo, Universitas Indonesia, Depok, Indonesia

MA1-3 79pJ/b 80Mb/s Full-duplex Transceiver and 42.5uW 100kb/s super-regenerative Transceiver for Body Channel Communication

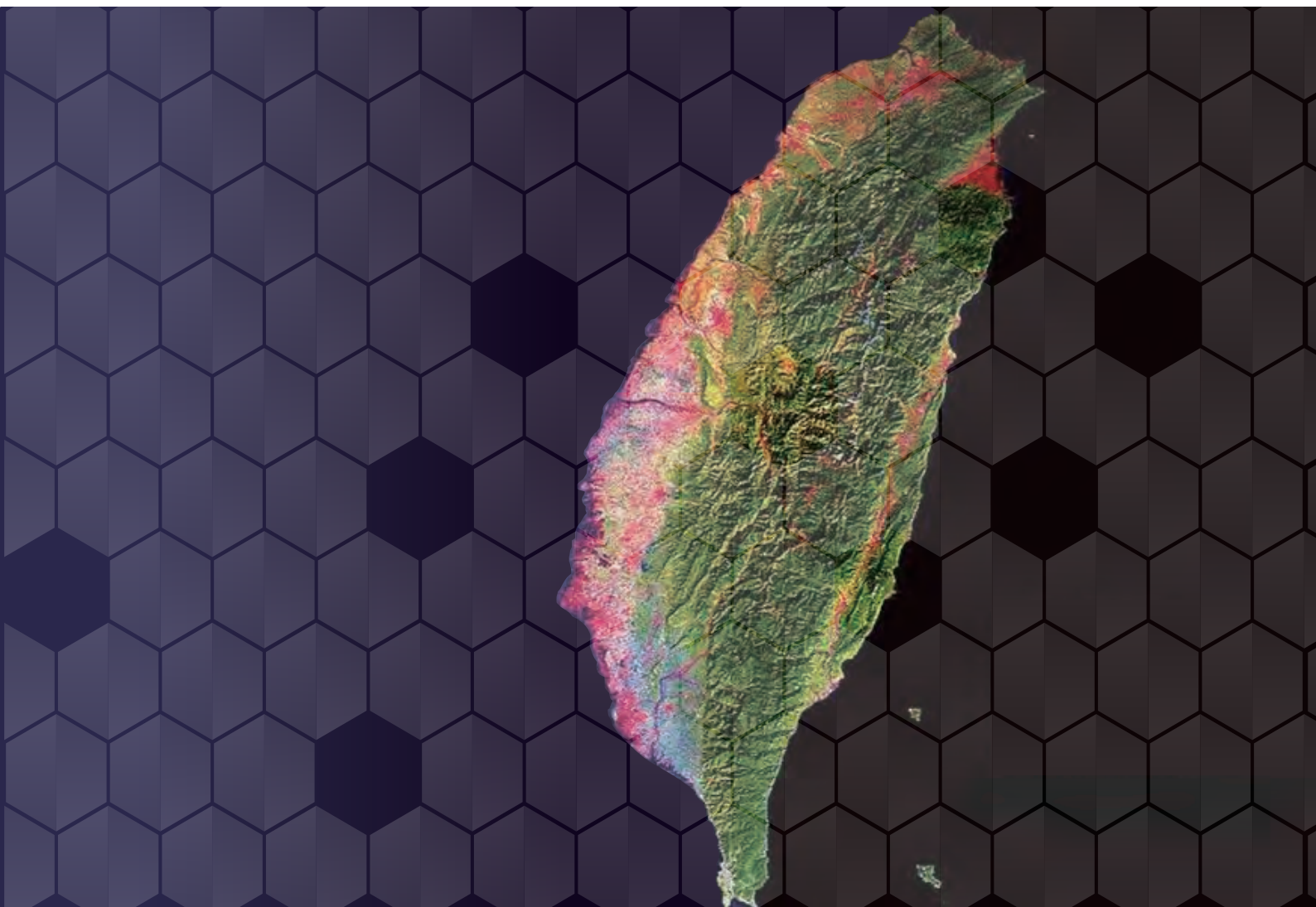
1200-1220 H. Cho, H. Kim, M. Kim, J. Jang, H. Yoo, KAIST, Daejeon, Republic of Korea

MA1-4 Developing Innovation - Wireless Transceiver Design for Implantable Medical Devices (invited)

1220-1240 Z. Wang, H. Jiang, Tsinghua University, Beijing, China

MA1-5 A Shielded On-Body Dielectric Resonator Antenna for Body-Centric Communication

1240-1300 H. Memarzadeh-Tehran¹, R. Abhari², ¹University of Tehran, Tehran, Iran, ²Santa Clara University, Santa Clara, United States



科技報



NAR Labs 國家實驗研究院
儀器科技研究中心
Instrument Technology Research Center

遠東關係企業
暨 徐有庠先生紀念基金會