2nd International Workshop on

Global Research Initiative for Wireless Technology

(IGROW)

23rd and 24th April

Co-sponsored by

GROW-THz (JST ASPIRE project)

and

Cooperative Research Project of RIEC, Tohoku University,
“Integrated Design of Wireless Communication System and Hardware in the Massive Connect IoT Era”

Preface for the 2nd International Workshop on Global Research Initiative for Wireless Technology (IGROW)

It is my great pleasure to welcome you to the 2nd International Workshop on Global Research Initiative for Wireless Technology (IGROW), which will be held on April 23-24 in Sendai, Japan. This year's workshop will take place at Tohoku University and at Ryokusuitei, a traditional hot spring inn in the Akiu Onsen area, offering a stimulating environment for both academic exchange and informal discussions.

This workshop is organized by the Global Research Initiative on Wireless Terahertz (GROW-THz) project, an international research initiative dedicated to pioneering ultra-high-speed wireless communication technologies using terahertz frequencies. IGROW serves as a core activity of GROW-THz, bringing together researchers, engineers, and students from around the world to share their latest findings and to cultivate global research collaboration.

The 1st IGROW workshop, held in February in Hiroshima and Tokyo, was a great success. It featured lively discussions across a wide range of topics and attracted a diverse and enthusiastic group of participants. Building upon this strong foundation, we look forward to making the 2nd IGROW an even more vibrant and productive forum for advancing the frontiers of wireless technology.

The workshop continues to reflect the core mission of GROW-THz: to integrate communication and device technologies, accelerate international brain circulation, and foster the development of young researchers through collaborative engagement. The name "GROW-THz" symbolizes our commitment to growth—both technological and personal—through global partnerships.

This year's program spans a broad spectrum of topics, not only focused on terahertz communication but also including innovative approaches in wireless circuits, systems, and related fields. We hope that all participants—whether seasoned experts or emerging scholars—will find inspiration, forge new connections, and take steps toward new collaborations through their involvement in IGROW.

I would like to extend my sincere gratitude to all invited speakers, contributors, and participants for their invaluable support. Let us make the 2nd IGROW another milestone in our collective journey toward technological innovation and international research excellence.

Welcome to IGROW. May this workshop serve as a fruitful forum for exchange and growth.

Sincerely,

Minoru Fujishima
Professor, Hiroshima University
Principal Investigator, GROW-THz Project

Day 1 Wednesday, 23rd April

IGROW Opening Session

Time: 14:00-14:05

Room: M601, 6th Floor, Main Building, Research Institute of Electrical Communication (RIEC)

Welcoming Remarks and GROW-THz Overview

Minoru Fujishima

Hiroshima University

Session 1: Terahertz Wireless Systems: Measurements, Modeling, and Circuit Innovations

Time: 14:05-15:50

Room: M601, 6th Floor, Main Building, Research Institute of Electrical Communication (RIEC)

Chair: Kenta Umebayashi (Tokyo University of Agriculture and Technology)

14:05-14:30

(Invited) Research Perspective on the Next-generation Communications, Sensing and Computing Challenges

Haris Gacanin

RWTH Aachen

6G will redefine how we interact with the physical and digital worlds. Emerging technologies like machine learning and distributed edge computing will be central to this evolution. This talk will explore the key challenges and opportunities shaping 6G, from spectrum use and network architecture to energy efficiency. We'll also touch on the role of international collaboration and research in driving this transformation. I invite you to imagine a future where communication systems are not just faster—but fundamentally smarter, more adaptive, and more computing efficient.

14:30-14:55

(Invited) Terahertz for Mobile Communication Field Measurement

Ayumu Yabuki

SoftBank Corp.

The terahertz waves attract attention to achieve high-speed wireless communication in the Beyond 5G/6G era. We conducted field measurements targeting vehicle communication with the 300GHz to realize mobile communication. This experiment demonstrated the future use cases of utilizing terahertz for mobile communication.

14:55-15:20

(Invited) Millimeter-wave Digital Beamforming Antenna System for Low Earth Orbit Satellites Using Digital RF Technology

Satoshi Tsukamoto, Tomoyuki Furuichi, Noriharu Suematsu

Tohoku University, Japan

In Beyond 5G/6G, non-terrestrial networks are being discussed, and the use of millimeter wave bands is expected to increase in the future. The authors are researching and developing a smaller, lighter millimeter-wave digital beamforming antenna system for low-orbit satellites using digital RF technology. In this paper, we report on this system.

15:20-15:35

Experimental Estimation of Causal Impulse Response for Terahertz Channels via Humidity-Differential Analysis

Kenta Umebayashi[1], Janne Lehtomaki[2]

[1]Tokyo University of Agriculture and Technology, Japan; [2]University of Oulu, Finland

We propose a method to estimate the impulse response of THz wireless channels using experimental measurements under different humidity conditions. By eliminating hardware effects and employing a causal time-domain model based on the minimum phase criterion, we validate both the model and estimation approach through comparison with measured results.

15:35-15:50

Variation Aware D-Flip-Flop Design using Regression Analysis

Shinichi Nishizawa
Hiroshima University

This talk presents a design methodology for a process variation-aware D-Flip-Flop (DFF) using regression analysis. The worst-case delay of the DFF is modeled through regression analysis and optimized by transistor width tuning. The proposed method results in a DFF with delay characteristics similar to designs created by experienced designers.

Photo Session

Evening Session

Time: 21:00-22:00

Room: Ryokusuitei (Akiu Onsen) 27-2 Uehara, Akiu-machi Yumoto, Taihaku-ku, Sendai, Miyagi, Japan

Chair: Kentaro Ishizu (NICT)

21:00-21:30

Transition Techniques for Transmission-Line Measurements in 300-GHz Band

Kunio Sakakibara, Yoshiki Sugimoto
Nagoya Institute of Technology

Various transmission-line transitions were developed for loss measurements of various transmission lines in 300-GHz band. For example, microstrip-to-waveguide transitions are useful to feed microstrip lines from a vector network analyzer through standard waveguides. Waveguide transitions from various planar lines such as microstrip line, co-planar line, substrate integrated waveguide (SIW) are developed in 300-GHz band.

21:30-22:00

Challenges in Terahertz Dielectric Measurement

Ryo Sakamaki
Hiroshima University

In this study, we developed a high-precision probe control technology that is applicable in the millimeter-wave range up to 300 GHz, as well as a new evaluation technique for dielectric materials using this technology. Unlike conventional microscopic methods, the developed probe control technology automatically determines the probe position by analyzing the actual electrical signals measured. Additionally, the dielectric material evaluation technique developed in this study involves inducing resonance by making contact with a high-frequency probe in the middle of a transmission line, allowing for in-situ material evaluation. The probe position control technology and dielectric material evaluation technique developed in this study are effective for evaluating devices and materials used in next-generation communication technologies, which have recently been a subject of discussion, and are expected to have significant ripple effects on industrial society.

Day 2 Thursday, 24th April

Session 2: Architectures and Enabling Technologies for Beyond-5G and Terahertz Wireless Networks

Time: 9:45-11:40

Room: M601, 6th Floor, Main Building, Research Institute of Electrical Communication (RIEC)

Chair: Yozo Shoji (NICT)

9:45-10:10

(Invited) Reconfigurable User-centric Radio Access Network for Building Green and Resilient 6G Networks

Fumiyuki Adachi

Tohoku University

To advance mobile communications into the 6G era, research activities are currently being intensified around the world. The rapid growth of mobile data traffic has made it essential to utilize the mmWave band in addition to the sub-6GHz band. However, the mmWave bands have serious disadvantages of high propagation path loss and frequent blockage due to their strong rectilinear propagation nature. A reconfigurable user-centric radio access network (RAN) based on distributed massive MIMO (mMIMO) is a promising solution that turns the disadvantages of the mmWave band into advantages, making RAN scalable, flexible, resilient, and capable of utilizing renewable energy. This talk will introduce a framework of reconfigurable user-centric RAN based on distributed mMIMO for building green and resilient 6G networks.

10:10-10:35

(Invited) Fast and Sensitive THz detection based on 2D Dirac Semimetal heterostructures

Chao Tang

Tohoku University

In this study, we present recent progress in high-speed and highly sensitive terahertz (THz) detection using two-dimensional (2D) Dirac semimetals (DSMs), including graphene, Bi2Se3, and other 2D materials. By engineering heterostructures that leverage the rectification, tunneling, and bolometric effects of carriers in DSMs, we achieved THz detection with response times on the order of 100 ps and responsivities reaching approximately 10 V/W.

10:35-11:00

(Invited) Polar Codes for Wireless Terahertz

Hideki Ochiai

The University of Osaka

We discuss suitable channel codes for Wireless Terahertz systems.

11:00-11:25

(Invited) UTC-PD-Integrated HEMT Photonic Double-Mixer for Beyond-5G Fiber-Wireless-Convergence Network Systems

Akira Satou, Tsung-Tse Lin, Taiichi Otsuji

Research Institute of Electrical Communication, Tohoku University

We review recent progress in the development of the UTC-PD-integrated HEMT photonic double-mixer as an optical-to-sub-terahertz (sub-THz)/THz wireless carrier frequency down-converter for use in the future beyond-5G fiber-wireless-convergence network systems. We succeeded in enhancing the double-mixing conversion gain up to -39 dB at the 120-GHz band as well as in demonstrating the double-mixing operation for the first time at the 300-GHz band.

11:25-11:40

Hybrid Photonic-CMOS Integrated Devices for High-Frequency Wireless Systems

Takeshi Kuboki

Hiroshima University

This talk introduces our ongoing research toward integrating photonic and CMOS circuits for future high-frequency wireless systems. We present conceptual architectures targeting millimeter-wave and sub-THz applications, and discuss expected advantages, integration challenges, and design strategies. The aim is to explore potential device directions for next-generation 6G communication platforms.

Poster Session

Time: 11:40-13:00

Room: 1st Floor, Lounge, Main Building, Research Institute of Electrical Communication (RIEC)

Session 3: Sensing and Characterization Technologies for Terahertz and RF Systems

Time: 13:00-13:25

Room: M601, 6th Floor, Main Building, Research Institute of Electrical Communication (RIEC)

Chair: Kunio Sakakibara (Nagoya Institute of Technology)

13:00-13:25

(Invited) Introduction to Latest Semiconductor Test Trend and Basical Construction for RF Test Solution

Masayuki Kimishima

Advantest Laboratories Ltd.

A trend of the latest semiconductor test business and the basic RF test solution are described. Based on the keyword of AI, HPC, HBM, PIC, the device trend and the test target will be presented, and our typical RF test solution and the key hardware technologies will be focused.

13:25-13:50

(Invited) Experimental trial for vital sensing using sub-terahertz wave

Shusaku Umeda, Kazuaki Ishioka, Akinori Taira
Mitsubishi Electric Corp. Information Technology R&D Center

Sub-terahertz waves (terahertz waves below 1THz) possess unique characteristics, such as the ability to penetrate materials like radio waves and high resolution like light, enabling the detection of minute changes in objects even in shielded environments. One of the use cases for detecting such minute changes is remote vital sensing. In this paper, we present the results of experiments on remote vital sensing using a sub-terahertz wave experimental system operating in the 300GHz band.

13:50-14:15

(Invited) Propagation characteristics of 300-GHz-band wireless link

Akihiko Hirata
Chiba Institute of Technology

In this paper, we report on the evaluation technique of radio propagation characteristics in the 300 GHz band, and showed the measurement results of terahertz propagation characteristics.

14:15-14:40

(Invited) PCB-Embedded Cavity-Based Filters: Challenges and Design Considerations

Arash Arsanjani, Michael Ernst Gadringer, Wolfgang Bösch
Graz University of Technology

Embedded components are increasingly sought after for their ability to enhance integration in next-generation telecommunication systems. Among these, embedded filters play a crucial role in achieving compact, high-performance designs. This presentation explores the key challenges associated with the implementation of PCB-embedded metasurface filters. It highlights critical design considerations, manufacturing limitations, and measurement constraints that must be addressed to enable their practical adoption in advanced RF systems.

14:40-14:55

(Invited) From Millimeter-Wave to Terahertz: Exploring Communication Standards and System Architectures with Emerging Devices

Keitarou Kondou
NICT

This talk introduces our research on the transition from millimeter-wave (mmWave) to terahertz (THz) communication. We focus on the development and evaluation of communication standards, such as IEEE 802.15.3e and 802.15.3d, and show how they can be extended to support higher frequencies. We also explain our system design using THz-capable devices, including how these systems are built and how the signal processing is structured. While this talk does not include a live demonstration, we will present the architecture and planning of our experimental systems. Our goal is to share ideas on how current mmWave technologies can be expanded into the THz range to support future high-speed wireless communication.

14:55-15:00

Award Ceremony

Minoru Fujishima

Hiroshima University

Poster Session
Time: 11:40-13:00
Room: 1st Floor, Lounge, Main Building, Research Institute of Electrical Communication (RIEC)

P1: Direction of Arrival Estimation of Radio Waves using Compressed Sensing in Adaptive Beam Space

Ryu Shimamura, Nobuyoshi Kikuma, Kunio Sakibara
Nagoya Institute of Technology, Japan

A Study on How the Estimation Accuracy of Direction of Arrival (DOA) of Radio Waves Improves by Introducing Adaptive Beam Space into Compressed Sensing

P2: Design of SIW Rotman Lens Multibeam Antenna with Broadband Termination Connecting to Back SIW in 300-GHz Band

Koki Shikano, Kenta Nishimura, Azuki Iwamoto, Kunio Sakibara, Yoshiki Sugimoto, Nobuyoshi Kikuma
Nagoya Institute of Technology, Japan

A Rotman lens multibeam antenna combining with a substrate‐integrated waveguide (SIW) traveling‐wave slot array with broadband termination connecting to back SIW operating in the 300‐GHz band was designed. Electromagnetic simulations confirmed that the proposed antenna achieves high gain and beam‐scanning capability while effectively suppressing reflected waves over a wide bandwidth.

P3: OTFS and OFDM Performance in Q/V-Band LEO Satellites Under High Doppler Shifts

Ryo Arimura, Masataka Miyake, Suguru Kameda
Hiroshima University, Japan

This study investigates the effectiveness of orthogonal time frequency space (OTFS) modulation for reliable low Earth orbit (LEO) satellite communications in the Q/V bands. We evaluate the bit error rate (BER) performance with respect to satellite elevation angles and compare OTFS with orthogonal frequency division multiplexing (OFDM) under high Doppler shift conditions. The results demonstrate that OTFS provides superior reliability, making it a promising candidate for high‐mobility and high‐frequency satellite communication systems.

P4: Joint Optimization of Transmission Parameters in Single-Carrier Systems with Band-Limited Analog Front-End Constraints

Shun Ishihara[1], Minoru Fujishima[2], Suguru Kameda[2], Kosuke Katayama[3], Janne Lehtomaki[4], Nuutti Tervo[4], Kenta Umebayashi[1]

[1]Tokyo University of Agriculture and Technology, Japan; [2]Hiroshima University, Japan; [3]Tokuyama National College of Technology, Japan; [4]University of Oulu

This paper examines a single‐carrier system that employs pre‐equalization to mitigate inter‐symbol interference caused by a band‐limited analog front end. While conventional studies often fix specific design parameters such as symbol rate and sampling timing, our approach adaptively chooses these parameters and shows better performance based on computer simulations.

P5: Implementation and Evaluation of Synchronized SS-CDMA Using Space-Time Synchronization on USRP X310

Toshiki Ouchi, Serena Akasaka, Masataka Miyake, Suguru Kameda

Hiroshima University, Japan

Synchronized spread spectrum code division multiple access (SS-CDMA), utilizing wireless two-way interferometry (Wi-Wi) for space-time synchronization, enables high-capacity Internet of Things (IoT) connectivity. Using the universal software radio peripheral (USRP) X310 to increase the sampling rate, we implemented root raised cosine (RRC) filters both before transmission and after reception, and compared the bit error rate (BER) performance of the conventional and improved communication systems.

P6: Wideband Waveguide-to-differential-line Transition with Slots and Back-short in Multilayer Substrate

Azuki Iwamoto, Makoto Yamazaki, Yoshiki Sugimoto, Kunio Sakibara, Shumpei Kishi, Nobuyoshi Kikuma

Nagoya Institute of Technology, Japan

This paper proposes a wideband waveguide-to- differential-line transition with slots and a back-short structure for use in 300-GHz band. Slots and a back-short structure are formed in a multilayer substrate to create a double resonance. By controlling these resonant frequencies, a transition with wide bandwidth of low-loss connection can be obtained. As a result of the optimization, the simulated bandwidths were 107.5 GHz for reflection lower than -10 dB and 131.9 GHz for transmission higher than -3 dB.

P7: A study on threshold optimization for SIMO Systems with 1-Bit ADCs

Rina Takagi[1], Kenta Umebayashi[1], Antti Tölli[2], Bikshapathi Gouda[2], Janne Lehtomäki[2]

[1]Tokyo University of Agriculture and Technology, Japan; [2]University of Oulu

This research investigates the quantization threshold setting in 1-bit ADCs for SIMO communication systems. An optimal detector that considers the distribution of the received signals is employed. Numerical simulations demonstrate that the proposed threshold results in a significant improvement in SER performance.

P8: Design of Parallel Differential-line Fed Planar Aperture Antenna Excited by X-shaped Patch Using Slot Coupling

Taisuke Uemura, Yoshiki Sugimoto, Kunio Sakakibara, Nobuyoshi Kikuma

Nagoya Institute of Technology, Japan

A planar aperture antenna with parallel-differential line excited by X-shaped patch using slot coupling is developed in 300-GHz band. The occupied area of the antenna on the bottom layer can be reduced by coupling parallel differential transmission lines and an X-shaped patch via a slot.

P9: Evaluation of Time Synchronization Offset of Wireless Two-Way Interferometry (Wi-Wi) by Using Automatic Measurement System

Hiroto Kita[1], Masataka Miyake[1], Suguru Kameda[1], Satoshi Yasuda[2], Nobuyasu Shiga[2]

[1]Hiroshima University, Japan; [2]National Institute of Information and Communications Technology (NICT), Japan

Wireless two-way interferometry (Wi-Wi) enables high-precision time synchronization in wireless systems. Previously, the time-synchronization offset was measured manually, limiting measurement counts and confining evaluation to environments with fluctuating radio conditions. This study automates the process, increasing measurement counts and enabling evaluation in stable radio conditions.

P10: Measurement Characteristic of Endfire Antenna with Step Horn Structure in Multilayer Substrate at 300 GHz

Daisuke Sakai[1], Yoshiki Sugimoto[1], Kunio Sakibara[1], Ken Takahashi[2], Nobuyoshi Kikuma[1]

[1]Nagoya Institute of Technology, Japan; [2]Panasonic System Networks R&D Lab. Co., Ltd., Japan

An eight-layer substrate-integrated waveguide (SIW) end-fire antenna with E-plane horn structure is designed at 275 GHz. The length of matching with a free space and SIW is different from the length of matching within SIWs with each other. So, these lengths need to be different. Simulated results show that the smaller the size of the matching between the free space and the waveguide, the larger the resonance frequency and the wider the bandwidth. The fabricated antenna is evaluated and its measured characteristics are presented.

P11: Multibeam Microstrip Array Antenna Fed by Low-Loss and Compact Rotman-Lens in 300-GHz Band

Kenta Nishimura, Yoshiki Sugimoto, Kunio Sakibara, Motoko Sakamoto, Nobuyoshi Kikuma
Nagoya Institute of Technology, Japan

A multibeam antenna fed by a microstrip Rotman lens was designed in 300-GHz band. The Rotman lens was minimized for the required number of beams and array elements to minimize transmission losses. The proposed multibeam antenna achieves a gain of over 20 dBi across a 60-degree range at 274 GHz.

P12: Design of a 300-GHz-Band Up-Conversion Mixer for Self-Heterodyne Transceiver in 0.13-μm SiGe BiCMOS

Taiga Noguchi, Kyoya Takano
Tokyo University of Science, Japan

We present an up-conversion mixer in 0.13-μm SiGe BiCMOS technology for 300-GHz wireless communication using a self-heterodyne system.
In the simulation results, the mixer achieved a maximum conversion gain of -8.8 dB, 3 dB bandwidth of 46 GHz, IP1dB of 2.5 dBm, and OP1dB of -1.96 dBm.

P13: Low Scan-Loss Multi-Beam Lens Antenna Fed by Horns with Separated Phase Centers in E/H-Planes

Shota Takada, Yoshiki Sugimoto, Kunio Sakibara, Nobuyoshi Kikuma
Nagoya Institute of Technology, Japan

This study proposes a wide-angle beam-scanning multi-beam lens antenna fed by horns with separated phase centers in E/H-planes by different wall heights. In the proposed antenna, these phase centers are aligned at the focus position of the lens separated by astigmatism. The proposed antenna improves the directivity in wide-angle directions.

P14: Performance evaluation of ADGG-HEMT THz plasmonic detectors for beyond-5G wireless communication networks

M. Nagatsu[1], K. Narita[1], Y. Takida[2], H. Minamide[2], T.-T. Lin[1], T. Suemitsu[3], T. Otsuji[4], A. Satou[1]

[1]Research Institute of Electrical Communication, Tohoku University, Sendai, Japan;

[2]RIKEN Center for Advanced Photonics, RIKEN, Sendai, Japan;

[3]New Industry Creation Hatchery Center, Tohoku University, Sendai, Japan;

[4]Research Institute of Electrical Communication, Tohoku University, Sendai, Japan, International Research Institute of Disaster Science, Tohoku University, Sendai, Japan, Center of Excellence ENSEMBLE3 Ltd., Warsaw, Poland;

We have developed the so-called Asymmetric Dual-Grating-Gate (ADGG) terahertz (THz) plasmonic detectors based on InGaAs-channel High-Electron-Mobility Transistors (HEMTs). We experimentally evaluated their performances such as detection responsivity, linearity, and frequency bandwidth at around 1 THz and demonstrated their high performances for use in the beyond-5G wireless communication networks.

P15: Evaluation of Input Signals for Deep Learning-Based Antenna Spacing Control in Adaptive Arrays

Junya Miura, Kenta Umebayashi

Tokyo University of Agriculture and Technology, Japan

Adaptive array antennas with optimized spacing can suppress two or more interfering signals with only two antennas. However, optimizing antenna spacing remains a challenging task. To address this problem, we employ deep learning to optimize antenna spacing. Numerical evaluations show how the performance varies with the input of deep learning.

P16: 300-GHz Band Capacitor Modeling with Passivity-Constrained Rational Polynomial Approximation

Yuto Hirayama[1], Shun Beppu[1], Shinsuke Hara[2], Akifumi Kasamatsu[2], Yoshio Mita[3], Kyoya Takano[1]

[1]Tokyo University of Science, Japan; [2]National Institute of Information and Communications Technology (NICT), Japan; [3]The University of Tokyo, Japan

This study proposes a modeling method based on rational polynomial approximation (RPA) for metal-oxide-metal (MOM) capacitors used in 300-GHz band applications. The proposed approach refines the model through constrained re-fitting to ensure passivity and causality, enabling the development of highly accurate equivalent circuits suitable for high-frequency simulations.

P17: Ultra-wide Band Coplanar Waveguide Crossover with Coupling Suppression and Low Loss for Millimeter-Wave Applications

Leshan Xu, Satoshi Tanaka, Takeshi Yoshida, Minoru Fujishima

Hiroshima University, Japan

To minimize the influence of crossover at various locations along the transmission path in a D-band phased array, it is essential to reduce both coupling and loss to the greatest extent possible. In this study, we proposed a crossover with metallic ground shields to reduce coupling. The isolation is improved by 18dB compared with the conventional design, with an insertion loss of less than 0.2dB.

P18: Decoupling Technique for Power Line that Balances Noise Suppression and Chip Area Reduction

Yudai Miyoshi, Takeshi Yoshida, Satoshi Tanaka, Minoru Fujishima

Hiroshima University, Japan

We propose a power panel structure extending 0Ω transmission lines into a two-dimensional layout, enabling compact, low-DC-resistance decoupling. This approach reduces chip area from 1.985 mm^2 to 0.45 mm^2 while ensuring sufficient decoupling capacitance, overcoming conventional limitations in power distribution for high-frequency IC.

P19: A study of DOA estimation by time sample thinning utilizing received signal levels

Ryo Watabe[1], Kenta Umebayashi[1], Antti Tölli[2]

[1]Tokyo University of Agriculture and Technology, Japan; [2]University of Oulu, Finland

This study proposes a novel direction-of-arrival (DOA) estimation method that performs time sample thinning based on received signal levels. By selecting only the samples whose signal strength exceeds a predefined threshold, the method achieves more accurate DOA estimation. Numerical results demonstrate that this approach outperforms conventional methods, particularly when the number of available samples is limited.

P20: A Compact D-Band 360° Active Differential Phase Shifter for Sub-Terahertz Phased-Array Antennas in 40nm CMOS

Zhen Yan, Satoshi Tanaka, Takeshi Yoshida, Minoru Fujishima

Hiroshima University, Japan

This study presents the design of a D-band 156-GHz active differential phase shifter intended for transceiver circuits in phased array antennas to receive terahertz signals. The proposed phase shifter utilizes a tunable active circuit composed of series-connected NMOS transistors, where the bias voltage is controlled to adjust the drain-source resistance. This configuration enables both continuous and fixed phase shifts. The phase shift range is extended to cover the full 360° by connecting multiple adjustable phase shifter units in series, employing a 0°/60° phase shift switch, and incorporating a Gilbert cell as a 0°/180° phase switch. The circuit is fabricated using TSMC's 40nm CMOS process, ensuring a compact layout and facilitating miniaturization. Measurement results confirmed the circuit operates effectively, demonstrating its potential for further research and practical applications.

P21: Spectrum Usage Prediction in Wireless Systems Using Human Activity Patterns

Leow Yau Hong[1], Kenta Umebayashi[1], Sergio Infante[2], Julia Robles[2], Manuel Díaz[2], Cristian Martín[2]

[1]Tokyo University of Agriculture and Technology, Japan; [2]University of Málaga, Málaga, Spain

This research introduces human presence as a novel feature for predicting spectrum usage in wireless systems. Existing approaches that rely solely on historical usage data often struggle to accurately predict sudden usage increase which usually caused by random human activity. Correspondingly, experimental results demonstrate that incorporating human presence can provide a strong prior indicator for predicting the sudden usage increases.

Main Session Venue

Room M601, 6th Floor, Main Building,

Research Institute of Electrical Communication (RIEC), Tohoku University

Address: Katahira 2-1-1, Aoba-ku, Sendai, Japan

Access

From Sendai Airport

- By taxi: About 60 minutes from Sendai Airport to Katahira Campus
- By Sendai Airport Access Line: About 25 minutes from Sendai Airport to JR Sendai Station

From JR Sendai Station

- On foot: About 20 minutes from JR Sendai Station
- By taxi: About 5minutes from JR Sendai Station

Workshop Venue

Room M601, 6th Floor, Main Building

Evening Session Venue

Ryokusuitei (Akiu Onsen)

27-2 Uehara, Akiu-machi Yumoto, Taihaku-ku, Sendai, Miyagi, Japan

https://www.ryokusuitei.co.jp/

Access

Chartered bus (Details will be provided at the IGROW venue on the day of the event.)