

2021 IEEE Photonics Society Summer Topicals Meeting Series (SUM 2021)

**Virtual Conference
19 – 21 July 2021**



**IEEE Catalog Number: CFP21SUM-POD
ISBN: 978-1-6654-4673-0**

**Copyright © 2021 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:	CFP21SUM-POD
ISBN (Print-On-Demand):	978-1-6654-4673-0
ISBN (Online):	978-1-6654-1600-9
ISSN:	1099-4742

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

JOINT SESSION SIMP-ROP I

RECONFIGURABLE MID-INFRARED PHOTONICS	1
<i>Tian Gu, Juejun Hu</i>	
MID-IR PHOTONIC INTEGRATED CIRCUITS.....	3
<i>J. R. Meyer, M. Kim, C. S. Kim, C. L. Canedy, C. D. Merritt, W. W. Bewley, I. Vurgaftman</i>	

SLB PANEL I

MICRO/NANO-STRUCTURED OPTICAL FIBER GAS SENSOR.....	5
<i>Wei Jin</i>	

OPTICAL NETWORKS

TOWARDS MULTI-BAND WDM SYSTEMS WITH HUNDREDS OF TERABIT/S TRANSPORTED ON ONE SINGLE-MODE FIBER	7
<i>Erwan Pincemin</i>	
ULTRA-WIDEBAND TRANSMISSION SYSTEMS USING SOAS	11
<i>Renaudier Jeremie, Ionescu Maria, Bissessur Hans</i>	

MULTIMODE FIBER

MODE-DIVISION MULTIPLEXING FOR MICROWAVE SIGNAL PROCESSING	13
<i>Elham Nazemosadat, Ivana Gasulla</i>	

MATERIALS I

MAGNETO-OPTICAL INVESTIGATION OF THE DYNAMICS OF SPIN-POLARIZED CARRIERS IN GESN HETEROSTRUCTURES	15
<i>Simone Rossi, Elisa Vitiello, Fabio Pezzoli</i>	
MOMENTUM (K)-SPACE CHARGE SEPARATION MID-WAVE INFRARED PHOTODETECTORS USING SIGESN ALLOYS	17
<i>Tyler T. McCarthy, Zheng Ju, Shui-Qing Yu, Yong-Hang Zhang</i>	
ANALYSIS OF TEMPERATURE-DEPENDENT AND TIME-RESOLVED ELLIPSOMETRY SPECTRA OF GE	19
<i>Carola Emminger, Farzin Abadizaman, Nuwanjula S. Samarasingha, José Menéndez, Shirley Espinoza, Steffen Richter, Mateusz Rebarz, Oliver Herrfurth, Martin Zahradník, Rüdiger Schmidt-Grund, Jakob Andreasson, Stefan Zollner</i>	

SLB PANEL II

THREE-DIMENSIONAL INTENSITY CORRELATIONS IN RANDOM FIELDS GENERATED BY VORTEX STRUCTURED BEAMS.....	21
<i>Mahed Batarseh, Cristian Hernando Acevedo, Aristide Dogariu</i>	

TRANSMISSION SYSTEMS I

REAL-TIME MEASUREMENTS OF 200-600GBIT/S DIGITAL COHERENT SIGNALS IN UWB SYSTEMS.....	23
<i>Donald Govan</i>	

PHOTONIC COMPUTING

NEUROMORPHIC PROCESSING AT 11 TERA-OPS WITH SOLITON CRYSTAL KERR MICROCOMBS	25
<i>M. Tan, X. Xu, J. Wu, A. Boes, B. Corcoran, T. Nguyen, S. T. Chu, B. E. Little, R. Morandotti, A. Mitchell, D. J. Moss</i>	
INTEGRATED METASYSTEM FOR IMAGE RECOGNITION	27
<i>Zi Wang, Lorry Chang, Tingyi Gu</i>	
BENCHMARKING THE POOR MAN'S ISING MACHINE.....	29
<i>Gautham Umasankar, Parth S Shah, Nitin Chandrachoodan, Anil Prabhakar</i>	
SOLVING THE TWO-WAY NUMBER-PARTITIONING PROBLEM USING A SPATIAL-PHOTONIC ISING MACHINE.....	31
<i>Vikram Ramesh, Vighnesh Natarajan, Anil Prabhakar</i>	

DEVICES I

HIGH-PERFORMANCE GESN ELECTRONIC DEVICES AND SPIN-ORBIT COUPLING IN GESN/GE HETEROSTRUCTURES	33
<i>Chia-You Liu, Yen Chuang, Chia-Tse Tai, Hsiang-Shun Kao, Kai-Ying Tien, Jiun-Yun Li</i>	

IMAGING

MULTIDIMENSIONAL INCOHERENT DIGITAL HOLOGRAPHY WITH PHASE-SHIFTING INTERFEROMETRY	35
<i>Tatsuki Tahara, Yuichi Kozawa, Takako Koujin, Atsushi Matsuda, Ryutaro Oi</i>	
HIGH-SPEED STRUCTURED LIGHT ILLUMINATION AND MULTIPLE-PIXEL DETECTION FOR COMPRESSED SENSING	37
<i>Ken-Ichi Kitayama, Munenori Takumi, Keisuke Uchida, Naoaki Kato, Katsuhiro Ishii</i>	
PHOTONIC SPIKING CONVOLUTIONAL NEURAL NETWORKS FOR HIGH-SPEED IMAGE PROCESSING.....	39
<i>Menelaos Skontranis, George Sarantoglou, Adonis Bogris, Charis Mesaritakis</i>	

OPTICS & PHOTONICS I

SI SUBSTRATE BASED GAAS/ALGAAS QUANTUM WELL INFRARED PHOTODETECTOR WITH GE BUFFER	41
<i>Etienne Rodriguez, Kian Hua Tan, Wang Chongwu, Kwang Hong Lee, Satrio Wicaksono, Carlo Sirtori, Soon Fatt Yoon, Wang Qijie</i>	

ADVANCED COMPUTING

TEMPORAL OPTICAL NEURONS FOR SERIAL DEEP LEARNING	44
<i>Ming Li, Zhixing Lin, Xiangyan Meng</i>	

JOINT SESSION SIMP-ROP II

SILICON PHOTONICS FOR ARTIFICIAL INTELLIGENCE AND NEUROMORPHIC COMPUTING	46
<i>Bhavin J. Shastri, Thomas Ferreira De Lima, Chaoran Huang, Bicky A. Marquez, Sudip Shekhar, Lukas Chrostowski, Paul R. Prucnal</i>	

SLB PANEL III

INTERCONNECTING HOLLOW-CORE FIBERS	48
<i>Matej Komanec, Dmytro Suslov, Daniel Dousek, Ailing Zhong, Stanislav Zvánovec, Thomas D. Bradley, Francesco Polletti, David J. Richardson, Radan Slavík</i>	
BEYOND TWO-OCTAVE OAM SUPERCONTINUUM GENERATION IN GEMANIUM- DOPED RING-CORE FIBER	50
<i>Jian Yang, Yingning Wang, Yuxi Fang, Wenpu Geng, Wenqian Zhao, Zhi Wang, Yan-Ge Liu, Changjing Bao, Yongxiong Ren, Zhongqi Pan, Yang Yue</i>	

NEUROMORPHIC PHOTONICS

CONSIDERATIONS FOR BRAIN-SCALE ARTIFICIAL NEURAL SYSTEMS IN SEMICONDUCTING AND SUPERCONDUCTING OPTOELECTRONIC HARDWARE	52
<i>Bryce Primavera, Jeffrey Shainline</i>	
SIMPLIFIED SYNAPTIC RECEPTOR FOR COHERENT OPTICAL NEURAL NETWORKS.....	54
<i>Bernhard Schrenk</i>	

PROGRAMMABLE PHOTONICS II

ESTABLISHING FREE-SPACE OPTICAL COMMUNICATION CHANNELS THROUGH A RECONFIGURABLE SILICON MESH	56
<i>Maziyar Milanizadeh, Seyedmohammad Seyedinnavadeh, Fabio Toso, Giorgio Ferrari, David A. B. Miller, Andrea Melloni, Francesco Morichetti, Charalambos Klitis, Marc Sorel</i>	
A DATA-DRIVEN APPROACH TO AUTONOMOUS MANAGEMENT OF PHOTONIC SWITCHING SYSTEM	58
<i>Ihtesham Khan, M Umar Masood, Lorenzo Tunesi, Enrico Ghillino, Paolo Bardella, Andrea Carena, Vittorio Curri</i>	

SENSING I

GE ON SI PHOTONICS PLATFORM FOR MID-INFRARED SENSORS	60
<i>Kevin Gallacher, Ugne Griškevičute, Ross W. Millar, Douglas J. Paul</i>	
MONOLITHIC MID-IR METHANE GAS SENSOR WITH WAVEGUIDE-INTEGRATED DETECTOR	62
<i>P. Su, K. Stoll, Z. Han, D. Kita, P. Becla, H. Lin, S. Deckoff-Jones, K. Richardson, L. C. Kimerling, J. Hu, A. Agarwal</i>	

SLB PANEL IV

LIGHT TWISTS MATERIALS	64
<i>Takashige Omatsu</i>	
MARITIME APPLICATIONS OF HIGHER ORDER BESSEL BEAMS INTEGRATED WITH TIME (HOBBIT).....	66
<i>Eric G. Johnson, Kunjian Dai, J. Keith Miller, R. J. Watkins, Justin Free, Dmitrii Tsvetkov, Pavel Terekhov, Natalia M. Litchinitser, Aristide Dogariu</i>	
CONTINUOUS FABRICATION OF MICROSTRUCTURED WAVEGUIDES FOR THZ COMMUNICATIONS USING INFINITE 3D PRINTING.....	68
<i>Guofu Xu, Kathirvel Nallappan, Yang Cao, Maksim Skorobogatiy</i>	

FIBRES, AMPLIFIERS, AND DEVICES II

DISTANCE AND SPECTRAL POWER PROFILE SHAPING USING MACHINE LEARNING ENABLED RAMAN AMPLIFIERS	70
<i>M. Soltani, F. Da Ros, A. Carena, D. Zibar</i>	
OPTIMIZATION OF RAMAN AMPLIFIERS USING MACHINE LEARNING.....	72
<i>U. C. De Moura, F. Da Ros, D. Zibar, A. M. Rosa Brusin, A. Carena</i>	
PHOTONIC INTEGRATED WDM SWITCHES AND FILTERS FOR ULTRA-WIDEBAND (O TO L) OPTICAL NETWORKS	74
<i>N. Calabretta, R. Kraemer, Yu Wang, A. Napoli, F. Nakamura, H. Tsuda, K. Prifti, B. Srivathsa, G. Delrosso, T. Aalto, H. Jung, J. Shin, N. Tessema</i>	

PULSES/BROADBAND

ASYNCHRONOUS RECOVERY OF BROADBAND SIGNALS CORRUPTED BY IN-BAND NOISE	76
<i>Benjamin Crockett, Saikrishna Reddy Konatham, José Azaña</i>	
PICOSECOND OPTICAL PULSE SHAPING IN STRONGLY INJECTION-LOCKED SEMICONDUCTOR MICRORING LASERS	78
<i>Gennady A. Smolyakov, Marek Osinski</i>	

RECONFIGURABLE META-OPTICS III

ARRAY-LEVEL INVERSE DESIGN FOR OPTIMIZED BEAM DIRECTIVITY IN ACTIVE METASURFACES	80
<i>Prachi Thureja, Ghazaleh Kafaie Shirmanesh, Katherine T. Fountaine, Ruzan Sokhoyan, Meir Grajower, Harry A. Atwater</i>	

SENSING II

SEMICONDUCTOR NANOMEMBRANS AND THEIR 3D ASSEMBLIES FOR SENSITIVE OPTICAL DETECTORS	82
<i>Yongfeng Mei</i>	

FIBRES, AMPLIFIERS, AND DEVICES III

IMPACT OF STIMULATED RAMAN SCATTERING ON ULTRAWIDEBAND SYSTEMS.....	84
<i>Esteban Paz, Gabriel Saavedra</i>	

PROGRAMMABLE PHOTONICS III

ROBUSTNESS ANALYSIS OF GENERALIZED OPTICAL UNITARY CONVERTER.....	86
<i>Ryota Tanomura, Rui Tang, Takuo Tanemura, Yoshiaki Nakano</i>	

MATERIALS II

FLEXIBLE SINGLE-CRYSTALLINE GSN METAL-SEMICONDUCTOR-METAL PHOTODETECTORS.....	88
<i>Shu An, Munho Kim</i>	

TRANSMISSION SYSTEMS II

ULTRA-WIDEBAND WDM OPTICAL TRANSMISSION TECHNOLOGIES FOR BEYOND 100-TB/S SYSTEMS	90
<i>Fukutaro Hamaoka, Kyo Minoguchi, Takayuki Kobayashi, Yutaka Miyamoto, Yoshiaki Kisaka</i>	

OPTICAL COMMUNICATIONS

CARRIER-ASSISTED DIFFERENTIAL DETECTION USING GENERALIZED TRANSFER FUNCTIONS.....	92
<i>William Shieh, Honglin Ji</i>	

PROGRAMMABLE METAMATERIALS

INFRARED PROGRAMMABLE NANOPHOTONICS USING THE PLASMONIC PHASE-CHANGE MATERIAL IN_3SBTE_2	95
<i>Andreas Heßler, Thomas Taubner</i>	

SLB PANEL V

FIRST-ORDER PHASE STATISTICS IN LAGUERRE-GAUSS SPECKLES.....	96
<i>Pedro A. Alvarez Fernandez, Cristian Hernando Acevedo, Aristide Dogariu</i>	
PHASE MEMORY OF OPTICAL VORTEX BEAM SCATTERED BY RANDOM PHASE SCREENS	98
<i>Mahdi Eshaghi, Aristide Dogariu</i>	
37-AIR-CORE CHALCOGENIDE RING FIBER WITH >4000 RADIALY FUNDAMENTAL OAM MODES ACROSS C+L BANDS	100
<i>Yingning Wang, Zhi Wang, Yuxi Fang, Wenpu Geng, Yan-Ge Liu, Changjing Bao, Yongxiong Ren, Zhongqi Pan, Yang Yue</i>	
SPACE-TIME WAVE PACKETS INTERACTING WITH PHOTONIC STRUCTURES	102
<i>Abbas Shiri, Kenneth L. Schepler, Ayman F. Abouraddy</i>	
SPACE-TIME WAVE PACKETS: A NEW CLASS OF SPATIO-TEMPORALLY STRUCTURED LIGHT WAVES.....	104
<i>Murat Yessenov, Ayman F. Abouraddy</i>	
EXPERIMENTAL DEMONSTRATION FOR A POWER SCALABLE COHERENT VECTOR BEAM IN A TURBULENT ENVIRONMENT.....	106
<i>Justin Free, J. Keith Miller, Luke Snow, Jacob Nix, Richard J. Watkins, Eric G. Johnson</i>	

FIBRES, AMPLIFIERS, AND DEVICES IV

ULTRA-WIDEBAND AMPLIFICATION STRATEGIES.....	108
<i>Lutz Rapp, Michael Eiselt</i>	
BI-DOPED FIBER AMPLIFIERS FOR ULTRA-WIDEBAND OPTICAL COMMUNICATION SYSTEMS.....	110
<i>Yu Wang, Naresh Kumar Thipparapu, David J Richardson, Jayanta Sahu</i>	

SOLITONS

STRUCTURING LIGHT TO ROTATE OPTICAL TURING PATTERNS AND SOLITONS.....	113
<i>Alison M. Yao, Christopher J. Gibson, Gian-Luca Oppo</i>	
PHOTONIC IMPLEMENTATION OF DEVICE-INDEPENDENT QUANTUM RANDOMNESS EXPANSION	115
<i>Xingjian Zhang, Ming-Han Li, Xiongfen Ma, Qiang Zhang, Jingyun Fan, Jian-Wei Pan</i>	

PROGRAMMABLE PHOTONICS IV

GENERAL-PURPOSE PROGRAMMABLE PHOTONIC CHIPS.....	117
<i>Wim Bogaerts, Mi Wang, Xiangfeng Chen, Hong Deng, Iman Zand, Lukas Van Iseghem, K. P. Nagarjun, Umar Khan</i>	
RECONFIGURABLE FSR-FREE MICRORING RESONATOR FILTER WITH WIDE HITLESS TUNABILITY.....	119
<i>Matteo Petrini, Mazyar Milanizadeh, Francesco Zanetto, Giorgio Ferrari, Marco Sampietro, Francesco Morichetti, Andrea Melloni</i>	

ENHANCED GENERALIZED MACH-ZEHNDER INTERFEROMETER FOR TUNABLE CHANNEL ROUTING	121
<i>N. Hoppe, C. Schweikert, W. Vogel, R. Elster, P. Adam, M. Berroth</i>	

MATERIALS III

INAS/GAAS QUANTUM-DOT LASERS MONOLITHICALLY GROWN ON ON-AXIS SILICON (001).....	123
<i>Manyu Dang, Mingchu Tang, Junjie Yang, Alwyn Seeds, Siming Chen, Huiyun Liu</i>	

SYSTEM MODELLING AND NETWORKING II

COMPARISON OF COST-EFFECTIVE SOLUTIONS TO INCREASE THE CAPACITY OF REGIONAL OPTICAL TRANSPORT NETWORKS.....	125
<i>Nelson Costa, João Pedro</i>	

MULTIBAND POWER CONTROL IMPACT ON THE TRANSMISSION CAPACITY OF OPTICAL LINE SYSTEMS	127
<i>Bruno Correia, Rasoul Sadeghi, Emanuele Virgillito, Antonio Napoli, Nelson Costa, João Pedro, Vittorio Curri</i>	

C+L-BAND NETWORK UPGRADE: CAPACITY AND ENERGY ANALYSES WITH DIFFERENT TRANSCEIVERS	129
<i>Rasoul Sadeghi, Bruno Correia, Emanuele Virgillito, Antonio Napoli, Nelson Costa, João Pedro, Vittorio Curri</i>	

ROUTING AND SPECTRUM ALLOCATION HEURISTIC FOR SLICED ELASTIC OPTICAL NETWORK SYSTEM	131
<i>Shahzad Alam, Ihtesham Khan, Muhammad Umar Masood, Arsalan Ahmad, Salman Ghafoor, Vittorio Curri</i>	

COMPARISON OF WIRED AND WIRELESS CHANNEL FOR SHORT RANGE FREQUENCY HOPPING TERAHERTZ SYSTEM.....	133
<i>Kathirvel Nallappan, Maksim Skorobogatiy</i>	

APPLICATIONS

HIGH EFFICIENCY END-FIRE 3-D OPTICAL PHASED ARRAY BASED ON MULTI-LAYERS SIN/SIO PLATFORM	135
<i>Dachuan Wu, Yasha Yi</i>	

ADDITIVE MANUFACTURING OF RECONFIGURABLE TWO-WIRE PLASMONIC CIRCUITS FOR TERAHERTZ COMMUNICATIONS	137
<i>Yang Cao, Kathirvel Nallappan, Hichem Guerboukha, Guofu Xu, Maksim Skorobogatiy</i>	

OPTICS & PHOTONICS II

ELECTRONIC PROPERTIES OF GROUP-IV SNGE ALLOY TOPOLOGICAL QUANTUM MATERIALS	139
<i>Rabindra Basnet, Tyler T. McCarthy, Zheng Ju, Yong-Hang Zhang, Shui-Qing Yu, Jin Hu</i>	

MATERIALS IV

MID-IR GAIN OF TENSILE GERMANIUM WAVEGUIDE LASERS WITH SINX STRESS
LINERS 141
Md. Shamim Reza, Istvan Gulyas, Mark A. Wistey

Author Index