

Optical and Electronic Signal Processing for Fiber-Optic Communications

IEEE Photonics Society Distinguished Lecture

By Dr. John Cartledge

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Abstract

Currently, there is a substantial research and development effort directed toward optical signal processing and electronic signal processing for fiber-optic communications. Much of the work is aimed at mitigating the effects of transmission impairments such as chromatic dispersion, polarization mode dispersion, fiber nonlinearities, amplifier noise, and band-limiting. It is being pursued in the presence of an ongoing interest in increasing the per-channel bit rate in order to meet the growing demand for telecommunication services. For optical signal processing, a variety of approaches are available for implementing functions such as 2R (re-amplification and re-shaping) and 3R (re-amplification, re-shaping and re-timing) regeneration. For electronic signal processing, advanced digital signal processing is being applied to both fiber-optic transmitters and receivers, and has led to a renewed interest in coherent optical detection. This lecture presents an overview of optical and electronic signal processing technologies, including a critical assessment of each approach. Specific examples are considered in more detail to highlight key aspects of the technologies.

Biography

John Cartledge was a Member of Scientific Staff at Bell-Northern Research from 1979 to 1982. Since 1982 he has been with the Department of Electrical and Computer Engineering, Queen's University. In 2002 he was appointed an inaugural recipient of a Queen's Research Chair. He has spent sabbatical leaves with Bellcore (1988-89), Tele Danmark Research (1995-96), and Corning (2009-10). His current research interests include optical modulators, optical signal processing (wavelength converters, optical regenerators), electronic signal processing for optical waveform generation, and digital coherent systems. Dr. Cartledge is a Fellow of the Optical Society of America, a Fellow of the Institute of Electrical and Electronics Engineers (IEEE), recipient of the IEEE Canada Outstanding Engineering Educator Award (2009), and an Associate Editor for IEEE Photonics Technology Letters.

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