PROCEEDINGS OF SPIE

Radar Sensor Technology XXVII

Abigail S. Hedden Gregory J. Mazzaro Ann Marie Raynal Editors

1–3 May 2023 Orlando, Florida, United States

Sponsored and Published by SPIE

Volume 12535

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 *Radar Sensor Technology XXVII*, edited by Abigail S. Hedden, Gregory J. Mazzaro, Ann Marie Raynal, Proc. of SPIE 12535, Seven-digit Article CID Number (DD/MM/YYYY); (DOI URL).

ISSN: 0277-786X

ISSN: 1996-756X (electronic)

ISBN: 9781510661844

ISBN: 9781510661851 (electronic)

Published by

SPIE

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

Copyright © 2023 Society of Photo-Optical Instrumentation Engineers (SPIE).

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 fees. To obtain permission to use and share articles in this volume, visit Copyright Clearance Center at 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.

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.



Paper Numbering: A unique citation identifier (CID) number is assigned to each article in the Proceedings of SPIE 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

vii Conference Committee

SYSTEMS AND APPLICATIONS I		
12535 02	Statistical analysis of radar parameters from published research [12535-1]	
12535 03	A proposed concept for metacognitive configuration switching for tracking radar systems [12535-2]	
12535 04	Long-range single-target tracking with UWB SoC: further development [12535-3]	
	SYSTEMS AND APPLICATIONS II	
12535 05	Application of low-cost software-defined radio to augmented radio navigation [12535-5]	
12535 06	Airborne antenna placement optimization for navigational aid infrastructure inspection mission [12535-6]	
12535 08	Optimized phase shifts in intelligent reflective surfaces for robust radar-based indoor coverage enhancement $[12535-7]$	
	ALGORITHMS AND PROCESSING	
12535 09	Sudoku sequences, Costas sequences, and random permutations in a multi-sub-FDA radar [12535-9]	
12535 0A	Connected spectrogram graph fitting and random optimization combined time frequency analysis $[12535-10]$	
12535 OB	The extended Luenberger sliding innovation filter [12535-12]	
12535 0C	Quantum radar: a brief review of current progress and new methods of understanding and signal processing, validated by experimental results [12535-13]	

	PHENOMENOLOGY I
12535 0D	RF stealth for small UAS: characterization and evaluation of the impacts of RFI and RCS [12535-14]
12535 OE	Radar micro-Doppler predictions and analysis for the DJI Phantom 2 drone at X, V, and W-band $[12535\text{-}15]$
	PHENOMENOLOGY II
12535 OF	Physical layer mechanisms for coherent change detection [12535-18]
12535 OG	Application of the Boltzmann-Ehrenfest principle to the resonant frequency shift of a radio-wave electromagnetic cavity containing a dielectric object [12535-19]
12535 OH	Loaded waveguide measurements of plastic explosives at V-band [12535-20]
	MILLIMETER- AND SUBMILLIMETER-WAVE SENSING AND IMAGING
12535 01	Short-range measurements of dielectric and conductive targets using a 38-GHz active incoherent millimeter-wave imaging array [12535-21]
12535 OJ	Incoherent millimeter-wave imaging using 5G communications signals of opportunity for detection of cracks in building materials $[12535-22]$
12535 OK	Partial image reconstruction adapted to extracting the frequency spectrum of discrete targets in millimeter-wave AIT images [12535-24]
12535 OM	Imaging experiments with a 340-GHz FMCW radar and frequency-diverse holograms [12535-27]
12535 ON	Fast and sensitive MMW imaging system with up-conversion readout working in the NIR zone [12535-28]
	SPECIAL SESSION ON AUTOMOTIVE RADAR
12535 0Q	Millimeter wave radar-based road segmentation [12535-30]
	AI/ML AND RADAR SENSOR TECHNOLOGY: JOINT SESSION WITH CONFERENCES 12535 AND 12538
12535 OR	Investigation of potential 5G RF interference with C-band radar operations and mitigation solutions [12535-32]

	12535 OS	Ghost imaging at submillimeter waves: correlation and machine learning methods [12535-33]
	12535 OT	Multimodal feature assessment using multibranch 3D CNN to BI-LSTM for feature level multi-polarization SAR image data fusion and vehicle identification [12535-34]
<u>-</u>		POSTER SESSION
	12535 OU	Extraction of ground clutter return interference from downward-looking UWB radar signal via low-rank and sparse optimization [12535-36]
_		DIGITAL POSTER SESSION
	12535 OV	Fourier-domain image reconstruction in near-field microwave imaging using a dynamic metasurface antenna: a sparse-sampling-based approach [12535-11]
	12535 OW	UAV micro-Doppler recognition comparison of HeRM lines versus blade flash phenomenology [12535-16]
	12535 0X	UAV discrimination from birds using radar track information [12535-17]