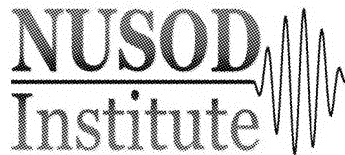


2006 International Conference on

**Numerical Simulation of  
Semiconductor Optoelectronic  
Devices**

**NUSOD '06**

Editors / Chairs:  
Joachim Piprek and Siu-Fung Yu



Technical Co-Sponsor: The IEEE Lasers and Electro-Optics Society  
IEEE Catalog Number: 06EX1456 ISBN: 0-7803-9755-X

© 2006 IEEE. Personal use of this material is permitted. However, permission to reprint/republish this material for advertising or promotional purposes or for creating new collective works for resale or redistribution to servers or lists, or to reuse any copyrighted component of this work in other works must be obtained from the IEEE.

IEEE Catalog Number: 06EX1456

ISBN: 0-7803-9755-X

Library of Congress: 2006927955

IEEE Operations Center  
445 Hoes Lane  
Piscataway, NJ 08854-4150  
USA

+1 800 678 IEEE (+1 800 678 4333)

+1 732 981 1393

+1 732 981 9667 (FAX)

email: [customer-service@ieee.org](mailto:customer-service@ieee.org)

NUSOD Conference web site: <http://www.nusod.org>

# Table of Contents

**Monday, 11 September 2006**

## **MB Novel Materials**

- MB1 Simulation of carrier injection and propagation in molecularly disordered systems  
G. Meller, L. Li, S. Holzer, H. Kosina (*Technical Univ. Vienna, Austria*) 1
- MB2 Microscopic simulation of semiconductor lasers in the GaInNAs material system  
A. Thranhardt, C. Schlichenmaier, I. Kuznetsova, S. W. Koch; W.W. Chow; J. Hader,  
J. V. Moloney (*Philipps-University Marburg, Germany; Sandia National Labs, USA;  
University of Arizona, USA*) 3
- MB3 Effect of In-Segregation on subbands in GaInNAs/GaAs quantum wells for 1.3 and 1.55  
micron operation wavelength  
V. Dixit, H. F. Liu, N. Xiang (*National Univ., Singapore*) 5
- MB4 Accurate modeling of InGaN quantum wells  
H. Wenzel (*Ferdinand Braun Institut, Germany*) 7
- MB5 Optoelectronic properties of InGaN SQW with embedded AlGaIn delta-layer  
J. Park, A. Kaneta, M. Funato, Y. Kawakami (*Kyoto Univ., Japan*) 9

## **MC GaN-based Devices**

- MC1 Simulation of InGaN Violet and Ultraviolet Multiple-Quantum-Well Laser Diodes  
S.-H. Yen, B.J. Chen, Y.-K. Kuo (*Nat. Changhua Univ., Taiwan*) 11
- MC2 Optical Performance of InGaN/AlGaIn Double Heterostucture Light Emitting Diode  
S. M. Thahab, H. Abu Hassan, Z. Hassan (*Sains Univ., Malaysia*) 13
- MC3 Simulation of InGaN/GaN multiple quantum well light emitting diodes with Quantum Dot  
electrical and optical effects  
C. S. Xia, W. Lu; Z. M. Simon Li, Z. Q. Li (*Shanghai Inst. Techn. Physics, China;  
Crosslight Software, Canada*) 15
- MC4 Analysis of the extraction efficiency in GaN-on-sapphire light emitting diodes  
J.-B. Lee, S.-H. Yoon, D.-W. Kim, C.-H. Choi (*Samsung, South Korea*) 17
- MC5 3D Simulation of InGaN/GaN Micro-Ring Light-Emitting Diodes  
Y. Sheng, O. Shmatov, Z. M. Simon Li (*Crosslight Software, Canada*) 19

## Tuesday, 12 September 2006

### TuA Nanostructures

- TuA1 Time dependent quantum transport through nanostructures: status and challenges  
(invited)  
Jian Wang (*University of Hong Kong, China*) 21
- TuA2 All-optical Coherent Control of Spin Dynamics in Semiconductor Quantum Dots  
G. Slavcheva, O. Hess (*Univ. of Surrey, UK*) 23
- TuA3 Simulation of two-state lasing dynamics in quantumdot lasers  
L.-C. Su, M.-H. Mao (*National Taiwan Univ., Taiwan*) 25
- TuA4 Energy band structures of strained membrane quantum wires considering the  
redistribution of elastic strain relaxation  
F. Ferdous, A. Haque (*Bangladesh Univ. Eng. Technol., Bangladesh*) 27

### TuB Photodetectors and Solar Cells

- TuB1 Dark current models for HgCdTe long-wavelength photodiodes (invited)  
Z. Quan, X. Chen, W. Lu (*Shanghai Inst. Techn. Physics, China*) 29
- TuB2 Modeling of intersubband transitions in quantum well infrared photodetectors with  
complex well-barrier structures  
W. Liu, D. H. Zhang (*Nanyang Technol. Univ., Singapore*) 31
- TuB3 Optical modeling and simulation of thin-film Cu(In,Ga)Se solar cells  
J. Krc, A. Campa, G. Cernivec; J. Malstroem, M. Edoff; F. Smole, M. Topic (*Univ. of  
Ljubljana, Slovenia; Uppsala Univ., Sweden*) 33
- TuB4 Planarization of Passivation Layers during Manufacturing Processes of Image Sensors  
A. Sheikholeslami, S. Selberherr; F. Parhami, H. Puchner (*Techn. Univ. Vienna,  
Austria; Cypress Semicond. Corp., USA*) 35

### TuC Laser Diodes I

- TuC1 Many-body optical gain in ZnO- and GaN-based quantum well lasers (invited)  
S.-H. Park, D. Ahn (*Catholic Univ. of Daegu & Univ. of Seoul, South-Korea*) 37
- TuC2 Carrier Recombination in Semiconductor Lasers: Beyond the ABC  
J. Hader, J. V. Moloney, S. W. Koch, L. Fan, M. Fallahi (*Nonlinear Control Strategies  
Inc. & Univ. of Arizona, USA*) 39
- TuC3 The Impact of Nonequilibrium Gain in a Spectral Laser Model  
P. J. Bream, J. J. Lim, S. Bull, S. Sujecki, E. C. Larkins (*Univ. of Nottingham, UK*) 41

TuC4 Harmonic Balance Analysis for Semiconductor Lasers under Large-Signal Modulation  
S. Odermatt, B. Witzigmann; B. Schmithuesen (*ETH & Synopsys, Switzerland*) 43

## TuD Optoelectronic Integrated Circuits

TuD1 Design and demonstration of semiconductor active waveguide optical isolators  
(invited)  
H. Shimizu (*University of Tokyo, Japan*) 45

TuD2 Design of a Widely Tunable Laser with a Chirped Ladder Filter  
T. Kakitsuka, S. Matsuo, S.-H. Jeong, T. Segawa, H. Okamoto, Y. Kawaguchi,  
Y. Kondo, Y. Yoshikuni, H. Suzuki (*NTT Photonics Labs, Japan*) 47

TuD3 A simulator for integrated optoelectronic devices  
R. Gutierrez-Castrejon; M. Duellk, P. Bernasconi (*National Autonomous Univ., Mexico;  
Bell Labs, USA*) 49

## TuP Poster Session

TuP1 Effects of size and shape on electronic states of quantum dots  
C. Y. Ngo, S. F. Yoon, W. J. Fan, S. J. Chua (*Nanyang Technol. Univ., Singapore*) 51

TuP2 Characteristics of plasmonic resonance in a sandwiched metamaterial nano film  
K. P. Chiu, D. P. Tsai (*National Taiwan Univ., Taiwan*) 53

TuP3 Free-excitonic gain in ZnO/MgZnO strained quantum well  
A. P. Abiyasa, S. F. Yu, W. J. Fan, S. P. Lau (*Nanyang Technol. Univ., Singapore*) 55

TuP4 Modeling of ZnO thin film random lasers  
E. S. P. Leong and S. F. Yu (*Nanyang Technol. Univ., Singapore*) 57

TuP5 Optimization of microcavity OLED by varying the thickness of multi-layered mirror  
A. W. Lu, J. Chan, A. D. Rakic; A. M. C. Ng, A. B. Djuriscic (*Univ. of Queensland,  
Australia; Univ. of Hong Kong, China*) 59

TuP6 A 3D numerical simulation of quantum dot photodetector  
M. Madheswaran (*Muthayammal Engineering College, India*) 61

TuP7 A novel design and characterization of oxide confined 850 nm VCSEL  
S. M. Mitani, M. S. Alias, K. A. Sharif, S. A. Mohamad, P. K. Choudhury (*Telecom &  
Multimedia Univ., Malaysia*) 63

TuP8 Tailoring of polarization bistability characteristics in birefringent ARROW VCSELs  
P. L. Neo, S. F. Yu, T. D. Wilkinson (*Cambridge Univ., UK; Nanyang Technol. Univ.,  
Singapore*) 65

TuP9 First and second order DFB lasers with GaInNAs-GaAs quantum-well  
M. Nadir (*Tampere Univ., Finland*) 67

TuP11 Cost optimal strategies for placement of amplifiers in a point to point optical link M. A. Dallaali, M. Premaratne, A. J. Lowery ( <i>Monash Univ., Australia</i> )	69
TuP12 Design of all-optical multi-functional logic gate in single format by using SOAs C. W. Son, S. H. Kim, Y. M. Jhon, Y. T. Byun, S. Lee, D. H. Woo, S. H. Kim, T.-H. Yoon ( <i>Korea Inst. Science Technol. &amp; Pusan National Univ., South Korea</i> )	71
TuP13 All optical wavelength conversion technique in DWDM network with study on step and linear shared buffer for packet switching M.S. Salleh, B. H. L. Lee, A. Azrin, R. Mohamad, K. Dimiyati ( <i>Telecom Malaysia</i> )	73
TuP14 Performance Improvement on Optical Spectral CDMA System using DCF K. Khairi, B. H. L. Lee, M. Z. Abdul Kadir, R. Mohamad, M.S. Salleh, K. Dimiyati ( <i>Telecom Malaysia</i> )	75
TuP15 Optimal transient response of Erbium-doped fiber amplifiers N. Petrovacki; Z. D. Jelcic ( <i>Univ. of California, USA; Univ. of Novi Sad, Serbia-Montenegro</i> )	77
TuP17 Macromodel of electro-thermal feedback for nonlinear microbolometers M. Ou-Yang, S.-W. Huang; S.-F. Tsai, H.-Y. Ko, B.-J. Wen ( <i>National Central Univ. &amp; Industrial Technol. Research Institute, Taiwan</i> )	79
TuP18 Two-dimensional multi-fluid modeling on micro-plasma discharge by an AC bipolar scan waveform B.-H. Chen, Y.-C. Liang ( <i>National Dong Hwa Univ., Taiwan</i> )	81
TuP19 None-touched near-field optical nanolithography S. C. Chen; T. M. Chang, K. P. Chiu, D. P. Tsai ( <i>Far East College &amp; National Taiwan Univ., Taiwan</i> )	83

## Wednesday, 13 September 2006

### WA Semiconductor Optical Amplifiers

WA1 Wideband Steady-State Numerical Model of a Tensile-Strained Bulk SOA M. Connelly ( <i>University of Limerick, Ireland</i> )	85
WA3 Carrier-density evolution in polarization sensitive semiconductor optical amplifiers B. S. Gopalakrishna Pillai, A. Nirmalathas, C. Lim; M. Premaratne ( <i>Univ. of Melbourne &amp; Monash Univ., Australia</i> )	87
WA4 Modeling of SOA-based high speed all-optical wavelength conversion with optical filter assistance J. Dong, S. Fu, P. Shum, X. Zhang, H. Liu, D. Huang ( <i>Huazhong Univ., China; Nanyang Technol. Univ., Singapore</i> )	89

- WA5 Design and Simulation of All-Optical AND Gate using XGM in SOAs without Input Additional Beam  
S. H. Kim, J. H. Kim, C. W. Son, G. Kim, Y. T. Byun, Y. M. Jhon, S. Lee, D. H. Woo, S. H. Kim (*Korea Inst. Science Technol., South Korea; Penn State Univ., USA*) 91

## **WB Laser Diodes II**

- WB1 On The Prediction of Self-Pulsations in Two-Section Partially Gain-Coupled DFB Lasers  
M. Al-Mumin (*College of Technol. Studies, Kuwait*) 93
- WB3 Modeling of distributed Bragg reflectors for current crowding simulation in intracavity-contacted VCSEL  
I.-S. Chung, Y. T. Lee (*Gwangju Inst. Science Technol., South Korea*) 95
- WB4 Integrated high speed VCSELs for bi-directional optical interconnec  
V. V. Lysak, K. S. Chang, Y. T. Lee (*Gwangju Inst. Science Technol., South Korea*) 97
- WB5 Simulation of interaction of the femtosecond laser pulse with chirped mirror  
S. O. Yakushev, I. A. Sukhoivanov, O. V. Shulika, V. V. Lysak, S. I. Petrov (*Kharkov National Univ. Radio Electron., Ukraine; Gwangju Inst. Science Technol., South Korea; Univ. Guanajuato, Mexico*) 99

## **WC Photonic Devices**

- WC1 Strengths and applications of semi-analytic techniques for photonic crystal device modelling (**invited**)  
L. Botten (*CUDOS, University of Technology, Australia*) 101
- WC2 Design and analysis of microoptical elements for display applications (**invited**)  
H.-Y. Lin (*National Taiwan University, Taiwan*) 103
- WC3 Modelling methods for high-index contrast linear and non-linear nanophotonics (**invited**)  
P. Bienstman, P. Vandersteegen, B. Maes, R. Baets (*Ghent University, Belgium*) 105
- WC4 Nonlinear FDTD Analysis and Experiment of FWM in InGaAsP-InP Optical Microresonator  
M. Fujii, Ch. Koos, Ch. Poulton, J. Leuthold, W. Freude (*Univ. Karlsruhe, Germany*) 107

## **WD Fiber Optics and Networks**

- WD1 Challenges in Photonic System Simulation (**invited**)  
M. Premaratne (*Monash University, Australia*) 109
- WD2 Performance Simulation of Multi Protocol Optical Switch (MPOS) with Multicasting Capability for Optical GRID Networks  
B. H. L. Lee, R. Mohamad, K. Dimiyati (*Telecom Malaysia*) 111

WD3 Pulse Splitting by Third-Order Dispersion U. Bandelow, A. Demircan ( <i>Weierstrass Institute, Germany</i> )	113
WD4 Simulation of PMD Compensation Using Optical FIR Lattice Filter F. Abu Khadra, K. Dimiyati ( <i>Univ. of Malaysia</i> )	115

## Thursday, 14 September 2006

### ThA Novel Devices

ThA1 Numerical simulations of an ultrasimple ultrashort-laser-pulse measurement device - GRENOUILLE X. Liu, R. Trebino; A. V. Smith ( <i>Georgia Inst. Technol. &amp; Sandia Nat. Labs, USA</i> )	117
ThA2 Box-like spectral output of nested ring feedback Mach-Zehnder interferometer S. Darmawan, M.K. Chin ( <i>Nanyang Technol. Univ., Singapore</i> )	119
ThA3 Electrically induced Bragg modulator for ultrafast light modulation in Indium Phosphide devices M. DeLaurentis, F. M. DePaola, V. d'Alessandro, A. Irace, G. Breglio ( <i>Univ. of Naples, Italy</i> )	121
ThA4 Numerical modeling of electrically controlled waveguide channel in nematic LC cell A. G. Maksimochkin, S. V. Pasechnik, V. A. Tsvetkov, D. A. Yakovlev, G. I. Maksimochkin, V. G. Chigrinov ( <i>Moscow State Univ. &amp; Saratov State Univ., Russia; Hong Kong University, China</i> )	123

### ThB Light-Emitting Diodes

ThB1 Advanced industrial design methods for LEDs ( <b>invited</b> ) N. Linder ( <i>OSRAM Opto Semiconductor, Germany</i> )	125
ThB2 Generalized photon recycling theory for 2D and 3D LED simulation ( <b>invited</b> ) W.-Ch. Ng ( <i>Synopsys, U.S.A.</i> )	127
ThB3 Diffraction Efficiency of 2D Photonic Crystal Structures on Light Emitting Diodes Ch. Wiesmann, R. Wirth, N. Linder; R. Stanley; R. Houdre ( <i>OSRAM, Germany; CSEM &amp; EPFL, Switzerland</i> )	129
ThB4 Super-Luminescent LEDs—Modeling of Emission Spectra and LI-Characteristics M. Loeser, L. Occhi, V. Laino, Ch. Velez, R. Rezzonico, B. Witzigmann ( <i>ETH &amp; Exalos AG, Switzerland</i> )	131
ThB5 Performance Simulation of Organic Light-Emitting Diodes J. Park, N. Suganuma, A. Kaneta, Y. Kawakami ( <i>Kyoto Univ., Japan</i> )	133

## ThC Photonic Circuits

ThC2 Simulation of Soliton Propagation in a Directional Coupler ( <b>invited</b> ) P. Shum ( <i>Nanyang Technological University, Singapore</i> )	135
ThC3 Numerical analysis of a swift, high resolution wavelength monitor designed as a Generic Lightwave Integrated Chip (GLIC) J. Ging, R. O'Dowd ( <i>Iniv. College Dublin, Ireland</i> )	137
ThC4 Asymmetrical Fano resonance and Bistability in two ring resonator configuration L. Y. Mario, M. K. Chin ( <i>Nanyang Technol. Univ., Singapore</i> )	139
ThC5 An efficient time lens for optical pulse compression T. Chattopadhyay, S. Das ( <i>Visva-Bharati Univ., India</i> )	141