ThT OPTICAL LAYER SIMULATION: 1

10:15am-12:00pm Room: 104A

Dipak Q. Chowdhury, *Corning Inc., USA, Presider*

ThT1 10:15am **Symmetric slope compensation in a long haul WDM using the CRZ format**
R.-M. Mu, Univ. of Maryland–Baltimore County, USA; C.R. Menyuk, Univ. of Maryland–Baltimore County and USARL, USA. We numerically compared symmetric and asymmetric dispersion slope compensation schemes in a long-haul, chirped-return-to-zero, wavelength-division-multiplexed-system. Symmetric compensation has significant advantages over asymmetric compensation. We show that intra-channel, inter-pulse nonlinear interactions are the physical source of this difference. We then elucidate the system implications.

ThT2 10:30am **Intra-channel nonlinear effects in high speed optical communication systems**
A. Nolasco Pinto, Paulo Almeida, J. Ferreira da Rocha, Univ. of Aveiro, Portugal. Signal distortion due to intra-channel nonlinear effects in high-speed optical communication systems is discussed. A new design scheme for intra-channel nonlinear effects compensation, in strong dispersion managed systems, is proposed. This scheme allows the deployment of ultra-long DWDM all-optical networks with switching functions.

ThT3 10:45am (Invited) **Role of distributed amplification in designing high-capacity lightwave systems**
Govind P. Agrawal, Univ. of Rochester, USA. The importance of distributed amplification for high-speed soliton communication systems is discussed considering the gain provided by both the Raman effect and the erbium dopants. Hybrid amplification schemes are also considered in which Raman amplification in used in combination with lumped amplifiers. The use of distributed amplification improves the Q factor and reduces the timing jitter, allowing longer transmission distances and higher bit rates compared with the case of lumped amplifiers.

ThT4 11:15am **Stability and optimization of dispersion-managed soliton control**
Mayra H. Sousa, Mário F.S. Ferreira, Univ. of Aveiro, Portugal. We analytically study soliton pulse stability in optical transmission systems with periodic variations of power, chromatic dispersion, and lumped control elements, such as inline narrow-band filters and synchronous amplitude modulators. We show that, unless the compensating fibers and control elements are properly arranged, regenerated dispersion-managed solitons are subject to instabilities that lead to growth of initial small-amplitude or timing fluctuations with distance.

ThT5 11:30am **Timing jitter in dispersion-managed soliton systems with distributed amplification**
E. Putrina, Govind P. Agrawal, Univ. of Rochester, USA. We compare, analytically and numerically, timing jitter in dispersion-managed soliton systems for the lumped, distributed, and hybrid amplification schemes. We find that timing jitter can be reduced considerably using even partial distributed amplification. The erbium-based distributed amplification gives the smallest value of timing jitter, but considerable reduction occurs when a Raman amplification scheme is employed.

ThT6 11:45am **Propagation of dispersion-managed solitons in the normal dispersion regime**
Mayra H. Sousa, Mário F.S. Ferreira, Univ. of Aveiro, Portugal. We show that the strongly coupled and reversible amplitude-chirp dynamics provides a mechanism by which a dispersion-managed soliton can be supported in the mean-normal dispersion regime. Among other results, we find that there are two branches of soliton solutions in this regime of dispersion for different levels of energy and different pulse durations at fixed propagation constant. The short pulses with larger energy are proved to be linearly unstable, while the long pulses with smaller energy are neutrally stable.

ThU TUNABLE LASER SENSORS: 2

10:15am-12:00pm Room: 201A

Richard M. Williams, *Pacific Northwest Natl. Lab., USA, Presider*

ThU1 10:15am (Invited) ***In situ* interrogation of surface contaminants using UV-Raman lidar**
Arthur J. Sedlacek, Brookhaven Natl. Lab., USA. Brookhaven National Laboratory (BNL) has developed a "proof-of principle" chemical sensor that combines the spectral fingerprinting of Raman spectroscopy with the principles of lidar. The 266 nm-based Mini-Raman Lidar System (MRLS) enables the short-range (meters to tens of meters), non-contact detection and identification of unknown substances on surfaces. Description of the MRLS along with results from recent field tests will be presented.

ThU2 10:45am **Applications of Kalman filtering to real-time trace gas concentration measurements**
D.P. Leleux, R. Claps, W. Chen, F.K. Tittel, T.L. Harman, Rice Univ., USA. Kalman filtering techniques are applied to the real-time, simultaneous detection of NH_3 and CO_2 using a portable diode laser-based sensor, which operates utilizing vibrational overtone direct-absorption spectroscopy at 1.53 im. These filters aid in the detection of trace gas concentrations in the presence of noise and can improve the signal-to-noise ratio.

ThU3 11:00am **Digital signal processing for diode-laser-based gas detection**
David S. Bomse, Daniel J. Kane, Mark E. Paige, Joel A. Silver, William Wood, Southwest Sciences Inc., USA. Low cost Digital Signal Processors (DSP) provide impressive computation power and straightforward I/O. We describe DSP-based diode laser instruments for trace gas measurement including a moisture sensor operating at 500 mW and weighing under 250 g. Wavelength modulation detection using (nearly) all-digital implementation is compared with measurements using analog electronics.