Mario F. S. Ferreira, J Phys Chem Biophys 2013, 3:5
http://dx.doi.org/10.4172/2161-0398.S1.004

OMICS Group Conferences
Accelerating Scientific Discovery

International Conference and Exhibition on
Lasers, Optics & Photonics
October 07-09, 2013 Hilton San Antonio Airport, TX, USA

Impact of nonlinear effects in optical fiber communications

Mario F. S. Ferreira
University of Aveiro, Portugal

Nonlinear effects in optical fibers impose different limitations on the communications link, and an understanding of such effects is almost a prerequisite for actual lightwave-system designers. On the other hand, they offer a variety of possibilities for all-optical signal processing, amplification and regeneration. Using conventional optical fibers for these applications, a length of several kilometres is usually required due to their relatively small nonlinear parameter ($\gamma \sim 1.3 W^{-1}/Km$). Such long fibers pose some practical limitations, concerned namely with the size and stability of the system. The required fiber length is reduced to about 1 km using highly nonlinear silica fibers with a smaller effective mode area, and hence, a larger nonlinear parameter ($\gamma \sim 11 W^{-1}/Km$). A further reduction in fiber length by one order of magnitude has been achieved in recent years using nanowires and microstructured optical fibers with an extremely small effective mode area and significantly enhanced nonlinear characteristics. Another main advance was the production of highly nonlinear fibers using materials with a nonlinear refractive index higher than that of the silica glass, namely lead silicate, tellurite, bismuth glasses and chalcogenide glasses. Using such fibers, the required fiber length for nonlinear processing can be dramatically reduced to the order of centimetres.

In this lecture, we review the effects, both detrimental and potentially beneficial, of optical nonlinearities both in conventional and in highly nonlinear fiber systems. Such lecture will be based on my book "Nonlinear Effects in Optical Fibers", recently published by John Wiley & Sons, with the sponsorship of the Optical Society of America.

Biography

Mario F. S. Ferreira graduated in Physics from the University of Porto, Portugal, and he received the Ph.D. degree in Physics in 1992 from the University of Aveiro, Portugal, where he is now a Professor at the Physics Department. His research interests have been concerned with the modeling and characterization of multi-section semiconductor lasers for coherent systems, quantum well lasers, optical fiber amplifiers and lasers, soliton propagation, polarization and nonlinear effects in optical fibers. He is actually the leader of the Optics and Optoelectronics Group of the I3N – Institute of Nanostructures, Nanomodelling and Nanofabrication. He has written about 300 scientific journal and conference publications, a book with the title: "Optics and Photonics" (Lidel, 2003, in Portuguese) and another with the title: "Nonlinear Effects in Optical Fibers" (John Wiley & Sons, May 2011).

He is a member of the Optical Society of America (OSA), SPIE - The International Society for Optical Engineering, The New York Academy of Sciences (NYAS), the American Association for the Advancement of Science (AAAS), the European Optical Society (EOS), the European Physical Society (EPS) and the Portuguese Physical Society. He served in various committees of the Optical Society of America (OSA) and of SPIE – The International Society for Optics and Photonics, having been also a member of the Telecommunications Committee of the "International Association of Science and Technology for Development" (IASTED). He served also in the technical committees of various international conferences. He is presently an associate editor of "Optical Fiber Technology- Materials, Devices, and Systems" (Elsevier) and a member of the advisory board of "Fiber and Integrated Optics" (Taylor & Francis), "Nonlinear Optics, Quantum Optics" (Old City Publishing, Inc.), "Research Letters in Optics" (Hindawi Publishing Corporation), and "International Journal of Optics" (Hindawi Publishing Corporation).

mfernando@ua.pt