SPIE Seminar

Friday, September 25th 2009, 12 noon
CREOL Room #102

"Power Scaling of Diffraction-Limited Fiber Sources"

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ABSTRACT

Rare-earth-doped fiber lasers offer great advantages for practical applications because of their high efficiency, excellent beam quality, and broad wavelength coverage. Conventional single-mode (SM) fiber sources are constrained to low output powers by fundamental physical limitations of the fiber, specifically, by low energy storage (relevant for pulsed fiber sources) and by the onset of nonlinear processes in the fiber (relevant for both cw and pulsed sources). The simplest way to overcome both limiting factors is to increase the core size, but maintaining SM operation imposes an upper limit. Further power scaling is possible with multimode (MM) fiber, but the poor beam quality generally associated MM fiber is unacceptable for many applications.

I will review power scaling of diffraction-limited fiber sources, with emphasis on the dominant technique of bend-loss-induced mode filtering, which allows the core size to be increased significantly beyond the SM limit while maintaining excellent beam quality. Capabilities and limitations of this approach will be discussed, particularly for power scaling of pulsed fiber sources. Constraints imposed by various nonlinear processes will be summarized, along with results of high-fidelity modeling of fiber amplifiers. I will show results for frequency conversion of fiber sources to access wavelengths from the mid-IR through the deep-UV. Finally, I will present application examples that demonstrate the unique capabilities and advantages of high-power fiber sources.

BIOGRAPHY

Dahv Kliner obtained a Ph.D. in physical chemistry in 1991 from Stanford University, where he studied the quantum-state-resolved dynamics of gas-phase chemical reactions. He performed postdoctoral research in ultrafast spectroscopy at the University of Minnesota and in atmospheric chemistry at Harvard University. He was at Sandia National Laboratories in Livermore, CA, from 1997 until 2008, where he led Sandia's fiber-laser program. This program involved more than 20 researchers at multiple institutions and developed key enabling technologies for power scaling of fiber sources. He is now at JDSU in Milpitas, CA, developing cw and pulsed fiber sources for commercial applications. Dahv and his coworkers have pursued a variety of applications for fiber lasers, including real-time detection of natural-gas leaks in refineries, measurements of mercury emissions from coal-fired power plants, and high-sensitivity measurements of atmospheric sulfur dioxide for climate and air-quality studies.

Pizza and drinks will be served.

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