

# Improving network scalability and data security of incoherent OCDMA systems by employing ultra fast all-optical signal processing techniques

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## Abstract

Optical code-division multiple access (OCDMA) is a data multiplexing technique which can support bursty traffic, variable data rates and can deliver superior network scalability. However, the performance of OCDMA systems can be severely limited by multiple access interference (MAI) and interferometric noise (IN) which will gradually degrade system performance with the growing number of simultaneous users. The effect is called soft blocking. On the other hand the soft blocking property can be used to trade the system performance (bit error rate, BER) against the existing number of simultaneous users present on the OCDMA network. We have investigated the use of ultra fast all-optical signal processing to mitigate the deleterious effects of both MAI and IN on the BER under different network conditions. In addition, to address network security, spectral efficiency, and to improve OCDMA system scalability, different approaches and techniques involving optical and all-optical signal processing were investigated and demonstrated.



**BIOGRAPHY, Prof. Ivan Glesk** received his Ph.D. degree in Quantum Electronics and Optics from Comenius University in Bratislava, Slovak Republic, and D.Sc. degree from the Slovak Academy of Sciences. In 1986 he joined Comenius University where he later became Professor of Physics. He conducted his research in the areas of nonlinear optics, laser physics, liquid crystals, and LIDAR sensing. As the recipient of IREX Fellowship he was a Visiting Fellow at the Department of Mechanical and Aerospace Engineering at Princeton University, USA in 1990-1991.

After that he joined the Department of Electrical Engineering at Princeton University where he became Senior Research Scholar and Manager of the Lightwave Communication Research Laboratory. In 2007 he joined Electronic and Electrical Engineering Department at University of Strathclyde in Glasgow, UK as Professor of Broadband Communication Systems. His current research interests are broadband communication systems, optical interconnects; all-optical signal processing and switching. He has co-authored 16 book chapters, over 230 publications, and holds 5 patents. He is member of several international committees. Since 1998, he has been a Chairman of the Slovak Commission for Optics.