JOURNAL OF TELECOMMUNICATIONS AND INFORMATION TECHNOLOGY

Preface

The tremendous growth of the Internet, the large increase in traffic demands, and the relentless demand for network capacity have produced a need for new flexible types of services. Optical networks are expected to support the diverse requirements of a broad range of applications as they are evolving dramatically in terms of technology and architecture. In particular, optical component technology is rapidly maturing, offering cost effective solutions to a point where optical networks are currently being deployed in core backbone networks, and are gaining increased interest for deployment in metro and access environments. Wavelength division multiplexing systems are widely deployed, thanks to low-cost and high reliability of optical components. Core, metropolitan, and access networks are increasingly based on optical technologies to overcome the electronic bottleneck at network edge. Even, traditional multi-layer architectures, such as the widely deployed IP/ATM/SDH protocol stacks, are already based on WDM transport systems increasing efforts to move some of functionalities available in higher layers to the optical layer. New components and subsystems for very high speed optical networks offer new design options to network operators and designers.

This issue of the *Journal of Telecommunications and Information Technology* addresses the most significant optical technologies for optical switching and networking and it contains twelve carefully selected papers which reflect the progress with all-optical devices and technologies for communications and computing applications.

The first, invited paper, by Armand Toguyéni and Ouajdi Korbaa from Ecole Centrale de Lille, France, and the University of Sousse, Tunisia, *DiffServ Aware MPLS Traffic Engineering for ISP Networks: State of the Art and New Trends*, addresses the issues of quality of service in multimedia applications or networked control application of novel Internet services. It reviews main MPLS approaches such as MATE, LDM or LBWDP as novel models for traffic engineering. The Authors introduce a PEMS model that adapts the offered QoS depending on the class of the routed traffic.

The second, invited paper, by Marian Marciniak from the Department of Transmission and Optical Technologies, National Institute of Telecommunications, Warsaw, Poland, *100/1000 Gbit/s Ethernet and beyond*, discusses the challenges, advantages and constraints of hyper-speed Ethernet optical networking and switching.

The third, invited paper, by Nicola Calabretta, Hyun-Do Jung, Javier Herrera Llorente, Eduward Tangdiongga, Ton Koonen, and Harm Dorren from the COBRA Research Institute, Eindhoven University of Technology, The Netherlands, *All-Optical Techniques Enabling Packet Switching with Label Processing and Label Rewriting*, introduces a 1×4 all-optical

packet switch based on label swapping technique that utilizes a scalable and asynchronous label processor and label rewriter, and demonstrates an error-free operation indicating a potential utilization of the swapping technique in a multi-hop packet-switched network.

The fourth, invited paper, by Andrey Ananenkov, Anton Konovaltsev, Alexey Kukhorev, Vladimir Nujdin, Vladimir Rastorguev, and Pavel Sokolov from the Moscow Aviation Institute, State Technical University, Russia, *Features of Formation of Radar-Tracking and Optical Images in a Mobile Test Stand of Radio-Vision Systems of a Car*, reports on the features of formation of radar images and optical images in the mobile test stand of radio-vision systems of a car. The radio-vision system of a car of the millimeter-wavelength with frequency modulation is proposed and its performance analyzed in detail.

The fifth, invited paper, by Luca Tartara, Vittorio Degiorgio, Rim Cherif, and Mourad Zghal from the Department of Electronics, University of Pavia, Italy, and the Cirta'Com Laboratory, Engineering School of Communication of Tunis (Sup'Com), Ariana, Tunisia, *Setting an Upper-Wavelength Limit to the Supercontinuum Generated in a Photonic Crystal Fibre*, reports on a novel kind of supercontinuum generation in a photonic crystal fibre in which the spectral broadening occurs only on the blue side of the pump wavelength. A theoretical analysis along with experimental data which are supported by the results of a set of numerical simulations are presented in this paper.

The sixth, invited paper, by Maria C. R. Medeiros, Ricardo Avó, Paula Laurêncio, Noélia S. Correia, Alvaro Barradas, Henrique J. A. da Silva, Izzat Darwazeh, John E. Mitchell, and Paulo M. N. Monteiro from the Center for Electronics, Optoelectronics and Telecommunications (CEOT), University of Algarve, Faro, Portugal, and the Department of Electrical and Computer Engineering, University of Coimbra, Portugal, and the Telecommunications Research Group, Department of Electronic and Electrical Engineering, University College London (UCL), UK, and the Nokia Siemens Networks Portugal S.A., Amadora, Portugal, and the Institute of Telecommunications, University of Aveiro, Portugal, *RoFnet – Reconfigurable Radio over Fiber Network Architecture Overview*, introduces the basic operational concepts of the RoFnet – reconfigurable radio over fiber network, which is a project supported by the Portuguese Foundation for Science and Technology. The Authors propose an innovative radio over fiber optical access network architecture, which combines a low cost base station design, incorporating reflective semiconductor optical amplifiers, with fiber dispersion mitigation provided by optical single sideband modulation techniques. Optical wavelength division multiplexing techniques are used to simplify the access network architecture allowing for different base stations to be fed by a common fiber. Different wavelength channels can be allocated to different base stations depending on user requirements. Additionally, in order to improve radio coverage within a cell, it is considered a sectorized antenna interface. The combination of subcarrier multiplexing with WDM, further simplifies the network architecture, by using a specific wavelength channel to feed an individual base station and different subcarriers to drive the individual antenna sectors within the base station.

The seventh, invited paper, by Marek Jaworski from the Department of Transmission and Optical Technologies, National Institute of Telecommunications, Warsaw, Poland, *Methods of Step-Size Distribution Optimization Used in S-SSFM Simulations of WDM Systems*, introduces two novel methods of step-size distribution optimization used to improve symmetrized split step Fourier method (S-SSFM) numerical efficiency: pre-simulated local error S-SSFM and modified logarithmic S-SSFM. The pre-simulated local error S-SSFM contains two stages: in the initial stage step-size distribution optimization is carried out by combining local error method and pre-simulation with signal spectrum averaging; in the second stage conventional SSFM is used by applying optimal step-size distribution obtained in the initial stage. The modified logarithmic S-SSFM is generalization of logarithmic method proposed to suppress spurious FWM tones, in which a slope of logarithmic step-size distribution is optimized. Overall time savings exceed 50%, depending of a simulated system scenario.

The eighth, invited paper, by Nebiha Ben Sedrine, Jaouher Rihani, Jean-Christophe Harmand, and Radhouane Chtourou from the Laboratory of Photovoltaïc, Semiconductors and Nanostructures (LPVSN), Research and Technology Energy Center (CRTEn), Hammam-Lif, Tunisia, and the Laboratory for Photonics and Nanostructures (LPN), Marcoussis, France, *Spectroscopic Ellipsometry Analysis of Rapid Thermal Annealing Effect on MBE Grown $GaAs_{1-x}N_x$*, reports on the effect of rapid thermal annealing (RTA) on $GaAs_{1-x}N_x$ layers, grown by molecular beam epitaxy, using room temperature spectroscopic ellipsometry. A comparative study was carried out on a set of $GaAs_{1-x}N_x$ as-grown and the RTA samples with small nitrogen content ($x = 0.1\%$, 0.5% and 1.5%). Thanks to the standard critical point model parameterization of the $GaAs_{1-x}N_x$ extracted dielectric functions, the Authors determined the RTA effect, and its nitrogen dependence. They have found that RTA affects more samples with high nitrogen content. In addition, RTA is found to decrease the E_1 energy

nitrogen blue-shift and increase the broadening parameters of E_1, $E_1+\Delta_1$, E_0' and E_2 critical points.

The ninth, invited paper, by Ridha Rejeb and Mark S. Leeson from the Institute for Advanced Engineering and Research, Germany, and the School of Engineering, University of Warwick, UK, *Control Mechanism for All-Optical Components*, provides a brief overview of security and management issues that arise in all-optical networks (AONs). Then the Authors introduce the idea of the multiple attack localization and identification (MALI) algorithm that can participate in some of the tasks for fault management in AONs. A hardware-based control unit that can be embedded in AON nodes to accelerate the performance of the MALI algorithm is discussed in detail, and an applicability and implementation of this device in AON management systems is demostrated.

The tenth, invited paper, by Yousef S. Kavian, Wei Ren, Majid Naderi, Mark S. Leeson, and Evor L. Hines, from the Faculty of Engineering, Shahid Chamran University, Ahvaz, Iran, and the School of Engineering, University of Warwick, UK, and the Electrical Engineering Department, Iran University of Science and Technology (IUST), Tehran, Iran, *Fault Tolerant Dense Wavelength Division Multiplexing Optical Transport Networks*, presents a genetic algorithm based approach for designing fault tolerant dense wavelength division multiplexing optical networks in the presence of a single link failure. The working and spare lightpaths are encoded into variable length chromosomes. Then the best lightpaths are found by use of a fitness function and these are assigned the minimum number of wavelengths according to the problem constraints using first-fit algorithm. The results, obtained from the ARPA2 test bench network, show that the method is well suited to tackling this complex and multi-constraint problem.

The eleventh, invited paper, by Yousef S. Kavian, Habib F. Rashvand, Mark S. Leeson, Wei Ren, Evor L. Hines, and Majid Naderi from the Faculty of Engineering, Shahid Chamran University, Ahvaz, Iran, and the School of Engineering, University of Warwick, UK, and the Electrical Engineering Department, Iran University of Science and Technology (IUST), Tehran, Iran, *Network Topology Effect on QoS Delivering in Survivable DWDM Optical Networks*, investigates the effect of network topology on QoS delivering in survivable dense wavelength division multiplexing optical transport networks using bandwidth/load ratio and design flexibility metrics. The dedicated path protection architecture is employed to establish diverse working and spare lightpaths between each node pair in demand matrix for covering a single link failure model. The simulation results, obtained for the Pan-European and the ARPA2 test bench networks, demonstrate that the network topology has a great influence on QoS delivering by network at optical layer for different applications.

Finally, the twelfth paper, by Krzysztof Borzycki from the Department of Transmission and Optical Technologies, National Institute of Telecommunications, Warsaw, Poland, *Fusion Splicing and Testing of Photonic Crystal Fibers*, is devoted to characterization of optical, thermal and opto-mechanical properties of new class of optical fibers finding applications in optical components, sensors and signal processing. Tests on two fibers developed by IPHT Jena, Germany, allowed for comparisons; in particular, temperature and twist dependence of polarization mode dispersion are very different. The paper also presents in detail fusion splicing techniques for splicing of photonic crystal fibers samples to conventional single mode fibers. This research was performed within COST Action 299.

We have to emphasize the excellent progress and valuable results in photonic technologies for optical switching and networking responds to growing demands of next generation networking and services in view of bandwidth offered to the customer, quality of service, and security, reported in this issue. We thank the Authors for their wide response to the call for contributions which was intended to reflect the scope of the International Conference on Transparent Optical Networking ICTON and ICTON – Mediterranean Winter to which a majority of the Authors have contributed.

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Guest Editors