

2022 IEEE International Symposium on
Radio-Frequency Integration Technology
August 29 – 31, 2022 • Busan Korea • www.RFIT2022.org

Program Booklet

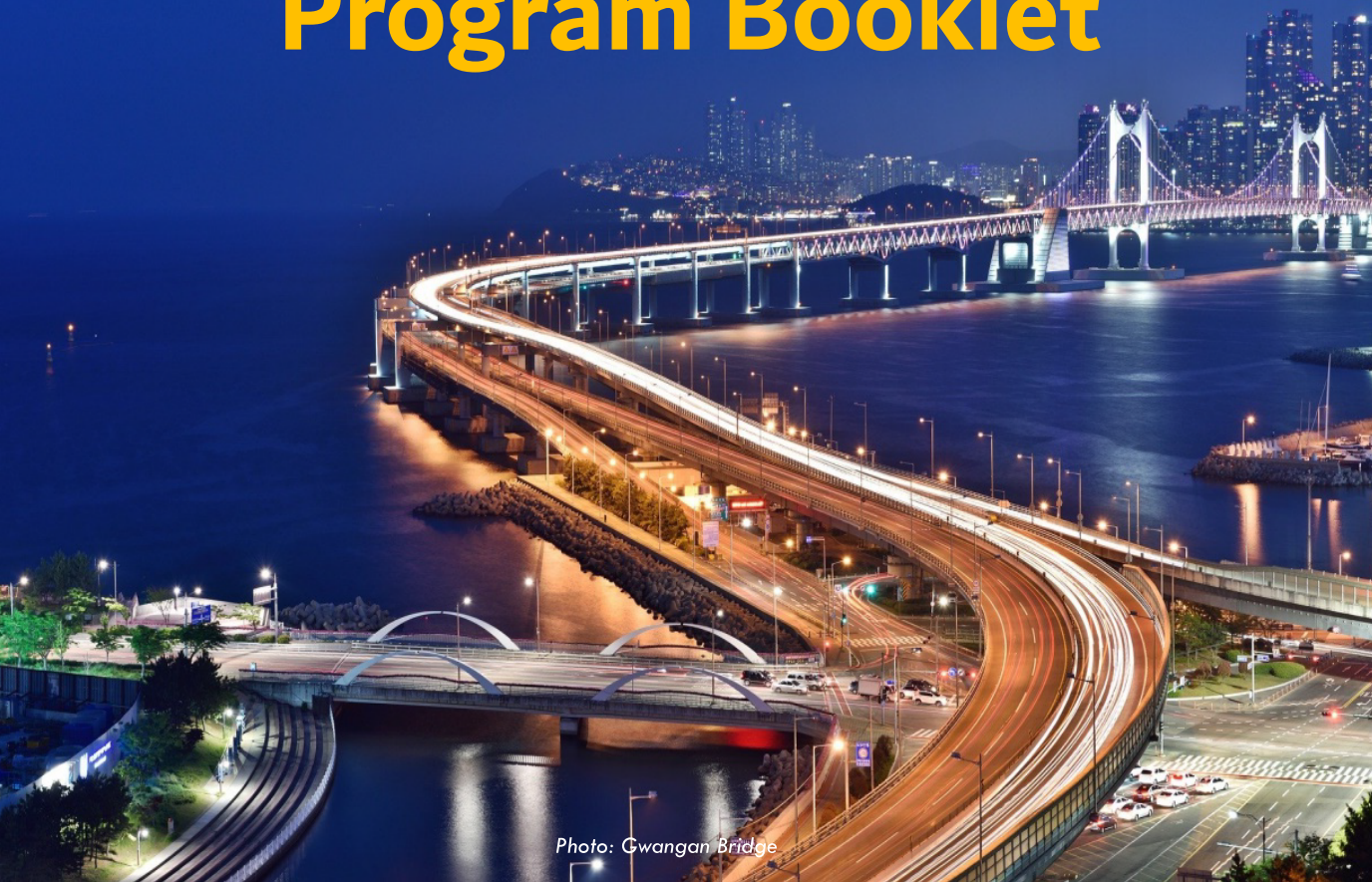


Photo: Gwangan Bridge





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Program at a Glance

D-1, Monday, August 29	
Room Time	Forum 1
	M1W Workshop: mm-wave/THz Integrated Beamforming Technologies
09:30 - 10:10	M1W.1: Prof. Kenichi Okada
10:10 - 10:50	M1W.2: Dr. Aoki Yuuichi
10:50 - 11:10	Break
11:10 - 11:50	M1W.3: Prof. Jungsuek Oh
11:50 - 12:30	M1W.4: Dr. Jinseok Park
12:30 - 13:30	Lunch @ Cafeteria (2F)
	M2W Workshop: RF Technologies for Emerging Biomedical Applications
13:30 - 14:10	M2W.1: Prof. Kaiyuan Yang
14:10 - 14:50	M2W.2: Prof. Joonsung Bae
14:50 - 15:10	Break
15:10 - 15:50	M2W.3: Dr. Minyoung Song
15:50 - 16:30	M2W.4: Prof. Taekwang Jang
17:00 - 18:00	Welcome Reception @ Vernazza

Exhibition

Program at a Glance

D-2, Tuesday, August 30		
Room Time	Forum 1	Vernazza
09:00 - 10:20	T1A Microwave/mm-Wave Frequency Synthesis	T1B Power Amplifiers for 5G Applications
10:20 - 10:40	Break	
10:40 - 10:50	Opening Ceremony	
10:50 - 11:30	T2P.1 Plenary Talk 1: Prof. Mark Rodwell	
11:30 - 12:10	T2P.2 Plenary Talk 2: Prof. Songcheol Hong	
12:10 - 13:30	Lunch @ Cafeteria (2F)	
13:30 - 15:10	T3A mm-Wave/THz Building Blocks	T3B Advanced Circuit and System Designs
15:10 - 16:20	T4F Interactive Forum	RFIT Student Paper Competition
16:20 - 18:00	T5A Technologies for mm-wave/THz Circuits and Systems	T5B Wireless Power Transfer and Power Management
18:30 - 20:30	Banquet @ Monterosso (B1)	

Exhibition

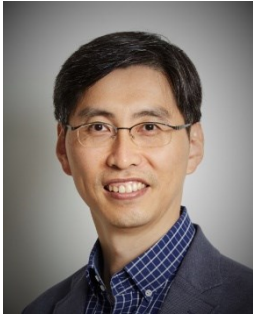
D-3, Wednesday, August 31		
Room Time	Forum 1	Vernazza
09:00 - 10:20	W1A mm-Wave/THz Signal Generation	W1B Antennas and Metasurfaces
10:20 - 10:40	Break	
10:40 - 12:00	W2A Advanced Power Amplifier Designs	W2B Passive Components
12:00 - 13:30	Lunch @ Cafeteria (2F)	
13:30 - 15:10	W3A Advanced mm-Wave/THz Circuit Design Techniques	W3B Emerging Technologies, Circuits, Systems, and Applications
15:10 - 15:30	Break	
15:30 - 17:10	W4A mm-Wave/THz Systems and Applications	W4B Radar and Imaging
17:10 - 17:20	Closing	

Exhibition



Welcome Messages

Greetings from the General Chair



On behalf of the organizing committee, I would like to welcome you to the 2022 IEEE International Symposium on Radio-Frequency Integration Technology (RFIT 2022), which will be held on August 29 – 31, 2022, in Busan, Korea. By the time you read this greeting message, the conference should be ready to start or has already started, for which the organizing committee has been working hard for the past few years. Looking back, RFIT had its inaugural meeting on 2005 in Singapore and became an IEEE conference sponsored by the MTT Society from its 6th conference that was held in Hefei, China, in 2014. Since then, five countries – China, Japan, Taiwan, Korea, and Australia – have been taking turns to host the conference, which has developed into an established major event stationed in Asia that covers a wide range of exciting topics surrounding RF engineering. This year marks the 14th meeting in the series, which is also the second RFIT event Korea hosts, after the 9th meeting held in Seoul in 2017.

The past two RFIT meetings were affected by COVID-19, leading to a hybrid conference in Hiroshima, Japan (2020) and a fully online event in Taiwan (2021). The organizing committee of RFIT 2022 had initially hoped to see the pandemic to be over well before the conference, but it turned out to be more persistent than expected and still lasts. Hence, it was decided this year's conference will be again held in a hybrid format. The past couple of years, however, have witnessed great advances in operating techniques for virtual or hybrid meetings. RFIT 2022 will be conveniently accessed by both online and offline attendees through a tool developed for this purpose. For this reason, you may expect the conference will fully serve its original purpose of exchanging technical ideas as well as developing human networks.

Busan is the 2nd largest city and also the largest port in Korea. It is full of attractions that you may enjoy in addition to the exciting technical sessions offered by RFIT 2022. I would like to take this opportunity to appreciate the great efforts generously provided by the organizing committee as well as technical program committee members. I hope all the attendees, both online and offline, will find this year's program a great technical resource that will help develop their expertise in respective research fields.

Jae-Sung Rieh
RFIT 2022 General Chair
Korea University



Welcome Messages

Greetings from the Technical Program Chair and Co-Chair



On behalf of the RFIT 2022 Technical Program Committee (TPC), we would like to thank all the authors for sharing their excellent research results with RFIT 2022. With those contributions, we could prepare an exciting 3-day program for the symposium. The first day of the symposium is filled with two workshops on “mm-Wave/THz Integrated Beamforming Technologies” and “RF Technologies for Emerging Biomedical Applications,” which will provide comprehensive overviews of these interesting topics. During the following two days, technical papers, both invited and contributed, will be presented. A total of 95 papers, which were carefully selected by 69 TPC members out of 108 submissions from 12 countries, will be presented over 15 technical sessions, including one poster session. On the second day, we will have two plenary talks, “100-300GHz MIMO Communications: Transistors, ICs, Arrays, and Systems” by Prof. Mark Rodwell from the University of California, Santa Barbara, USA, and “Subarray Hybrid Beamforming Front-End ICs for Millimeter-Wave Communication and High-Resolution Sensing” by Prof. Songcheol Hong from KAIST, Korea. In addition, RFIT Paper Awards will be presented to the authors of the three best papers presented in the symposium, and the Student Paper Competition (SPC) will take place, for which 11 student finalists will compete for the three final winners.

We would like to take this opportunity to thank all the TPC members and subcommittee chairs for their valuable time and effort that has been so generously contributed to the creation of a great technical program and also thank the session chairs who will facilitate the sessions during the symposium. We sincerely hope all the attendees will find the technical program we prepared informative and useful.

Sincerely yours,

Minkyu Je
RFIT 2022 TPC Chair
KAIST, Korea

Ho-Jin Song
RFIT 2022 TPC Co-Chair
POSTECH, Korea



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Co-chair Ahmed Ahmed, Cairo University, Egypt
Ali Farid, Intel Research, USA
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Makoto Takamiya, University of Tokyo, Japan
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Tae Wook Kim, Yonsei University, Korea
Ho-Jin Song, POSTECH, Korea

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- Chair** Myounggon Kang, Korea National University of Transportation, Korea
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Ickhyun Song, Hanyang University, Korea
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- Korean Federation of Science and Technology Societies
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- Korea University
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General Information

Hybrid Format

RFIT 2022 will be in a hybrid mode, consisting of both on-site and online sessions. All the sessions will have live presentations and answer questions on Webex. On-site and online speakers are requested to attend their live sessions 10 minutes before their sessions. Speakers are also expected to answer the questions that attendees pose to them asynchronously via the Comments box on InfoVaya. All presentation materials will be available on the Cloud Platform InfoVaya. Speakers have already uploaded their presentation materials on InfoVaya.

COVID-19 Safety Guideline

Overseas travellers need to have negative COVID-19 PCR test result certificate within 3 days or Rapid Antigen Test (RAT) result within 1 days for boarding. They need to enter related information and obtain a QR code. They are also required to have an additional test (PCR) within 1 days after arrival at airport or near the place of stay. (Released on August 1, 2022)

Symposium Venue

RFIT 2022 will be held at Forum 1 and Vernazza on the 3rd floor of Hanwha Resorts Haeundae, Busan. See the floor map.

Registration Information

On-site registration will be open from 8:30 am to 6:00 pm from Monday to Wednesday, 29 - 31 August at the lobby of the 3rd floor of the hotel.

Exhibition

Exhibition will be open from 9 am to 6 pm at the lobby of the 3rd floor of the hotel during the Symposium.

Green MICE Compliance

RFIT 2022 Organizers will comply with the Green MICE Guidance (ISO20121: Event Sustainability Management System) that makes the symposium more sustainable and less impact on global environment. Accordingly, we will offer you electronic distribution of materials (proceedings, final program book, receipt, or a certificate of attendance), reusable badge, and tap water instead of plastic bottles. Attendees are encouraged to use public transport.

Symposium Dates, Times, and Language

Symposium dates and times are based on Korean time (GMT+9). Please note that Korea is 14 hours ahead of the Eastern Standard Time (EST). The official spoken language is English. Translation service is not provided.

Plenary Session

T2P.1: Plenary Speech
Tuesday 30-Aug, 10:50 - 11:30, Room: Forum 1

Chair: Minkyu Je, KAIST

100-300GHz MIMO Communications: Transistors, ICs, Arrays, and Systems



Prof. Mark Rodwell, USCB, USA

Abstract: 100-300GHz wireless systems can provide very high data rates per signal beam, and, given the short wavelengths, even compact arrays can contain many elements, permitting massive spatial multiplexing for further increased capacity. We will describe the underlying transistor technology, plus ICs, modules, and system design of 140 GHz massive MIMO wireless hubs and 210 GHz and 280 GHz MIMO backhaul links. (Authors: Mark Rodwell¹, Ali A. Farid¹, A. S. H. Ahmed¹, M. Seo², U. Soyulu¹, A. Alizadeh¹, N. Hosseinzadeh¹, S. Lee¹, ¹University of California, Santa Barbara, ²Sungkyunkwan University)

Biography: Mark Rodwell holds the Doluca Family Endowed Chair in Electrical and Computer Engineering at UCSB and directs the SRC/DARPA ComSenTer Wireless Research Center. His research group develops high-frequency transistors, ICs and communications systems. He and his collaborators received the 2010 IEEE Sarnoff Award, the 2012 Marconi Prize Paper Award, the 1997 IEEE Microwave Prize, the 2009 IEEE IPRM Conference Award, and the 1998 European Microwave Conference Microwave Prize.

Plenary Session

T2P.2: Plenary Speech
 Tuesday 30-Aug, 11:30 - 12:10, Room: Forum 1

Chair: Ho-Jin Song, POSTECH

Subarray hybrid beamforming front-end ICs for millimeter-wave communications and high resolution sensings



Prof. Songcheol Hong, KAIST, Korea

Abstract: Millimeter-wave 5G wireless communication adopts a subarray hybrid beamforming structure in the base stations, since it provides a simple front-end structure to drive many antenna arrays. It is also expected to be used in millimeter wave B5G and 6G communications more actively because the simpler structure is necessary in the higher frequencies. Especially, the need of joint communication and sensing (JCAS) in B5G communications causes the structure become very important to support many antenna arrays efficiently. Since it is basically consisted of several RF beamforming structures, many RF beamforming ICs are used to implement the hybrid beamforming front-end.

In this talk, it will be explained why the hybrid front-end structure with several RF beamforming ICs is the simplest and widely used compared to the other ones. The beamformer ICs with the key RF subcircuits, such as a power amplifier, a low noise amplifier, a phase shifter, a variable gain amplifier will be presented for millimeter-wave 5G communication. Especially the beamforming phase shifters in the ICs are presented and compared for B5G communications. A high angular resolution MIMO radar structure with the phased subarray antennas is also introduced, which might be used for JCAS in B5G and 6G communications.

Biography: He received the B.S and M.S degrees in Electronics Engineering from Seoul National University in 1982 and 1984, respectively and the Ph.D degrees in Electrical Engineering and Computer Science from the University of Michigan in 1989. He is currently a Professor in the School of Electrical Engineering at the KAIST (Korea Advanced Institute of Science and Technology) and KT-chaired professor. He received Qualcomm Faculty Award 2019. He visited EECS Department of Stanford University as a visiting professor in 1997. He worked with Samsung Microwave Semiconductor in Milpitas, CA. He served as a dean of research affairs and a director of KI-IT convergence in KAIST. He is currently a director of millimeter wave radar-communication research center (MiraCom-RC) supported by Korean government. He is currently a member of IEEE, NAEK, KIEES and KITE. He has served as a board member of Techno-park of Daejeon Metropolitan city for 15 years. He served as general chair of RFIT 2017 supported by IEEE and TPC chairs of APMC 2013 and GSMM 2014. He published more than 300 technical papers and 150 patents. He is currently interested in RFICs and especially in millimeter wave Front-end ICs for 5G communications and intelligent high resolution radars.

Workshops

Workshop 1: mm-wave/THz Integrated Beamforming Technologies

Monday, 29-Aug, 09:30 – 10:10, Room: Forum 1

Chairs: Sanggeun Jeon, Korea University

Minkyu Je, KAIST

M1W.1: Bi-Directional Doherty Phased-Array Transceiver for 5G and Beyond



Prof. Kenichi Okada, Tokyo Institute of Technology, Japan

Abstract: In this presentation, a 39-GHz CMOS phased-array beamformer with the bi-directional Doherty PA-LNA will be presented. A compact layout design and DPD is required for applying Doherty frontend to the phased array. The DPD is effective for improving linearity while it suffers from PVT variation over the array elements. An inter-element mismatch compensation technique is introduced for improving the shared-LUT DPD performance over the PVT variations. A implementation results using 65nm CMOS will be introduced.

Biography: Prof. Kenichi Okada received the B.E., M.E., and Ph.D. degrees from Kyoto University, Kyoto, Japan, in 1998, 2000, and 2003, respectively. He joined Tokyo Institute of Technology in 2003, and he is now Professor. He has authored and co-authored more than 500 journal and conference papers. His current research interests include millimeter-wave/terahertz wireless transceiver, digital PLL, and ultra-low-power RF circuits. He has worked as a TPC member of ISSCC, VLSI Circuits, and ESSCIRC, RFIC Symposium, A-SSCC, Guest Editors and Associate Editor of JSSC and T-MTT, a Distinguished Lecturer of SSCS.

Workshops

Workshop 1: mm-wave/THz Integrated Beamforming Technologies

Monday, 29-Aug, 10:10 – 10:50, Room: Forum 1

Chairs: Sanggeun Jeon, Korea University

Minkyu Je, KAIST

M1W.2: Fast simultaneous calibration of integrated phased-array systems for 5G mm-Wave base station



Dr. Aoki Yuuichi, Samsung Electronics, Korea

Abstract: The 5G network introduces the new frequency bands in millimeter-wave (mmWave) frequency. The short wavelength of mmWave allows the use of the phased-array antenna (PAA), which allocates a large number of antenna elements in a small area. PAA steers the direction of the beam in a real time by changing the phase electrically and creates a directional beam focusing onto a specific user device. Recent commercial mmWave base stations have more than 1000 antenna elements and they need a calibration to obtain optimum array performance. Therefore, the allowable calibration time per antenna is very short. In this lecture, a fast PAA calibration using

an orthogonal code is introduced. The method can characterize all the array element simultaneously in a short time of measurement. Also, solutions to issues, e.g., the first row issue of Hadamard matrix, GPS synchronization issue, and a build-in-self-test configuration will be presented.

Biography: Yuuichi Aoki received the B.S. degree in electrical and computer engineering from Kanazawa University, Ishikawa, Japan, in 1996, and the M.S. degree in electrical and electronic engineering from Tokyo Institute of Technology, Tokyo, Japan, in 1998. He joined System Devices Research Laboratories of NEC Corporation in 1998 where he had been engaged in research and development of RFICs for wireless communications. He was an industrial resident in IMEC in 2005. He joined Communications Research Team of Samsung Electronics in 2011 where he is currently a principal engineer of Modem R&D group and has been engaged in research and development of RF and mmWave systems for 5G mobile communications. He has 20+ years of research experience and is a senior member of IEEE.

Workshops

Workshop 1: mm-wave/THz Integrated Beamforming Technologies

Monday, 29-Aug, 11:10 – 11:50, Room: Forum 1

Chairs: Sanggeun Jeon, Korea University

Minkyu Je, KAIST

M1W.3: mmWave Metasurface-in-Package (MiP) for Spatially Tailored 5G/6G Connectivity



Prof. Jungsuek Oh, Seoul National University, Korea

Abstract: In the advanced 5G/6G communications, extreme wide bandwidth and RF energy-efficient connectivity is expected to survive under the harsh conditions of considerable channel attenuation and components/packaging losses. Accordingly, the range of the dominant connectivity technology in the commercialization domain is being extended from the conventional stochastic channel establishment and guided-wave based antenna packages to Metasurface and reconfigurable intelligent surface(RIS) based spatially tailored channel establishment and antenna packages.

In this talk, background/motivation and concept of the mmWave Metasurfaces for 5G/6G communications will be introduced in terms of both component and system aspects.

Then, several design examples and corresponding simulation/measurement results will be presented with the practical considerations such as fabrication process and integration scenarios.

Biography: Jungsuek Oh received his B.S. and M.S. degrees from Seoul National University, Korea, in 2002 and 2007, respectively, and a Ph.D. degree from the University of Michigan at Ann Arbor in 2012. From 2013 to 2015, he was a staff RF engineer with Samsung Research America, Dallas, working as a project leader for 5G/millimeter-wave antenna systems.

He is currently an Associate Professor in the Department of Electrical and Computer Engineering, Seoul National University, South Korea. His research areas include mmWave Metasurface/Lens beam focusing/shaping techniques, antenna/RF circuit miniaturization for integrated systems, and radio propagation modeling for complex scenarios. He is the recipient of the 2011 Rackham Predoctoral Fellowship Award, 2014 Samsung DMC Innovation Award, and 2018 SNU Creative-Pioneering Researcher Award. He has served as an Editor-in-Chief for JEES (SCIE) and an Associate Editor for MOTL (SCIE) and ICT Express (SCIE), and so on. He has served as a TPC member for numerous conferences such as IEEE AP-S/USNC-URSI, ISAP, and KIEES where his group has been awarded honorably. His group members were also awarded for Industry Best Paper Award from Samsung Electro-Mechanics and Samsung Research. He has been a senior member of IEEE since 2017.

Workshops

Workshop 1: mm-wave/THz Integrated Beamforming Technologies

Monday, 29-Aug, 11:50 – 12:30, Room: Forum 1

Chairs: Sanggeun Jeon, Korea University

Minkyu Je, KAIST

M1W.4: Phased Array for mm-wave 5G and 6G LEO Satellite Communications



Dr. Jinseok Park, ETRI, Korea

Abstract: Phased arrays have become a key technique in various fields. In particular, CMOS-based beamforming ICs have attracted much attention due to their high-level integration and low cost. In this talk, two CMOS beamforming front-end ICs for mmWave 5G and LEO satellite communications will be introduced.

The beamforming front-end IC must be both compact and power efficient. Also, high-resolution and high-accurate phase and gain controls are essential not only for controlling the beams precisely but also for error corrections. In addition, because digital predistortion linearization techniques of a PA are not easily applicable to the phased array system due to its multiple PAs and high bandwidth signals, analog linearization techniques must be adopted for CMOS PAs. As a solution for the challenges, a variable gain phase shifter (VGPS) using dual-vector

synthesis technique is reported, which achieves an inherently orthogonal phase and gain controls in a single block. This greatly reduces chip size, power consumption, and calibration complexity. Also, an analog linearization technique, which improves both AM-AM and AM-PM distortion of a PA, is introduced. A scalable 64-element brick-type phased-array module based on 4-channel core chips with the VGPS and PA linearizer will be presented.

Biography: Jinseok Park received the M.S. and Ph.D. degrees in electrical engineering from Korea Advanced Institute of Science and Technology (KAIST), Daejeon, South Korea, in 2016 and 2021, respectively. He is currently a senior researcher with Electronics and Telecommunications Research Institute (ETRI), Daejeon, South Korea, where he is involved in the development of RFIC and phased-array systems for LEO satellite communication. His current research interests include millimeter-wave integrated circuits for next-generation satellite payloads, and phased-array systems for high-data-rate wireless communications. Dr. Park was a recipient of a Grand Prize in the 25th Human-Tech Paper Award hosted by Samsung Electronics in 2019, and a Prime Minister Award of the Republic of Korea in the Korea Semiconductor Design Competition in 2020. He holds over 20 patents related to phased-array systems and ICs. His research result was selected as one of Top Ten Innovative Patents of KAIST in 2017.

Workshops

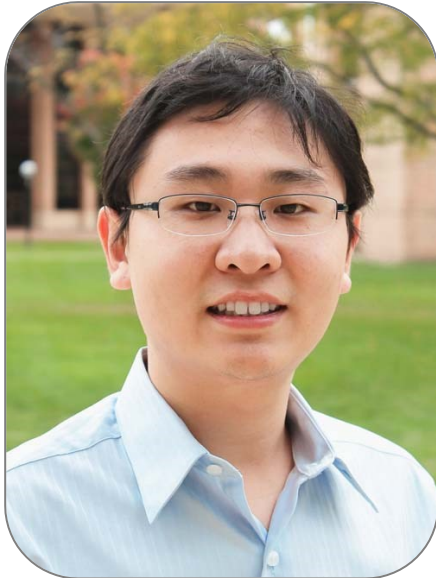
Workshop 2: RF Technologies for Emerging Biomedical Applications

Monday, 29-Aug, 13:30 – 14:10, Room: Forum 1

Chairs: Minkyu Je, KAIST

Sanggeun Jeon, Korea University

M2W.1: Magnetoelectrically Powered and Controlled Millimetric Bioelectronic Implants



Prof. Kaiyuan Yang, Rice University, USA

Abstract: Millimeter-scale bioelectronic implants promise transformative applications in medicine, health, and scientific research. This talk will focus on unconventional hardware challenges and solutions towards next generation biomedical implants with unprecedented power, volume, and wireless requirements. Specifically, I will introduce our latest progresses on building safe and reliable multi-site networked millimetric bio implants, including magnetoelectric wireless power transfer and communication, multi-access communication, PUF-based device addressing and security, and system integration and validation.

Biography: Kaiyuan Yang is currently an Assistant Professor of ECE at Rice University, USA. He received his B.S. degree in Electronic Engineering from Tsinghua University, China, in 2012, and his Ph.D. degree in Electrical Engineering from the University of Michigan, Ann Arbor, MI, in 2017. His research interests include digital and mixed-signal circuits for secure and intelligent microsystems, bioelectronics, and hardware security. Dr. Yang is a recipient of the 2022 National Science Foundation (NSF) CAREER award, 2016 IEEE Solid-State Circuits Society (SSCS) Predoctoral Achievement Award, and multiple best paper awards from top-tier conferences in various fields, including 2021 IEEE Custom Integrated Circuit Conference (CICC), 2016 IEEE Symposium on Security and Privacy (Oakland), 2015 IEEE International Symposium on Circuits and Systems (ISCAS), and the Best Student Paper Award finalist at 2022 RFIC and 2019 CICC.

Workshops

Workshop 2: RF Technologies for Emerging Biomedical Applications

Monday, 29-Aug, 14:10 – 14:50, Room: Forum 1

Chairs: Minkyu Je, KAIST

Sanggeun Jeon, Korea University

M2W.2: Body-Coupled Data and Power Transmission for Wireless Neural Implants



Prof. Joonsung Bae, Kangwon National University, Korea

Abstract: Miniaturized neural implants for monitoring neurological disorders have been investigated as a promising alternative to the neural interface for patients. However, such implants rely on physical tethers to external hardware for data and power transmission, which not only causes tissue damage and infection but also hinders stable in-vivo recordings. To enable non-tethered implants, a key feature for the robust and high-fidelity neural interface, neural implants using various wireless technologies have been reported. However, the use of an inductive link imposes a stringent requirement on the alignments between coils with a limited transfer range. Optical and ultrasound telemetry suffer from attenuation from skull absorption, which requires surgically placed subcranial repeater or has only been demonstrated at low data

rates (tens of kbps). Hence, they are limited to the short operation range and the susceptibility to orientation. In contrast, body-coupled communication (BCC) and body-coupled power delivery have been reported for wearable devices, each of which uses the body as a data/power delivery channel. The unique property of body-coupled schemes does not require precise alignments between devices and still ensures data/power delivery. In this presentation, a miniaturized wireless neural implant is presented that uses both body-coupled data transmission and power delivery. The implant only needs small electrodes for data transmission and power delivery, and external devices with patch electrodes can be placed far away from the implant, e.g., in the back of the rat and this facilitates stable chronic in-vivo recordings in freely behaving animals.

Biography: Joonsung Bae graduated from the Electrical Engineering Department of Korea Advanced Institute of Science and Technology (KAIST), Daejeon, Korea, in 2007 and received the M.S. and Ph.D. degrees in electrical engineering from the KAIST in 2009 and 2013, respectively. His Ph.D. work concerned the Wireless Body Area Network (WBAN) circuits and systems. Since 2017, he has been with the Department of Electrical and Electronics Engineering, Kangwon National University, where he is currently an Assistant Professor. From 2013 to 2014, he was with the Memory Business of Samsung Electronics, Korea, where he developed the SoC Design for the SSD (Solid-State Drive) and UFS (Universal Flash Storage). As a Senior Engineer, he designed the integrated circuits for PCI-Express 3.0 and M-PHY 3.0. In 2014, he joined the Information and Electronics Research Institute of KAIST as a Postdoctoral Researcher. Before joining Kangwon National University, he was an Analog Circuit Designer with IMEC, Belgium, where he investigated ultra-low-power biomedical circuits. His current research interests are energy-efficient mixed-signal circuits and systems, wireless neural interfaces, bio-medical integrated sensors, and body area networks.

Workshops

Workshop 2: RF Technologies for Emerging Biomedical Applications

Monday, 29-Aug, 15:10 – 15:50, Room: Forum 1

Chairs: Minkyu Je, KAIST
Sanggeun Jeon, Korea University

M2W.3: Smaller in Volume, Larger in Throughput: Wireless Solutions in Biomedical Application



Dr. Minyoung Song, imec, Netherlands

Abstract: By virtue of the rapid evolution of integrated circuit technologies in recent decades, the quality of services and equipment for biomedicine and healthcare has been dramatically improved. As a clear example, wireless medical implants reform existing medical treatment and diagnosis, in terms of patient comfort, safety, and flexibility. One of the technical trends in wireless medical implant design is miniaturization. It allows more freedom in implantation into the body, in terms of location, non-/less-invasiveness, etc. Such miniaturization is promising but still challenging in the wireless system. Another technical trend in the wireless implant is to facilitate the high data transfer while covering the longer communication range to convey more sensor data from the implant. This presentation

discusses some of the technical challenges and future trends in miniaturization and the high data rate communication of wireless medical implants.

Biography: Minyoung Song is senior researcher at imec and has led analog frontend designs for ultra-low power wireless systems for automotive, IoT and biomedical applications. He has been with imec, since 2016, after working with Samsung Electronics. He has developed ultra-low-power wireless solutions for BLE, Wi-Fi, MedRadio, and UWB. He received the B.S. and Ph. D. degrees in electrical engineering from Korea University, Seoul, Korea, in 2006 and 2013, respectively. His current research interests are ultra-low-power wireless solutions for IoT/Biomedical applications, and frequency synthesizers/clock generators.

Workshops

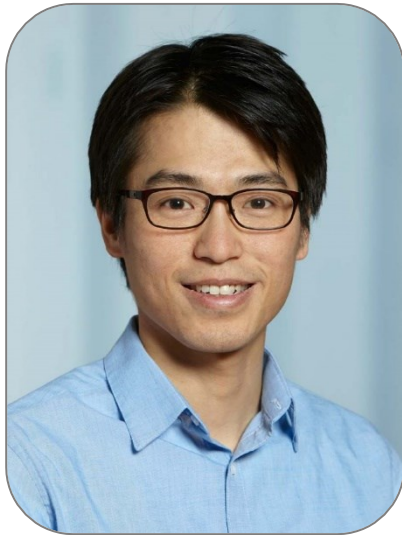
Workshop 2: RF Technologies for Emerging Biomedical Applications

Monday, 29-Aug, 15:50 – 16:30, Room: Forum 1

Chairs: Minkyu Je, KAIST

Sanggeun Jeon, Korea University

M2W.4: Wireless and Free Floating Micromotes for Chronic Neural Recording



Dr. Prof. Taekwang Jang, ETH Zürich, Switzerland

Abstract: Brain-machine interface (BMI) has the potential to treat many brain disorders and to restore motor function for people who are paralyzed or amputated. Promising system level implementations with high channel counts have been introduced to record and decode the complex neural signals. However, such implantable systems are typically tethered with an array of wires for power and data communications, increasing risks of tissue damage and infection and rendering these devices unsuitable for chronic neural recording. To address this challenge, wireless and free floating micromotes have been proposed by adopting power and data telemetry through RF and infrared light. In this talk, based on the recent publications, I will introduce 200 μ m-scale neural recording integrated circuits for the motor-function restoration. An energy efficient neural amplifier, clock-and-data recovery circuits and random chip-ID generator are implemented for the ultra-low power signal acquisition and communication. The systems also include a

neural feature extraction circuits to reduce the data bandwidth while achieving the state-of-the-art finger position decoding accuracy of 0.85 correlation factor.

Biography: Taekwang Jang is currently an assistant professor at the ETH Zürich, Switzerland. He received his B.S. and M.S. in electrical engineering from the Korea Advanced Institute of Science and Technology, Korea, in 2006 and 2008, respectively. From 2008 to 2013, he worked at Samsung Electronics Company Ltd., Yongin, Korea, focusing on mixed-signal circuit design, including analog and all-digital phase-locked loops for communication systems and mobile processors fabricated in 20-45nm CMOS processes. In 2017, he received his Ph.D. from the University of Michigan; his dissertation was titled “Circuit and System Designs for Millimeter-Scale IoT and Wireless Neural Recording.” After working as a post-doctoral research fellow at the University of Michigan for one year, he joined the ETH Zürich in 2018 as an assistant professor, and he is leading the Energy-Efficient Circuits and IoT Systems group. He is also a member of the Competence Center for Rehabilitation Engineering and Science and the chair of the IEEE Solid-State Circuits Society, Switzerland Chapter. His research focuses on circuits and systems for highly energy-constrained applications such as wireless sensor nodes and biomedical interfaces. Essential building blocks such as a sensor interface, energy harvester, power converter, communication transceiver, frequency synthesizer, and data converters are his primary interests. He holds 14 patents and has (co)authored more than 60 peer-reviewed conferences and journal articles. He is the recipient of the 2021 IEEE ISSCC Jan Van Vessel Award for Outstanding European Paper and the 2009 IEEE CAS Guillemin-Cauer Best Paper Award. Since 2022, he has been a TPC member of the IEEE International Solid-State Circuits Conference (ISSCC), IMMD Subcommittee, and IEEE Asian Solid-State Circuits Conference (ASSCC), Analog Subcommittee. In addition, he served as the chair of the 2022 IEEE International Symposium on Radio-Frequency Integration Technology (RFIT), Frequency Generation Subcommittee.



RFIT Student Paper Competition

Student Paper Competition

Tuesday, 30-Aug, 15:10 – 16:20, Room: Vernazza

Chair: Jong-Ryul Yang, Yeungnam University

Student Paper Competition aims to encourage students to experiment RFIT technologies and to achieve innovative results in this symposium. Students who submitted papers have the opportunity to challenge this Competition. A total of 23 authors applied for the student paper award competition in the paper submissions. In the written evaluation, each paper was strictly reviewed by three reviewers. The Award Committee selected 11 finalist papers below out of the 23 papers based on their review scores. For presentation evaluation, the finalists are requested to present their research results during the Competition. They will have an in depth interaction with the Award Committee. The Committee will evaluate their originality, concept feasibility, material preparation, and communication skills. Award winners will receive cash prizes and award certificates.

List of Finalist Papers

- T3A.3** An Ultra-Compact Bidirectional Ka-Band Front-End Module With 4.0-dB NF and 13.5-dBm OP1dB
Jian Zhang, Wei Zhu, Ruitao Wang, Chenguang Li, Sen Yin and Yan Wang (Tsinghua University, China)
- T3A.4** 25-31-GHz Low Noise Amplifiers in 0.15- μm GaN/SiC HEMT Process
Shih-Yun Chen (National Taiwan University, Taiwan)
- T4F.7** A High Gain Vector-Sum Phase Shifter in 28nm CMOS for 5G Communication
Jinhyun Kim (Seoul National University, Korea (South)); Seongwoog Oh (Seoul National University & Institute New Media and Communications (INMC), Korea (South)); Jungsuek Oh (Seoul National University, Korea)
- T4F.8** A 28-GHz Low Insertion Loss Variation 4-Bit Phase Shifter
Juwon Kim and Byung-Wook Min (Yonsei University, Korea (South))
- T4F.9** 29-To-65-GHz CMOS Amplifier With Tunable Frequency Response
Shunsuke Yabuki, Shinichiro Fujimoto, Shuhei Amakawa, Takeshi Yoshida and Minoru Fujishima (Hiroshima University, Japan)
- W1B.1** Sensor-Integrated RIS Unit Element Featuring Mutual Coupling Reduction
Myeonggin Hwang, Youngno Youn, Suho Chang, Daehyeon Kim, Cheonga Lee and Donggeun An (Pohang University of Science and Technology, Korea (South)); Wonbin Hong (Pohang University of Science and Technology (POSTECH), Korea (South))
- W1B.2** Reconfigurable Metasurface With an Intermediate Phase Shift Scheme for Beam Steering
Sebastian Johan Verho, Van Thang Nguyen, Philip A. Dzagbletey and Jae-Young Chung (Seoul National University of Science and Technology, Korea (South))



RFIT Student Paper Competition

- W1B.4** Design of Chip Integrated Circularly Polarized Phased Array System
Jeong-Wook Kim (KAIST, Korea (South)); Sol Kim (Korea Advanced Institute Science and Technology(KAIST), Korea (South)); Hyunyoung Cho (KAIST, Korea (South)); Soo-Chang Chae (Korea Electronics Technology Institute, Korea (South)); ByungKuon Ahn and Jong-Won Yu (KAIST, Korea (South))
- W3A.2** A D-Band Variable-Gain LNA With Triple-Inductive Coupling Gm-Boosting
Ilgwon Kim (KAIST, Korea (South)); Songcheol Hong (IEEE, USA); Wansik Kim (LIG NEX1, Korea (South))
- W4B.3** Compact Concentric Antenna Module Integrated With Coplanar T/Rx Array and Multi-Channel CMOS Radar IC
JiHo Lee, Hyun-Jun Dong, Hakmin Lee and Woo Hee Lim (Chung-Ang University, Korea (South)); Donghyun Baek (Chung-ang University, Korea (South)); Han Lim Lee (Chung-Ang University, Korea (South))
- W4B.4** Frequency Discrimination Based on the Different Number of Peaks in Envelope Detection of Two-Tone CW Radar
Jae Young Sim and Jong-Ryul Yang (Yeungnam University, Korea (South))



Social Events

Welcome Reception

Monday, August 29 at 5 p.m. @ Vernazza, 3F

We will welcome anyone who attends the symposium to the Welcome Reception; workshop applicants, accompanying persons, exhibitors, or symposium attendees. You can explore the symposium venue, enjoy ice breaking freely with newcomers. We will offer you light meals and refreshments.

Symposium Banquet

Tuesday, August 30 at 6:30 p.m. @ Monterosso, B1

Regular registrants are invited to attend the banquet. A banquet performance will liven up the mood after having a gala dinner. Also, the award ceremony will take place at the banquet. Award winners will be invited to the banquet, where the General Chair will present a certificate of best paper award and a cash prize at the ceremony. Additional banquet is available at \$80 (KRW 90,000).

Luncheons

Monday, August 29 from 12:30 p.m. to 1:30 p.m. @ Cafeteria, 2F

Tuesday, August 30 from 12:10 p.m. to 1:30 p.m. @ Cafeteria, 2F

Wednesday, August 31 from 12 p.m. to 1:30 p.m. @ Cafeteria, 2F

We will offer all participants lunches during the symposium. Please take on your name badge to enter the cafeteria for lunch meals.

Floor Map

3rd Floor

Vernazza



Forum 1



Forum 2
Poster session
(Interactive Forum)

B1

Monterosso

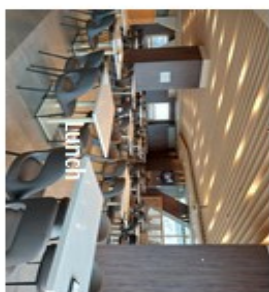


Lobby
Coffee breaks
Exhibition
Registration

Forum 3
ExCom Meeting

2nd Floor

Cafeteria





Understanding Session Code

Each session in the technical program is assigned a unique number which clearly indicates when and how the paper is presented. A typical number is shown below:

Typical Session Number: T1A.2

The first letter (i.e. T) indicates the day of the symposium.

M = Monday

T = Tuesday

W = Wednesday

The second number (i.e. 1) indicates the time of the day.

1 = the first time

2 = the second time

3 = the third time

4 = the fourth time

5 = the fifth time

The third letter (i.e. A) shows the presentation type.

A / B = Oral

P = Plenary

F = Poster

W = Workshop

The fourth number (i.e. 2) shows the presentation order in the session.

1 = the first presentation

2 = the second presentation

3 = the third presentation

4 = the fourth presentation

5 = the fifth presentation

Technical Program Details

- Tuesday 30 August (D2)**
- Wednesday 31 August (D3)**



D2 Technical Program

T1A: Microwave/mm-Wave Frequency Synthesis

09:00 – 10:20, Tuesday 30-Aug, Room: Forum 1

Chairs: Jong-Ryul Yang, Yeungnam University
Heein Yoon, UNIST

T1A.1 *Invited* **Reference Oversampling Phase-Locked Loops for Achieving Low Jitter, Spur, and Power Consumption**
09:00 – 09:20
Taekwang Jang (ETH Zürich, Switzerland)

T1A.2 *Invited* **An Ultra-Low Integrated-Phase-Noise 28-GHz LO Generator for 5G Transceivers Supporting Multiple Frequency Bands**
09:20 – 09:40
Heein Yoon (UNIST, Korea (South)); Suneui Park, Juyeop Kim and Jaehyouk Choi (KAIST, Korea (South))

T1A.3 *Invited* **An 84-GHz CMOS Injection-Locked Frequency Multiplier With Phase Tuning Control**
09:40 – 10:00
Chien-Nan Kuo and Wei-Chien Wang (National Yang Ming Chiao Tung University, Taiwan)

T1A.4 *Invited* **Microwave and Millimeter-Wave Signal Generation Using Injection Locked Technique**
10:00 – 10:20
Hong-Yeh Chang (National Central University, Taiwan)



D2 Technical Program

T1B: Power Amplifiers for 5G Applications

09:00 – 10:20, Tuesday, 30-Aug, Room: Vernazza

Chairs: Hyunchul Park, Samsung Electronics

Jusung Kim, Hanbat National University

T1B.1 *Invited* **23-28 GHz Doherty Power Amplifier Using 28 nm CMOS for 5G Applications**

09:00 – 09:20

Young Chan Choi (Sungkyunkwan University, Korea (South)); Sungjae Oh (Samsung Electronics Ltd., Korea (South)); Youngoo Yang (Sungkyunkwan University, Korea (South))

T1B.2 *Invited* **A Compact Broadband Power Amplifier Covering 23-39 GHz for 5G Mobile Communication**

09:20 – 09:40

Chenguang Li, Ruitao Wang, Jian Zhang, Wei Zhu and Yan Wang (Tsinghua University, China)

T1B.3 *Invited* **Two-Stage CMOS/GaAs HBT Doherty Power Amplifier Module for 5G Handsets**

09:40 – 10:00

Hyeongjin Jeon and Jongyun Na (Sungkyunkwan University, Korea (South)); Hansik Oh (Samsung Electronics, Korea (South)); Youngoo Yang (Sungkyunkwan University, Korea (South))

T1B.4 *Invited* **Power Combining Configurations of HPUE PA for 5G Mobile Phone Applications**

10:00 – 10:20

Satoshi Tanaka and Hiroshi Okabe (Murata Manufacturing Co., Ltd., Japan)



D2 Technical Program

T3A: mm-Wave/THz Building Blocks

13:30 – 15:10, Tuesday 30-Aug, Room: Forum 1

Chairs: Munkyo Seo, Sungkyunkwan University
Donggu Im, Jeonbuk National University

- T3A.1** *Invited* **Multiplexing Schemes for Sub-THz/THz Interconnects**
13:30 – 13:50 *Xuan Ding, Bo Yu, Hai Yu, Sajjad Saber and Jane Gu (University of California Davis, USA)*
- T3A.2** *Invited* **Design of Frequency-Reconfigurable Filtering Phase Shifter Based on Controllable Mixed Electric-Magnetic Coupling**
13:50 – 14:10 *Tao Yang (University of Electronic Science and Technology of China, China)*
- T3A.3** **An Ultra-Compact Bidirectional Ka-Band Front-End Module With 4.0-dB NF and 13.5-dBm OP1dB**
14:10 – 14:30 *Jian Zhang, Wei Zhu, Ruitao Wang, Chenguang Li, Sen Yin and Yan Wang (Tsinghua University, China)*
- T3A.4** **25-31-GHz Low Noise Amplifiers in 0.15- μ m GaN/SiC HEMT Process**
14:30 – 14:50 *Shih-Yun Chen (National Taiwan University, Taiwan)*
- T3A.5** **An E-Band Built-In Self-Tester Detectable Active Reflection Coefficient for Millimeter-Wave Beamforming Transmitters**
14:50 – 15:10 *Seung-Uk Choi (Pohang University of Science and Technology, Korea (South)); Kyunghwan Kim (Pohang University of Science and Technology (POSTECH), Korea (South)); Kangseop Lee, Seunghoon Lee and Ho-Jin Song (POSTECH, Korea (South))*



D2 Technical Program

T3B: Advanced Circuit and System Designs

13:30 – 15:10, Tuesday, 30-Aug, Room: Vernazza

Chairs: Sang-Gyu Park, Hanyang University

Young-Ha Hwang, Soongsil University

- T3B.1** *Invited* **An Energy-Efficient Supply- and Temperature-Independent $\Delta\Sigma$ Capacitance-To-Digital Converter**
13:30 – 13:50
Junghyup Lee (DGIST, Korea (South))
- T3B.2** *Invited* **Number of Oscillation Cycles (NOC): A New Paradigm for VCO-Based Comparison**
13:50 – 14:10
Qiang Li (University of Electronic Science and Technology of China, China)
- T3B.3** *Invited* **Tabbed Routing Modeling and Design Optimization for High-Speed Signaling Channel**
14:10 – 14:30
Kyunghwan Song (Korea Advanced Institute of Science and Technology, Korea (South)); Seonghi Lee (KAIST, Korea (South)); Seungyoung Ahn (Korea Advanced Institute of Science and Technology, Korea (South))
- T3B.4** **A Refined Skew Matrix Model of the CIM3 in the Up-Mixer Extending the Duality of I/Q Imbalance**
14:30 – 14:50
Ealwan Lee (GCT Semiconductor, Inc., Korea (South))
- T3B.5** *Invited* **Body-Coupled Powering for Wearables**
14:50 – 15:10
Jiamin Li (National University of Singapore, Singapore); Jerald Yoo (National University of Singapore & The N1 Institute for Health, Singapore)

D2 Technical Program

T4F: Interactive Forum

15:10 - 16:20, Tuesday, 30-Aug, Room: Forum 2

Chair: Jong-Ryul Yang, Yeungnam University

- T4F.1** **A 350-GHz Fundamental-Mode Common-Base Cross-Coupled Oscillator in 130-nm InP HBT Technology**
Heekang Son, Junghwan Yoo and Jae-Sung Rieh (Korea University, Korea (South))
- T4F.2** **A High PAE Stacked K-Band Power Amplifier Using π -Phase Compensation Technique**
Omar Alngar, Adel Barakat and Ramesh K. Pokharel (Kyushu University, Japan)
- T4F.3** **Differential HPUE PA for n77 Band With a Cross-Coupled Feed-Forward Gain Control Circuits**
Hideyuki Sato, Satoshi Tanaka, Yuuri Honda, Masafumi Kazuno, Kenji Mukai, Yusuke Tanaka, and Hiroshi Okabe (Murata Manufacturing Co., Ltd., Japan)
- T4F.4** **26 GHz 2-Stacked Power Amplifier Using 28 nm Bulk CMOS**
Soohyun Bin, Young Chan Choi and Youngoo Yang (Sungkyunkwan University, Korea (South))
- T4F.5** **900 MHz Differential Power Amplifier IC Using 55 nm CMOS Technology**
Jiwon Hwang, Sooncheol Bae, Young Chan Choi, Woojin Choi, Jaekyung Shin and Youngoo Yang (Sungkyunkwan University, Korea (South))
- T4F.6** **A 4-9 GHz Reconfigurable Differential Power Combiner/Splitter in 65nm CMOS**
Haipeng Duan, Qin Chen and Xu Wu (Southeast University, China); Dongming Wang (Southeast University & National Mobile Communications Research Lab., China); Lianming Li (National Mobile Communications Research Lab., China)
- T4F.7** **A High Gain Vector-Sum Phase Shifter in 28nm CMOS for 5G Communication**
Jinhyun Kim (Seoul National University, Korea (South)); Seongwoog Oh (Seoul National University & Institute New Media and Communications (INMC), Korea (South)); Jungsuek Oh (Seoul National University, Korea (South))
- T4F.8** **A 28-GHz Low Insertion Loss Variation 4-Bit Phase Shifter**
Juwon Kim and Byung-Wook Min (Yonsei University, Korea (South))
- T4F.9** **29-To-65-GHz CMOS Amplifier With Tunable Frequency Response**
Shunsuke Yabuki, Shinichiro Fujimoto, Shuhei Amakawa, Takeshi Yoshida and Minoru Fujishima (Hiroshima University, Japan)

D2 Technical Program

T4F: Interactive Forum

15:10 - 16:20, Tuesday, 30-Aug, Room: Forum 2

- T4F.10** **An E-Band Direct Conversion Transmitter With I/Q Calibration**
Seunghoon Lee (POSTECH, Korea (South)); Kyunghwan Kim (Pohang University of Science and Technology (POSTECH), Korea (South)); Kangseop Lee and Ho-Jin Song (POSTECH, Korea (South))
- T4F.11** **150-GHz Vector Modulator Phase Shifter in 65-nm CMOS**
Ju-Hyeon Park, Ui-Gyu Choi and Jong-Ryul Yang (Yeungnam University, Korea (South))
- T4F.12** **A Switchless Bidirectional Distributed Amplifier With 2-dB Gain Variation in One Decade Frequency Range in 90-nm CMOS Process**
Wei Hsuan Tsai, Yunshan Wang and Huei Wang (National Taiwan University, Taiwan)
- T4F.13** **A 19 GHz 5-Bit Low RMS Phase Error Passive Phase Shifter Using 0.18 μm CMOS Process**
Jeng-Han Tsai, Ying-Chen Chang and Pin-Jung Chen (National Taiwan Normal University, Taiwan)
- T4F.14** **A Study of K-Band Gain-Boosted Amplifier Using Inductor Coupling**
Yuki Hayashi, Nobuyuki Itoh and Kiyotaka Komoku (Okayama Prefectural University, Japan)
- T4F.15** **Design of Diplexer-Matching Dual-Band Active Load Mixer With Master-Slave IF Active Filter**
Wen Cheng Lai (National Taiwan University of Science and Technology, Taiwan)
- T4F.16** **Design of a Coplanar Waveguide for X-Band Radar Antenna Elements**
Jeongmin Cho (University of Hongik, Korea (South)); Doyoung Jang (Hongik University, Korea (South), Korea (South)); Chang-Hyun Lee and Hyun Kim (LIG Nex1 Company Ltd., Korea (South)); Hosung Choo (Hongik University, Korea (South))
- T4F.17** **Design of a High-Gain Antipodal Vivaldi Antenna Using Periodic Diagonal Slots and an Elliptical Director for Microwave Power Transmission Systems**
Sungsik Ohm and Eunjung Kang (Hongik University, Korea (South)); Chulhun Seo (Soongsil University, Korea (South)); Hosung Choo (Hongik University, Korea (South))

D2 Technical Program

T4F: Interactive Forum

15:10 - 16:20, Tuesday, 30-Aug, Room: Forum 2

- T4F.18** **Modeling of Hot-Via Technology for System-In-Package at Millimeter-Wave Frequencies**
Yi-Fan Tsao and Yuan Wang (National Yang Ming Chiao Tung University, Taiwan); Serguei Chevtchenko (Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik, Germany); Mihaela Wolf (Ferdinand-Braun-Institut Leibniz-Institut für Höchstfrequenztechnik, Germany); Joachim. Wuerfl (Ferdinand-Braun-Institut, Germany); Heng-Tung Hsu (National Chiao Tung University & International College of Semiconductor Technology, Taiwan)
- T4F.19** **Grating Lobe Suppression in Wide-Angle Scanning Phased Array With Large Inter Element Spacing by Subarray Rotation**
Hyunyoung Cho and Jeong-Wook Kim (KAIST, Korea (South)); Sol Kim and Ji-Hoon Lee (Korea Advanced Institute Science and Technology(KAIST), Korea (South)); Ju-Ik Oh and Jong-Won Yu (KAIST, Korea (South))
- T4F.20** **An Accurate and Instantaneous Permittivity Measurement Using Modified Multi-Line Method**
Junhyuk Ahn, Myeonggin Hwang and Youngno Youn (Pohang University of Science and Technology, Korea (South)); Wonbin Hong (Pohang University of Science and Technology (POSTECH), Korea (South))
- T4F.21** **Circularly Polarized High-Gain Patch Antenna Using Higher-Order Mode for GPS Applications**
Eunjung Kang and Hosung Choo (Hongik University, Korea (South))
- T4F.22** **Frequency Tunable Microstrip Patch Antenna Based on Liquid Crystal at Millimeter-Wave Band**
Jinki Park, Ye-Eun Chi and Seong-Ook Park (Korea Advanced Institute of Science and Technology, Korea (South))
- T4F.23** **Sub-Terahertz Electromagnetic-Wave Absorber for Future Wireless Communication**
Sangyeop Lee (Tokyo Institute of Technology, Japan); Masao Fujita and Masayuki Toyoda (Maxell, Ltd., Japan); Kyoya Takano (Tokyo University of Science, Japan); Shinsuke Hara (National Institute of Information and Communications Technology, Japan); Issei Watanabe (National Institute of Information and Communications Technology, Japan); Akifumi Kasamatsu (National Institute of Information and Communications Technology, Japan); Hiroyuki Ito (Tokyo Institute of Technology, Japan)
- T4F.24** **Design of Power Detector for mm-Wave Beamforming Systems**
Soo-Chang Chae, Chung-Geun Jang, Soo-Jeong Kim, Ki-Jin Kim and Kwang-Ho Ahn (Korea Electronics Technology Institute, Korea (South))

D2 Technical Program

T4F: Interactive Forum

15:10 - 16:20, Tuesday, 30-Aug, Room: Forum 2

- T4F.25** **Evaluation of Partial Denture Management RFID System Using a Simple Phantom Model**
Yuji Takatera, Eisai Nagahari and Bowen Dang (Tohoku University, Japan); Mizuki Motoyoshi (Shizuoka Institute of Science and Technology, Japan); Junyi Xu (Tohoku University, Japan); Hiroyasu Sato (Tohoku University, Japan); Qiang Chen and Noriharu Suematsu (Tohoku University, Japan)
- T4F.26** **Study of an Atmospheric Refractivity Estimation Using AREPS and Genetic Algorithm**
Doyoung Jang (Hongik University, Korea (South), Korea (South)); Jongmann Kim (Yonsei University & ADD, Korea (South)); Yong Bae Park (Ajou University, Korea (South)); Hosung Choo (Hongik University, Korea (South))
- T4F.27** **Fast Anomaly Detection via the Orthogonality Sampling Method in Microwave Imaging**
Sangwoo Kang (KAIST, Korea (South)); Seongje Chae and Won-Kwang Park (Kookmin University, Korea (South))
- T4F.28** **Vital Signal Detection for Continuous-Wave Radar Sensor Using Compensation Technique**
Ah-Jung Jang, In-Seong Lee, Jae Young Sim and Jong-Ryul Yang (Yeungnam University, Korea (South))
- T4F.29** **Cooperative Microwave Power Transfer Using Beam Scanning Scheme**
Minjae Ahn and Hyunchul Ku (Konkuk University, Korea (South))
- T4F.30** **Correction of Multilayer Semiconductor Process Parameters for Electromagnetic Field Analysis in the 300-GHz Band**
Rion Shinya (Tokyo University of Science, Japan); Shinsuke Hara and Akifumi Kasamatsu (National Institute of Information and Communications Technology, Japan); Yohtaro Umeda and Kyoya Takano (Tokyo University of Science, Japan)
- T4F.31** **Optimization of Deep Learning-Based BSIM-CMG I-V Parameter Extraction in Seconds**
Fredo P Chavez (Macquarie University, Australia); Ming-Yen Kao (University of California Berkeley, Berkeley, US, USA); Chenming Hu (University of California Berkeley USA, USA); Sourabh Khandelwal (Macquarie University, Australia)



D2 Technical Program

T5A: Technologies for mm-wave/THz Circuits and Systems

16:20 – 18:00, Tuesday, 30-Aug, Room: Forum 1

Chairs: Myounggon Kang, Korea National University of Transportation

Byung-Wook Min, Yonsei University

- T5A.1** *Invited* **SiGe BiCMOS Technology With Advanced Integration Solutions for mm-Wave and THz Applications**
16:20 – 16:40
Mehmet Kaynak (IHP, Germany & IHP Microelectronics, Turkey)
- T5A.2** *Invited* **A Compact and Low-Cost THz SoP Heterogeneous Integration Platform**
16:40 – 17:00
Chun-Hsing Li (National Taiwan University, Taiwan); Te-Yen Chiu (National Tsing Hua University, Taiwan)
- T5A.3** **Investigation of BEoL Integrated Ferroelectric Thin-Film HfO₂ for mmWave Varactor Applications**
17:00 – 17:20
Sukhrob Abdulazhanov and Dang Khoa Huynh (Fraunhofer IPMS, Germany); Quang Huy Le (Fraunhofer IPMS & Brandenburg University of Technology, Germany); David Lehninger and Thomas Kämpfe (Fraunhofer IPMS, Germany); Gerald Gerlach (Technische Universität Dresden, Germany)
- T5A.4** **Design of Wideband CMOS ESD Protection Circuit Using Mutually Coupled Inductor**
17:20 – 17:40
Hyungeun Kim (Sogang University, Korea (South)); Jaehoon Jeong (Sogang University, Korea, Korea (South)); Jinho Jeong (Sogang University, Korea (South))
- T5A.5** *Invited* **Chip-Level High-Frequency EMC Strategies and Measurement Techniques**
17:40 – 18:00
Yin-Cheng Chang (Taiwan Semiconductor Research Institute, NARLabs, Taiwan); Ping-Yi Wang (National Tsing Hua University, Taiwan); Ta-Yeh Lin and Chaoping Hsieh (Taiwan Semiconductor Research Institute, National Applied Research Laboratories, Taiwan); Da-Chiang Chang (Chip Implementation Center, National Applied Research Laboratories, Taiwan); Shawn S. H. Hsu (National Tsing Hua University, Taiwan)



D2 Technical Program

T5B: Wireless Power Transfer and Power Management

16:20 – 18:00, Tuesday 30-Aug, Room: Vernazza

Chairs: Franklin Bien, UNIST

Hyungho Ko, Chung Nam University

- T5B.1** *Invited* **Wireless Powering and Communication With Miniaturized Implantable Devices**
16:20 – 16:40
Sanghoek Kim (Kyung Hee University, Korea (South))
- T5B.2** *Invited* **Duty-Cycled Wireless Power Transfer for Biomedical Implants**
16:40 – 17:00
Muhammad Abrar Akram (New York University Abu Dhabi, Abu Dhabi, UAE, United Arab Emirates); Kai-Wen Yang (Johns Hopkins University, USA); Sohmyung Ha (New York University Abu Dhabi, United Arab Emirates)
- T5B.3** **An 87% Efficient Wireless Powered System Using Adaptively Controlled Active Rectifier for Smart Electronics**
17:00 – 17:20
Chamith Chandrarathna Seneke Ralalage (Kyung Hee University, School of Electronics and Information, Korea (South))
- T5B.4** *Invited* **Research of Dual-Path DC-DC Power Converter**
17:20 – 17:40
Se-Un Shin (UNIST, Korea (South))
- T5B.5** *Invited* **3D-Integrated Beyond-10MHz Buck Converter With Fe-Based Metal Composite Magnetic Core Inductor**
17:40 – 18:00
Kousuke Miyaji (Shinshu University, Japan); Makoto Sonehara (Shinshu University & Faculty of Engineering, Japan); Toshiro Sato (Shinshu University, Japan)



D3 Technical Program

W1A: mm-Wave/THz Signal Generation

09:00 – 10:20, Wednesday, 31-Aug, Room: Forum 1

Chairs: Woo-Seok Choi, Seoul National University

Jong-Ryul Yang, Yeungnam University

- W1A.1** *Invited* **Progress in Silicon Based Millimeter-Wave and THz Signal Sources**
09:00 – 09:20 *Zhe Chen (Southeast University, China); Peigen Zhou (Southeast University & State Key Laboratory of Millimeter Wave, China); Rui Zhang, Jixin Chen, Pinpin Yan, Debin Hou and Wei Hong (Southeast University, China)*
- W1A.2** **Triple-Push VCO With Robust Start-Up Using Tri-Core in CMOS for 6G Communication**
09:20 – 09:40 *Seongwoog Oh (Seoul National University & Institute New Media and Communications (INMC), Korea (South)); Jungsuek Oh (Seoul National University, Korea (South))*
- W1A.3** *Invited* **Design of Waveguide-Based H-Band Source Module Using InP HBT Integrated Circuits**
09:40 – 10:00 *Youngchae Jeon, Yeongmin Jang, Hyungeun Kim and Jinho Jeong (Sogang University, Korea (South))*
- W1A.4** *Invited* **A Compact Mm-Wave Multi-Band VCO Based on Triple-Mode Resonator for 5G and Beyond**
10:00 – 10:20 *Mohammad Chahardori (Washington State University, USA); Md Aminul Hoque (Washington State University, India); Mohammad Ali Mokri and Deukhyoun Heo (Washington State University, USA)*



D3 Technical Program

W1B: Antennas and Metasurfaces

09:00 – 10:20, Wednesday, 31-Aug, Room: Vernazza

Chairs: Wonbin Hong, POSTECH

Gangil Byun, UNIST

- W1B.1**
09:00 – 09:20
Sensor-Integrated RIS Unit Element Featuring Mutual Coupling Reduction
Myeonggin Hwang, Youngno Youn, Suho Chang, Daehyeon Kim, Cheonga Lee and Donggeun An (Pohang University of Science and Technology, Korea (South)); Wonbin Hong (Pohang University of Science and Technology (POSTECH), Korea (South))
- W1B.2**
09:20 – 09:40
Reconfigurable Metasurface With an Intermediate Phase Shift Scheme for Beam Steering
Sebastian Johan Verho, Van Thang Nguyen, Philip A. Dzagbletey and Jae-Young Chung (Seoul National University of Science and Technology, Korea (South))
- W1B.3**
09:40 – 10:00
100GHz-Band On-Chip 1x2 Phased Array Antenna Fed by Hybrid Coupler on 45nm CMOS SOI
Jean Temga (Tohoku University & RIEC, Japan); Mizuki Motoyoshi (Shizuoka Institute of Science and Technology, Japan); Noriharu Suematsu (Tohoku University, Japan)
- W1B.4**
10:00 – 10:20
Design of Chip Integrated Circularly Polarized Phased Array System
Jeong-Wook Kim (KAIST, Korea (South)); Sol Kim (Korea Advanced Institute Science and Technology(KAIST), Korea (South)); Hyunyoung Cho (KAIST, Korea (South)); Soo-Chang Chae (Korea Electronics Technology Institute, Korea (South)); ByungKuon Ahn and Jong-Won Yu (KAIST, Korea (South))



D3 Technical Program

W2A: Advanced Power Amplifier Designs

10:40 – 12:00, Wednesday, 31-Aug, Room: Forum 1

Chairs: Ockgoo Lee, Pusan National University

Sanggeun Jeon, Korea University

- W2A.1** *Invited* **A 38 GHz Ultra-Compact High Power Density CMOS Power Amplifier**
10:40 – 11:00 *Jeng-Han Tsai, Chun-Lin Chen and Chuan-Chi Hung (National Taiwan Normal University, Taiwan)*
- W2A.2** *Invited* **Deep Learning Enabled mmWave PA and Antenna Design**
11:00 – 11:20 *Kaushik Sengupta, Zheng Liu and Emir Karahan (Princeton University, USA)*
- W2A.3** **A 57-64 GHz Two-Way Parallel-Combined Power Amplifier With 16.6 dBm Psat and 23.6% Peak PAE in 40nm Bulk CMOS**
11:20 – 11:40 *Junjie Gu, Haoqi Qin, Guixiang Jin and Hao Xu (Fudan University, China); Rui Yin and XiaoLiang Shen (National Integrated Circuit Innovation Center, China); Na Yan (State Key Lab of ASIC & System, Fudan University, China)*
- W2A.4** *Invited* **A Wideband E-Band Power Amplifier Utilizing Interstage Networks With Low-Coupling Transformers**
11:40 – 12:00 *Jung-Dong Park and Van-Son Trinh (Dongguk University, Korea (South))*



D3 Technical Program

W2B: Passive Components

10:40 – 12:00, Wednesday, 31-Aug, Room: Vernazza

Chairs: Minkyu Je, KAIST

Sangkil Kim, Pusan National University

- W2B.1** *Invited* **Spatial Separations of Multiple Harmonics**
10:40 – 11:00 *Gangil Byun (Ulsan National Institute of Science and Technology (UNIST), Korea (South))*
- W2B.2** **Multi-Beam Metasurface Scheme Using Polarization Matching for Improving Resource Efficiency**
11:00 – 11:20 *Sol Kim (Korea Advanced Institute Science and Technology(KAIST), Korea (South)); Hyunyoung Cho, Jeong-Wook Kim, Hyo-Won Lee and Jong-Won Yu (KAIST, Korea (South))*
- W2B.3** **Microstrip Line Non-Reciprocal Bandpass Filter With Tunable Center Frequency**
11:20 – 11:40 *Girdhari Chaudhary, Jaehun Lee and Phanam Pech (Jeonbuk National University, Korea (South)); Yongchae Jeong (Chonbuk National University, Korea (South))*
- W2B.4** *Invited* **Study on Loss of Varactor-Loaded Tunable Microstrip Antennas Considering Q Factor**
11:40 – 12:00 *Eisuke Nishiyama, Ryo Araki and Ichihiko Toyoda (Saga University, Japan)*



D3 Technical Program

W3A: Advanced mm-Wave/THz Circuit Design Techniques

13:30 – 15:10, Wednesday, 31-Aug, Room: Forum 1

Chairs: Ho-Jin Song, POSTECH

Byung-Wook Min, Yonsei University

- W3A.1** *Invited* **RF Front-Ends for 6G Wireless Communication: Challenges and Opportunities**
13:30 – 13:50 *Munkyo Seo (Sungkyunkwan University, Korea (South))*
- W3A.2** **A D-Band Variable-Gain LNA With Triple-Inductive Coupling Gm-Boosting**
13:50 – 14:10 *Ilgwon Kim (KAIST, Korea (South)); Songcheol Hong (IEEE, USA); Wansik Kim (LIG NEX1, Korea (South))*
- W3A.3** **A Mm-Wave CMOS Feed-Forward Amplifier Based on a Quasi-Balanced Structure**
14:10 – 14:30 *Minjae Jung (University of California, San Diego, USA); Gyoung June Jeon and Byung-Wook Min (Yonsei University, Korea (South))*
- W3A.4** **Mm-Wave CMOS Matrix Distributed Amplifier for Ultra-Wideband Applications**
14:30 – 14:50 *Gunwoo Park, Minwoo Kim and Sanggeun Jeon (Korea University, Korea (South))*
- W3A.5** **A Novel Design of Gain-Boosting Amplifier for Gain-Bandwidth Improvement**
14:50 – 15:10 *Jiseul Kim, Chan-Gyu Choi and Ho-Jin Song (POSTECH, Korea (South))*



D3 Technical Program

W3B: Emerging Technologies, Circuits, Systems, and Applications

13:30 – 15:10, Wednesday, 31-Aug, Room: Vernazza

Chairs: Tae Wook Kim, Yonsei University

Jaeduk Han, Hanyang University

- W3B.1** *Invited* **A Wearable Oscillator Tag for Heart Health Monitoring**
13:30 – 13:50 *Tzyy-Sheng Jason Horng (National Sun Yat-sen University, Taiwan); Rezki El Arif (Universitas Brawijaya, Malang & National Sun Yat-Sen University, Kaohsiung, Taiwan); Wei-Chih Su (National Sun Yat-sen University, Taiwan)*
- W3B.2** *Invited* **Planar Microwave Sensors for Measuring Materials Composition and Mechanical Parameters**
13:50 – 14:10 *Kamran Ghorbani and Amir Ebrahimi (RMIT University, Australia)*
- W3B.3** *Invited* **Emerging Computing Systems Utilizing Electro-Magnetic Near-Field Connectivity**
14:10 – 14:30 *Noriyuki Miura (Osaka University, Japan)*
- W3B.4** *Invited* **140 GHz Silicon I/O Interconnect Exploiting Metadevices for Short-Range OOK Communications**
14:30 – 14:50 *Hao Yu (SUSTech, China); Yuan Liang (Nanyang Technological University, Singapore); Hao Chi Zhang and Tie Jun Cui (Southeast University, China)*
- W3B.5** *Invited* **RF Front-End Transmitting System for Agricultural Applications**
14:50 – 15:10 *Phanam Pech, Samdy Saron, Girdhari Chaudhary, Yu Kyeong Shin and Jun Gu Lee (Jeonbuk National University, Korea (South)); Yongchae Jeong (Chonbuk National University, Korea (South))*



D3 Technical Program

W4A: mm-Wave/THz Systems and Applications

15:30 – 17:10, Wednesday, 31-Aug, Room: Forum 1

Chairs: Ho-Jin Song, POSTECH

Ockgoo Lee, Pusan National University

- W4A.1** *Invited* **Millimeter-Wave/THz CMOS Phased-Array Transceiver for 5G and Beyond**
15:30 – 15:50 *Kenichi Okada (Tokyo Institute of Technology, Japan)*
- W4A.2** *Invited* **Recent Researches of Microwave and Millimeter-Wave System Applications at National Taiwan University**
15:50 – 16:10 *Huei Wang (National Taiwan University, Taiwan)*
- W4A.3** *Invited* **Potential of Terahertz Communication Not Limited to Short Range**
16:10 – 16:30 *Minoru Fujishima (Hiroshima University, Japan)*
- W4A.4** *Invited* **A 260GHz Wireless Transmission Over 100m for Beyond 5G Xhaul Networks**
16:30 – 16:50 *Soek-Bong Hyun (ETRI, Korea (South))*
- W4A.5** *Invited* **300-GHz Self-Heterodyne-Mixing-Receiver-Based Wireless Data Transmission**
16:50 – 17:10 *Sangyeop Lee (Hiroshima University); Yohei Morishita (Panasonic Industry Co., Ltd.); Shuhei Amakawa, Takeshi Yoshida and Minoru Fujishima (Hiroshima University, Japan)*



D3 Technical Program

W4B: Radar and Imaging

15:30 – 17:10, Wednesday, 31-Aug, Room: Vernazza

Chairs: Minkyu Je, KAIST

Wonbin Hong, POSTECH

- W4B.1** *Invited* **Multiple-Input Multiple-Output-Beam Mixing Radar for Fast Sweeping Applications**
15:30 – 15:50
Tsai Zuo-Min (National Yang Ming Chiao Tung University & Institute of Communication Engineering, Taiwan)
- W4B.2** *Invited* **Feature Extraction for Target Classification Using an FMCW Radar Sensor**
15:50 – 16:10
Sungho Lee (Korea Electronics Technology Institute, Korea (South))
- W4B.3** **Compact Concentric Antenna Module Integrated With Coplanar T/Rx Array and Multi-Channel CMOS Radar IC**
16:10 – 16:30
JiHo Lee, Hyun-Jun Dong, Hakmin Lee and Woo Hee Lim (Chung-Ang University, Korea (South)); Donghyun Baek (Chung-ang University, Korea (South)); Han Lim Lee (Chung-Ang University, Korea (South))
- W4B.4** **Frequency Discrimination Based on the Different Number of Peaks in Envelope Detection of Two-Tone CW Radar**
16:30 – 16:50
Jae Young Sim and Jong-Ryul Yang (Yeungnam University, Korea (South))
- W4B.5** **Terahertz 3D Imaging With a 300-GHz CMOS Multi-Chip Array Detector**
16:50 – 17:10
Kiryong Song (Samsung Electronics, Korea (South)); Doyoon Kim (Korea University, Korea (South)); Jungsoo Kim (ETRI, Korea (South)); Jai Heon Cho (Samsung Electronics, Korea (South)); Jae-Sung Rieh (Korea University, Korea (South))

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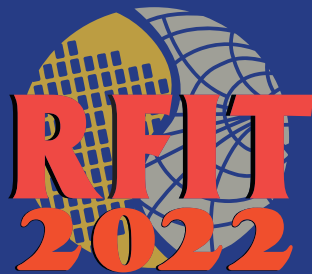
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