

TeraTech 2023

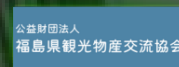
10th International Symposium on
Terahertz-Related Devices and **Tech**nologies

Advance Program

University of Aizu
Aizuwakamatsu, Fukushima
Japan

September 4 - 8, 2023

Financial Sponsors:



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Timetable of TeraTech 2023

Time in JST Time Zone

Plenary: 45 min. (including 5 min. Q&A)
 Invited: 30 min. (including 5 min. Q&A)
 Contributed: 15 min. (including 3-5 min. Q&A)

4th, Sept. (MON)	5th, Sept. (TUE)	6th, Sept. (WED)	7th, Sept. (THU)	8th, Sept. (FRI)
	8:45 - 9:00 Opening			
	9:00 - 10:30 Session Tu1 Phenomena I Xi-Cheng Zhang (Plenary) Mona Jarrahi (Plenary)	9:00 - 10:30 Session We1 Mini-Coloquium Michael S. Shur (DL) Taiichi Otsuji (DL)	9:00 - 10:30 Session Th1 Devices & Systems II Hartmut Roskos (Plenary) Hiroaki Minamide (Plenary)	9:00 - 10:30 Session Fr1 Devices & Systems VI Vladimir I. Gavrilenko (Plenary) Victor Ryzhii (Plenary)
	10:30 - 11:00 Coffee Break	10:30 - 11:00 Coffee Break	10:30 - 11:00 Coffee Break	10:30 - 11:00 Coffee Break
	11:00 - 12:30 Session Tu2 Phenomena II Kazu Hirakawa (Invited) Manfred Helm (Invited) Denis Bandurin (Invited)	11:00 - 12:30 Session We2 Phenomena IV Junichiro Kono (Invited) Alessandro Tredicuuci (Invited) Wladislaw Michailow (Invited)	11:00 - 12:30 Session Th2 Devices & Systems III Tadao Nagatsuma (Invited) Minoru Fujishima (Invited) Yuta Shiratori (Invited)	11:00 - 12:30 Session Fr2 Devices & Systems VII Chiko Otani (Invited) Kousuke Murate (Invited) Enrique Castro Camus (Invited)
	12:30 - 13:45 Lunch	12:30 - 13:45 Lunch	12:30 - 13:45 Lunch	12:30 - 13:45 Lunch
14:00 - 17:00 Registration at Aizuwakamatsu Washington Hotel	13:45 - 15:15 Session Tu3 Devices & Systems I Mitsuki Watanabe (Contributed) Luwei Zheng (Contributed) Vladimir Mitin (Invited) Berardi Sensale-Rodriguez (Invited)	13:45 - 15:15 Session We3 Phenomena V Zizwe Chase (Contributed) Dongxun Yang (Contributed) Wojciech Knap (Invited) Vyacheslav V. Popov (Invited)	13:45 - 15:15 Session Th3 Devices & Systems IV Michael Feiginov (Contributed) Vladislovas Cizas (Contributed) Safumi Suzuki (Invited) Yahya Moubarak Meziani (Invited)	13:45 - 16:00 Session Fr3 Devices & Systems VIII Sergey Morozov (Invited) Dmitry Ponomarev (Invited) Kazutohi Kato (Invited) Miriam S. Vitiello (Plenary)
	15:15 - 15:45 Coffee Break	15:15 - 15:45 Coffee Break	15:15 - 15:45 Coffee Break	
	15:45 - 18:00 Session Tu4 Phenomena III Masayoshi Tonouchi (Plenary) Sandra Ruffenach (Invited) Erwin Mönch (Contributed) Christophe Consejo (Invited) Khabibullin Rustam (Contributed)	15:45 - 16:30 Session We4 Phenomena VI Viktor Sverdlov (Invited) Marcel Hild (Contributed)	15:45 - 17:30 Session Th4 Devices & Systems V Gintaras Valusis (Invited) Mingxi Chen (Contributed) Xueqing Liu (Invited) Zhenxing Wang (Invited)	16:00 - 16:30 Closing
17:00 - 19:00 Welcome Reception at Aizuwakamatsu Washington Hotel		16:30 - 18:00 Session We5 Poster	(Transfer to the Hotel)	
			18:00 - 20:00 Banquet at Aizuwakamatsu Washington Hotel	

Technical Program of TeraTech-2023

TUESDAY September 5th, 2023

08:45 - 09:00 Opening

1. T. Otsuji, General Chair
2. V. Ryzhii, ISC member
3. M. Ryzhii, LOC Chair
4. W. Knap, TPC Chair

Session Tu1 Phenomena I
09:00 - 10:30 Chair: W. Knap, *CENTERA, NIHPP, PAS, Poland*

09:00 - 09:45 **Perspective of THz Liquid Photonics**

Tu1-1

Plenary

Xi-Cheng Zhang
University of Rochester, USA

09:45 - 10:30 **High-throughput time-domain terahertz imaging through plasmonic photoconductive focal-plane arrays**

Tu1-2

Plenary

Mona Jarrahi
University of California Los Angeles, USA

10:30 - 11:00 Coffee Break

Session Tu2 Phenomena II
11:00 - 12:30 Chair: A. Satou, *Tohoku Univ., Japan*

11:00 - 11:30 **Terahertz carrier dynamics in single molecule transistors**

Tu2-1

Invited

Kazuhiko Hirakawa
University of Tokyo, Japan

11:30 - 12:00 **Time-resolved THz spectroscopy of single nanowires**

Tu2-2

Invited

Manfred Helm
Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Germany

12:00 - 12:30 **Teratronics in the flatland: recent advances and novel applications**

Tu2-3

Invited

Denis Bandurin
National University of Singapore, Singapore

12:30 - 13:45 Lunch

Session Tu3 Devices & Systems I
13:45 - 15:15 Chair: K. Hirakawa, *Univ. Tokyo, Japan*

13:45 - 14:00 **Optical-to-MMW/THz Carrier Frequency Down Conversion by UTC-PD-Integrated HEMT: Optimization of UTC-PD Mesa Shape and Size**

Tu3-1

Contributed

Mitsuki Watanabe
Tohoku University, Japan

14:00 - 14:15 Tu3-2	The Assessment of Reflective Characteristics of Meta-atoms Exploiting Point Terahertz Sources and Its Application in Microfluidics
Contribute	Luwei Zheng <i>Osaka University, Japan</i>
14:15 - 14:45 Tu3-3	Voltage Tunable Infrared Detector for AI-Based Object Recognition
Invited	Vladimir Mitin <i>University at Buffalo, SUNY, USA</i>
14:45 - 15:15 Tu3-4	Machine learning enables multi-degree-of-freedom reconfigurable terahertz holograms with cascaded diffractive optical elements
Invited	Berardi Sensale-Rodriguez <i>The University of Utah, USA</i>

15:15 - 15:45 Coffee Break

Session Tu4 Phenomena III 15:45 - 18:00

Chair: M. Helm, *Helmholtz-Zentrum Dresden-Rossendorf (HZDR), Germany*

15:45 - 16:30 Tu4-1	LTEM as a new tool for semiconductor manufacturing process monitor
Plenary	Masayoshi Tonouchi <i>Osaka University, Japan</i>
16:30 - 17:00 Tu4-2	Towards THz Spectroscopy of Living Matter by Activating Long-Range Electrodynamical Forces
Invited	Sandra Ruffenach <i>Montpellier Université, CNRS, France</i>
17:00 - 17:15 Tu4-3	Circular polarization immunity of the cyclotron resonance photoconductivity in two-dimensional electron systems
Contributed	Erwin Mönch <i>University of Regensburg, Germany</i>
17:15 - 17:45 Tu4-2	Landau emission from 2D Dirac fermions in HgTe QWs
Invited	Christophe Consejo <i>CNRS-Université de Montpellier, France</i>
17:45 - 18:00 Tu4-3	Terahertz quantum cascade lasers with resonant two-photon design
Contributed	Rustam Khabibullin <i>Institute of Ultra-High Frequency Semiconductor Electronics, RAS, Russia</i>

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Wednesday September 6th, 2023

Session We1 Mini - Colloquium (IEEE-EDS DL Lecture Meeting)

09:00 - 10:30

Chair: V. Mitin, *Univ. Buffalo, SUNY, USA*

09:00 - 09:45

Sensing Using Terahertz Radiation

We1-1

DL Lecture

Michael Shur

Rensselaer Polytechnic Institute, USA

09:45 - 10:30

Terahertz Plasmonic Devices Using Graphene-based 2D Materials

We1-2

DL Lecture

Taiichi Otsuji

Tohoku University, Japan

10:30 - 11:00 Coffee Break

Session We2 Phenomena IV

11:00 - 12:30

Chair: D. Bandurin, *National Univ. Singapore, Singapore*

11:00 - 11:30

Quantum-Vacuum Effects in Solids in Terahertz Cavities

We2-1

Invited

Junichiro Kono

Rice University, USA

11:30 - 12:00

Micro-thermo-mechanical devices: THz detection concepts and novel read-out schemes

We2-2

Invited

Alessandro Tredicucci

Università di Pisa, Italy

12:00 - 12:30

The in-plane photoelectric effect – a new opportunity for efficient terahertz detection

We2-3

Invited

Wladislaw Michailow

University of Cambridge, UK

12:30 - 13:45 Lunch

Session We3 Phenomena V

13:45 - 15:15

Chair: Y.M. Meziani, *Univ. Salamanca, Spain*

13:45 - 14:00

Inverse-design Optimized Metamaterial for THz

We3-1

Application of Deutsch-Jozsa Algorithm

Contributed

Zizwe Chase

University of Illinois at Chicago, USA

	14:00 - 14:15 We3-2	Characterization of the Large-scale Graphene on Si Surface by Terahertz Emission Spectroscopy and Microscopy
	Contribute	Dongxun Yang <i>Osaka University, Japan</i>
	14:15 - 14:45 We3-3	Electrical Tuning of Plasmonic Crystals Phases
	Invited	Woiciech Knap <i>CENTERA Laboratories, IHPP Polish Academy of Sciences , Poland</i>
	14:45 - 15:15 We3-4	Amplification and Lasing of TE Electromagnetic Modes in Graphene with a Drift-Current Bias
	Invited	Vyacheslav V. Popov <i>Kotelnikov Institute of Radio Engineering and Electronics (Saratov Branch), RAS, Russia</i>

15:15 - 15:45 Coffee Break

Session We4 Phenomena VI

15:45 - 16:30 Chair: C. Consejo, *CNRS-Univ. Montpellier, France*

	15:45 - 16:15 We4-1	Modeling Emerging Spintronic Devices and Spintronic THz Emitters
	Invited	Viktor Sverdlov <i>Technische Universität Wien, Austria</i>
	16:15 - 16:30 We4-2	Terahertz spin ratchet in magnetic metamaterials
	Contributed	Marcel Hild <i>University of Regensburg, Germany</i>

Session WeP Poster

16:30 - 18:00

16:30 - 18:00
WeP-01
~ WeP-20

Technical Program of TeraTech-2023

THURSDAY September 7th, 2023

Session Th1 09:00 - 10:30	Devices & Systems II	
	Chair: A. Tredicucci, <i>Università di Pisa, Italy</i>	
	09:00 - 09:45 Th1-1	THz Holographic Imaging: Emergent Opportunities by Hardware Developments and Deep Learning
	Plenary	Hartmut G. Roskos <i>Goethe-Universität, Germany</i>
	09:45 - 10:30 Th1-2	Ubiquitous high-power terahertz-wave parametric source that opens up a new future for nondestructive testing
	Plenary	Hiroaki Minamide <i>RIKEN, Japan</i>

10:30 - 11:00 Coffee Break

Session Th2 11:00 - 12:30	Devices & Systems III	
	Chair: Z. Wang, <i>AMO GmbH, Germany</i>	
	11:00 - 11:30 Th2-1	Merging Terahertz, Photonics and Optics in Communications
	Invited	Tadao Nagatsuma <i>Osaka University, Japan</i>
	11:30 - 12:00 Th2-2	300 GHz Band Wireless Communications and Its Future
	Invited	Minoru Fujishima <i>Hiroshima University, Japan</i>
	12:00 - 12:30 Th2-3	Recent Progress in Ultra-high-speed InP-based Heterojunction Bipolar Transistors for future THz-band Communication Systems
	Invited	Yuta Shiratori <i>NTT Corporation, Japan</i>

12:30 - 13:45 Lunch

Session Th3 13:45 - 15:15	Devices & Systems IV	
	Chair: M. Fujishima, <i>Hiroshima Univ., Japan</i>	
	13:45 - 14:00 Th3-1	Improved Performance of THz Resonant Tunneling-Diode Oscillators
	Contributed	Michael Feiginov <i>Technische Universität Wien, Austria</i>

	14:00 - 14:15 Th3-2 Contribute	High-Frequency Gain Effects in Doped Semiconductor Superlattices Vladislovas Cizas <i>Center for Physical Sciences and Technology, Lithuania</i>
	14:15 - 14:45 Th3-3 Invited	Developments and future prospects of THz resonant tunneling diodes Safumi Suzuki <i>Tokyo Institute of Technology, Japan</i>
	14:45 - 15:15 Th3-4 Invited	Terahertz rectification up to 4.7 THz by using an Asymmetric Dual-Grating Gate Field-Effect Transistor Yahya Moubarak Meziani <i>Universidad de Salamanca, Spain</i>

15:15 - 15:45 Coffee Break

Session Th4 Devices & Systems V

15:45 - 17:30

Chair: K. Kato, *Kyushu Univ., Japan*

	15:45 - 16:15 Th4-1 Invited	Terahertz Structured Light and Its Application in Imaging Gintaras Valusis <i>Center for Physical Sciences and Technology (FTMC), Lithuania</i>
	16:15 - 16:30 Th4-2 Contributed	Photonic Crystal-Based Waveguide Optimization for Surface-Emitting Terahertz Quantum Cascade Lasers with High-Index Contrast Coupled Wave Theory Mingxi Chen <i>RIKEN, Japan</i>
	16:30 - 17:00 Tu4-3 Invited	Compact SPICE models for TeraFETs Xueqing Liu <i>Rensselaer Polytechnic Institute, USA</i>
	17:00 - 17:30 Th4-2 Invited	2D/3D Heterostructure Diodes for Application in High Frequency Electronics Zhenxing Wang <i>AMO GmbH, Germany</i>

Transfer to the Hotel

18:00 - 20:00 Banquet

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Friday September 8th, 2023

Session Fr1 09:00 - 10:30	Devices & Systems VI	
	Chair: T. Nagatsuma, <i>Osaka Univ., Japan</i>	
	09:00 - 09:45 Fr1-1 Plenary	HgCdTe-based Mid and Far Infrared Lasers Vladimir I. Gavrilenko <i>Institute for Physics of Microstructures, RAS, Russia</i>
	09:45 - 10:30 Fr1-2 Plenary	Coulomb Drag Mechanisms of Terahertz Generation in Graphene Hot-Electron Structures Victor Ryzhii <i>Tohoku University, Japan</i>
10:30 - 11:00 Coffee Break		
Session Fr2 11:00 - 12:30	Devices & Systems VII	
	Chair: S. Suzuki, <i>Tokyo Inst. Tech., Japan</i>	
	11:00 - 11:30 Fr2-1 Invited	Terahertz-Wave Phase Modulation at Photo-mixing by Interferometric Phase Stabilization Kazutoshi Kato <i>Kyushu University, Japan</i>
	11:30 - 12:00 Fr2-2 Invited	Practical measurement system using terahertz parametric generator and detector Kousuke Murate <i>Nagoya University, Japan</i>
12:30 - 13:45 Lunch		
Session Fr3 13:45 - 16:00	Devices & Systems VIII	
	Chair: M. Ryzhii, <i>Univ. Aizu, Japan</i>	
	13:45 - 14:15 Fr3-1 Invited	THz emission from quasirelativistic QW HgTe/CdHgTe structures: way from photoluminescence to laser Sergey Morozov <i>Institute for Physics of Microstructures, RAS, Russia</i>

	14:15 - 14:45 Fr3-2 Invited	Large-area THz emitters with sapphire-fiber optics Dmitry Ponomarev <i>Institute of Ultra-High Frequency Semiconductor Electronics, RAS, Russia</i>
	14:45 - 15:15 Fr3-3 Invited	An Ultra-high-Q Thin-film Superconducting Resonator for Terahertz Detectors Chiko Otani <i>RIKEN, Japan</i>
	15:15 - 16:00 Fr3-4 Plenary	Nano-Photonic Devices at Terahertz Frequencies Employing Scalable Single-Layer-Graphene Heterostructures Miriam Serena Vitiello <i>NEST, National Research Council CNR-NANO and Scuola Normale Superiore, Pisa, Italy</i>
16:00 - 16:30 Closing		
1. W. Knap, TPC Chair 2. A. Satou, LOC Co-Chair 3. F. Teppe, TeraTech 2024 Chair (TBC) 4. T. Otsuji, General Chair		

Technical Program of TeraTech-2023

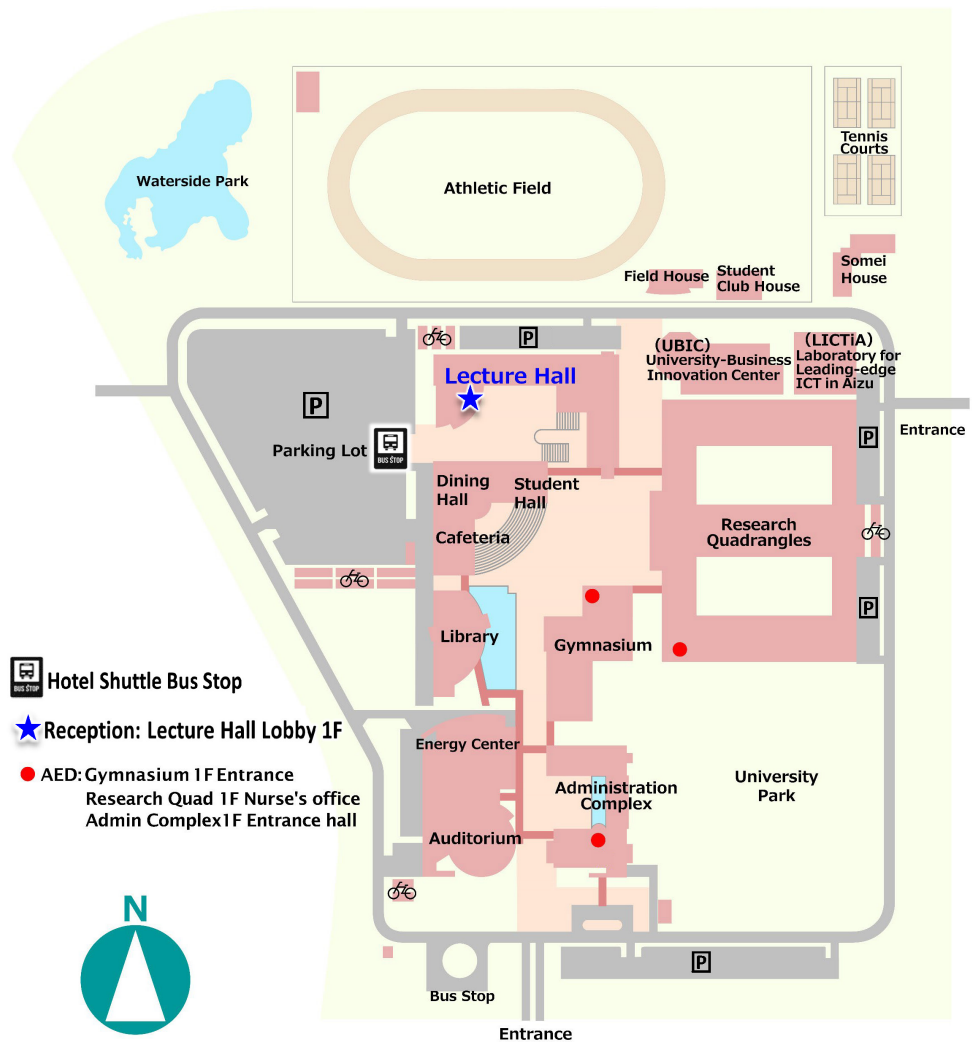
POSTER Session on Sept. 6 WED, 2023

Session WeP
16:30 - 18:00

- WeP-01 **Plasmonic Arrays for Terahertz Detection, Amplification, and Generation**
M. Shur, J. Mikalopas, G. Aizin
Rensselaer Polytechnic Institute, Troy, NY, USA
- WeP-02 **Evaluation on the interface potential of VO₂/Si Heterojunction by Terahertz Emission Spectroscopy**
D. Yang, F. Murakami, S. Genchi, H. Tanaka, M. Tonouchi
Institute of Laser Engineering, Osaka University, Osaka, Japan
- WeP-03 **GaAs terahertz quantum cascade lasers approaching room-temperature operation**
L. Wang, M. X. Chen, T.T. Lin, K. Wang, H. Hirayama
Research Center for Advanced Photonics, RIKEN, Sendai, Japan
- WeP-04 **Heteroepitaxy of graphene on h-BN using SiC as a substrate**
R. Kohama, K. Yonekubo, H. Sugino, K. Suwa, K. Sugawara, C. Tang, T. Otsuji, H. Fukidome
Research Institute of Electrical Communication, Tohoku University, Sendai, Japan
- WeP-05 **Development of graphene terahertz radiation detectors based on noise thermometry method**
I. A. Gayduchenko, K. V. Shein, P. I. Bondareva, A. N. Lubchak, R. I. Izmaylov, E. M. Baeva, G. N. Goltsman
National Research University Higher School of Economics, Moscow, Russia
- WeP-06 **Instability of intense laser pulse reflection from metal surface**
I. V. Oladyshkin, D. A. Fadeev
Institute of Applied Physics of the Russian Academy of Sciences, Nizhny Novgorod, Russia
- WeP-07 **Terahertz Imaging Employing Flexible Metasurface-Based Optics**
V. Čižas, R. Ivaškevičiūtė-Povilauskienė, E. Nacius, K. Redekas, M. Bernatoniš, S. Orlov, I. Grigelionis, G. Valušis, L. Minkevičius
Department of Optoelectronics, Center for Physical Sciences and Technology, Vilnius, Lithuania
- WeP-08 **Terahertz Spectroscopy of Chiral Phonons**
F. G. G. Hernandez, A. Baydin, S. Chaudhary, F. Tay, I. Katayama, Jun Takeda, H. Nojiri, A. K. Okazaki, P. H. O. Rappl, E. Abramof, M. Rodriguez-Vega, G. A. Fiete, and J. Kono
University of São Paulo, São Paulo, Brazil
- WeP-09 **Terahertz Wave Power Enhancement Using T-Junction Connected UTC-PDs on SiC Substrate**
H. Ssali, K. Kato
Graduate School of Information Science and Electrical Engineering, Kyushu University, Fukuoka, Japan
- WeP-10 **Features of terahertz generation in Al_xGa_(1-x)As/GaAs p-i-n diodes**
V. Truchin, I. Mustafin, V. Malevich, X. Fan, V. Kalinovskiy, E. Kontrosh, K. Prudchenko, I. Tolkachev
Ioffe Institute, St Petersburg, Russia
- WeP-11 **Current Driven Terahertz Oscillations in p-Diamond TeraFET**
M. M. Hasan, N. Pala, M. Shur
Electrical and Computer Engineering, Florida International University, Miami, USA
- WeP-12 **THz Gas Sensing Using Terahertz Time-Domain Spectroscopy with Ceramic Architecture**
K. Komatsu, T. Iwamoto, M. Aono
Department of Materials Science and Bioengineering, Nagaoka University of Technology, Niigata, Japan
- WeP-13 **Room temperature fast THz detection based on plasmonic rectification in an asymmetric periodic gated graphene field effect transistor**
H. Seki, C. Tang, K. Tamura, S. Uchigasaki, H. Fukidome, Y. Takida, H. Minamide, A. Satou, T. Otsuji
Research Institute of Electrical Communication, Tohoku University, Sendai, Japan

- WeP-14 **Multi-Element Structure-simplified Resonant-Tunneling-Diode Terahertz Oscillator Array**
S. Suzuki, T. Namba, T. V. Mai
Department of Electrical and Electronic Engineering, Tokyo Insutitute of Technology, Tokyo, Japan
- WeP-15 **Generation of Various Stokes Beams in Slant-Stripe-Type Periodically Poled Lithium Niobate**
D. Yadav, Y. Takida, J. E. Muldera, H. Minamide
Tera-Photonics Research Team, RIKEN Center for Advanced Photonics, Sendai, Japan
- WeP-16 **Terahertz-Wave Radar Configuration for High-Precision Landing Surface Imaging**
N. Sakamoto, I. Morohashi, A. Kanno
Tokyo Metropolitan University, Tokyo, Japam
- WeP-17 **Highly Sensitive and Fast Grating-Gate Plasmonic THz Detector Based on an Inverted-HEMT Structure**
K. Narita, T. Negoro, Y. Takida, H. Minamide, T. Suemitsu, T. Otsuji, A. Satou
Reseach Institute of Electrical Communication, Tohoku University, Sendai, Japan
- WeP-18 **Introduction of a Guided-Mode-Resonance Structure in the Uni-Traveling-Carrier Photodiode for Enhancement of Photoabsorption Efficiency**
R. Kojima, T. Otsuji, A. Satou
Reseach Institute of Electrical Communication, Tohoku University, Sendai, Japan
- WeP-19 **Phase modulation in terahertz wave communication using micro-optical comb**
T. Kikuhara, Y. Makimoto, Y. Tokizane, N. Kuse, E. Hase, Y. Matsumura, H. Kishikawa
Grad. Sch. Tech. Innov. Tokushima Univ., Tokushima University, Tokushima, Japan
- WeP-20 **Heterodyne and direct detection at terahertz and sub-terahertz wavelengths with a superconducting niobium diselenide**
K. Shein, E. Zharkov, M. A. Kashchenko, A. Lyubchak, E. Nguyen, A. Semenov, G. N. Goltsman, K. S. Novoselov, I. Charaev, A. Schilling, I. A. Gayduchenko, D. A. Bandurin
National Research University Higher School of Economics, Moscow, Russia

University of Aizu Campus Map



Conference Facilities

■ Univ. of Aizu

**Auditorium 160 max.
for Tech. Session**

**Lecture Rooms for
Poster Sessions,
Registration,
Exhibitions &
Coffee Break**

Cafeteria for Lunch

