2022 International Conference on Numerical Simulation of Optoelectronic Devices (NUSOD 2022)

Turin, Italy
12-16 September 2022

IEEE Catalog Number: CFP22817-POD
ISBN: 978-1-6654-7900-4

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:	CFP22817-POD
ISBN (Print-On-Demand):	978-1-6654-7900-4
ISBN (Online):	978-1-6654-7899-1
ISSN:	2158-3234

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

Non-Uniform Time-Stepping for Fast Simulation of Photodetectors Under High-Peak-Power, Ultra-Short Optical Pulses 1
Ergun Simsek, Ishraq Md Anjum, Thomas F. Carruthers, Curtis R. Menyuk

Electro-Optical Simulation and Characterization of DCR and Secondary Emission in SPADs 3
Bozidar Novakovic, Kurtis Raymond, Giacomo Gallina, Liang Xie, Fabrice Retiere, Dylan McGuire

3D Multiphysics Transient Modeling of Vertical Ge-On-Si Pin Waveguide Photodetectors 5
Matteo G. C. Alasio, Paolo Franco, Alberto Tibaldi, Francesco Bertazzi, Soha Namnabat, Donald Adams, Prakash Gothoskar, Gianlorenzo Masini, Fabrizio Forghieri, Giovanni Ghione, Michele Goano

Numerical Simulation on the Dependence of Photoresponse on the Thickness of the Charge Layer for GaN SAM Avalanche Photodiodes 7
Xiaodong Wang, Muran Wang, Huiyuan Cui, Zewen Wang, Yulu Chen, Weiyi Ma

Mode-Guided Infrared Absorption in Ge/SiO_2 Grating for Large-Angle and Broadband Photodetection 9
Ching-Yu Hsu, Zingway Pei, Jia-Ming Liu

Examination of Resonant Cavity Enhanced Strain Compensated SiGeSn/GeSn Interband MQWIP 11
Prakash Pareek, Lokendra Singh, Ravi Ranjan, Nishit Malviya, Vipul Agarwal

Theoretical Study of Back-To-Back Avalanche Photodiodes for Mid- And Longwave Infrared Applications 13
T. Manyk, K. Majkowycz, J. Rutkowski, P. Martyniuk

Numerical Simulation on the Effect of Operation Temperature on the Optical Transfer Characteristics for GaN/AlGaN SAM Avalanche Photodiodes 15
Muran Wang, Zewen Wang, Xiaodong Wang, Huiyuan Cui, Yulu Chen, Weiyi Ma

Analysis of Differential Phase Shift Quantum Key Distribution Using Single-Photon Detectors 17
Vishal Sharma, Asha Bhardwaj

Network Authentication with Synchronized Chaotic Lasers 19
Lorenzo Lombardi, Valerio Annovazzi-Lodi, Giuseppe Aromataris

Exploring Modern Alternatives to the Whittaker-Shannon-Nyquist Sampling Theorem in THz Spectroscopy 21
Christian D. Andersen, Jacob A. S. Noura, Bjørn H. Mølvig, Oscar G. Garcia, Simon J. Lange

Polarization-Randomized Gateway Against Detector-Blinding Hacks of Quantum Key Distribution 23
Salem F. Hegazy, Salah S. A. Obayya, Bahaa E. A. Saleh

All-Optical and Logic Gate Based on Semiconductor Optical Amplifiers for Implementing Deep Recurrent Neural Networks 25
Badrul Alam, Andrea Ceschini, Antonello Rosato, Massimo Panella, Rita Asquini

Thermal Crosstalk Mitigation in a Dual-Drive Mach-Zehnder Modulator 27
Souvaraj De, Ranjan Das, Karanveer Singh, Younus Mandalawi, Thomas Kleine-Ostmann, Thomas Schneider

Characteristics of All-Optical Gate Switch Employing Quasi-Phase-Matched Lithium Niobate Devices 29
Genki Abe, Shotaro Umemoto, Ryoichi Miyauchi, Yutaka Fukuchi

OFDM Transmission Using a Self-Seeded Ring Cavity Based on a Semiconductor Optical Amplifier 31
Raed El Hassanieh, Pascal Morel, Mohamad Hamze, Véronique Quintard, André Pérennou, Ammar Sharaiha

Flat-Band 8-Channel Optical MUX/DeMUX for Long Reach 400GbE Applications 33
Seok-Hwan Jeong

Collision Dynamics of Solitons in a Grating Assisted Semilinear Dual-Core System with Phase Mismatch 35
Shuvashis Saha, Javid Atai

Modelling and Characterisation of Silicon Waveguides in Photonic Integrated Circuits 37
M. Ljubotina, M. Topic, J. Krc

Numerical Investigation of the Performance of OAM-Mode Shifting Recirculating Delay Loop Under the Effect of Mode Shifter Displacement 39
Ahmed Almaiman

A Compact Kerr Effect Based Plasmonic Logic Device for Nanotechnology Applications 41
Lokendra Singh, Prakash Pareek, Ankit Dixit, Vipul Agarwal

Design and Performance Analysis of All Optical Half Adder Based on Carrier Reservoir SOA - Mach Zehnder Interferometer (MZI) Configuration 43
Vipul Agarwal, Prakash Pareek, Lokendra Singh, Vijayshri Chaurasia

Tunable Optical Mode Converter Based on SOI Asymmetric Channel Waveguides 45
B. M. Younis, Mohamed Saleh M. Esmail, Mohamed Farhat O. Hameed, S. S. A. Obayya

Inverse Hyperbolic-Tangent Pre-Distortion for OOFDM Systems 47
Safana Alzoubi, Mohamed Shehata

Steady States in Dynamical Semiconductor Laser Models and Their Analysis 49
Mindaugas Radziunas

Microscopic Modeling of Interface Roughness Scattering and Application to the Simulation of Quantum Cascade Lasers 51
Thomas Grange, S. Mukherjee, G. Capellini, M. Montanari, L. Persichetti, L. Di Gaspare, S. Birner, A. Attiaoui, O. Moutanabbir, M. Virgilio, M. De Seta

Numerical Analysis of High-Brightness Tapered Ridge-Waveguide Lasers 53
J.-P. Koester, H. Wenzel, M. Wilkens, A. Knigge

Modeling Carrier Transport in Mid-Infrared VCSELs with type-II Superlattices and Tunnel Junctions 55
Valerio Torrelli, Jesus Alberto Gonzalez Montoya, Alberto Tibaldi, Pierluigi Debernardi, Andrea Simaz, Mikhail A. Belkin, Michele Goano, Francesco Bertazzi

Data-Driven Modeling of Non-Markovian Noise in Semiconductor Lasers 57
Lutz Mertenskötter, Markus Kantner

Relative Intensity Noise of Injection-Locked Epitaxial Quantum Dot Laser on Silicon 59
Qi Chu, Shiyuan Zhao, Frédéric Grillot, Jiawei Wang, Feng He, Mingyu Zhang, Xiaochuan Xu, Yong Yao, Jianan Duan

Physics-Based Time-Domain Modeling of VCSELs 61
Martino D'Alessandro, Alberto Gullino, Alberto Tibaldi, Francesco Bertazzi, Michele Goano, Pierluigi Debernardi

Modeling of THz Comb Emission in Difference-Frequency Quantum Cascade Lasers 63
Johannes Popp, Lukas Seitner, Michael Schreiber, Michael Haider, Luigi Consolino, Francesco Cappelli, Paolo De Natale, Kazuue Fujita, Christian Jirauschek

Simulation of the Spectral Behavior in High-Power Distributed Feedback Lasers Above Threshold 65
M. Reggentin, J.-P. Koester, H. Wenzel, A. Knigge

Effect of Self-Phase Modulation on the Signal Quality of Fourier Domain Mode-Locked Lasers 67
Ö. E. Asirim, R. Huber, C. Jirauschek

Single Transverse Mode Operation of Over 10 µm Wide Ridge-Type Semiconductor Lasers with Transversal Diffraction Gratings 69
Tatsuhiro Hirose, Takahiro Numai

Study of Reflectivity and Resistance Properties of P-Type Distributed Bragg Reflectors with Composition Graded Interfaces 71
Liwen Cheng, Da Yang, Shun Yao

Numerical Analysis of Electrically Pumped Si-GeSn/GeSn Quantum Well Transistor Laser 73
Ravi Ranjan, Prakash Pareek, Nishit Malviya

Design Analysis of Linear Graded Quantum Barriers in Ultavoilet-C Laser Diodes 75
Shazma Ali, Muhammad Usman, Sana Saeed

First-Principles Computation of Charge-Carrier Recombination Coefficients in Optoelectronic Materials 77
Xie Zhang

Carrier Transport in Multi Colour Deep Ultraviolet Light Emitting Diodes 79
G. Hofmann, J. Höpfner, M. Schilling, A. Muhin, F. Römer, T. Wernicke, M. Kneissl, B. Witzigmann

RGB LED Active Region Design and Optimization with Genetic Evolution Algorithm 81
Denis V. Mamedov, Mikhail V. Kisin, Chih-Li Chuang, Hussein S. El-Ghoroury

Development of Time-Dependent Exciton Diffusion Solver for Modeling Triplet-Triplet Fusion Mechanism in OLEDs 83
Jun-Yu Huang, Hsiao-Chun Hung, Kung-Chi Hsu, Chia-Hsun Chen, Pei-Hsi Lee, Hung-Yi Lin, Bo-Yen Lin, Man-Kit Leung, Tien-Lung Chiu, Jiun-Haw Lee, Yuh-Renn Wu

Reliable Prediction of the Singlet-Triplet Gap in TADF Molecules with GW/BSE Approach 85
Debapriya Chaudhuri, Charles H. Patterson

Ray Tracing Simulation of a GaN-Based Integrated LED-Photodetector System 87
P. Amiri, O. Casals, M. Auf Der Maur, J. D. Prades

Effect of Parabolic Quantum Well on Internal Quantum Efficiency of InGaN/GaN Based Micro-LED at Low Current Density 89
Ramvilas Gurjar, Chandra Prakash Singh, Ajay Singh Meena, Kankat Ghosh

Influence of Prestrained Graded InGaN Interlayer on the Optical Characteristics of InGaN/GaN MQW-Based LEDs 91
Samadrita Das, Trupti Ranjan Lenka, Fazal Ahmed Talukdar, Ravi Teja Velpula, Hieu Pham Trung Nguyen, Giovanni Crupi

Enhanced Optoelectronic Properties of UV-C Light-Emitting Diode 93
Saad Rasheed, Muhammad Usman

Rigorous Modal Analysis of Micro Or Nanoresonators 95
Philippe Lalanne

Carrier Transport in (In,Ga)N Quantum Well Systems: Connecting Atomistic Tight-Binding Electronic Structure Theory to Drift-Diffusion Simulations 97
Michael O'Donovan, Patricio Farrell, Timo Streckenbach, Thomas Koprucki, Stefan Schulz

Implementation of Partially Reflecting Boundary Conditions in the Generalized Maxwell-Bloch Equations 99
Michael A. Schreiber, Johannes Popp, Lukas Seitner, Michael Haider, Christian Jirauschek

Simulation of Ac Conductivity of Monolayer MoS_2 at Terahertz Frequencies 101
Shuva Mitra, Irena Knezevic

Comparison of Flux Discretizations for Varying Band Edge Energies 103
Julien Moatti, Patricio Farrell

Dual-Potential Finite-Difference Technique for Computational Electrodynamics 105
Samuel Belling, Laleh Avazpour, Michelle King, Irena Knezevic

Volume Exclusion Effects in Perovskite Charge Transport Modeling 107
Dilara Abdel, Nicola Courtier, Patricio Farrell

Data-Driven Doping Reconstruction 109
S. Piani, W. Lei, L. Heltai, N. Rotundo, P. Farrell

FiPo FDTD: Computational Electrodynamics Technique Producing Both Fields and Potentials 111
Laleh Avazpour, Michelle King, Samuel Belling, Irena Knezevic

Full-Vectorial Meshfree Finite Cloud Mode Solver for Fused Fiber-Optic Couplers 113
Xiaoer Wu, Jinbiao Xiao

The Variations of Photoluminscence Decay Times Under the Influence of a Trapping State 115
K. P. Chiu

Influence of Random Alloy Fluctuations on the Electronic Properties of Axial $In_xGa_{1-x}N$/GaN Nanowire Heterostructures 117
Oliver Marquardt, Thomas Koprucki, Michael O'Donovan, Stefan Schulz, Oliver Brandt

Band Structures in Highly Strained 3D Nanowires 119
Y. Hadjimichael, O. Marquardt, C. Merdon, P. Farrell

An Efficient Workflow of Modeling Single-Nanowire Based Single-Photon Avalanche Detectors 121
Zhe Li, H. Hoe Tan, Chennupati Jagadish, Lan Fu

Effect of Poole-Frenkel Emission on Electroluminescence in Quantum Dot Light Emitting Devices with Nickel Oxide Layer 123
Sweta Rani, Jitendra Kumar

Numerical Simulations of Nonparaxial Solitons and Their Interaction Dynamics in Coupled Helmholtz Systems 125
Tamilselvan Kamatchi, Govindarajan Arjunan

DFT Investigation of Optoelectronic Properties of Ultra-Small C, CN and SiC Nanotubes 127
R. Takassa, F. Elfatouaki, O. Farkad, S. Hassine, O. Choukri, A. El Mouncharih, Y. Ijdiyaou, E. A. Ibnouelghazi, D. Abouelaoualim

Inverse Design of Multilayer Thin Film by Deep Neural Network 129
Preetam Kumar, Fekadu Mihret, Arpita Mishra, E. S. Shivaleela, T. Srinivas

Beam Shaping Using a Chain of Photonic Nanojet Induced Plasmonics 131
Tulika Agrawal, Prem B. Bisht

Machine Learning Assisted Material and Device Parameter Extraction from Measurements of Thin Film Semiconductor Devices 133
Evelyne Knapp, Mattia Battaglia, Sandra Jenatsch, Beat Ruhstaller

Impact of Random Alloy Fluctuations on the Electronic and Optical Properties of C-Plane Al_xGa_{1-x} Quantum Wells 135
Robert Finn, Stefan Schulz

Simulation of Near-IR and Mid-IR Cascade Raman Microlasers Based on Bismuth-Modified Tungsten-Tellurite Glass 137
Elena A. Anashkina, Alexey V. Andrianov

Semi-Analytic Modelling of Slot Waveguides in Silicon-Organic Hybrid Mach-Zehnder Modulators 139
Raik Elster, Niklas Hoppe, Manfred Berroth

Modeling the Effects of Surface Recombination Velocity in Scanning Photocurrent Microscopy for Ohmic-Contact Thin-Film Devices 141
Yu-Chien Wei, Ming-Hua Mao

Modelling an Acousto-Optic Beam Shaping Device for a DIRCM Laser Laboratory Setup 143
Mehmet Ziya Keskin, Ziya Gürkan Figen, Ibrahim Tuna Özdür

Silicon-Based Plasmonic Nanoantennas at Mid-Infrared for Gas Sensing Applications 145
Ahmad E. Alsayed, Abdelrahman M. Ghanim, Ashraf Yahia, Mohamed A. Swillam

Early Cancer Detection by Plasmonic PCF Sensor 147
M. Abdelghaffar, Yusuf Gamal, Wafaa Soliman, Y. Badr, Mohamed Farhat O. Hameed, S. S. A. Obayya

Calculation of Intersubband Absorption in N-Doped $BaSnO_3$ Quantum Wells 149
Novak Stanojevic, Jelena Radovanovic, Nikola Vukovic

One Channel Tunable Bandpass Superconducting Filter for Wavelength Selective Switching Applications in Communications Systems 151
Luz E. González Reyes, Lina M. Segura-Gutierrez, John E. Ordoñez, Gustavo Zambrano, John H. Reina

Highly Efficient and Novel Lumped Michelson Modulator Using Vertical PN Junction Based Phase Shifter 153
M. A. Hamdani, G. Qazi, S. K. Naik, R. G. J. Sugesh, M. A Magray

Design of Slot Waveguide Based Directional Coupler for Optical Sensing of Low Concentration of Ethanol in Water 155
Nishit Malviya, Ravi Ranjan, Prakash Pareek

Highly Sensitive Ring Resonator Based Refractive Index Sensor for Label Free Biosensing Applications 157
Sanchit Kundal, Arpit Khandelwal

Mid-Infrared Optical Modulator Based on D-Shaped PCF 159
B. M. Younis, Nada Yazeed, El-Sayed Usama, Bilal El-Sayed, Mohamed H. Almoqadem, Mohamed A. El-Sonbaty, Abdullah El-Shawadfy, Amal Abd-Elaziz, Saleh Mahmoud, Mohamed Farhat O. Hameed, S. S. A. Obayya

Performance Optimization of Surface Plasmon Resonance Based Sensors from the First Principle 161
Himanshu Kushwah, Jagneet Kaur Anand

Continuous-Wave Second-Harmonic Generation in Orientation-Patterned Gallium Phosphide Waveguides at Telecom Wavelengths 163
Konstantinos Pantzas, Sylvain Combrié, Alfredo De Rossi, Yoan Léger, Arnaud Grisard, Isabelle Sagnes

Modal Properties of Dielectric Bowtie Cavities with Deep Sub-Wavelength Confinement 165
George Kountouris, Jesper Mørk, Emil Denning, Philip Trøst Kristensen

Numerical Simulations on Quantum Noise Squeezing for Soliton-Like Pulses in Optical Fiber 167
Arseny A. Sorokin, Nikolay I. Salnikov, Anna N. Kosareva, Valeriya P. Alyukova, Gerd Leuchs

Numerical Modeling and Experimental Verification of Advanced Methods for Characterization of Broadband Optical Pulses and Optical Frequency Combs 169
Alexey V. Andrianov, Elena A. Anashkina

Tunable and Compact SiP Quasi-Dichroic Filter with ≥ 10 dB/nm Roll-Off Across C- & L-Bands 171
Asher Novick, Songli Wang, Anthony Rizzo, Robert Parsons, Kaylx Jang, Keren Bergman

Flexible, Process-Aware Compact Model of Effective Index in Silicon Waveguides for Commercial Foundries 173
Aneek James, Yuyang Wang, Anthony Rizzo, Keren Bergman

Low-Cross-Talk Metal-Dielectric-Metal Waveguide Intersections Based on Sodium 175
Vitaly Felix Rodriguez-Esquerre, Claudio Garrido Muzis Sobrinho, Pedro Paulo Matos Barreto, Gilliard N. Malheiros-Silveira

Tunable Guided-Mode Resonance Filter Using Spacetime Periodic Structure 177
Yaser Khorrami, Davood Fathi, Nasrin Razmjooei, Raymond C. Rumpf

120° Hybrid for Bimodal Interferometers 179
Christian Schweikert, Niklas Hoppe, Wolfgang Vogel, Manfred Berroth

Ultraviolet and Infrared Blocking Meta-Glasses for Electric Vehicles 181
Ashish Kumar Chowdhary, Tanmay Bhowmik, Jegyasu Gupta, Debabrata Sikdar

Numerical Study of Stimulated Brillouin Scattering in Optical Microcavities Made of Telecommunication Fibres 183
A. Kosareva, V. Alyukova, N. Salnikov, N. Kalinin

Design and Simulation of Temperature Sensors Based on Thermo-Optical WGM Shifts in Silica and Non-Silica Glass Microcavities 185
M. P. Marisova, A. V. Andrianov, E. A. Anashkina

Genetic Algorithm Optimization of Infrared Plasmonic Absorbers 187
Diego Souza Bezerra, Vitaly Felix Rodriguez-Esquerre

Numerical Simulation of Silicon Grating-Based Plasmonic Sensor 189
Ankit Kumar Pandey, Harshvardhan Kumar

Dynamically Tunable Graded Index Photonic Crystal Lens Based on Dirac Semimetal 191
P. Panahianfar, B. Rezaei

Plasmonic Dual D-Shaped PCF Sensor for Low Refractive Index Applications 193
Yusuf Gamal, B. M. Younis, Mohamed Farhat O. Hameed, S. S. A. Obayya

Simulation Analysis of Microring Resonator in Mobius Topology 195
Rohan Katti, Shanthi Prince

The Counter-Propagating Traveling-Wave Technique for Optimizing a Continuous-Wave Fiber Laser Presenting Excited State Absorption 197
Yuri O. Barmenkov, Vicente Aboites, Josué A. Minguela-Gallardo

Numerical Assessment of Bloch Surface Wave 1D-PhC Sensor Using $Ba_2NaNb_5O_{15}$ Defect Layer 199
Kalpana Sagar, Ajay Kumar

Simulation of Optical Planar Waveguide Sensor for Microplastics Detection in Water 201
Nazirah Mohd Razali, Nur Najahatul Huda Saris

Numerical Investigation of Optical Bistability in Inhomogeneous PT-Symmetric Gratings 203
S. Sudhakar, S. Vignesh Raja, A. Govindarajan

Dynamics of Colliding Bragg Solitons in a Dual-Core System with Separated Grating and Cubic-Quintic Nonlinearity 205
Nadia Anam, Javid Atai

Nanoplasmonic Ultra Compact, Low Insertion Loss UWB Band-Pass Filter Using Square Ring Resonators 207
Kola Thirupathaiah, L Koteswara Rao, Ravi Boda

Built-In Electric Field in Irregular Morphologies of Bulk-Heterojunction Solar Cells 209
I. C. Flores-Contreras, V. Cabrera-Arenas, L. M. Reséndiz-Mendoza

Numerical Simulation of Eco-Friendly 4-Terminal All Perovskite Tandem Solar Cell Using Novel HTL Structure in the Bottom Sub Cell 211
Mahsa Moradbeigi, Mohammad Razaghi

Simulation and Optimization of Nano-Structured Gratings Alternative of Thin-Film Anti-Reflectors for GaAs Solar Cells Conversion Efficiency Improvement 213
Narottam Das, Ashish Sharma, Mohammad Khairul Basar, Mohammad Nur-E-Alam

Performance Evaluation of Lead-Free $Cs_2CuSbCl_6$ Perovskite Solar Cells for > 21.67% Efficiency 215
Ajay Kumar, Melvin Saji Thomas, Neha Gupta, Aditya Jain

Highly Efficient Dome Shaped Nanowires Solar Cell 217
R. El-Bashar, Mohamed Farhat. O. Hameed, S. S. A. Obayya

Absorption Enhancement of GaAs Thin Film Solar Cell Using Hemisphere Core-Shell Nanoparticles 219
Asmaa Mohamed A. Aly, Awad Khaled, Mohamed Farhat O. Hameed, S. S. A. Obayya

Author Index