Physics Seminar

Using Interferometry to look at Nonlinear Laser Beam Dynamics

Prof. Charles G. Durfee
Department of Physics
Colorado School of Mines

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By making laser pulses short, we can reach high peak power and high focused intensity with the available pulse energy. A table-top ultrashort pulse laser amplifier can reach focused intensity well over the point that will ionize atoms and molecules. At high intensity, the propagation of the laser beam can develop interesting dynamics, such as self-focusing and filamentation. In filamentation, the beam creates an ionized track in air that can be as long as several kilometers. These dynamics come about because the refractive index of air (and other materials) increases with intensity, creating a lens that makes the beam even more intense, eventually ionizing the air. To better understand these dynamics and to compare our measurements with computer models, we have been using a technique (spectrally- and spatially-resolved interferometry, SSRI) that can simultaneously measure the temporal and spatial dependence of the field. In this talk, I will discuss how SSRI works, and some of our experiments to use it to understand nonlinear lens formation and filamentation.