Advance Program

Next Generation Transceiver Technology for Long Haul Communication Systems

Tuesday, 22 July 2008

ALL SESSIONS WILL BE HELD IN MARQUESA IV

09.00 - 10.00

Session TuD1: ADVANCED ELECTRICAL SIGNAL PROCESSING
Session Chair: Alexei N. Pilipetskii, *Tyco Telecommunications Laboratories, Eatontown, NJ, USA*

TuD1.1 09.00 - 09.30 (Invited)

LDPC-Based Advanced FEC for 100 Gbps Transmission, T. Mizuochi and Y. Miyata*, Mitsubishi Electric Corporation, Kanagawa, Japan*

Practical FEC implementation of 100 Gbps long-haul transmission is discussed. An LDPC code using a novel algorithm is introduced to reduce circuit complexity. Simulation shows that the Q limit is 7.1 dB, and that the concatenation effectively suppresses unwanted error-floor.

TuD1.2 09.30 - 09.45

A 10-Gb/s Adaptive EDC-IC with Integrated Dispersion Monitor for Optical Duobinary Transmission, A. Kanda, M. Nakamura*,* K. Yonenaga, K. Suzuki, T. Yamamoto*,* A. Takada and A. Okada*, NTT Corporation, Kanagawa, Japan*

We describe an electronic dispersion compensator (EDC)-IC that consists of adaptive FFE with an integrated dispersion monitor, optimized for 10-Gb/s ODB transmission. The dispersion tolerance has been successfully enhanced, while simplified circuitry has enabled size reduction, low power consumption, and high controllability.

TuD1.3 09.45 - 10.00

Generalized LDPC Codes with Component Reed-Solomon Codes for Beyond 100 Gb/s Optical Transmission, I. B. Djordjevic*, University of Arizona, Tucson, AZ, USA*, L. Xu and T. Wang*, NEC Laboratories America, Inc., Princeton, NJ, USA*

We present a hard-decision decoding FEC-scheme suitable for use in beyond-100Gb/s transmission. It is based on generalized-LDPC (GLDPC)-codes with component RS-codes. The GLPDC code of rate 0.82 with component codes being (255,239) and (255,223) RS-codes, provides net effective coding gain of 9.67dB at BER=10^{-15}.

10.00 - 10.30 COFFEE BREAK

10.30 - 12.00

Session TuD2: SUBSYSTEMS
Session Chair: Murat Serbay, *MergeOptics GmbH, Berlin, Germany*

TuD2.1 10.30 - 11.00 (Invited)
Photonic Integration and Bandwidth Virtualization for Next Generation Long Haul Optical Networks, S. G. Grubb*, Infinera, Columbia, MD, USA*, S. Melle, R. Dodd, C. Liou, V. Vusirikala and D. Welch, *Infinera, Sunnyvale, CA, USA*

This paper describes how bandwidth virtualization can enable transmission of ultra-high bandwidth 40 Gb/s and 100 Gb/s services over existing optical transport networks independently of the underlying network infrastructure. Two real world examples will be highlighted.

TuD2.2 11.00 - 11.15

Performance Demonstration of 300-km Dispersion Un-Compensated Transmission using Tunable Chirp-Managed Laser and EDC Integratable into Small-form-factor XFP, X. Zheng, K. McCallion, D. Mahgerefteh, Y. Matsui, Z. F. Fan, J. Zhou, M. Deutsch*, Finisar Corporation, Wilmington, MA, USA*, and Y. F. Chang, *Vitesse Semiconductor Corporation, Camarillo, CA, USA*

We demonstrate 300-km transmission of 10Gb/s data over SMF-28 fiber without DCF using a 4-channel tunable chirp managed laser and EDC chip at the receiver, which can fit into hot pluggable XFP modules.

TuD2.3 11.15 - 11.45 (Invited)

Recent Advances on Polarization Multiplexing, B. Spinnler*, Nokia Siemens Networks, Munich, Germany*

We review structures for equalization in coherent receivers with polarization multiplexing and compare them in terms of computation complexity. We cover single and multi carrier approaches.

TuD2.4 11.45 - 12.00

12 krad/s Endless Polarization Stabilization with Lithium Niobate Component, B. Koch, A. Hidayat, H. Zhang, V. Mirvoda, M. Lichtinger, D. Sandel and R. Noé*, University of Paderborn, Paderborn, NRW, Germany*

We demonstrate an FPGA-based control system which compensates random polarization changes with a fluctuation speed of up to 12 krad/s. Endless and uninterruptible behavior is confirmed. The residual polarization mismatch remains below 0.16 rad.

12.00 - 13.30 LUNCH BREAK

15.30 - 16.45

Session TuD3: TRANSMISSION SYSTEMS
Session Chair: Torger Tokle, *OFS Fitel Denmark, Brøndby, Denmark*

TuD3.1 15.30 - 16.00 (Invited)
Modulation Formats for Undersea Long-Haul Transmission, J.-X. Cai*, Tyco Telecommunications Laboratories, Eatontown, NJ, USA*

This paper reviews recent technology advances in modulation formats and techniques for 40G long-haul WDM transmission including RZ-DPSK, RZ-DQPSK, and polarization division multiplexing. Future enabling technologies for >100G long-haul transmission are also discussed.

TuD3.2 16.00 - 16.15

Increasing Maximum Capacity on installed Submarine Cable Systems with RZ-DPSK Transceivers, M. Manna and E. A. Golovchenko*, Tyco Telecommunications Laboratories, Eatontown, NJ, USA*

The capabilities of legacy submarine systems are significantly enhanced using RZ-DPSK transceivers. Single channel systems are upgraded to WDM, capacity of WDM systems is significantly increased, and distance is extended through concatenation of existing segments.

TuD3.3 16.15 - 16.30

Demonstration of 16 Channels 10 Gb/s WDM Free Space Transmission Over 2.16 km, J. Wu*,* P.-L. Chen, H.-W. Tsao and J.-P. Wu*, National Taiwan University, Taipei, Taiwan*

In this paper, we present the 16 x 10 Gb/s free space optical transmission over 2.16km. This system uses mostly commercial available components such as lenses, wavelength division multiplexer (WDM), erbium doped fiber amplifiers (EDFAs), transmitter, and receiver. The results show that in the normal

TuD3.4 16.30 - 16.45

1.0 bit/sec-Hz Spectral Efficiency in Single Polarization at 2000km with Narrowly Filtered Intensity Modulated Signals, N. Alic, E. Myslivets and S. Radic*, University of California - San Diego, La Jolla, CA, USA*

Numerical simulations indicate possibility of long-haul transmission with 1.0 bit/sec-Hz spectral efficiency per polarization, based on intensity modulated principles with low complexity equalization at the receiver.

Wednesday, 23 July 2008

09.00 - 10.00

Session WD1: ELECTRICAL MITIGATION USING COHERENT RECEIVER
Session Chair: Werner Rosenkranz, *University of Kiel, Kiel, Germany*

WD1.1 09.00 - 09.30 (Invited)
Long-Haul Transmission Systems Involving Coherent Detection for Linear Impairments Mitigation, J. Renaudier and G. Charlet*, Alcatel-Lucent, Nozay, France*

We show that coherent-based systems associated with PDM-QPSK format is a very attractive candidate for next generation long haul 100Gb/s applications over WDM infrastructures with typical 50GHz grid.

WD1.2 09.30 - 10.00 (Invited)

Linear Electrical Dispersion Compensation of 40Gb/s Polarization Multiplex DQPSK using Coherent Detection, C. Wree, S. Bhandare and A. Joshi, *Discovery Semiconductors, Inc., Ewing, NJ, USA*

40Gb/s polarization multiplex DQPSK is transmitted (based on real time BER measurements) over 0 to 75km of standard single-mode fiber using coherent detection and linear electrical dispersion compensation with 2dB dispersion tolerance of 640ps/nm.

10.00 - 10.30 COFFEE BREAK

10.30 - 12.00

Session WD2: **JOINT SESSION ON COHERENT OPTICAL COMMUNICATION SYSTEMS AND NEXT GENERATION TRANSCEIVER TECHNOLOGY FOR LONG-HAUL COMMUNICATION SYSTEMS**
Session Chair: Nobuhiko Kikuchi, *Hitachi, Ltd., Tokyo, Japan*

WD2.1 10.30 - 11.00 (Invited)

Mitigation of Transmission Impairments in Long-Haul and Submarine Links Using DSP-Based Electronic Predistortion, R. I. Killey, *University College London, London, UK*

Simulations assessing the use of electronic predistortion in 10 Gbit/s RZ-DPSK submarine links are described. It is shown that EPD can be effective in compensating for residual dispersion caused by inexact in-line dispersion slope matching.

WD2.2 11.00 - 11.30 (Invited)

Digital Compensation of the Optical Line: Pre-Distortion Tx & Coherent Rx, K. Roberts, *Nortel Networks, Ottawa, ON, Canada*

Precompensation and coherent postcompensation mitigate many of the depredations of the optical line. Fiber loss, and consequential amplifier noise, remains the major issue.

WD2.3 11.30 - 12.00 (Invited)

Narrowband Filtering Tolerance and Spectral Efficiency of 100GbE PDM-OFDM, S. L. Jansen, I. Morita and H. Tanaka, *KDDI R&D Laboratories, Fujimino, Saitama, Japan*

We show that the tolerance of 100GbE PDM-OFDM with respect to narrowband optical filtering is comparable to that of its single-carrier counterpart. This translates into a comparable spectral efficiency of OFDM and single-carrier modulated signals.

12.00 - 13.30 LUNCH BREAK

13.30 - 14.45

Session WD3: **ADVANCED MODULATION FORMATS**
Session Chair: Itsuro Morita, *KDDI R&D Laboratories, Japan*

WD3.1 13.30 - 14.00 (Invited)
OFDM Transceiver Design for Optimizing Sensitivity and Long-Haul Performance, J. Leibrich, A. Ali and W. Rosenkranz, *University of Kiel, Kiel, Germany*

Design parameters for optical OFDM transceivers based on intensity modulation and direct detection are considered. Proper selection of modulator bias improves sensitivity by several dB. The length of the guard interval is adapted for uncompensated long-haul transmission.

WD3.2 14.00 - 14.15

Incoherent 40-Gbit/s 16QAM and 30-Gbit/s Staggered 8APSK (amplitude- and phase-shift keying) Signaling with Digital Phase Pre-Integration Technique, N. Kikuchi and S. Sasaki, *Hitachi, Ltd., Kokubunji, Tokyo, Japan*

The use of arbitrary signal constellation for incoherent optical multilevel signaling has been demonstrated with newly proposed transmitter-side digital phase pre-integration technique for the first time by up to 16QAM signaling experiments.

WD3.3 14.15 - 14.45 (Invited)

Higher Order Modulation Formats Using Coherent Detection and Electronic Distortion Equalisation for Application in Future Backbone Networks, R. Freund and M. Seimetz, *Fraunhofer-Institut, Berlin, Germany*

Higher order modulation formats, coherent detection and electronic distortion equalisation are attractive technologies to further increase spectral efficiency in future backbone networks. We report on the latest achievements in this research area.

END OF PROGRAM