

# **2020 3rd West Asian Symposium on Optical and Millimeter-wave Wireless Communication (WASOWC 2020)**

**Tehran, Iran  
24 – 25 November 2020**



**IEEE Catalog Number: CFP20X62-POD  
ISBN: 978-1-7281-8692-4**

**Copyright © 2020 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:	CFP20X62-POD
ISBN (Print-On-Demand):	978-1-7281-8692-4
ISBN (Online):	978-1-7281-8691-7

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# TABLE OF CONTENTS

<b>IMPLEMENTATION AND EVALUATION OF A 10 GBPS REAL-TIME FSO LINK</b> .....	1
<i>Zun Htay; Nithin Mohan; Mojtaba Mansour Abadi; Zabih Ghassemlooy; Andrew Burton; Stanislav Zvanovec</i>	
<b>IMPACT OF NUMBER OF LEDS ON AN OPTICAL CAMERA COMMUNICATION BASED INDOOR POSITIONING SYSTEM</b> .....	8
<i>Khadijeh Ali Mahmoodi; Asghar Gholami; Zabih Ghassemlooy</i>	
<b>ACHIEVED THROUGHPUT OF HOVERING UAV-BASED OPTICAL WIRELESS COMMUNICATIONS</b> .....	12
<i>Mohammad Taghi Dabiri; Seyed Mohammad Sajad Sadough; Himan Savojbolaghchi</i>	
<b>PERFORMANCE INVESTIGATION OF OCC-BASED VEHICLE TO VEHICLE COMMUNICATIONS</b> .....	17
<i>Negar Masjedi Esfahani; Asghar Gholami; Negar Shirvani Kordavani; Stanislav Zvanovec; Zabih Ghassemlooy</i>	
<b>SYNTHESIS OF NANO-ANTENNAS FOR DESIRED FAR-FIELD RADIATION PATTERNS USING VECTOR SPHERICAL HARMONICS</b> .....	22
<i>Seyed Sina Vaezi; Saeid Nikmehr; Ali Pourziad</i>	
<b>ON N-PAM AND M-QAM IMPLEMENTATION WITHIN THE HYBRID ROF-FSO-PON SYSTEM</b> .....	27
<i>Dong-Nhat Nguyen; Jan Bohata; Luis Vallejo; Stanislav Zvanovec; Beatriz Ortega; Zabih Ghassemlooy</i>	
<b>ADAPTIVE EQUALIZATION FOR VISIBLE LIGHT COMMUNICATIONS WITH POWER OVER ETHERNET BACKHAUL</b> .....	32
<i>Mahdi Ataei; Seyed Mohammad Sajad Sadough; Zabih Ghassemlooy</i>	
<b>BANDWIDTH DEPENDENCY OF (O)LEDS ON BIAS CURRENT</b> .....	37
<i>Andrew Burton; Paul Anthony Haigh; Petr Chvojka; Zabih Ghassemlooy; Stanislav Zvanovec</i>	
<b>NEURON-LIKE SIGNAL PROPAGATION FOR OWC NANONETWORKS</b> .....	43
<i>Joao Pandeirada; Luis Nero Alves; Zabih Ghassemlooy</i>	
<b>EFFICIENT LED LIGHT CONVERTER BASED ON PEROVSKITE NANOCRYSTALS FOR VISIBLE LIGHT COMMUNICATION</b> .....	49
<i>Meysam Saeedi; Tahereh Ashjari; Farzaneh Arabpour Roghabadi; Vahid Ahmadi</i>	
<b>PERFORMANCE ANALYSIS OF TURBO CODE CONCATENATED WITH STBC OVER LAND MOBILE SATELLITE COMMUNICATION CHANNELS</b> .....	53
<i>Sanaz Baradaran Rowhani; Iman Ahadi Akhlaghi</i>	
<b>DESIGN AND ANALYSIS OF ASYMMETRIC GRAPHENE-COATED NANOWIRE PAIR FOR SECOND HARMONIC GENERATION</b> .....	58
<i>Babak Janjan; Vahind Ahmadi; Davood Fathi</i>	
<b>DESIGN AND FABRICATION OF MICROWAVE CIRCULATORS BASED ON FERROMAGNETIC NANOWIRES</b> .....	62
<i>B. Mousaeei; S. M. Hamidi; E. Mehrshahi</i>	
<b>A PARAMETRIC STUDY ON GAUSS-NEWTON ITERATIONS FOR WIRELESS SENSOR NETWORK LOCALIZATION</b> .....	66
<i>Alireza Jahangiri; Meysam Mohammadi-Amin; Ghasem Kahe</i>	
<b>PERFORMANCE EVALUATION OF A MIMO VLC SYSTEM EMPLOYING SINGLE CARRIER MODULATION WITH FREQUENCY DOMAIN EQUALIZATION</b> .....	70
<i>Tayebeh Ganjian; Gholamreza Baghersalimi; Zabih Ghassemlooy</i>	
<b>FREE SPACE OPTICAL (FSO) CHANNEL ESTIMATION AND TRACKING USING THE INCREMENTAL ADAPTIVE NETWORKS</b> .....	75
<i>Hosein Abdavinejad; Ehsan Mostafapour; Reza Fazli Garaboghloo; Changiz Ghobadi; Javad Nourinia; Ali Soleimani</i>	
<b>INVESTIGATION OF A WDM M-QAM ROF-ROFSO SYSTEM</b> .....	80
<i>Ehsan Hamidnejad; Asghar Gholami; Stanislav Zvanovec; Zabih Ghassemlooy</i>	
<b>TAPERED PLASMONIC WAVEGUIDE FOR TERAHERTZ INTERCONNECTS: AN FDTD METHOD</b> .....	85
<i>Mohsen Heidari; Vahid Ahmadi</i>	
<b>A MSM 2D RUDDLESDEN POPPER PEROVSKITE PHOTODETECTOR FOR VISIBLE LIGHT COMMUNICATION</b> .....	88
<i>Parsa Darman; Amin Yaghoobi; Sara Darbari</i>	
<b>PERFORMANCE EVALUATION OF POLAR CHANNEL CODING ON A PRACTICAL VLC LINK: A COMPARISON STUDY</b> .....	91
<i>Hooman Hematkah; Yousef Seifi Kaviani</i>	

<b>DUAL-BAND NEAR-PERFECT OPTICAL ABSORPTION BY GRAPHENE-COATED CORE-SHELL SPHERICAL NANOPARTICLES</b> .....	97
<i>Shiva Hayati Raad; Zahra Atlasbaf</i>	
<b>AN ENERGY EFFICIENT DEMODULATION SCHEME FOR DUAL RING STAR QAM CONSTELLATIONS</b> .....	101
<i>Mir Mahdi Safari; Jafar Pourrostam; Rolf Kraemer</i>	
<b>DIFFERENT MODELS OF THE REFRACTIVE INDEX STRUCTURE CONSTANT CALCULATION</b> .....	106
<i>Pasha Bekhrad; Erich Leitgeb</i>	
<b>64-QAM LTE SIGNAL TRANSMISSION AT 25 GHZ OVER HYBRID SSMF AND NON-UNIFORM TURBULENT FSO CHANNEL</b> .....	110
<i>Luis Vallejo; Dong-Nhat Nguyen; Stanislav Zvanovec; Beatriz Ortega; Jan Bohata</i>	
<b>A HYBRID VARIABLE M-CAP-BASED INDOOR VISIBLE LIGHT COMMUNICATIONS AND FINGERPRINT POSITIONING SYSTEM</b> .....	115
<i>Mahdi Nassiri; Atiyeh Pouralizadeh; Gholamreza Baghersalimi; Zabih Ghassemlooy</i>	
<b>ON THE PERFORMANCE OF OPTICAL WIRELESS COOPERATIVE SYSTEMS OVER THE DGG FADING CHANNEL</b> .....	120
<i>Ehsan Soleimani-Nasab; Zabih Ghassemlooy</i>	
<b>FREE SPACE BEAM SHAPING USING PHASE-CHANGE RECONFIGURABLE METASURFACES</b> .....	126
<i>Omid Abed; Leila Youefi</i>	
<b>COMPARATIVE ANALYSIS OF SUCCESSIVE CANCELLATION AND LIST DECODERS USING DISTINCT COMBINATIONS OF LLRS FOR POLAR CODES</b> .....	130
<i>Rafee Al Ahsan; Luchakorn Wuttisittikulij; Sunita Khichar; Pruk Sasithong; Ambar Bajpai; Pisit Vanichchanunt; Amir Parnianifard; Muhammad Saadi; Irfan Ullah; Sushank Chaudhary</i>	
<b>ANALYSIS OF DOWNLINK SATELLITE FREE SPACE OPTICAL COMMUNICATIONS SYSTEMS USING STATE-SPACE METHOD FOR THE RATE EQUATIONS OF THE SEMICONDUCTOR LASER DIODE</b> .....	135
<i>Sina Ahadi; Gholamreza Baghersalimi; Saeed Ashouri</i>	
<b>OUTAGE PROBABILITY IMPROVEMENT THROUGH OPTIMAL LED PLACEMENT FOR VISIBLE LIGHT COMMUNICATIONS</b> .....	140
<i>Mahmoud Mohammadi; Seyed Mohammad Sajad Sadough</i>	
<b>EVALUATION OF FOG EFFECTS ON OPTICAL CAMERA COMMUNICATIONS LINK</b> .....	145
<i>Vicente Matus; Shivani Rajendra Teli; Victor Guerra; Cristo Jurado-Verdu; Stanislav Zvanovec; Rafael Perez-Jimenez</i>	
<b>A DEEP LEARNING BASED DETECTOR FOR FSO SYSTEM CONSIDERING IMPERFECT CSI SCENARIO</b> .....	150
<i>Mohammad Ali Amirabadi; Mohammad Hossein Kahaei; S. Alireza Nezamalhoseini</i>	
<b>Author Index</b>	