## PROCEEDINGS OF SPIE

# **Broadband Access Communication Technologies II**

Raj Jain Benjamin B. Dingel Shozo Komaki Shlomo Ovadia Editors

10–11 September 2007 Boston, Massachusetts, USA

Sponsored and Published by SPIE

Volume 6776

Proceedings of SPIE, 0277-786X, v. 6776

The papers included in this volume were part of the technical conference cited on the cover and title page. Papers were selected and subject to review by the editors and conference program committee. Some conference presentations may not be available for publication. The papers published in these proceedings reflect the work and thoughts of the authors and are published herein as submitted. The publisher is not responsible for the validity of the information or for any outcomes resulting from reliance thereon.

Please use the following format to cite material from this book:

Author(s), "Title of Paper," in *Broadband Access Communication Technologies II*, edited by Raj Jain, Benjamin B. Dingel, Shozo Komaki, Shlomo Ovadia, Proceedings of SPIE Vol. 6776 (SPIE, Bellingham, WA, 2007) Article CID Number.

ISSN 0277-786X ISBN 9780819469366

Published by

SPIE

P.O. Box 10, Bellingham, Washington 98227-0010 USA Telephone +1 360 676 3290 (Pacific Time) · Fax +1 360 647 1445 SPIE.org

Copyright © 2007, Society of Photo-Optical Instrumentation Engineers

Copying of material in this book for internal or personal use, or for the internal or personal use of specific clients, beyond the fair use provisions granted by the U.S. Copyright Law is authorized by SPIE subject to payment of copying fees. The Transactional Reporting Service base fee for this volume is \$18.00 per article (or portion thereof), which should be paid directly to the Copyright Clearance Center (CCC), 222 Rosewood Drive, Danvers, MA 01923. Payment may also be made electronically through CCC Online at copyright.com. Other copying for republication, resale, advertising or promotion, or any form of systematic or multiple reproduction of any material in this book is prohibited except with permission in writing from the publisher. The CCC fee code is 0277-786X/07/\$18.00.

Printed in the United States of America.

Publication of record for individual papers is online in the SPIE Digital Library.



**Paper Numbering:** Proceedings of SPIE follow an e-First publication model, with papers published first online and then in print and on CD-ROM. Papers are published as they are submitted and meet publication criteria. A unique, consistent, permanent citation identifier (CID) number is assigned to each article at the time of the first publication. Utilization of CIDs allows articles to be fully citable as soon they are published online, and connects the same identifier to all online, print, and electronic versions of the publication. SPIE uses a six-digit CID article numbering system in which:

- The first four digits correspond to the SPIE volume number.
- The last two digits indicate publication order within the volume using a Base 36 numbering system employing both numerals and letters. These two-number sets start with 00, 01, 02, 03, 04, 05, 06, 07, 08, 09, 0A, 0B ... 0Z, followed by 10-1Z, 20-2Z, etc.

The CID number appears on each page of the manuscript. The complete citation is used on the first page, and an abbreviated version on subsequent pages. Numbers in the index correspond to the last two digits of the six-digit CID number.

### **Contents**

vii ix	Conference Committee Introduction				
SESSION 1	ADVANCES IN WIRELESS BROADBAND ACCESS AND SENSOR NETWORKS				
6776 03	<b>R&amp;D</b> on wireless broadband communication systems: new generation ubiquitous mobile network (Invited Paper) [6776-02] H. Ogawa, National Institute of Information and Communications Technology (Japan)				
6776 04	The influence of interference networks in QoS parameters in a WLAN 802.11g: a Bayesian approach [6776-03] J. P. L. Araújo, J. C. Rodrigues, S. G. C. Fraiha, H. S. Gomes, J. Reis, Federal Univ. of Pará (Brazil); N. L. Vijaykumar, National Institute for Space Research (Brazil); G. P. S. Cavalcante, C. R. L. Francês, Federal Univ. of Pará (Brazil)				
6776 05	On optimal contention-based access scheme in WLAN for next generation networks [6776-04] HH. Yeh, CC. Cheng, National Chung Cheng Univ. (Taiwan); MS. Chen, Billion Electric Co. Ltd. (Taiwan); BC. Cheng, H. Chen, National Chung Cheng Univ. (Taiwan)				
SESSION 2	HYBRID BROADBAND ACCESS AND SENSOR NETWORK TECHNOLOGIES				
6776 06	Development project of radio on free space optics (Invited Paper) [6776-05] K. Tsukamoto, S. Komaki, Osaka Univ. (Japan); M. Matsumoto, Waseda Univ. (Japan)				
6776 07	A novel fair queuing algorithm for hybrid wired/wireless architecture with wireless compensation to provide end-to-end quality of service support [6776-06] A. Sana, X. Ye, S. Hussain, M. A. Ali, S. Ahmed, City Univ. of New York (USA)				
6776 08	Generation of arbitrarily shaped pulse for optical wireless communication [6776-08] S. You, M. Kavehrad, Pennsylvania State Univ. (USA)				
SESSION 3	ADVANCES AND CHALLENGES IN FITX ACCESS				
6776 09	Let there be light and broadband internet: You will have happier life, I bet (Invited Paper) [6776-09] M. Kavehrad, The Pennsylvania State Univ. (USA)				
6776 OB	A cost model for broadband access networks: FTTx versus WiMAX [6776-11]  J. P. R. Pereira, Institute Politecnico de Braganca (Portugal)				

SESSION 4	EMERGING BROADBAND DATA TRANSPORT AND ADVANCES IN CABLE/DSL-BASED ACCESS TECHNOLOGIES				
6776 OC	MoCA: ubiquitous multimedia networking in the home (Invited Paper) [6776-26] S. Ovadia, Entropic Communications, Inc. (USA)				
6776 OD	Terahertz technology for space exploration and data communications (Invited Paper) [6776-12] M. S. Shur, Rensselaer Polytechnic Institute (USA)				
6776 OF	MDP-based resource allocation for triple-play transmission on xDSL systems [6776-14] L. V. de Souza, G. H. S. de Carvalho, D. L. Cardoso, Federal Univ. of Pará (Brazil); S. V. de Carvalho, Brazilian Institute for Space Research (Brazil); C. R. L. Francês, J. C. W. A. Costa, Federal Univ. of Pará (Brazil); J. R. i. Riu, Ericsson AB (Sweden)				
6776 OG	Performance evaluation of IPTV traffic over pDSL [6776-15] D. L. Cardoso, M. S. da Silva, M. C. Seruffo, L. V. de Souza, C. R. L. Francês, J. A. M. de Souza, J. C. W. A. Costa, Federal Univ. of Pará (Brazil)				
6776 OH	Enhanced dynamic bandwidth allocation in WDM-PON [6776-29] X. Ye, A. Sana, City Univ. of New York (USA); C. M. Assi, Concordia Univ. (USA); M. A. Ali, City Univ. of New York (USA)				
SESSION 5	BROADBAND ACCESS DEVICES AND INDUSTRIAL SENSOR NETWORKS				
6776 OI	Large optical 3D MEMS switches in access networks (Invited Paper) [6776-16] N. Madamopoulos, V. Kaman, S. Yuan, O. Jerphagnon, R. Helkey, J. E. Bowers, Calient Networks, Inc. (USA)				
	POSTER SESSION				
6776 OJ	Secure encapsulation of nonsecure middleware [6776-18] J. Zhao, F. Zhang, Daqing Petroleum Institute (China); T. Li, Daqing Oilfield Corp. Ltd. (China)				
6776 OK	Triple play service under the impact of nonstationary noise in a DSL system: an Amazon approach [6776-19] L. V. de Souza, D. Cardoso, M. Silva, M. Seruffo, C. R. L. Francês, J. C. W. A. Costa, A. L. S. Castro, G. Cavalcante, Federal Univ. of Pará (Brazil); J. Rius i Riu, Ericsson AB (Sweden)				
6776 OL	Sequence and spread spectrum time domain reflectometry for transmission line analysis				
	[6776-21] J. Reis, A. L. S. Castro, J. C. W. A. Costa, Federal Univ. of Pará (Brazil); J. R. I. Riu, K. Ericson, Ericsson (Sweden)				
6776 ON	A tutorial on optimization techniques applied to DSM algorithms [6776-23] D. M. Neves, A. B. da Rocha Klautau, Jr., M. M. Conte, E. L. de Medeiros, J. D. Reis, Signal Processing Lab. (Brazil); B. Dortschy, Ericsson (Sweden)				

#### 6776 00 A system-awareness decision classifier to automated MSN forensics [6776-25]

Y.-T. T. Chu, National Chung Cheng Univ. (Taiwan); K.-P. Fan, Industrial Technology Research Institute of Taiwan (Taiwan); Y.-W. Cheng, P.-K. Tseng, H. Chen, B.-C. Cheng, National Chung Cheng Univ. (Taiwan)

#### 6776 OP Process scheduling with fuzzy inference models [6776-27]

D. L. Cardoso, Á. L. Santana, C. R. Francês, J. A. Souza, J. W. Costa, Federal Univ. of Para (Brazil)

Author Index

#### **Conference Committee**

#### Symposium Chairs

**Achyut Kumar Dutta**, Banpil Photonics, Inc. (USA) **Werner Weiershausen**, T-Systems Enterprise Services GmbH (Germany)

#### Conference Chairs

Raj Jain, Washington University in St. Louis (USA) Benjamin B. Dingel, Nasfine Photonics, Inc. (USA) Shozo Komaki, Osaka University (Japan) Shlomo Ovadia, Entropic Communications (USA)

#### Program Committee

Arjan Durresi, Louisiana State University (USA)
David W. Faulkner, British Telecom Research Laboratory (United Kingdom)

Mahbub Hassan, University of New South Wales (Australia)
Mohsen Kavehrad, The Pennsylvania State University (USA)
Rangaraj Madabhushi, Madabhushi Consultants, LLC (USA)
Dalma Novak, University of Melbourne (Australia)
Jean-Charles Point, JCP-Consult (France)
Ken-ichi Sato, Nagoya University (Japan)
Katsutoshi Tukamoto, Osaka University (Japan)
Peter Van Daele, University Gent (Belgium)
Jeroen S. Wellen, Bell LaboratoryEurope/Alcatel Lucent (Netherlands)

#### Session Chairs

- Advances in Wireless Broadband Access and Sensor Networks Raj Jain, Washington University in St. Louis (USA) Sergey I. Balandin, Nokia Research Center (Finland)
- 2 Hybrid Broadband Access and Sensor Network Technologies Katsutoshi Tsukamoto, Osaka University (Japan) Sergey I. Balandin, Nokia Research Center (Finland)
- 3 Advances and Challenges in FTTX Access Benjamin B. Dingel, Nasfine Photonics, Inc. (USA)

- Emerging Broadband Data Transport and Advances in Cable/DSL-based Access Technologies
   Shlomo Ovadia, Entropic Communications (USA)
- Broadband Access Devices and Industrial Sensor Networks Sergey I. Balandin, Nokia Research Center (Finland) Katsutoshi Tsukamoto, Osaka University (Japan)

#### Introduction

It is our pleasure to welcome all of you to the Optics East 2007 conference on Broadband Access Communication Technologies III. This year we have assembled high-quality technical papers from Europe, Asia, and North America. Furthermore, two joint sessions with Conf. 6773, Next-Generation Communication and Sensor Networks 2007, are organized to provide coherent coverage and latest technologies in broadband access. All these efforts have resulted in a very strong technical program representing the state of the art in the field.

The purpose of this conference is to promote discussions and dissemination of design, development, and performance of various types of broadband access communication technologies. This includes platform technologies such as optical-fiber-based, radio-over-fiber-based, photonics-based, copper-based, satellite-based, mobile-wireless-based, and power-line communications. We have invited a number of well-known speakers to present the current and future trends of these broadband access technologies.

Finally, we strongly appreciate the speakers and authors of all the contributed and invited papers, the technical program committee members, the session chairs for helping with the sessions, and the conference chair from Next-Generation Communication and Sensor Networks 2007 for making the two joint sessions possible. We also thank the SPIE staff for their help in processing the submissions on the web and organizing the conference. The success of this conference is strongly due to them.

Thank you for joining us at the Broadband Access Communication Technologies conference.

Raj Jain Benjamin B. Dingel Shlomo Ovadia Shozo Komaki