Optical fibers and a theory of things that go bump in the light

September 15 2004

University of California scientists working at Los Alamos National Laboratory have developed **a theory describing light pulse dynamics in optical** fibers that explains how an interplay of noise, line imperfections and pulse collisions lead to the deterioration of information in optical fiber lines. The theory will help to enhance the performance necessary for high-speed optical communication systems like video on demand and ultra-broadband Internet, and the research has helped establish a new field of inquiry -- the statistical physics of optical communications.

The theory, developed by Los Alamos scientists Michael Chertkov, Yeo-Jin Chung, Ildar Gabitov and Avner Peleg, proposes that an understanding of the physics of signal propagation is important for evaluating and optimizing the performance of optical lines since the natural nonlinearity and disorder of optical fibers results in the corruption of signals traveling through the fiber which, in turn, can lead to information loss. The theory enables scientists to do a comparative analysis of different techniques for the suppression of these information outages.

In addition to the theoretical advance, the team developed, and subsequently patented, a new technique called the pinning method that is capable of reducing the negative impact of optical fiber structural disorder and improving high-speed optical fiber system performance.

Besides the Los Alamos scientists, other collaborators include Igor

Kolokolov and Vladimir Lebedev from Russia's Landau Institute and Joshua Soneson from the University of Arizona in Tucson.

Source: DOE/Los Alamos National Laboratory