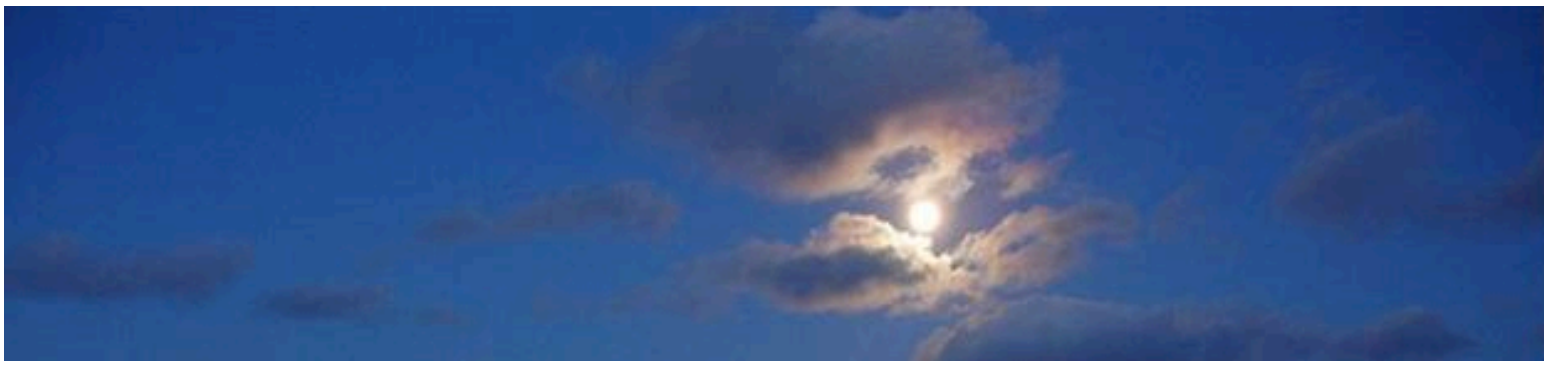
2011 SBMO/IEEE MTT-S International Microwave and Optoelectronics Conference



SHORT-COURSES TECHNICAL PROGRAM

Imirá Plaza Hotel

2011 SBMO/IEEE MTT-S International Microwave and Optoelectronics Conference Oct. 29 – Nov. 01, 2011

Saturday, October 29, 2011

8:00h - 12:20h

Short-course: State-of-the-Art in Internet Traffic Performance Enhancement over Wireless Networks
Room: Ponta Negra I

Abstract: Wireless communications have been rapidly evolving in later years, mainly due to the increased need for deploying mobile Internet services. However, Internet protocols like TCP were conceived for a different kind of network, where the communication channel is guided and less variant, and the main cause for packet loss is due to congestion in routers. When such protocols are applied unchanged in wireless networks, where channel conditions impose larger variations in link performance (i.e. causing additional packet losses), performance of these Internet services may be severely affected. This course intends to review the concepts involved in TCP performance evaluation and optimization, as well as providing the state-of-the-art in optimization of TCP traffic for wireless networks.

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About the presenter: Fuad Mousse Abinader Jr. has obtained his BSc in Computer Science at UFAM in 2003, his MSc in Informatics/Networks at UFAM in 2006 and has started in 2011 his PhD in EE/Telecommunications at UFRN. He has worked in the past for companies like Siemens Mobile, Nokia and NSN, in topics including embedded software development, network performance evaluation via simulation, power consumption optimization for WiMAX mobile terminals, development & prototyping of IP Mobility & IPv6 Transition protocols and IETF standards development. His current research is focused on developing cross-layer optimizations for cooperative dynamic spectrum access systems and evaluating their trade-offs.

Short-course: Negative Refractive Index Metamaterials: Fundamentals, Theory and Applications in Engineering
Room: Ponta Negra II

Abstract: This short-course presents the fundamental properties of negative refractive index metamaterials. From the first theoretical predictions by Russian physicist Veselago in the late 60's, going through the breakthrough experiments in the beginning 2000's, a historical perspective is given emphasizing both theoretical and experimental aspects of negative refractive index propagation. A basic ray optics approach is initially introduced, revealing the so-called "inversion of Snell's law" or the reversal of wave refraction for plane surfaces. A full-wave theory is then presented in view of Maxwell's equations, and causality is shown to follow naturally by assuming these metamaterials as dispersive structures. Finally, we overview some of the most exciting current and future applications of negative refractive index metamaterials, discussing their revolutionary aspects also in current and near future technologies for both microwaves and optics.

Table of Contents:

6. Final considerations and conclusions.

About the presenter: Leonardo André Ambrosio received the B.Sc., M. Sc. and the Ph.D. degrees in Electrical Engineering from University of Campinas, School of Electrical and Computer Engineering, Campinas, Brazil, in 2002, 2005 and 2009, respectively. Since 2009, he is a postdoctoral Fellow with the Department of Microwaves and Optics at the School of Electrical and Computer Engineering, University of Campinas (UNICAMP). During the last three years, he has been researching the optical properties of negative refractive index metamaterials for potential biomedical applications in optical trapping and micromanipulation. His research interests concentrate on Optical Communications, Electromagnetism, Optical Trapping and Micromanipulation, and Metamaterials.

About the presenter: Hugo E. Hernández-Figueroa (M'94-SM'96 IEEE) received the B.Sc. degree in electrical engineering from the Federal University of Rio Grande do Sul, Porto Alegre, Brazil, in 1983, the M.Sc. degree in electrical engineering and the M.Sc in informatics, from the Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil, in 1985 and 1987, respectively, and the Ph.D. degree in physics from the Imperial College of Science, Technology and Medicine, University of London, UK, in 1992. After spending two years as a Postdoctoral Fellow with the Department of Electronic and Electrical Engineering, University College London (UCL), London, UK, he joined the University of Campinas (UNICAMP), School of Electrical and Computer Engineering (FEEC), Department of Microwaves and Optics (DMO), as an Assistant Professor in 1995. He became Full Professor in 2005 and has been DMO's Head since 2004. He has published about 100 papers in renowned journals and almost 200 international conference papers. He is Co-Editor of the book Localized Waves: Theory and Applications (Wiley and Sons, 2008). His research interests concentrate on a wide variety of wave electromagnetic phenomena and applications mainly in integrated photonics, nanophotonics, optical fibers, metamaterials, and plasmonics. He is also involved on research projects dealing with information technology applied to technology-based education. Since 1994 Prof. Hernández-Figueroa has been very active with IEEE (Photonics Society, Microwave Theory and Techniques Society, Antennas and Propagation Society, and Education Society), and also with the Optical Society of America (OSA), acting as organizer for several international conferences, guest editor for special issues, and AdCom member. He founded in 2010 and chairs the first IEEE Photonics Society Brazilian Chapter. He is an Associate Editor (Nanophotonics) of the IEEE Photonics Journal (March 2011- February 2014), and was an Associate Editor (Opto-Electronics/Integrated Optics) of the IEEE / OSA Journal of Lightwave Technology (January 2004 – December 2009). He was the General Co-Chair of the OSA Integrated Photonics and Nanophotonics Research and Applications (IPNRA) 2008 topical meeting. Prof. Hernández-Figueroa is a Fellow of the OSA class 2011 and was a recipient of the IEEE Third Millennium Medal in 2000.

Short-course: MEMS/solid state based reconfigurable microwave devices and micromachined millimeter-wave circuits
Room: Ponta Negra III

Abstract: This course will focus on the design and development of reconfigurable microwave devices based on both MicroElectoMechanical Systems (MEMS) and solid state components. Micromachined circuits for emerging millimeterwave applications will also be addressed. The devices will be mostly filters, however some antenna or coupling structure will also be covered, and all devices will be explained from design to fabrication and experimentation. The course will give an overall view of Microsystems technology for the realization of reconfigurable devices up to 40 GHz and micromachined circuits for high frequency applications up to 60 GHz. Implementations using solid state surface mount components will also be covered in the frequency range from 1 to 10 GHz; these are low cost solutions using traditional microwave laminates. Reconfigurable microwave filters make microwave transceivers adaptable to multiple bands of operation using a single filter, which is highly desirable in today's communications with evermore growing wireless applications. Tunable filters can replace the necessity of switching between several filters to have more than one filter response by introducing tuning elements embedded into a filter topology. Microwave tunable filters can be divided in two groups, filters with discrete tuning, and filters with continuous tuning. Filter topologies presenting a discrete tuning generally use PIN diodes or MEMS switches. On the other hand, filter topologies using varactor diodes, MEMS capacitors, ferroelectric materials or ferromagnetic materials are frequently used to obtain a continuous tuning device. Filter topologies can mix continuous and discrete tuning by combining tuning elements as well, e.g. the use of switches and varactors on a filter topology can form part of a discrete and continuous tuned device. The reconfigurable devices that will be presented include discreet tuning using MEMS switches and PIN diodes, on the other hand continuously tuned devices will be presented using varactor diodes and MEMS varactors. Micromachined circuits will be presented for millimeter-wave applications; these components have a small size, and are constructed with precision manufacturing technology to achieve miniature components with high performances. The devices to be presented are mainly miniature coaxial transmission lines made by several micro/nano fabrication techniques, these include gold coated polymers, suspended ground half coaxial transmission lines and BCB based multilayer structures. The devices are aimed for emerging applications at millimetre-waves (e.g. wireless local area networks operating at 60 GHz or satellite links operating at Ka band).

About the presenter: Ignacio Llamas-Garro received the PhD degree from the University of Birmingham, United Kingdom in December 2003. Prior to his PhD studies he obtained his first degree in Electronics and Communications Engineering from the Autonomous University of Nuevo Leon State, Mexico. He joined the Laboratory for Micro Sensors and Actuators as a post doctoral researcher and the Inter-University Semiconductor Research Center as a visiting researcher, at Seoul National

University, Seoul, Korea from March 2004 to March 2005. He was a BK-21 Assistant Professor at the School of Electrical Engineering and Computer Science at Seoul National University, from March 2005 to March 2006. He was an Associate Professor with the Large Millimeter Telescope Research Group at the National Institute for Astrophysics, Optics and Electronics, INAOE, Mexico from May 2006 to May 2007. He was a Juan de la Cierva Fellow with the Signal Theory and Communications Department at the Technical University of Catalonia, Barcelona, Spain from May 2007 to May 2010. He is currently with the Centre Tecnològic de Telecomunicacions de Catalunya (CTTC), Barcelona, Spain. Dr. Llamas-Garro is a senior member of the IEEE and a member of the IET and the EuMA.

About the presenter: Zabdiel Brito-Brito received the B.S. degree in communications and electronics engineering and M.S. degree in electronics engineering from the National Polytechnic Institute (IPN), Mexico, in 2001 and 2003, respectively, and received the PhD. degree in Communications and Signal Theory at the Technical University of Catalonia (UPC), Barcelona, Spain, in 2010. He joined the department of communications and electronics engineering (ICE) at National Polytechnic Institute (IPN), Mexico, from august 2003 to august 2011. He is currently a professor with the Department of Electronics, Systems and Informatics (DESI) at ITESO, Jesuit University of Guadalajara, Mexico since august 2011. Dr. Brito-Brito is a member of the Research Group on Computer-Aided Engineering of Circuits and Systems (CAECAS) at ITESO. His main research interests are tunable filters, involving central frequency, bandwidth and selectivity control using diodes and RF MEMS.

14:00h – 18:20h

Short-course: Software Defined Radio: basic concepts and implementation
Room: Ponta Negra I

Abstract: the idea of to implement a radio in software, named by Mitola as Software Defined Radio (SDR), and the possibilities opened by this concept has gained attention of researchers in telecommunications. In this tutorial we present basic concepts related to SDR, the actual stage of development, the implementation of SDR based on GnuRadio and Universal Software Radio Peripheral and some projects developed using these technologies. Finally, some perspectives of developments in SDR are presented.

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6. Projects with Gnuradio and USRP
    - Basic Frequency Modulation Transmission
    - Educational Software De_ned Radio
    - Spectrum Detection
    - Smart Antenna
    - Video Transmission
    - Very Simple Base Station
7. Future Developments
8. Conclusions

About the presenter: Edmar Candeia Gurjão received his PhD in Electrical Engineering from the Federal University of Campina Grande (UFCG) in 2003. He is currently a professor in the Electrical Engineering Department of this institution. He had worked with Signal Processing applied to telecommunications specially in Software Defined Radio and Compressed Sampling. He also contributes to the Gnuradio open software community.

Short-course: High Performance Computing in Computational Electromagnetism
Room: Ponta Negra II

Abstract: This short-course presents a brief overview about computational electromagnetism challenges and techniques, focusing on efforts to process their numerical methods. Three main recent free processing resources are presented, being parallel computing in CPU cluster, GPU processing and a brief introduction about multi-thread processing in multi-core architectures. Recent and sophisticated numerical simulators have introduced these computational resources as alternative solutions for performance requirements. The Message Passing Interface (MPI) standard is largely adopted in parallel CPU processing organized in cluster computers. For parallel GPU applications the Compute Unified Device Architecture (CUDA) is presented. Using the Finite Difference Time Domain (FDTD) method, applied to electromagnetic simulations, we are able to introduce high performance computing in CPUs and GPUs concepts.

Table of Contents:

1. Introduction: computational electromagnetism and high performance computing definitions
2. MPI and Cluster: initial concepts, how to use and examples of applications.
3. GPU Processing: introduction to GPU architecture, basic concepts to create an application and a complete example with 2D FDTD.
4. Trends: introduce some of the recent trends and examples of computational demands.

About the presenter: Maicon Saul Faria graduated in Physics from Universidade Federal de Santa Catarina (2004) and received his master and PhD degrees in Physics from Universidade Federal de Santa Catarina (2006) and from Universidade de São Paulo (USP - 2010), respectively. Has experience in Physics, focusing on Physical Statistics and Thermodynamics, acting on the following subjects: cluster beowulf, stocastic processes, free software, high performance computing and non periodicity.

About the presenter: Hugo E. Hernández-Figueroa (M'94-SM'96 IEEE) received the B.Sc. degree in electrical engineering from the Federal University of Rio Grande do Sul, Porto Alegre, Brazil, in 1983, the M.Sc. degree in electrical engineering and the M.Sc in informatics, from the Pontifical Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil, in 1985 and 1987, respectively, and the Ph.D. degree in physics from the Imperial College of Science, Technology and Medicine, University of London, UK, in 1992. After spending two years as a Postdoctoral Fellow with the Department of Electronic and Electrical Engineering, University College London (UCL), London, UK, he joined the University of Campinas (UNICAMP), School of Electrical and Computer Engineering (FEEC), Department of Microwaves and Optics (DMO), as an Assistant Professor in 1995. He became Full Professor in 2005 and has been DMO's Head since 2004. He has published about 100 papers in renowned journals and almost 200 international conference papers. He is Co-Editor of the book *Localized Waves: Theory and Applications* (Wiley and Sons, 2008). His research interests concentrate on a wide variety of wave electromagnetic phenomena and applications mainly in integrated photonics, nanophotonics, optical fibers, metamaterials, and plasmonics. He is also involved on research projects dealing with information technology applied to technology-based education. Since 1994 Prof. Hernández-Figueroa has been very active with IEEE (Photonics Society, Microwave Theory and Techniques Society, Antennas and Propagation Society, and Education Society), and also with the Optical Society of America (OSA), acting as organizer for several international conferences, guest editor for special issues, and AdCom member. He founded in 2010 and chairs the first IEEE Photonics Society Brazilian Chapter. He is an Associate Editor (Nanophotonics) of the IEEE PHOTONICS JOURNAL (March 2011- February 2014), and was an Associate Editor (Opto-Electronics/Integrated Optics) of the IEEE / OSA JOURNAL OF LIGHTWAVE TECHNOLOGY (January 2004 – December 2009). He was the General Co-Chair of the OSA Integrated Photonics and Nanophotonics Research and Applications (IPNRA) 2008 topical meeting.

Prof. Hernández-Figueroa is a Fellow of the OSA class 2011 and was a recipient of the IEEE Third Millennium Medal in 2000.

About the presenter: Carlos H. Silva-Santos was born in Sorocaba, an internal city from São Paulo State in Brazil. He is Information Technologist (2003) by University of Campinas (Unicamp), when he was the awarded as high grade student from his group. At this outstanding Brazilian institution, he also graduated as Master and Ph.D. Electric Engineering, in the Department of Microwaves and Optics (DMO), from School of Electrical and Computer Engineering (FEEC) in 2005 and 2010, respectively. During his Ph.D. program he was awarded with Erasmus Mundus Fellowship for an internship period in the Technical University of Munich in Germany (2009) and FAPESP financial support for a short period internship in Cornell University, United States, (2010). His researches are focused on a wide variety of computational intelligence approaches based on bio-inspired computing, high performance computing, information technologies for Physics and Mathematics education and some numerical methods contributions to design new photonic and microwave devices. These researches were awarded during the biennial SBMO/MTT-IEEE International Microwave and Optoelectronics Conference (2009), Belém-PA, Brazil, as best Ph.D. student presentation for the introduction of new computational intelligent approaches to provide new complex photonic devices. Since 2010 he is a Reseacher Collaborator Department of Microwave and Optics (DMO), Unicamp, and professor and Service Department's head at São Paulo Federal Institute for Education, Science and Technology, placed on Itapetininga city. He has published six journal papers and almost fifth papers in national and international conferences. He is an active member on the IEEE Photonic Society.

Short-course: High Frequency Devices and Circuits – Integrating 3D Full Wave Solvers with Circuit Simulators
Room: Ponta Negra III

Abstract: In a communication channel, the integration of a 3D full wave solver and a circuit simulator enables the calculation of radiation patterns, electric field plots, bit error rate, constellation plots while incorporates the actual transmitter and receiver antennas as well as TX/RX system with numerous modulation schemes. Frequency and time domain responses can be seamlessly combined in order to yield a complete response of the entire system. In this course we will present how to model a 3D device in Ansys HFSS and perform an automated two way dynamic integration with the circuit simulator Ansys Designer. Examples including IEEE 802.11 Wi-Fi

communication channel between a router and a smart phone, RF amplification and microwave filters will be presented.

About the presenter: Juliano Fujioka Mologni holds a bachelor degree in Electrical Engineering, a Master´s Degree in Microelectronics and it is concluding a PhD in electromagnetic compatibility. He has over 12 years of experience on companies like Delphi Automotive Systems, Motorolla, Webtech Wireless and ESSS including many international experiences on activities related to EMC, Microwave, RF Design and numerical simulation.

Sunday, October 30, 2011

14:00h – 18:20h

Short-course: Photonic Devices Based in Non-Conventional Waveguiding Structures
Room: Tabatinga

Abstract: In this short course we will study the waveguiding mechanism in:

- Photonic Crystals Waveguides
- Plasmonic Waveguides
- Subwavelength Grating Waveguides, and
- Silicon Nanowires Waveguides

In order to understand the confinement of light mechanism, propagation losses and their main advantages will be pointed out. Several devices based in the above waveguides will be analyzed, their operating mechanism and their main applications in Telecom and Sensors will be explained in details

- Bending
- Directional couplers
- Resonant cavities
- Crossings
- Filters
- Mux/Demux
- Lenses

Finally, the main techniques of coupling and decoupling of light from/to conventional waveguides will be also presented.

About the presenter: V. F. Rodríguez-Esquerre was born in Peru, on February 04, 1973. He received the B.S. degree in electronic engineering from the University Antenor Orrego UPAO, Trujillo, Peru, in 1994, revalidated as Electrical Engineer by the Federal University of Minas Gerais UFMG in 2009, and the M.Sc. and the Ph.D. degrees in electrical engineering in 1998 and 2003, respectively, from the University of

Campinas, Sao Paulo, Brazil. He was a post-doctoral research fellow at the Division of Media and Network Technologies, Hokkaido University, Japan from 2003 until 2005 and he also was a post-doctoral research fellow at the at the Department of Microwaves and Optics, Unicamp, Brasil from 2005 until February 2006. He was an Adjunct Professor at the Department of Electrical- Electronical Technology (DTEE) at the Federal Center of Technological Education in Bahia, CEFET-BA, Salvador, Brazil from 2006 to 2009, where he was a member of the Assessor Committee for Science and Technology (CACT), Permanent Commission of Docent People Evaluation (CPPD) and member of the Council of Teaching Research and Extension (CONSEPE) as well as Institutional Coordinator at CEFET-BA of the Program of Development and Technological Research Scholarships (PIBITI). He was also the leader of the Signals and Systems Research Group (GPSS), and hi is the leader of the Communication Systems Research Group (GPSC). Currently he is an Adjunct Professor at the Department of Electrical Engineering (DEE) at the Federal University of Bahia, UFBA, Salvador, since 2009, where he is the Vice-Head of the Department of Electrical Engineering and he is also the leader of the Transmission and Information Processing Research Group. His current research interest includes numerical methods such as the finite element and the finite difference methods for modal and propagation analysis of electromagnetic fields in conventional and photonic crystal integrated optics waveguides, metallo-dielectric nanostructures and metamaterials, integrated optics and optical fibers as well as free space propagation. He also research evolutionary computing for microwave and optical devices design and Computer assisted learning and education. He is author and co-author of 11 papers in international journals, 01 chapter of book and more than 50 papers in national and international conferences.

Monday, October 31, 2011

10:20h – 12:20 h

Short-course: Application of game theory to wireless communication systems
Room: Tabatinga

Abstract: Game theory is a powerful mathematical tool to deal with decision making problems. Present in several knowledge areas, game theory has been increasingly applied to communication problems, providing suitable problem formulations and decision making strategies. This short course gives an overview of the main game theory concepts and presents some study cases of its application on telecommunication problems.

Table of Contents:

1. Introduction to game theory
    1. The optimization problem
    2. Elements and types of games
    3. Equibrium solutions
2. Non-cooperative static games
    1. Mathematical representation
    2. Nash and Stackelberg equilibrium solutions
3. Non-cooperative dynamic games
    1. Mathematical representation
    2. Nash and Stackelberg equilibrium solutions
4. Application of game theory to telecommunication problems
    1. Transmission power control in wireless networks
    2. "Worst case" analysis of channel equalization delay
    3. Other applications

About the presenter: Fabiano de Sousa Chaves received his B.Sc. degree in electrical engineering (2003) and his M.Sc. degree in teleinformatics engineering (2005), both from the Federal University of Ceará (UFC), Brazil, and his double D.Sc. degree in electrical engineering (2010) from the University of Campinas (UNICAMP), Brazil, and the École Normale Supérieure de Cachan (ENS-Cachan), France. Since 2010 he is researcher at Nokia Institute of Technology (INdT). His research interests include the application of automatic control and game theory to radio resource management and signal processing problems.

14:00h – 18:20h

Short-course: Advanced characterization of LTE / LTE-Advanced signals and components utilizing vector spectrum and network analyzers
Room: Tabatinga

Abstract: Engineers and scientists all over the world responsible for researching and designing LTE / LTE-Advanced systems may face complex challenges, related for example with measuring bursty OFDMA downlink signals from prototypes or transceivers in baseband and RF and characterizing active components such as mixers and amplifiers on the non-linear operational region. The objective of this training session is to detail LTE / LTE-Advanced characteristics and challenges and to present Agilent methodologies for improving measurement and design.

About the presenter: Cyro S. Hemsi is a RF Application Engineer from Agilent Technologies in Brazil. He received the B.S. degree in Electrical Engineer from Universidade Estadual de Campinas in 1995, and the M.S. degree in 2000 in Communications engineering from Escola Politécnica /Universidade de São Paulo.

Tuesday, November 01, 2011

08:00h – 12:20 h

Short-course: Evolution of Optical Networks from single wavelengths to Tb/s and Photonic Switching
Room: Tabatinga

Abstract: Early optical systems ran on single wavelengths. Later, WDM and optical amplification as well as dispersion compensation evolved to allow for transmission of hundreds of Gb/s and up to Tb/s demonstrations. At the optical nodes of the networks, Photonic Switching has emerged as a future oriented technology because it. brings the conventional switching and routing functions from the electronic domain to the optical domain, permitting high throughput and low latency, being totally compatible with packet-based technologies and to transparent transport of data, without recurring to costly and time-consuming opto-eletric conversions. It is also the only technology capable of switching Tb/s capacity throughout the network without loss of capacity. The maturity of fiber optic technology, in particular WDM active and passive components, as well as MEMs technologies and the widespread availability of top quality installed fiber cables point to a new era in Optical Communications.

About the presenter: Dr. Rudge Barbosa holds B.Sc. and M.Sc. degrees in Physics from the Catholic University of Rio de Janeiro (PUC-RJ), and Ph.D. in Electrical Engineering from the University of Campinas (Unicamp), in Brazil. He is specialist in Photonics Technology and Optical Communications (components, systems and networks). He is technical consultant, lecturer and senior research associate with the Photonics Technology Laboratory (LTF), at the School of Electrical and Computer Engineering (FEEC) – Unicamp; and also with the Instituto Namitec, in the Center for Information Technology (CTI), a federal laboratory of the Ministry of Science and Technology (MCT); in the city of Campinas, Brasil. He has also held various positions as project manager, technical staff leader, and innovation coordinator. Previously he had been active for over 25 years with the Fundaçao CPqD (former Telebras R&D center). He was a post-doc fellow at the University of Colorado, Boulder, USA (1992); and visiting professor in the University of Montpellier, France (2004). He has over 65 peer-reviewed publications in international conferences and technical journals. He is member of the Brazilian Physical Society (SBF), Brazilian Telecomm Society; and senior member of Brazilian Society for Microwave and Optoelectronics (SBMO) with a chair in its advisory council); also the IEEE ComSoc, the Optical Society of America, and invited expert to the ITU-T (Geneva). Dr. Rudge holds two technical prizes in Telecom.