2017 International Conference on Optical Instruments and Technology

IRMMW-THz Technologies and Their Applications

Cunlin Zhang
Xi-Cheng Zhang
Zhiming Huang

Editors

28–30 October 2017
Beijing, China

Sponsored by
CIS — China Instrument and Control Society (China)
SPIE

Published by
SPIE

Volume 10623
Contents

Authors vii
Symposium Committee ix
Conference Committee xi
Introduction xiii
Conference Organizers

SESSION 1  IRMMW-THz TECHNOLOGIES AND THEIR APPLICATIONS I

10623 02 Corrugated metal surface with pillars for terahertz surface plasmon polariton waveguide components [10623-36]
10623 03 THz computed tomography system with zero-order Bessel beam [10623-39]
10623 04 Manipulating the strength and broadband of the resonators in the terahertz metamaterials [10623-37]
10623 05 A debugging method of the Quadrotor UAV based on infrared thermal imaging [10623-44]

SESSION 2  IRMMW-THz TECHNOLOGIES AND THEIR APPLICATIONS II

10623 06 Terahertz carpet cloak based on ultrathin metasurface [10623-41]
10623 07 All-dielectric band stop filter at terahertz frequencies [10623-10]
10623 08 Compact terahertz spectrometer based on disordered rough surfaces [10623-13]

POSTER SESSION

10623 09 Stimulation research on the measurement of the IRW pneumatic thermal radiation [10623-3]
10623 0A Research on terahertz properties of rat brain tissue sections during dehydration [10623-8]
10623 0B Optical constant determination of cross-linked polystyrene in the infrared [10623-11]
10623 0C Nonlinear bias analysis and correction of microwave temperature sounder observations for FY-3C meteorological satellite [10623-14]
<table>
<thead>
<tr>
<th>Proc. of SPIE Vol. 10623 1062301-4</th>
</tr>
</thead>
<tbody>
<tr>
<td>10623 OD</td>
</tr>
<tr>
<td>10623 OE</td>
</tr>
<tr>
<td>10623 OF</td>
</tr>
<tr>
<td>10623 OG</td>
</tr>
<tr>
<td>10623 OH</td>
</tr>
<tr>
<td>10623 OI</td>
</tr>
<tr>
<td>10623 OJ</td>
</tr>
<tr>
<td>10623 OK</td>
</tr>
<tr>
<td>10623 OL</td>
</tr>
<tr>
<td>10623 OM</td>
</tr>
<tr>
<td>10623 ON</td>
</tr>
<tr>
<td>10623 OO</td>
</tr>
<tr>
<td>10623 OP</td>
</tr>
<tr>
<td>10623 OQ</td>
</tr>
<tr>
<td>10623 OR</td>
</tr>
<tr>
<td>10623 OS</td>
</tr>
<tr>
<td>10623 OT</td>
</tr>
<tr>
<td>10623 OU</td>
</tr>
</tbody>
</table>
Authors

Numbers in the index correspond to the last two digits of the seven-digit citation identifier (CID) article numbering system used in Proceedings of SPIE. The first five digits reflect the volume number. Base 36 numbering is employed for the last two digits and indicates the order of articles within the volume. Numbers start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B...0Z, followed by 10-1Z, 20-2Z, etc.

Chang, Chao, 0A
Chen, Gang, 0E
Chen, Lin, 07
Chen, Lizhi, 05
Chen, Wei, 0P
Chen, Wenxin, 0C
Cui, Gangqiang, 0A, 0B
Cui, Guangjie, 05
Cui, Hailin, 0F
Cui, T. J., 0E
Dang, H. X., 0E
Dong, Liquan, 09
Feng, Shengfei, 0T
Gao, Y. Q., 0Q
Ge, Jia-cheng, 08
Gu, Jianqiang, 06
Han, Jiaqiang, 02, 06
Han, Peng, 0T
Hao, Qian, 05
He, Jingsuo, 0F, 0G, 0H, 0O
Hu, Hongkang, 05
Hu, Taiyang, 0C, 0E
Huang, Huachuan, ON
Huang, Jingguo, 0Q
Huang, Wei, 08
Huang, Zhiming, 0Q
Jiang, Bing, 08
Jiang, Guanglong, 0R
Jiang, Lin, 0Q
Jin, Xipeng, 0H
Jin, Xu, 0C
Li, Chenyu, 04, 0M, 0P
Li, Hao, 0C, 0E
Li, Jining, 0D
Li, Xing-ao, 08
Li, Yanfeng, 02, 06
Li, Yihan, 0F
Li, Zeren, ON
Liang, Jianfeng, 0A, 0B
Liu, Changxiang, 04, 0M, 0P
Liu, Haishun, 0L
Liu, Jinsong, 03
Liu, Ming, 09
Liu, Qiao, 0N
Liu, Shangjian, 0I, 0J
Liu, Wenyuan, 0B
Liu, Xiaohua, 09
Long, Liang, 0K
Lu, Yuying, 0D
Lv, Rongchuan, 0C, 0E
Niu, Liting, 03
Peng, Jilong, 0U
Peng, Wenyu, 0B
Qi, Yanwen, 0T
Qiao, Zhi, 0B
Qu, Yue, 0Q
Shao, Yajun, 0U
Shi, Lan, 0M, 0P
Shi, Zexia, 0F, 0H
Su, Bo, 0F, 0G, 0H, 0O
Su, Xiang, 0E
Sun, Huijuan, 0M
Sun, Wenfeng, 0T
Sun, Xueming, 0F, 0H
Tari, X. M., 0E
Tan, Weichong, 05
Tan, Chunxu, 02
Tu, Min, 0B
Wang, Cuicui, 0I, 0J
Wang, Dong, 0U
Wang, Kejia, 03
Wang, Ruike, 0F, 0H
Wang, Shanshan, 0U
Wang, Xinke, 0T
Wei, Minggul, 06
Wei, Yifang, 09
Wu, Jing, 0Q
Wu, Linlin, 0K
Wu, Qiaoxia, 03
Wu, Yaxiong, 0G, 0O
Xiao, Ke, 0S
Xu, Quan, 02
Xu, Yuehong, 02
Yang, Jianguo, 05
Yang, Quanlong, 06
Yang, Tao, 08
Yang, Zhengang, 03
Yao, Jianquan, 0D
Yao, Xiangjuan, 0Q
Ye, Jiasheng, 0T
Yi, Zhong, 0U
Yin, Shan, 07
Yin, Yiming, 0Q
Yu, Qian, 0U
Zhang, Cong, 0G, 0O
Zhang, Cunlin, 04, 0F, 0G, 0H, 0I, 0J, 0L, 0M, 0O, 0P, 0R
Zhang, Hongfei, 0G, 0O
Zhang, Liangliang, OR
Zhang, Lijun, 05
Zhang, Lisha, 0K
Zhang, Shengbo, 0G, 0H, 0O
Zhang, Shijing, 0R
Zhang, Siyao, 0T
Zhang, Weili, 02, 06
Zhang, Xixiang, 02
Zhang, Xuemin, 0K
Zhang, Xueqian, 02, 06
Zhang, Yan, 0T
Zhang, Ying, 02
Zhang, Zhenwei, 0L
Zhang, Zili, 0S
Zhao, Changchun, 0S
Zhao, Hongwei, 0A
Zhao, Xianghui, 0A
Zhao, Xiaoqing, 0I, 0J
Zhao, Yuejin, 09, 0R
Zheng, Zhuyuan, 0S
Zhou, Qingli, 04, 0M, 0P
Zhou, Wei, 0Q
Zhou, Zihan, 0I
Zhu, Liguo, 0N
Zhu, Yong-yuan, 0B
Zuo, Jian, 0I, 0J
Symposium Committee

General Chairs

Tianchu Li, National Institute of Metrology (China)  
H. Phillip Stahl, NASA Marshall Space Flight Center (United States)

Conference Co-Chairs

Songlin Zhuang, Shanghai University of Science and Technology (China)  
Liwei Zhou, Beijing Institute of Technology (China)  
Shenghua Ye, Tianjin University (China)  
Yimo Zhang, Tianjin University (China)  
Zheng You, Tsinghua University (China)  
Guangjun Zhang, Southeast University (China)

Technical Program Chair

Guofan Jin, Tsinghua University (China)

Technical Program Co-Chairs

Jinxue Wang, SPIE  
Tiegen Liu, Tianjin University (China)

Local Organizing Committee Chair

Youhua Wu, China Instrument and Control Society (China)

Local Organizing Committee Co-Chairs

Guoqiang Ni, Beijing Institute of Technology (China)  
Daoyin Yu, Tianjin University (China)

General Secretary

Tong Zhang, China Instrument and Control Society (China)

Administrative Vice General Secretary

Yu-nan Sun, Beijing Institute of Technology (China)

Vice General Secretaries

Qun Hao, Beijing Institute of Technology (China)  
Yuejin Zhao, Beijing Institute of Technology (China)  
Cunlin Zhang, Capital Normal University (China)  
Liquan Dong, Beijing Institute of Technology (China)
Local Organizing Committee

Hongda Chen, Institute of Semiconductors, CAS (China)
Xuping Zhang, Nanjing University (China)
Shangzhong Jin, China Jiliang University (China)
Libo Yuan, Harbin Engineering University (China)
Yumei Wen, Chongqing University (China)
Tian Lan, Beijing Institute of Technology (China)
Cuiling Li, Beijing Institute of Technology (China)
Conference Committee

Conference Chairs

Cunlin Zhang, Capital Normal University (China)
Xi-Cheng Zhang, University of Rochester (United States)
Zhiming Huang, Shanghai Institute of Technical Physics, CAS (China)

Program Committee

Peter A. R. Ade, Cardiff University (United Kingdom)
Jun-Cheng Cao, Shanghai Institute of Microsystem and Information Technology (China)
Shengliang Chang, Nankai University (China)
Hou-Tong Chen, The Center for Integrated Nanotechnologies (United States)
Jian Chen, Nanjing University (China)
Jianming Dai, University of Rochester (United States)
Jiaguang Han, Tianjin University (China)
Zhi Hong, China Jiliang University (China)
Biaobing Jin, Nanjing University (China)
Weiqi Jin, Beijing Institute of Technology (China)
Ci-Ling Pan, National Tsing Hua University (Taiwan, China)
ShengCai Shi, Purple Mountain Observatory (China)
Fei-jun Song, Daheng New Epoch Technology, Inc. (China)
Jianmin Yuan, National University of Defense Technology (China)
Chao Zhang, University of Wollongong (Australia)
Weili Zhang, Oklahoma State University (United States)
Yan Zhang, Capital Normal University (China)
Zhuoyong Zhang, Capital Normal University (China)
Yuejin Zhu, University of Shanghai for Science and Technology (China)
Jianmin Yuan, National University of Defense Technology (China)

Zhenwei Zhang (Secretary), Capital Normal University (China)

Session Chairs

1. IRMMW-THz Technologies and Their Applications
   Yan Zhang, Capital Normal University (China)

2. IRMMW-THz Technologies and Their Applications
   Liangliang Zhang, Capital Normal University (China)
Introduction

The integration of infrared, millimeter wave and terahertz science and technology, has allowed mutual promotion and rapid development. Terahertz science and technology has not been fully explored. Due to its promising applications in spectroscopy, imaging, communications, and nondestructive testing, the tremendous demand has dramatically accelerated the research and development on the smaller terahertz emitter with high-power; the uncooled terahertz detector with high sensitivity; and the portable and robust devices and systems with high speed. In recent years, many reliable new signal sources, detectors, functional devices and systems have continued to emerge. Terahertz technologies already play a crucial role in aerospace, biological medicine, safety inspection, nondestructive testing, cultural relics protection, and next generation wireless communication. At the same time, the research and development of small power terahertz radiation sources, high sensitivity uncooled THz detectors, and portable high speed equipment and systems are still the key bottlenecks in technology. We are glad to see this subject attracting an increasing amount of attention and interest.

Joint effort made by academia and industry promotes terahertz science and technology development. In this regard, “The Infrared, Millimeter Wave and Terahertz Technologies and Their Applications” conference of OIT 2017 was organized. The conference accepted over 39 papers from different countries/areas of the world, which are focused on novel devices, systems and applications of IRMMW-THz science and technology, and other related research disciplines including plasma, metamaterials, testing and calibration, sensors, imaging, and biomedical technology. We also invited renowned scholars to present their cutting-edge work covering fundamental science such as “Wavelength scaling of terahertz wave generation from laser-induced air plasma,” and “Application of infrared nondestructive detection on cultural relic protection.” These experts and contributors together made a great feast of intellect.

As the committee chairs, we would like to express our appreciation to the committee members for their support, to the presenters for devoting their precious time to write the intriguing articles, and to the reviewers for their helpful comments. We are also grateful to the staff of SPIE for their efforts in publishing the volume of this Proceedings.

Cunlin Zhang
Xi-Cheng Zhang
Zhiming Huang
Conference Organizers

Organized by
Opto-Electronic-Mechanic Technology and System Integration Chapter, CIS (China)
Committee on Optoelectronic Technology, COS (China)
Committee on Optics, China Ordnance Society (China)
Optical Instrument Chapter, CIS (China)
Beijing Institute of Technology (China)
Tsinghua University (China)
Peking University (China)
Nanjing University (China)
Nankai University (China)
Capital Normal University (China)
Beijing University of Posts and Telecommunications (China)
Chongqing University (China)
University of Shanghai for Science and Technology (China)
Instrument Society of America (United States)
Institute of Measurement and Control (United Kingdom)
Hong Kong Institution of Engineers (Hong Kong, China)
The Society of Measurement and Control (Japan)