

2022 IEEE International Workshop on Electromagnetics: Applications and Student Innovation Competition (iWEM 2022)

**Narashino, Japan
29-31 August 2022**



**IEEE Catalog Number: CFP2254N-POD
ISBN: 978-1-6654-3239-9**

**Copyright © 2022 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:	CFP2254N-POD
ISBN (Print-On-Demand):	978-1-6654-3239-9
ISBN (Online):	978-1-6654-3238-2

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

Development of Intelligent Reflecting Surfaces for Mobile Communication Systems.....	5
<i>Hiromi Matsuno, Takuya Ohto, Takahiro Hayashi</i>	
A Series-Fed Ultra-Wideband Antenna Array.....	9
<i>Yaozong Sui, Xingyu Zhou, Hongfei Chang, Xinlong Xu, Xin Meng, Yuhao Zhang, Weihua Zong</i>	
Analysis Results of Single-Layered Reflectarray Antenna with Split Rectangular Loop Elements.....	11
<i>Masayoshi Takao, Shigeru Makino, Yusuke Kaimori</i>	
Scanning Spot Beam Reflectarray Antenna Study	13
<i>Yusuke Kaimori, Shigeru Makino, Masayoshi Takao</i>	
Directivity Measurement of a Weight-Polarized Beam-Steering MIMO Antenna with a Circular Phased Array	15
<i>Yuto Sekino, Kazuhiro Honda</i>	
Channel Capacity of Millimeter-Wave Communication System Using Drone Relay Stations	19
<i>Takanobu Watanabe, Kentaro Nishimori</i>	
MACKEY Type H with One-Side Short-Circuit Structure for Further Miniaturization	21
<i>Kota Hakamata, Keito Yokoe, Shigeru Makino, Kenji Itoh</i>	
Consideration of a One-Dimensional MACKEY Array.....	23
<i>Hajime Suzuki, Kiichi Wakayama, Shigeru Makino, Kenji Itoh</i>	
Radiation Characteristic on Metal Platform with Mushroom-Like EBG Structures	25
<i>Takumi Nishime, Naobumi Michishita, Hisashi Morishita</i>	
Unit Cell Structure of Huygens' Metasurfaces Reducing Beam Squint in Series-Fed Array	27
<i>Maria Ishida, Keizo Cho, Naobumi Michishita, Tanan Hongnara, Takayoshi Sasaki, Warangkana Chaihongsa, Keisuke Sato, Ichiro Oshima, Hiroaki Nakabayashi</i>	
Evaluation of Attenuation by Tree in 300-GHz-Band Wireless Communications.....	29
<i>Keisuke Matsui, Shunta Takagi, Akihiko Hirata</i>	
Reduction of Synthetic Aperture Array Element in THz Imaging Using Compressed Sensing.....	31
<i>Rio Yanagi, Keizo Cho, Hiroaki Nakabayashi, Koji Suizu</i>	
Numerical Evaluation on Tank Effect in a Pseudo-Scale Air-Sea Two-Layer Experimental Model.....	33
<i>Anri Kamiya, Nozomu Ishii, Masaharu Takahashi, Qiang Chen</i>	
A Study of Transmitting Devices for Wireless-Powered Small Sensors for Home Health Care	35
<i>Konosuke Shiba, Masaharu Takahashi</i>	
A Novel 60 GHz Spatial Synthetic Exposure Set-Up for the Study of Thermal Perception Thresholds for Biological Effects of 5G and Beyond Wireless Systems.....	37
<i>Kohei Yamamoto, Takashi Hikage, Hiroshi Masuda, Tatsuya Ishitake, Kun Li, Akiko Nagai</i>	
Characteristic Analysis of Vehicular 2×2 MIMO Antenna Correlation in Actual Environment.....	39
<i>Tomonori Ikeda, Mitoshi Fujimoto, Kazuma Tomimoto, Ryo Yamaguchi</i>	

Evaluation of Undersea Position Estimation Using Curved Surfaces Generated by Machine Learning	41
<i>Shinnosuke Sakaya, Masaharu Takahashi</i>	
Design of a Single-Layer Dual-Band and Wideband Multi-Ring Microstrip Antenna Fed by an L-Probe.....	49
<i>Masaya Takahashi, Sakuyoshi Saito, Yuichi Kimura</i>	
Design of a Dual-Ring Microstrip Antenna Excited by an Inclined Slot on a Narrow Wall of the Rectangular Waveguide for a 45-Degree Linearly-Polarized Planar Array	51
<i>Takuma Sato, Sakuyoshi Saito, Yuichi Kimura</i>	
Study on Electromagnetic Resonance Antennas in the Vicinity of Human Body	53
<i>Toshiya Hiramoto, Koichi Hirabayashi, Keisuke Noguchi</i>	
Study on MIMO Communication Using Microwave Guided-Modes Propagating Along PVC Pipe Wall	55
<i>Masafumi Suzuki, Kota Fukazawa, Akihoko Hirata, Hiroshi Murata, Masato Mizukami</i>	
Decoupling Design of Quad Polarization Patch Antenna Using Neutralization Bridge.....	57
<i>Ryoto Ohgushi, Shota Takato, Hiroyuki Arai</i>	
Study on Dual-Band Antennas with a Modified Conical Antenna and a Parasitic Helical Element	61
<i>Ryuji Hirohara, Shinpei Fusazaki, Keisuke Noguchi</i>	
A Multi-Band Metal-Frame Antenna for Wi-Fi 6E System in a Terminal Device.....	63
<i>Jui-Han Lu, Wei-Ren Chuang, Bo-Ming Chen</i>	
Microstrip Patch Antennas with Enhanced Linearly-Or Circularly-Polarized Beamwidth: A Mini-Review.....	67
<i>Neng-Wu Liu, Lei Zhu</i>	
Radiation Suppression Index of Filtering Antennas	69
<i>Kwok L. Chung, Xin Cheng, Botao Feng</i>	
Surface Wave Antenna Metallic Cell Pattern Design Using Neural Network Method	71
<i>Jiashu Yang, Kin-Fai Tong</i>	
A Dual-Band Shared-Aperture Antenna with Large Frequency Ratio for 5G Applications	73
<i>Yue Zhao, Lei Ge</i>	
Design of a MIMO Open-Slot Antenna Module with Dual-Band Circular Polarization.....	77
<i>Wei Li, Chien-Sheng Chen, Chien-Jen Wang</i>	
Experimental and Numerical Study of Near-Field Gain of an Underwater Dipole Antenna at 6 GHz	79
<i>Keith Sekiya, Nozomu Ishii, Yuto Shimizu, Tomoaki Nagaoka</i>	
Sampling Points Reduction in Over the Air	81
<i>Takaharu Nakase, Yusuke Mitsui, Hiroyuki Arai</i>	
Miniaturization of Wilkinson Power Divider Using Zigzag Combination of Microstrip and CPW Lines	85
<i>Kangtai Zheng, Jimhong He, Kwok L. Chung, Guoming Lai, Yingsong Li, Botao Feng</i>	
120-GHz-Band Close Proximity Wireless Communication Using Metamaterial Integrated Glass Substrate	87
<i>Tomohiro Kumaki, Satoshi Ozeki, Akihiko Hirata, Osamu Kagaya</i>	

Design of Microstrip-Line-Fed Rotman-Lens Beamforming Network at 274 GHz.....	89
<i>Takafumi Morioka, Shumpei Kishi, Kunio Sakakibara, Yoshiki Sugimoto, Nobuyoshi Kikuma</i>	
Indoor and Outdoor 300-GHz-Band Wireless Propagation Experiments for Beyond 5G Application	93
<i>Akihiko Hirata, Shunta Takagi, Keisuke Matsui</i>	
Pioneering New Frequency Bands Towards 6G Mobile Communication Systems.....	95
<i>Wataru Yamada, Minoru Inomata, Nobuaki Kuno, Motoharu Sasaki, Mitsuki Nakamura, Koshiro Kitao, Takahiro Tomie, Satoshi Suyama</i>	
A Study of the Horizontal and Vertical Arrival Angles at the Mobile Station in High Elevation Angle Environment	97
<i>Hideki Omote, Akihiro Sato, Sho Kimura, Shoma Tanaka, Ho Yu Lin</i>	
3D-Cell Control Technology for Frequency Sharing Between HAPS and Terrestrial Systems.....	99
<i>Yuki Hokazono, Hinata Kohara, Yoshihisa Kishiyama, Takahiro Asai</i>	
C/N0-Based GNSS Multipath Mitigation Methods: Research, Challenges, and Prospects.....	101
<i>Yuping Tan, Fuhai Li, Yihong Qi</i>	
Wideband Circularly Polarized MIMO Antenna for Sub 6 GHz 5G Application	103
<i>Zin Mar Phyo, Takafumi Fujimoto, Chai-Eu Guan</i>	
A Design of L-Probe Fed Miniaturized Patch Antenna for Earth Sensing Platform Via LEO Satellite.....	104
<i>Haruki Otomo, Takashi Hikage, Manabu Yamamoto, Kazumitsu Sakamoto, Yosuke Fujino</i>	
Large-Scale MIMO OTA Method for Realizing the Full-Rank Channel Matrix in Cluster Environment	106
<i>Rio Kitamura, Kazuhiro Honda</i>	
Orthogonal Polarization Omnidirectional Antenna Using a Halo Antenna Loaded with Short Elements	108
<i>Tomokazu Mizutani, Naobumi Michishita, Hiroshi Sato, Yoshio Koyanagi, Hisashi Morishita</i>	
Evaluation of Availability of 300-GHz-Band Wireless Fronthaul Link During Torrential Rain	112
<i>Shoichiro Furukawa, Ryo Okumura, Akihiko Hirata</i>	
A Study of Rain Attenuation Prediction Method by Deep Learning.....	114
<i>Yuji Komatsuya, Tetsuro Imai, Miyuki Hirose</i>	
Estimation of Human Body Shadowing for Indoor Propagation in the 5G Frequency Band Using Parallel FDTD Analysis	116
<i>Kazuki Yoshida, Takashi Hikage, Manebu Omiya</i>	
Dual-Frequency Sharing in MACKKEY Q Type	118
<i>Koki Iijima, Keito Yokoe, Shigeru Makino, Kenji Itoh</i>	
Optimization of Axial Ratio Characteristics of Circularly Polarized MACKKEY	120
<i>Michinori Yoneda, Keito Yokoe, Shigeru Makino, Kenji Itoh</i>	
Circularly Polarized MACKKEY with Improved Axial Ratio.....	122
<i>Keito Yokoe, Kota Hakamata, Shigeru Makino, Kenji Itoh</i>	
Using FEM Simulation to Estimation of Active Implantable Medical Device EMI Characteristic in the 4G and 5G Sub-6 Frequency Bands	124
<i>Takuji Nishikawa, Takashi Hikage, Manabu Yamamoto</i>	

Reflection and Shadowing Loss Due to Human Body in 300-GHz-Band Wireless Links.....	126
<i>Shunta Takagi, Keisuke Matsui, Akihiko Hirata, Kazuki Takezawa, Takahiro Hayashi</i>	
An Experimental System Based on Pseudo-Scale Model of Air-Sea Two-Layer Problem Operated at 100 MHz.....	128
<i>Taiga Wakabayashi, Nozomu Ishii, Masaharu Takahashi, Qiang Chen</i>	
Development of a Microwave Bedsore Detection Method Using Wavelet Transforms.....	130
<i>Yusuke Asano, Masaharu Takahashi</i>	
Estimation Accuracy of an AOA Antenna in Rice Propagation Environment Using OTA Apparatus	132
<i>Kaito Otsubo, Kazuhiro Honda</i>	
Position Estimation of Two Thin Cylindrical Targets Using Time Reversal Algorithm with Reflectors	134
<i>Hanns Christian Chua, Keizo Cho, Hiroaki Nakabayashi, Koji Suizu</i>	
A Study on Miniaturization and Group Delay Characteristic of Half-Shaped UWB Monopole Antenna with Coupling Structure	138
<i>Chikayo Hata, Nobuyasu Takemura</i>	
Design of a Circularly-Polarized Two-Element Microstrip Antenna Array Excited by a Cross Slot on a Broad Wall of the Rectangular Waveguide for a Waveguide-Fed Planar Array	140
<i>Mina Endo, Sakuyoshi Saito, Yuichi Kimura</i>	
Resonant Frequency Control of a Varactor-Loaded Single-Layer Triple-Band Miniaturized Microstrip Antenna Fed by an L-Probe with Straight Shorted Elements	142
<i>Ibuki Asahina, Sakuyoshi Saito, Yuichi Kimura</i>	
A Consideration on Low Profile Design of a Wideband Ring Microstrip Antenna Fed by an L- Probe.....	144
<i>Atsuki Kawahashi, Sakuyoshi Saito, Yuichi Kimura</i>	
A Helmet Antenna Using Disk-Loaded Monopole Antenna for Disaster Prevention	146
<i>Taiyo Kai, Naobumi Michishita, Hisashi Morishita</i>	
28 GHz 6-Sector Dual-Polarized Antenna for Indoor Base Station	148
<i>Shota Matsumoto, Hiroyuki Arai</i>	
Design of Broadband Patch Antennas Using Metasurfaces	150
<i>Naoto Tomiyama, Jo Tamura, Satoshi Sugaya, Hiroyuki Arai</i>	
Characteristics of a High-Impedance Folded Dipole Antenna in the Millimeter Wave Band.....	152
<i>Koki Yamashiro, Yoshiki Takashima, Keisuke Noguchi</i>	
Small WIFI/WLAN Antenna for Narrow Boarder Design.....	154
<i>Wei-Chiang Jhang, Jwo-Shiun Sun</i>	
Alternately Coupled Magnetoinductive Waveguide with Nulls-Free Characteristic for Two-Way Wireless Power Transfer Application.....	158
<i>Chawalit Rakhuea, Apisak Worapishet, Sarawuth Chaimool, Yan Zhao, Prayoot Akkaraekthalin</i>	
Very-Low-Profile, Dual-Polarized Oblong Loop	160
<i>Saou-Wen Su</i>	

A Simple Weight Calculation Method for Generalized Imperfect Block Diagonalization in MU-MIMO Downlink.....	162
<i>Tadatomo Sato, Teruji Ide</i>	
Basic Study of Map Image Processing for Simple Path Loss Prediction Using CNN.....	164
<i>Kiyooki Itoi, Hiroaki Nakabayashi</i>	
Miniaturized, Wi-Fi 6E Notebook Antenna Using an In-Series Chip Inductor.....	168
<i>Saou-Wen Su</i>	
A Compact Hybrid Antenna for 5G Sub-6GHz MIMO Operation	170
<i>Hong-Jun Lin, Kai-Ping Yang, Jui-Han Lu</i>	
A mmWave Transmitarray with Patch Array Feed	174
<i>Xiao-Long Huang, Guanghui Xu, Tyler Blundo, Zijian Shao, Kaushik Sengupta</i>	
Development of Terahertz EM-Wave Absorber.....	176
<i>Masao Fujita, Masayuki Toyoda, Kyoya Takano, Sangyeop Lee, Shinsuke Hara, Issei Watanabe, Akifumi Kasamatsu</i>	
A Study on Controlling the Direction of the Scattering Pattern on Meta-Surface Reflector	178
<i>Yuko Rikuta, Akira Maruyama, Hiroki Hagiwara</i>	
Numerical Study of the Coupled Metamaterial Microstrip Lines.....	180
<i>Hu Wei, Xiaofei Xu, Kaya Pi</i>	
Probe-Fed Wideband Planar Phased Array Antenna Element Using Stacked Rectangular and U-Slot Patches in Low Vertical Profile	182
<i>Jiale Lv, Xiaofei Xu, Bei Zhang</i>	

Author Index