



Editorial

Special Issue on Photonic and RF Communications Systems

Current and planned solutions used in the ICT infrastructure are largely based on Photonic and RF Communications Systems.

Rapid advances in photonic and RF photonic technologies have significantly accelerated the introduction of these new technologies in access storage, backbone and grid networks, defining and building the rules to ensure transfer of multi Tera-bit volumes of data. The purpose of this volume is to provide a vehicle for directing research in this area from multiple lenses in the selected areas of investigation. Following an introduction by the editors, reviews of research will be clustered into two sections. The first part of this Special Issue focuses on the Photonic and RF Communications systems technologies and this Section comprises 7 articles. Recent solutions in wideband and multi-band RF circuits are presented in the articles 7 through 9 in the second part of the Special Issue.

The first article, by Arash Bahrami *et al.*, present an experimental evaluation of a radio-over-fiber system. In the paper, the authors proposed an optical microwave radio-over-fiber system in which an integrated dual-parallel Mach-Zehnder modulator is biased at the maximum transmission biasing point. The authors consider the two following modulation schemes: binary phase shift keying (BSK) and quadrature phase shift keying (QPSK) over fiber spans of 10 and 25 km of standard single mode fiber. The obtained results show that the second order sideband of optical microwave has the potential to provide error-free transmission for BPSK and QPSK.

John S. Vardakas *et al.* in the next article, analyse the delay of converged Wavelength Division Multiplexing Ethernet Passive Optical Network and WiMax networks. In such access networks, the provision of Quality of Service (QoS) support is a challenging issue, mainly due to the different bandwidth allocation mechanisms of the two access technologies. In the paper, the authors analyse the delay performance by considering multiple service-classes with different priorities. The proposed analytical model allows the calculation of the average end-to-end packet delay of each service-class as the sum of the queuing delay in both domains. The accuracy of the analysis was verified by simulation.

Ioannis Mamounakis *et al.*, propose a novel traffic prediction method to minimize packet delay in Ethernet

Passive Optical Networks. The authors utilise traffic information to predict the accumulated burst size of each respective optical network unit in the following cycle. The paper demonstrates and proves that a significant delay enhancement can be accomplished by reporting the predicted burst size, rather than the current one, to the Optical Line Terminal (OLT). The simulation experiments carried out by the authors show that a significant decrease in the delay can be obtained without any changes to the dynamic bandwidth assignment scheme at the OLT.

The paper by Mariusz Głabowski *et al.* proposes an analytical model of a multi-service switching network with overflow links with finite capacity in the first stage of the network. This model can be used to evaluate the QoS parameters which are closely interrelated with the method of operation of the large capacity optical nodes. The proposed method allows their traffic capacity to be increased through a significant decrease in the phenomenon of internal blocking in switching networks which is the basic element of the node. The proposed calculation method is validated by the authors via simulation.

Aboagela Dogman *et al.* present an integrated QoS management process for multimedia traffic in wire and wireless networks. In the proposed process, the statistics of traffic are determined and then used as an input to a fuzzy interface system (FIZ). FIZ allows the traffic to be accurately sampled and this traffic is in the next step pre-processed using a fuzzy c-means (FCM). FIZ identifies clusters representing poor, average and good QoS. This information is then used in a multilayer perceptron neural network to assess the overall QoS for multimedia traffic. The authors showed that the developed adaptive statistical sampling represents traffic more correctly than systematic, stratified and random non-adaptive sampling methods.

The article by Adam Kaliszan *et al.* provides a generalised convolution algorithm for modelling state-dependent systems. This model corresponds to the system that uses one or many physical resources, e.g. one or a set of lambda channels in DWDM optical networks. The proposed calculation method can be used for the analysis and dimensioning of optical networks and systems. This method is also useful for an optical system in which advanced traffic management mechanism have been applied, e.g. bandwidth reservation

or threshold mechanism. The accuracy of the proposed model is validated by simulation experiments.

From their onset RF Communications Systems have been critical to the development of ICT infrastructure. In mobile and satellite communication systems, wideband and multi-band RF circuits are important for achieving high-rate wireless transmission and supporting a large number of standards (e.g. UMTS, WiFi, WiMAX, or LTE). A wideband or multi-band RF circuit can replace a number of single-band RF circuits, leading to a significant reduction of size, weight and cost of modern wireless systems. There have been a great number of recent developments in the above areas over the past years. The articles that outline these solutions are in the latter part of this Special Issue, i.e. comprise articles from Article 7 through Article 9.

The article by Bingo Wing-Kuen Ling *et al.* discusses the frequency spectrum of a pulse for ultra wideband impulse radio systems as the frequency response of a real valued causal rational infinite impulse response filter. The pulse design problem is formulated as a functional inequality constrained optimization problem that can be solved by the method proposed by the authors. This pulse can be generated via an excitation of a simple circuit. Numerical simulation results confirm that the energy compaction performance defined in the frequency domain of the proposed pulse outperforms that of existing pulses. It is worth emphasizing that the pulse can be generated via an excitation of a simple circuit.

In their article, Xue Li and *et al.* present the WiFi leakage problem that appears in the users' equipment that simultaneously use both LTE and WiFi technologies. The authors propose WiFi leakage detection algorithms for successful detection of the weak WiFi leakage in the presence of both LTE signal and Gaussian noise. The algorithms include energy ratio detection, entropy ratio detection and cyclostationary detection based on spectral correlation function. The effectiveness and efficiency of the proposed WiFi leakage detection techniques have been confirmed by simulations performed for different scenarios.

The article by Piotr Remlein discusses the performance of Intelligent Transportation Systems (ITS) that consists of satellite mesh networks. In the paper the author analyses a new power-limited and energy-efficient systems employing coded continuous phase modulation signals and with multiuser Frequency Division Multiplexed transmission. The results obtained by the author show that good performance of the proposed solution can be achieved by reducing the inter-carrier frequency spacing and using simple iterative ICI cancellation algorithm at the receiver. Based on the results, it can be concluded that this system might constitute a desirable option in ITS satellite mesh, ad-hoc networks.

The objective of this Special Issue is to bring together the state-of-the-art research contributions that address challenges in emerging devices and architecture for photonic systems and RF circuits for wideband and multi-band communications systems. Due to the complexity and scope of the subject area, the set of articles presented attempts to address only some selected relevant issues. The Guest Editors believe though that the contributions included in the Special Issue will inspire the research activities of leading authors and scholars worldwide. The Guest Editors also expect this Special Issue to provide insight into the questions that they address as the presented articles expose important contributions to each of the relevant subject areas.

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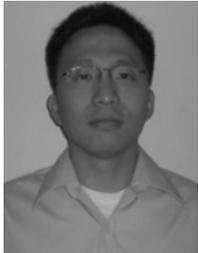


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