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Pulse Propagation through Dispersive Optical Materials

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It is now possible to characterize the complete time-frequency behavior of optical pulses with unprecedented precision [1, 2]. The frequency content of optical pulses determines how they propagate through dispersive optical materials. In this talk, we review recent work on methods for dramatically modifying the velocity with which light pulses propagate through material systems. This modification can be so severe that one speaks of slow light, fast light, and backwards light depending on how the magnitude and sign of the group velocity compares to the vacuum speed of light c. We review the physical processes that can be used to achieve such a strong modification of the velocity of light, and we discuss the conceptual understanding of exotic propagation effects such as backwards propagation. We also review the implications of modified pulse velocities within the context of modern optical technology.

[1] Kane, D.J. and R. Trebino, Opt. Lett., 18 823 (1993)
[2] C. Iaconis and I. A. Walmsley, Opt. Lett., 23 792 (1998).