Spatiotemporal Dynamics of Optical Pulse Propagation in Multimode Fibers

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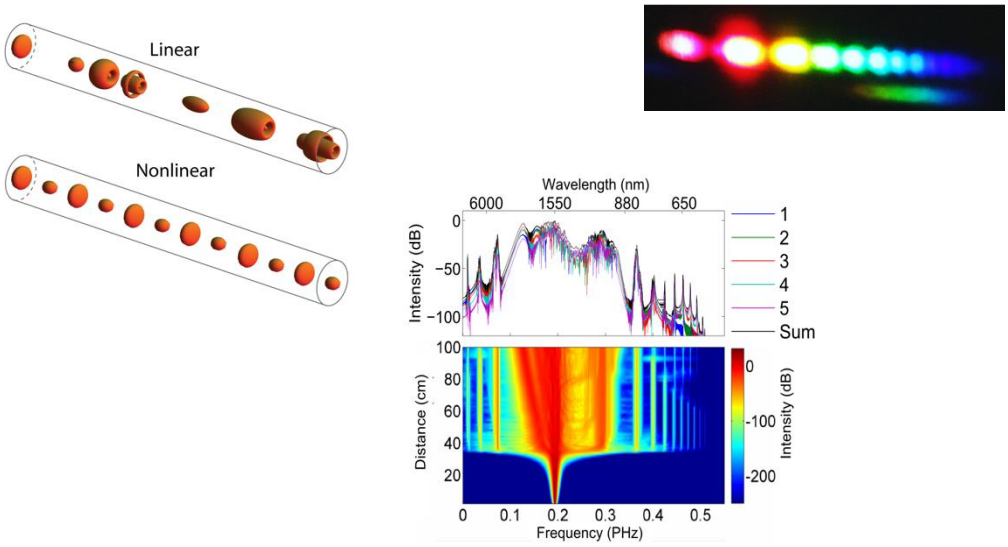
As optical fiber communications and fiber lasers approach fundamental limits, interest in multimode fibers has grown. Optical fibers designed to support multiple transverse modes offer opportunities to study wave propagation in a setting that is intermediate between single-mode fiber and free-space propagation. However, there are very few experimental studies of nonlinear pulse propagation in multimode fiber.

A variety of qualitatively-new phenomena have been observed recently in multimode fibers. Self-cleaning of a multimode beam, self-focusing, and multiple filamentation are observed at a fraction of the critical power. By varying the launched spatial modes, it is possible to generate megawatt ultrashort pulses tunable between 1550 and 2200 nm, dispersive waves over one octave in frequency, intense combs of visible light, or continua that span multiple octaves. New instabilities, which are spatiotemporal in nature, occur. A few of these new phenomena will be presented along with their connection to the spatiotemporal behavior of solitons in multimode fiber.

Possible directions for studies of new nonlinear wave physics in multimode fibers will be discussed along with potential applications.



Frank Wise received a BS in Engineering Physics from Princeton University, an MS in Electrical Engineering from the University of California at Berkeley, and a PhD in Applied Physics from Cornell University. Before PhD studies, he worked on advanced integrated circuits at Bell Laboratories. Since receiving the PhD in 1989, he has been on the faculty in Applied Physics at Cornell. His group has efforts in nonlinear optical pulse propagation and semiconductor nanostructures.