

2016 IEEE 9th UK-Europe-China Workshop on Millimetre Waves and Terahertz Technologies (UCMMT 2016)

**Qingdao, China
5-7 September 2016**



**IEEE Catalog Number: CFP1650V-POD
ISBN: 978-1-5090-2277-9**

**Copyright © 2016 by the Institute of Electrical and Electronics Engineers, Inc
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

****** This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP1650V-POD
ISBN (Print-On-Demand):	978-1-5090-2277-9
ISBN (Online):	978-1-5090-2276-2

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

CURRAN ASSOCIATES INC.
proceedings
.com

Table of Contents

001-P0090	Spoof-surface-plasmons-assisted enhanced Terahertz vacuum electronic source	1
	<i>Yong-Qiang Liu, Chao-Hai Du and Pu-Kun Liu</i>	
002-P0001	China Annually Statistical THz Wave Atmospheric Slant Route Propagation Attenuation Calculation	5
	<i>Xiaofan Yang, Yahua Wang, Yonghu Zeng, Liandong Wang and Xianqi Lin</i>	
003-P0059	Compact Ka-Band Substrate-Integrated Waveguide Filter with Spurlines for Satellite Communication Systems	9
	<i>Anqi Chen, Al-Juboori Bahaa Jasim Mousa, Yuan Zhuang, Yi Huang and Jiafeng Zhou</i>	
004-P0099	Millimeter-Wave Horizontally Polarized End-Fire Magneto-Electric Dipole Antenna Array	11
	<i>Jingxue Wang, Yujian Li and Junhong Wang</i>	
005-P0082	Development of high power broadband gyro-TWAs towards the terahertz range	14
	<i>W. He, C. R. Donaldson, L. Zhang, P. McElhinney, H. Yin, J. R. Garner, K. Ronald, A. W. Cross and A. D. R. Phelps</i>	
006-P0106	H-plane Loaded and Phase Velocity Tapered SWS for Improved Performance of TWT THz Sources	17
	<i>Xuyuan Chen, Laxma Reddy Billa, Xianbao Shi and Muhammad Nadeem Akram</i>	
007-P0016	High-frequency structure design of the 310GHz folded-waveguide extended interaction klystron and cold test of input cavity	19
	<i>Linlin Hu, Hongbin Chen, Zaojin Zeng, Sui Song and Guowu Ma</i>	
008-P0096	Theoretical Design of Planar Distributed Three-beam Electron Gun	22
	<i>Hongtao Liang, Cunjun Ruan and Qianzhong Xue</i>	
009-P0058	High Performance Microstrip Resonant Tunneling Diode Oscillators as Terahertz Sources	24
	<i>Edward Wasige, Abdullah Al-Khalidi, Khalid Hamed Alharbi and Jue Wang</i>	
010-P0029	A Wideband 8th-Harmonic Mixer Using Schottky Diode	28
	<i>Quanlong Lee, Bo Zhang, Yong Fan, Li Sen Zhang, Dong Xing and Jun Long Wang</i>	
011-P0110	Evaluation of a VNA-based Material Characterization Kit at Frequencies from 0.75 THz to 1.1 THz	30
	<i>Ata Khalid, Chong Li, Nick Ridler, Roland Clarke and David Cumming</i>	
012-P0017	The Design of a 0.33 THz Frequency Tripler	34
	<i>Meng Zezu, Bo Zhang, Fan Yong, Zhang Li Sen, Xing Dong and Wang Jun Long</i>	
013-P0003	Development of 220 GHz and 340 GHz TWTs	38
	<i>Pan Pan, Yinfu Hu, Ye Tang, Hanyan Li, Tianyi Li, Lin Zhang, Shishuo Liu, Yinghua Du, Dong Li, Xiaoqing Zhang, Lili Li, Jun Cai, Jinjun Feng</i>	

014-P0025	TWEETHER project for W-band wireless networks	41
	<i>Claudio Paoloni, François Magne, Frederic Andre, Xavier Begaud, Juvelino de Silva, Viktor Krozer, Marc Marillier, Antonio Ramirez, Ruth Vilar and Ralph Zimmerman</i>	
015-P0085	Recent progress in the Elegant Breadboard supra-THz activities for LOCUS and a view to an astronomy application.	43
	<i>G. Savini, D.Brooks, L.Zhu, B.Ellison, O.Auriacombe, T.Bradshaw, M.Crook, D.Gerber, M.Henry, T.Rawlings, H.Wang, J.Charlton, S. M. Tun, M.Emes, T.Hunt, B.Winter, E.Linfield, G.Davies, A.Valavanis, S.Parkes, D.Walker, G. Yu</i>	
016-P0013	Preliminary Study of the Mode-hopping phenomenon in Extended Interaction Oscillator	48
	<i>Liangjie Bi, Yong Yin, Changpeng Xu, Zhang Zhang, Zhiwei Chang, Bin Wang and Lin Meng</i>	
017-P0078	Terahertz Imaging with Compressed Sensing	50
	<i>Lin Liu, Zijian Zhang, Lu Gan, Yaochun Shen and Yi Huang</i>	
018-P0097	Terahertz Image Reconstruction Based on Sparse Information	54
	<i>Chao Li, Zhaoyang Sun, Wei Liu, Shiyu Wu, GuangYou Fang</i>	
019-P0030	Design and Image Simulation of Submillimeter Wave Imaging Optical System	57
	<i>H. Guo and W.B. Dou</i>	
020-P0067	Surface and volume mode coupling experiments for high power mm-wave sources	61
	<i>A. J. MacLachlan, A. R. Phipps, C. W. Robertson, I. V. Konoplev, A. W. Cross and A. D. R. Phelps</i>	
021-P0071	The Progress of Terahertz Wave Source in Communication	64
	<i>Ruiliang Song, Dongnuan Cui, Yong Li, Naibai Zhang, Qiang Lv and Chunting Wang</i>	
022-P0101	The Recent Progress of THz Radiation Sources in An Hui Huadong Photoelectric Technology Institute	67
	<i>Luwei Liu, Hongzhu Xi, Jiancheng Zhang, Gang Zhu and Zhaochang He</i>	
023-P0066	Compact Sub-terahertz Radiation Sources driven by Pseudospark-produced Electron Beams	69
	<i>A.W. Cross, W. He, L. Zhang, H. Yin, D. Bowes, K. Ronald, A.D. R. Phelps, Y. Yin, G. Shu, G. Liu, D. Li and X. Chen, J. Zhao</i>	
024-P0075	Study on a THz beam-scanning system with offset Dragonian dual-reflector antenna	72
	<i>Min Zhou, Yasir Alfadhl and Xiaodong Chen</i>	
025-P0079	Investigation of a 95 GHz spatial harmonic magnetron for cloud radar	74
	<i>Jiandong Lang, Yasir Alfadhl and Xiaodong Chen</i>	
026-P0004	280-320 GHz Imaging Antennas for Portable Automotive Radar Applications	76
	<i>David R Vizard, K. Konstantinidis, M. Gashinova, E. G Hoare and M. Cherniakov</i>	

027-P0051	Design of A High Sensitivity W-Band Radiometer Front-End	79
	<i>Mingchao Wang, Jianqin Deng, Jinxian Liu, Wanshun Jiang</i>	
028-P0108	Optimisation of Millimetre Wave Amplifiers for Satellite based Radiometer	82
	<i>Dirk Klugmann,Kai Parow-Souchon, David Smith, Barry Davis, Brian Ellison and Byron Alderman</i>	
029-P0009	Design of a 420GHz GaAs Monolithic Integrated Sub-Harmonic Mixer	84
	<i>Ge Liu, Bo Zhang, Yong Fan, Dong Xing, Lisen Zhang and Junlong Wang</i>	
030-P0038	Design of a Novel 0.325THz-0.5THz Tripler Based on a Customized TMIC	86
	<i>Haiming Xin, Xiaolin Cheng, Jianqin Deng, Zhuo Chen, Jinxian Liu, Wanshun Jiang, Dong Xing</i>	
031-P0006	The Design of 0.85THz Subharmonic Mixer Based on Schottky Diodes	89
	<i>Zhongqian Niu, Bo Zhang, Yong Fan, Li Sen Zhang, Dong Xing and Jun Long Wang</i>	
032-P0007	The design of 110GHz frequency tripler using GaN-based planar Schottky diode	92
	<i>Yingcun Min,Bo Zhang,Yong Fan,Xiongshi Liang,Dong Xing,Jun Long Wang</i>	
033-P0098	A Novel Double-layered Dielectric Reflectarray	94
	<i>Xiao-Chao Duan, Yu-Xuan Xia, Ying Zhou, Bin Li, Yong Liu and Xin Lv</i>	
034-P0037	The Spatial Resolution Enhancement deconvolution Technique of the optimized Wiener filter in Terahertz band	96
	<i>Weidong Hu,Wenqi Wang, Jinjia Ji and Liming Si</i>	
035-P0044	THz atmospheric propagation measurement system of CRIRP	100
	<i>Lu Changsheng,Lin Leke,Zhang Xin,Lv Zhaofeng,Li Haiying,Wu Zhensen,Hou Chunzhi</i>	
036-P0089	Planar Terahertz Functional Materials Based on Metallic Array Structures	104
	<i>Guozhong Zhao, Ying Liu,Yanchun Shen</i>	
037-P0103	Terahertz Conductivity Mapping of Graphene	107
	<i>Min Hu, Sen Gong, Tao Zhao, Renbin Zhong, Ping Zhang and Shenggang Liu</i>	
038-P0011	Terahertz response and mode coupling in a fractal meta-atom	109
	<i>Zhenyu Zhao, Zhiqiang Song,Wei Peng, Wangzhou Shi</i>	
039-P0010	Broadband Wire Grid Polarizer Application in Millimeter Wave Frequency	111
	<i>Hai Wang, Xiaoming Liu, Zejian Lu,Junsheng Yu, Yuan Yao, Hairui Liu, Limei Qi, Zhijiao Chen and Xiaodong Chen</i>	
040-P0014	Simulation of a 300GHz Confocal Gyro-Traveling Wave Amplifier	115
	<i>Shun Guo, Xuesong Yuan, Zhongxian Yuan, Biao Gu, Bin Wang and Yang Yan</i>	
041-P0032	Complex Signal Environment Analysis and Cognition of Multifunction Radar	117
	<i>Ren Mingqiu,Cai Yichao,Ma Liang,He yanfeng</i>	

042-P0043	The Design of W-band Broadband Output Window for TWT <i>Renjie Li and Cunjun Ruan</i>	121
043-P0048	Numerical Modelling of Rectangular TE₁₀ to Circular TE₁₁ Terahertz Mode Couplers <i>J. R. Garner, L. Zhang, C. R. Donaldson, A. W. Cross, A. D. R. Phelps and W. He</i>	123
044-P0057	Design of a sub-terahertz oscillator with high output power <i>G. Shu, W. He, L. Zhang, H. Yin, J. Zhao, A. W. Cross, and A. D. R. Phelps, G. Shu</i>	126
045-P0092	Research on Millimeter Wave Focal Plane Imaging of Compound Len <i>Jinbang Wang, Kui Yang, Lu Zhao, Zhiguo Liu and Tao Zhang</i>	128
046-P0093	Millimeter Wave Imaging of Hidden Targets with Complex Dielectric Lens in Slab Shape <i>Lu Zhao, Kui Yang, Jinbang Wang, Tao Zhang and Zhiguo Liu</i>	131
047-P0105	Measurement and Simulation of 28 GHz Millimeter-Wave Propagation Characteristics in the Corridor Environment <i>Shuangde Li, Yuanjian Liu, Xiaojun Zhang and Xingyu Qi</i>	134
048-P0021	Quasi-optical beam power combining at sub-millimeter wave band <i>L.H.Huang, W.B.Dou</i>	138
049-P0008	Design of millimeter-wave transmission standards for scattering parameter measurements in the frequency range from 140GHz to 220GHz <i>Jie Liu, Ting Chen, Na Zhang, Chuntao Yang, Chunyue Cheng and Yunmei Chen</i>	141
050-P0026	Circuit Design and Simulation of a W-band 100-W Extended Interaction Oscillator <i>Zhaowei Qu, Yaogen Ding and Shuzhong Wang</i>	145
051-P0040	Electron Beam Optics Design and Experiment of G-Band TWT <i>Qiang Zhang, Yinfu Hu, Pan Pan, Tianyi Li, Jinjun Feng, Fujian Liao</i>	147
052-P0070	Genetic Algorithm Optimization of Collector for W band Gyro-TWT <i>Wei Jiang, Yong Luo, Ran Yan, Jianxun Wang, Kun Dong</i>	149
053-P0074	design of a 75GHz-110GHz Broadband Millimeter Wave Harmonic Mixer <i>Weifeng Zhu, Wanshun Jiang and Shibin Zhang</i>	151
054-P0012	Design of a spline horn for a W-band gyro-TWA <i>Liang Zhang, Wenlong He, Craig R. Donaldson, Adrian W. Cross, Duncan Robertson, Robert Hunter and Graham Smith</i>	154
055-P0015	Linear Analysis of Terahertz Oscillator with Corrugated Cylindrical Waveguide <i>Haoying Wang, Cuicui He and Wenxin Liu</i>	156
056-P0019	The Design Of Five-Band Vivaldi Antenna <i>LuTian, Zhenghui Xue, Weiming Li, Wu Ren</i>	158

057-P0022	Design of a folded waveguide traveling-wave tube amplifier above 0.3THz	161
	<i>Xin Guo, Wenxin Liu and Chao Zhao</i>	
058-P0023	Feature information extraction and recognition of missile target based on THz Radar	164
	<i>Long Chen, Zejian Lu, Sheng Huang, Yue Pan and Xiao Liu</i>	
059-P0027	Design of Electron Optics System for 0.1THz Extended Interaction Oscillator	168
	<i>Chao Zhao, Wenxin Liu and Xin Guo</i>	
060-P0028	Design of a 0.325THz-0.5THz Power Sensor	170
	<i>Guoqing Fan, Shibin Zhang, Aiyong Zhao, Jinxian Liu</i>	
061-P0031	Design of a Broadband Quadruple-frequency Amplitude-stabilized Source Module Applied to THz Imaging System	174
	<i>Shibin Zhang, Guoqing Fan, Dengbao Li</i>	
062-P0033	A Ku-band High Power Backward Wave Oscillator	177
	<i>Jie He, Zhanliang Wang, Bo Zhang, Deng Fang</i>	
063-P0034	A E-Band E-Plane Type Waveguide Bandpass Filter	180
	<i>Deng Fang, Bo Zhang, Jie He</i>	
064-P0035	Design of a 220GHz Power Divider with T-shape Configuration	183
	<i>Ruiting Liu, Weidong Hu, Hao Wang, Xiannan Wang</i>	
065-P0036	Design of a novel 170GHz–260GHz sub-harmonic mixer based on planar Schottky diodes	186
	<i>Zhuo Chen, Jianqin Deng, Mo Wang, Jinxian liu, Wanshun Jiang</i>	
066-P0039	A Design of 300 GHz Waveguide Bandpass Filter with H-plane Offset Inductive Window	189
	<i>Hao Wang, Wei-Dong Hu, Rui-Ting Liu, Li-Ming Si</i>	
067-P0041	Development of A Prototype of 500W Ka-Band Helix TWTs	192
	<i>Bo Chen, Yanjun Cui, Qiru Lu, Yuan Feng, Jing Feng, Lili Li Jinjun Feng</i>	
068-P0045	An Investigation on the Propagation Characteristics of Terahertz wave in Kashgar	195
	<i>Li Haiying, Wu Zhensen, Lu Changsheng, Hou Chunzhi</i>	
069-P0047	The Design and Simulation of Terahertz Microfluidic Sensing Array Based on Metasurface	199
	<i>Lu Duan, Jiafu Wang, Junhong Tian, Xin Rao, Jun Zhou</i>	
070-P0052	Application of Terahertz Technology in Cooperative Detection of Space Targets	202
	<i>Zejian Lu, Xiao Liu, Yue Pan, Sheng Huang, Long Chen</i>	
071-P0055	A W-band corrugated horn incorporated with a vacuum window	206
	<i>P. McElhinney, C.R. Donaldson, L. Zhang, and W. He</i>	

072-P0056	Comparison of Output Couplers for 0.346 THz DCW-BWO	208
	<i>Rob Waring, Claudio Paoloni, Diana Gamzina, Branko Popovic, Logan Himes, Rosa Letizia, Ye Tang, Hanyan Li, Pan Pan, Jinjun Feng, Neville C. Luhmann Jr</i>	
073-P0062	Analytical Solutions of High Frequency Characteristics for Coaxial Disk-Load Waveguide	210
	<i>Qinghua Ma, Jirun Luo, Yu Fan</i>	
074-P0065	Low Profile Dual-Broadband 2G/3G/LTE Array Antenna for Vehicular Application	212
	<i>Jian Liu</i>	
075-P0068	Circular SAR Cylindrical Area Reconstruction Using Omega-k Algorithm Based on NUFFT	215
	<i>Xiang-xin Meng, Shuai Wu, Ting Li, Hua-kun Zhang</i>	
076-P0072	Design of a 73GHz Waveguide Bandpass Filter	219
	<i>Tao Zou1, Bo Zhang</i>	
077-P0073	A High Gain On-chip Terahertz Antenna with High Efficiency	222
	<i>Yong Li, Ruiliang Song</i>	
078-P0076	Electronic optics system of a W-band 100-W Extended Interaction Oscillator	225
	<i>Zhaowei Qu, Yaogen Ding and Shuzhong Wang</i>	
079-P0077	An 110GHz Waveguide Bandpass Filter Using Iris Inductive Window Coupled Structure	227
	<i>Yuan Tao, Bo Zhang, Deng Fang and Yong Fan</i>	
080-P0080	A comparison of spectroscopy standards and optical constant retrieval techniques in FTS and TDS measurements.	229
	<i>Giorgio Savini, Peter A.R. Ade, Guozhong Zhao, Nicola Baccichet, Yuan Yu and Paul Moseley</i>	
081-P0083	COMSOL Multiphysics Modeling and Simulation of Traveling Wave Tube Amplifiers	235
	<i>Laxma R. Billa, M. Nadeem Akram and Xuyuan Chen</i>	
082-P0084	Additive manufacturing method of prototyping novel mm-wave and THz sources	238
	<i>A. R. Phipps, A. J. MacLachlan, C. W. Robertson, A. W. Cross, and A. D. R. Phelps</i>	
083-P0086	The Design of a Ka-band Planar Broadband slot-coupled Antenna	241
	<i>Yuan Song, Bo Zhang and Yong Fan</i>	
084-P0087	Design and Analysis of Extremely Broad Bandwidth Input and Output Structure for THz Sheet Beam Device	243
	<i>Yuan Zheng, Jianxun Wang and Yong Luo</i>	
085-P0094	Omnidirectional Slot Arrays Fed by Stacked Butler Matrix for 5G Handset Devices	245
	<i>Qing-Ling Yang, Yong-Ling Ban, Shi-Rong Yang, and Ming-Yang Li</i>	

086-P0104	A High-Gain Resonant Cavity Antenna With Orthogonal Polarizations Working At 28 GHz	248
	<i>Yajin Wang and Dazhi Piao</i>	
087-P0112	Ka-band Microstrip Array Based on Mutual Coupling	251
	<i>Rongzhao Yao, Bo Zhang, Yong Fan, Shiwei Qu, Yuan Song</i>	
088-P0020	Progress In Development of A 346GHz BWO	254
	<i>Ye Tang, Shunyuan Ma, Pan Pan, JinjunFeng, Robert Waring, Rosa Letizia, Claudio Paoloni, Branko Popovic, Yuan Zheng, Logan Himes, Diana Gamzina, Neville C. Luhmann Jr</i>	