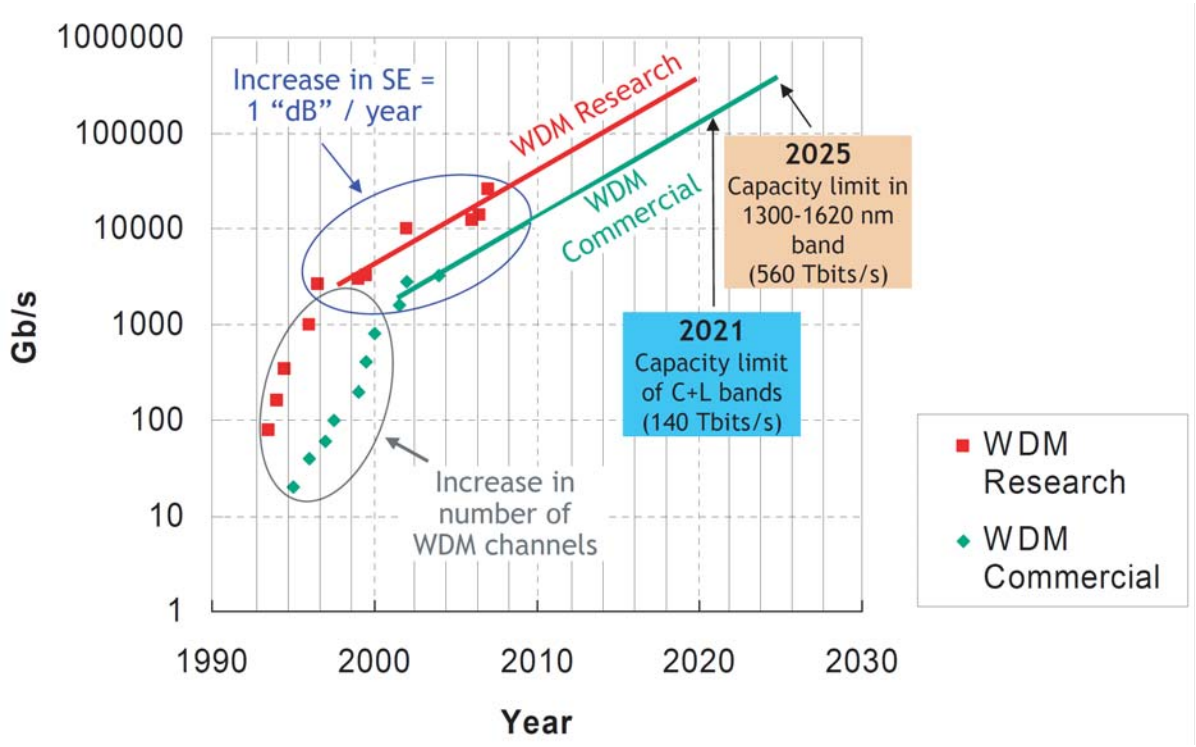
The Institute of OPTICS

Colloquium

UNIVERSITY of ROCHESTER

Capacity Limits of Fiber-Optic Communication Systems

Timeline to Achieve Fiber Capacity Limit



Dr. René-Jean Essiambre
Bell Labs, Alcatel-Lucent

PhD Université Laval
Post-doc Institute of Optics, U of R
Bell Labs 1997 -

This talk will present the main challanges for calculating the capacity for optical fibers in the presence of Kerr nonlinearities, and the associated advanced technologies to maximize capacity.

3:00 pm, Monday, October 19, 2009
Sloan Auditorium, Goergen 101
Refreshments provided.

Capacity Limits of Fiber-Optic Communication Systems

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Bell Labs, Alcatel-Lucent

Abstract

The capacity of fiber-optic communication systems, or “fiber capacity”, that a single strand of fiber can carry has steadily increased for the last two decades. Such capacity growth has been driven by technological innovations, both in the electrical and optical domains. The question then arises: are there fundamental limits to fiber capacity?

In this talk, I will describe a procedure that has been developed to calculate a fiber-capacity estimate starting from Shannon’s information theory. I will present the main challenges associated to calculating a capacity for optical fibers, all revolving around the presence of the instantaneous Kerr nonlinearity of fibers. We will show that a series of advanced technologies is necessary to maximize capacity. Such technologies include distributed Raman amplification, arbitrary waveform generation for generating Nyquist signals and advanced modulation formats, coherent detection and optimum digital signal processing based on reverse nonlinear fiber propagation. The fiber-capacity estimate obtained will be compared to the capacity of the highest capacity ‘hero experiments’.

Biography

René-Jean Essiambre is a Distinguished Member of Technical Staff at Bell Labs, Alcatel-Lucent. He received his doctorate from Université Laval and studied at the Institute of Optics of the University of Rochester under the supervision of Prof. Govind Agrawal before joining Lucent Technologies (now Alcatel-Lucent) in 1997. Dr. Essiambre is contributing to the design of advanced optical transmission systems, especially in relation to the management of fiber nonlinearities. Interests include information theory, advanced modulation formats, detection and optimization techniques for the design of optically routed networks to increase capacity, optical transparency and functionality of wavelength-division multiplexed communication systems. He is a recipient of the 2005 Engineering Excellence Award from OSA, where he is a Fellow.