Femtosecond Optical Kerr Gate in Tissues

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Abstract

The Optical Kerr Effect was investigated for the first time in biological tissues. This nonlinear optical effect was explored in both human brain and avian breast tissues using a time-resolved femtosecond pump-probe Optical Kerr Gate. The Optical Kerr Effect describes the nonlinear change in a material's refractive index in response to an electric field. It is fundamental to spectral effects that are commonly used in biological science. The tested tissues produced a unique ultrafast (700-800 fs) doubled peaked Kerr signal, which is indicative of temporal interplay between the different components (electronic plasma, and molecular) that make up the Kerr index. Temporal properties varied between samples suggesting that this method could be used as a new diagnostic. Understanding this Kerr behavior can help improve current spectral diagnostic techniques, such as SRS, and potentially create a new Kerr based biopsy method for the detection of diseased tissues, such as cancer and Alzheimer's.

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