

PROCEEDINGS OF SPIE

# ***Millimetre Wave and Terahertz Sensors and Technology XIII***

**Neil A. Salmon  
Frank Gumbmann**  
*Editors*

**21–25 September 2020  
Online Only, United Kingdom**

*Sponsored by*  
SPIE

*Cooperating Organisations*  
European Optical Society  
Cranfield University (United Kingdom)  
Technology Scotland (United Kingdom)  
Visit Scotland (United Kingdom)  
CENSIS (United Kingdom)

*Published by*  
SPIE

**Volume 11541**

Proceedings of SPIE 0277-786X, V. 11541

SPIE is an international society advancing an interdisciplinary approach to the science and application of light.

Millimetre Wave and Terahertz Sensors and Technology XIII, edited by Neil A. Salmon,  
Frank Gumbmann, Proc. of SPIE Vol. 11541, 1154101 · © 2020 SPIE  
CCC code: 0277-786X/20/\$21 · doi: 10.1117/12.2584645

Proc. of SPIE Vol. 11541 1154101-1

The papers in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. Additional papers and presentation recordings may be available online in the SPIE Digital Library at SPIEDigitalLibrary.org.

The papers reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from these proceedings:

Author(s), "Title of Paper," in *Millimetre Wave and Terahertz Sensors and Technology XIII*, edited by Neil A. Salmon, Frank Gumbmann, Proceedings of SPIE Vol. 11541 (SPIE, Bellingham, WA, 2020) Seven-digit Article CID Number.

ISSN: 0277-786X  
ISSN: 1996-756X (electronic)

ISBN: 9781510638952  
ISBN: 9781510638969 (electronic)

Published by

**SPIE**

P.O. Box 10, Bellingham, Washington 98227-0010 USA  
Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445  
SPIE.org

Copyright © 2020, Society of Photo-Optical Instrumentation Engineers.

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$21.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at [copyright.com](http://copyright.com). Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/20/\$21.00.

Printed in the United States of America by Curran Associates, Inc., under license from SPIE.

Publication of record for individual papers is online in the SPIE Digital Library.

**SPIE. DIGITAL  
LIBRARY**

[SPIEDigitalLibrary.org](http://SPIEDigitalLibrary.org)

---

**Paper Numbering:** *Proceedings of SPIE* follow an e-First publication model. A unique citation identifier (CID) number is assigned to each article at the time of publication. Utilization of CIDs allows articles to be fully citable as soon as they are published online, and connects the same identifier to all online and print versions of the publication. SPIE uses a seven-digit CID article numbering system structured as follows:

- The first five digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc. The CID Number appears on each page of the manuscript.

# Contents

---

## MILLIMETRE WAVE AND TERAHERTZ RADIOMETRIC AND RADAR IMAGERS AND SENSORS I

---

- 11541 04 **Detecting and tracking of a group of objects multi-position passive scanning millimeter-wave system [11541-1]**
- 11541 05 **A fully-staring THz video camera with wide field-of-view and close-looking optics [11541-2]**
- 11541 06 **Terahertz imaging of large objects with high resolution [11541-3]**

---

## MILLIMETRE WAVE AND TERAHERTZ RADIOMETRIC AND RADAR IMAGERS AND SENSORS II

---

- 11541 07 **Detection of concealed explosives and shrapnel weapons using decompositions of microwave polarimetric radar data (Invited Paper) [11541-4]**
- 11541 08 **Circular polarization millimeter wave SAR imaging using 3D-printed helix antennas [11541-5]**
- 11541 0A **Ferrosphenel ceramic containing oxides of titanium and cobalt [11541-19]**

---

## ENABLING TECHNOLOGY I

---

- 11541 0C **Sensitive and fast room temperature THz sensing: a challenge for Y-Ba-Cu-O semiconducting thin films [11541-8]**
- 11541 0D **Highly sensitive and moderately cooled THz sensing: a challenge for Y-Ba-Cu-O superconducting thin films [11541-9]**
- 11541 0F **Frequency multiplexing/demultiplexing using additive-manufacturing-based devices for terahertz networks [11541-11]**

---

## ENABLING TECHNOLOGY II

---

- 11541 0G **Millimetric radiometry for measuring human and porcine skin reflectance [11541-12]**
- 11541 0H **Millimetre-wave beam steering with analog-resolution and minimised distortion based on liquid crystals tunable delay lines with enhanced signal-to-noise ratios [11541-13]**
- 11541 0I **Development of a terahertz scanning apparatus with automatic object detection capabilities [11541-14]**

- 11541 OJ **Electromagnetic parameters of coatings based on W-type hexaferrite powders [11541-15]**
- 11541 OK **Method for suppressing side lobes of a linear phased antenna array using amplitude and phase distributions [11541-16]**
- 11541 OL **Assessment of the accuracy of the integration variable selection method and its practical application terahertz range [11541-17]**
- 11541 OM **Research of the influence of technological parameters on the electrophysical characteristics of the RF MEMS switch [11541-18]**