

# **2006 International Topical Meeting on Microwave Photonics**

**Grenoble, France  
3-6 October 2006**



**IEEE Catalog Number:**  
**ISBN:**

**06EX1314**  
**1-4244-0203-4**

**Copyright © 2006 by The Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republications permission, write to IEEE Copyrights Manager, IEEE Operations Center, 445 Hoes Lane, Piscataway, New Jersey USA 08854. All rights reserved.

IEEE Catalog Number:                   06EX1314  
ISBN:                                       1-4244-0203-4  
Library of Congress:                   2006920944

**Additional Copies of This Publication Are Available from:**

IEEE Service Center  
445 Hoes Lane  
Piscataway, NJ 08854  
IEEE Service Center  
445 Hoes Lane  
Piscataway, NJ 08854  
Phone:           (800) 678-IEEE  
                  (732) 981-1393  
Fax:             (732) 981-9667  
E-mail:         customer-service@ieee.org

# Table of Contents

<b>Microwave Photonics solutions for military systems .....</b>	<b>1</b>
<i>François Reptin, Patrice Le Helleye</i>	
<b>Optical Summation of RF Signals.....</b>	<b>5</b>
<i>M. Chtioui, A. Marceaux, A. Enard, F. Cariou, C. Dernazaretian, D. Carpentier, M. Achouche</i>	
<b>Optical Domain Down-Conversion of Microwave Signals for High Dynamic Range Microwave Fiber Optic Links.....</b>	<b>9</b>
<i>Yifei Li, P. Herczfeld, A. Rosen, M. Bystrom, Tibor Berceci</i>	
<b>Single-chip optical beam forming network in LPCVD waveguide technology based on optical ring resonators.....</b>	<b>13</b>
<i>L. Zhuang, C. G. H. Roeloffzen, R. G. Heideman, A. Borreman, A. Meijerink, W. van Etten</i>	
<b>Electrical-to-optical conversion of OFDM 802.11g/a signals by direct current modulation of semiconductor optical amplifiers.....</b>	<b>17</b>
<i>Francesco Vacondio, Marco Michele Sisto, Walid Mathlouthi, Leslie Ann Rusch, Sophie LaRochelle</i>	
<b>Photonic Millimeter-wave and Terahertz Source Technologies .....</b>	<b>21</b>
<i>Andreas Stöhr, Dieter Jäger</i>	
<b>Sensing Microwave Guided or Radiated Electric Field by Means of Vectorial Electro-Optic Sensors.....</b>	<b>25</b>
<i>G. Gaborit, G. Martin, M. Bernier, L. Duwillaret, J. L. Coutaz</i>	
<b>10-GHz Bandwidth RF Spectral Analyzer with MHz Resolution Based on Holography in Tm<sup>3+</sup>:YAG .....</b>	<b>29</b>
<i>Gy GorjuM, Ay ChauveM, Vy CrozatierM, Iy Lorgeré, M JymLy, Le GouëtM, Fy Bretenaker</i>	
<b>Millimeter-Wave Chaotic Cavity Detector for Non Metallic Concealed Weapons .....</b>	<b>33</b>
<i>MILLET Nicolas, LEHUREAU Jean-Claude, LAMARQUE Thierry</i>	
<b>Optical Hydrophone for Broadband Medical Ultrasound .....</b>	<b>37</b>
<i>C. Mu, S. Umchid, A.S. Daryoush, and P.A. Lewin</i>	
<b>Investigation of a Novel Optical Phase Demodulator Based on a Sampling Phase-Locked Loop.....</b>	<b>41</b>
<i>Darko Zibar, Leif A. Johansson, Hsu-Feng Chou, Anand Ramaswamy, Mark Rodwell, John Bowers</i>	
<b>Dynamic Range Enhancement in Analog Optical Links with a Balanced Modulation and Detection Scheme .....</b>	<b>45</b>
<i>D.A.I. Marpaung, C.G.H. Roeloffzen, W. van Etten</i>	
<b>Microwave Bandpass Filter Based on Air-Core Photonic Bandgap Fiber Loop Mirror.....</b>	<b>49</b>
<i>Xianbin Yu, Xiaoping Zheng, Hanyi Zhang</i>	
<b>An Approach to All-Optical UWB Pulse Generation.....</b>	<b>53</b>
<i>Fei Zeng, Qing Wang, Jianping Yao</i>	
<b>Ultra-wideband frequency chirp signal generation by using high-speed optical frequency control with optical single-sideband modulation technique.....</b>	<b>57</b>
<i>Tetsuya Kawanishi, Takahide Sakamoto, Masayuki Izutsu</i>	
<b>Optically Switched Oscillator.....</b>	<b>61</b>
<i>S. Faci, C. Tripon-Canseliet, F. Deshours, G. Alquié, C. Algani, S. Formont, J. Chazelas</i>	
<b>Tuning of an RF Optoelectronic Oscillator.....</b>	<b>65</b>
<i>H. E. Kotb, A. E. Safwat, H. Boghdady, D. Khalil</i>	
<b>Design of a new photomixer based on electro-optic polymer .....</b>	<b>69</b>
<i>François Dupont, Nguyễn Chi Thanh, Rolland Hierle, Bernard Journet, Patrick Labbé, Joseph Zys</i>	
<b>Fabrication of Waveguide Splitters Using Sol-Gel Hybrid Materials .....</b>	<b>73</b>
<i>Xiao Zhanga, Zhiqiang Zhaob, Min Qiana, Rui Yinc, Xianting Zenga, Patrick Planteb</i>	
<b>Millimeter-wave generation based on four-wave mixing in an SOA .....</b>	<b>77</b>
<i>Qing Wang, Fei Zeng, Howard Rideout, Jianping Yao</i>	
<b>Sensitivity Enhancement Method for Electro-optic Sensor without Balanced Detection.....</b>	<b>81</b>
<i>Kiyotaka Sasagawa, Masahiro Tsuchiya</i>	

# Table of Contents

<b>Design and realization of an optically controlled oscillator for radio over fiber at 5.2 GHz.....</b>	<b>85</b>
<i>Pierre LECOY, Bruno DELACRESSONNIERE</i>	
<b>Experimental Demonstration of Full-Duplex DOCSIS Signal Transmissions over a Wireline/Wireless-Fibre Access Network.....</b>	<b>89</b>
<i>H. Pfrommer, M. A. Piqueras, J. Herrera, V. Polo, A. Martinez, S. Karlsson, O. Kjebon, R. Schatz, A. Enard, F. Van Dijk, Y. Yu, T. Tsegaye, C. P. Liu, C. H. Chuang, J. Marti, A. J. Seeds</i>	
<b>High-Current Photodetectors as Efficient and High-Power RF Output Stages .....</b>	<b>93</b>
<i>Keith J. Williams, David A. Tulchinsky, John B. Boos, Doewan Park, Peter G. Goetz, William S. Rabinovich</i>	
<b>Theoretical Study of High-speed InGaAs/InP p-i-n Photodiodes for Microwave Generation .....</b>	<b>97</b>
<i>Sergei Malyshev, Alexander Chizh, Yury Vasileuski</i>	
<b>Optical Single Side Band SCM Header generation and 20Gb/s Payload combination/separation of multiple Label Swapping channels using Fibre Bragg Grating Arrays. ....</b>	<b>101</b>
<i>A. Martinez, D. Pastor, J. Capmany, M. Popov, T. Banky</i>	
<b>Non-linear Signal Retrieval in Wide-Band Photonic Time-Stretch Systems Using the Gerchberg-Saxton Algorithm.....</b>	<b>105</b>
<i>Johan Stigwall, Sheila Galt</i>	
<b>Distribution of 3G Base Stations on Passive Optical Network Architecture .....</b>	<b>109</b>
<i>Hugues Le Bras, Maryse Moignard</i>	
<b>Study of a Raman Crosstalk Management Technique for Analog Video RF Signal Transmission Systems.....</b>	<b>113</b>
<i>Ayako Murakami, Akira Agata, Yukio Horiuchi</i>	
<b>A Study on Photonic Frequency Conversion Efficiency Using Delayed-sequence Decoding in Software Definable Radio Network .....</b>	<b>117</b>
<i>Takeshi Higashino, Katsutoshi Tsukamoto, Shozo Komaki</i>	
<b>Digitized Radio-over-Fiber (DROF) System for Wide-Area Ubiquitous Wireless Network.....</b>	<b>121</b>
<i>Shigeru Kuwano, Yasuo Suzuki, Yoshiaki Yamada, Kazuji Watanabe</i>	
<b>Transmission of Microwave Signals beyond the Modal Bandwidth of Multimode Fiber Links.....</b>	<b>125</b>
<i>M. Garcia Larrodé, A.M.J. Koonen, J.J. Vegas Olmos</i>	
<b>Characterization of electrooptic polymer applied to microwave sensing.....</b>	<b>129</b>
<i>Arnaud Gardelein, Sylvain Le Tacon, Eric Tanguy, Nicolas Breuil, Tchanguiz Razban</i>	
<b>Optical Generation of Microwave Signals based on XPM of SOAs in a Fiber Loop .....</b>	<b>133</b>
<i>I. Gonzalez Insua, C.G. Schaeffer</i>	
<b>Intermodulation Distortion Modelling in IM-DD Multi-Band Radio over Fibre Links .....</b>	<b>137</b>
<i>L. Rosa, S. Selleri, G. Tartarini, E. M. Fabbri, P. Faccin</i>	
<b>Cost-effective optical modulation depth enhancement and optical carrier recovery in millimeter-wave fiber-wireless links using an all-fiber optical interleaver .....</b>	<b>141</b>
<i>Ming-Tuo Zhou, Qi Jie Wang, Yan Zhang, Y. Zhang, Y.C. Soh, M. Fujise</i>	
<b>Distortion Evaluation of Frequency-Converted Radio-on- Fiber System Employing RIN Reduction Technique.....</b>	<b>145</b>
<i>Noritaka Taguchi, Shingo Tanaka, Tsuneto Kimura, Yasunori Atsumi</i>	
<b>Tunable all-optical microwave filter using Cross-Phase Modulation in Semiconductor Optical Amplifier Mach- Zehnder interferometer .....</b>	<b>149</b>
<i>M.D. Manzanedo, J.Mora, B. Ortega, J. Capmany</i>	
<b>Modeling and Demonstration of Dual Wavelength All-Fiber Linear Cavity Laser .....</b>	<b>153</b>
<i>Yu Yao, Xiangfei Chen, Yitang Dai, Shizhong Xie</i>	
<b>Clipping-Free Dynamic Range: the Fundamental Limit for Class-B Microwave-Photonic Links.....</b>	<b>156</b>
<i>Jinye Zhang, Thomas E. Darcie</i>	
<b>Transient Properties of Photoexcited Inorganic and Organic Semiconductors using Terahertz Time Domain Spectroscopy .....</b>	<b>160</b>
<i>Yi-Hsing Peng, Weilou Cao, Victor Yun, Warren N. Herman, Chi H. Lee</i>	

# Table of Contents

<b>UWB system based on Gain-Switched Laser</b> .....	163
<i>A. Kaszubowska-Anandarajah, L.P. Barry</i>	
<b>Wideband fibre-agnostic DAS using pluggable analogue optical modules</b> .....	167
<i>P. Hartmann, A. Bothwell, R. Cronin, K. Leeson, A. Loveridge, D.C. Parkinson, J.W. Ure, R.V. Penty, I.H. White, A.J. Seeds</i>	
<b>VCSEL-based Single-mode and Multimode Fiber Star/Tree Distribution Network for Millimeter-wave Wireless Systems</b> .....	171
<i>Anthony Nkansah, Anjali Das, Nathan J. Gomes, Pengbo Shen, David Wake</i>	
<b>Phased-array antennas employing slow and fast light in alternating amplifying and absorbing sections</b> .....	175
<i>S. Sales, F. Öhman, A. Bermejo, J. Mørk, J. Capmany</i>	
<b>Bulk active layer DBR laser for 34 GHz electrical and optical active mode-locking</b> .....	179
<i>F. van Dijk, J. Renaudier, C. Gosset, F. Lelarge, R. Brenot, B. Rousseau, H. Sillard, O. Legouezigou, F. Poingt, F. Pommereau, J-L Oudar, G-H. Duan</i>	
<b>Advanced Microwave Optical Links for LO Distribution in Satellite Payloads</b> .....	183
<i>Bertrand Onillon, Benoît Bénazet, Olivier Llopis</i>	
<b>Recent advances in Quantum Dot material for microwave semiconductor lasers and amplifiers</b> .....	187
<i>B. Dagens, F. Lelarge, B. Rousseau, A. Accard, F. Poingt, J.G. Provost, D. Make, O. Le Gouezigou, J. Landreau, F. Pommereau, R. Brenot, J. Renaudier, F. van Dijk, G. H. Duan</i>	
<b>Very Low Noise and Reliable 1.55 <math>\mu\text{m}</math> InP-Based Quantum-Dash Fabry-Perot Lasers for Microwave Links</b> .....	191
<i>Patrick Resneaux, Michel Calligaroa, Olivier Parillauda, Michel Krakowskia, André Somersb, Johann Peter Reithmaierc</i>	
<b>Monolithic Distributed Balanced Traveling-Wave Photodetectors with Polymer Optical Waveguide for Fiber Optic Link Applications</b> .....	195
<i>Junghwan Kim, S. Kanakaraju, W. L. Cao, W. B. Johnson, W. N. Herman, Chi H. Lee</i>	
<b>A Monolithic MQW InP/InGaAsP-Based Comb Generator</b> .....	199
<i>C. C. Renaud, M. Pantouvaki, S. Gregoire, I. Lealman, P. Cannard, R. Gwilliam, A. J. Seeds</i>	
<b>Millimeter-wave Optoelectronic Mixers Based on CMOS-Compatible Si Photodetectors</b> .....	203
<i>Hyo-Soon Kang, Woo-Young Choi</i>	
<b>Hybrid Demultiplexing Towards the Integration of Millimeter-Wave Fiber-Radio Systems in DWDM Access Networks</b> .....	207
<i>Masduzzaman Bakaul, Ampalavanapillai Nirmalathas, Christina Lim, Dalma Novak, Rodney Waterhouse</i>	
<b>Evaluation of all-optical demultiplexing in millimeter-wave subcarrier-system for wireless communication</b> .....	211
<i>Andreas Wiberg, Pere Pérez-Millán, Miguel V. Andrés, Per Olof Hedekvist, Peter A. Andrekson</i>	
<b>Tunable Microwave Photonic Filter Free from Carrier Suppression Effect with Positive and Negative Coefficients</b> .....	215
<i>J. Mora, A. Ortigosa-Blanch, D. Pastor, J. Capmany</i>	
<b>A Novel Millimeter Wave Receiver Using Self-heterodyne Detection for a Digital Broadcasting ROF System</b> .....	219
<i>Tsuyoshi Nakatogawa, Mikio Maeda, Kimiyuki Oyamada</i>	
<b>Centralized Optical Beat Noise Suppression by Injection Locking in RSOA based WDM/SCM-PON Optical Links</b> .....	223
<i>Yong-Yuk Won, Hyuk-Choon Kwon, Sang-Kook Han</i>	
<b>Suppression of Intermodulation Distortion in Phase-Modulated Analog Photonic Links</b> .....	227
<i>Bryan Haas, Thomas E. Murphy</i>	
<b>Multimode Fiber-fed Indoor Wireless Networks</b> .....	231
<i>Nathan J. Gomes, Anjali Das, Anthony Nkansah, Majlinda Mjeku, David Wake</i>	
<b>Dynamic Range Improvement for Transmission of Optical Single Sideband Signals with Simultaneous Baseband Transmission for Access Networks</b> .....	235
<i>Christina Lim, Ampalavanapillai Nirmalathas, Kalun Lee, Dalma Novak, Rod Waterhouse</i>	

# Table of Contents

<b>Up-Conversion of IQ Modulated Subcarriers with Dispersive Fiber for 60 GHz Radio-Over-Fiber Networks</b> .....	239
<i>Yannis Le Guennec, Ghislaine Maury, Béatrice Cabon, Jianping Yao</i>	
<b>Study of system dynamic range for WLAN radio signal transmission over MMF and coax cable systems</b> .....	243
<i>Andrey Kobayakov, Jacob George, Michael Sauer</i>	
<b>Full-Duplex 25-GHz Spacing DWDM MM-Wave-Band Radio-on-Fiber System Using a Supercontinuum Light Source and Arrayed-Waveguide-Grating Filters</b> .....	247
<i>Takahiro Sono, Yoshitomo Takahashi, Teppei Nakasyotani, Hiroyuki Toda, Toshiaki Kuri, Ken-ich Kitayama</i>	
<b>Novel architectures of very low RIN semiconductor lasers in extended cavities for high performance microwave links</b> .....	251
<i>Ghaya Baili, Mehdi Alouini, Daniel Dolfi, Fabien Bretenaker, Isabelle Sagnes, Thomas Merlet, Jean Chazelas</i>	
<b>Optically-Amplified Short-Length Analog Photonic Links</b> .....	255
<i>Vincent J. Urick, Frank Bucholtz, Keith J. Williams</i>	
<b>TRANSIENT EFFECTS IN OPTICALLY MODULATED TRANSMISSION LINE SWITCHES</b> .....	259
<i>G. Poesen, J. Stiens, J. P. Raskin, M. Vanden Bossche, R. Vounckx</i>	
<b>Analysis of Crosstalk and Impedance Matching for 60 GHz Band Electro-Absorption Duplexer (EAD) Module</b> .....	263
<i>Kwang-Seong Choi, Young-Shik Kang, Yong-Duck Chung, Jae-Sik Sim, Jong-Tae Moon, Young-Wan Choi, Jeha Kim</i>	
<b>InP Digital Optical Switch with 72dB microwave crosstalk at 1.55<math>\mu</math>m wavelength</b> .....	267
<i>M. Zegaoui, J. Harari, D. Decoster, J. Chazelas, F. Mollot, C. Legrand, M. François, A. Leroy</i>	
<b>Continuous time realization of time-stretch ADC</b> .....	271
<i>George C. Valley, George A. Sefler</i>	
<b>All-Optical Coherent Receiver with Feedback and Sampling</b> .....	274
<i>Hsu-Feng Chou, Leif Johansson, Darko Zibar, Anand Ramaswamy, Mark Rodwell, John Bowers</i>	
<b>Optical Transmitter and Receiver of 24-GHz Ultra-Wideband Signal by Direct Photonic Conversion Techniques</b> .....	278
<i>Toshiaki Kuri, Yuki Omiya, Tetsuya Kawanishi, Shinsuke Hara, Ken-ichi Kitayama</i>	
<b>Active recirculating structures for UMTS noise and interference suppression</b> .....	282
<i>B.Ortega, J.Mora, J.Capmany, D.Pastor</i>	
<b>Opto-electronic free-space processor for UMTS signal filtering</b> .....	286
<i>S. Formont, L. Ménager, E. Yusta, L. Cucala, S. Tonda, D. Dolfi, J. Chazelas</i>	
<b>Continuous wave THz generation based on a dual-frequency laser and a LTG - InGaAs photomixer</b> .....	290
<i>R. Czarny, M. Alouini, X. Marcadet, S. Bansropun, J. L. Doualan, R. Moncorgé, J.F. Lampin, M. Krakowski, D. Dolfi</i>	
<b>Wide Band &amp; high resolution, RF spectral analysis using a high purity frequency agile laser oscillator</b> .....	293
<i>Vincent Crozatier, Guillaume Gorju, Fabien Bretenaker, Jean-Louis Le Gouët, Ivan Lorgère</i>	
<b>Simultaneous up-conversion of multiple wavelengths to 18GHz and 36GHz using 4-f technique and optical filtering</b> .....	297
<i>John E Mitchell</i>	
<b>RF transfer function of analogue multimode fiber links using an electric field propagation model: Application to Broadband Radio over fiber systems.</b> .....	301
<i>I. Gasulla, J. Capmany</i>	
<b>Simultaneous Baseband and RF Signal Generation Using Only One Single-Electrode MZM Based on Double-Sideband with Optical Carrier Suppression</b> .....	305
<i>Chun-Ting Lin, Wei-Ren Peng, Peng-Chun Peng, Cheng-Feng Peng, Chun-Chen Chiang, Jyeson(Jyehong) Chen, Bi-Shiou Chiou, Sien Chi</i>	