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Controlled, *i.e.* negative, peak velocity of light in ordinary dispersive media ALEXEI SOKOLOV, XI WANG, GOMBOJAV ARIUNBOLD, MARLAN SCULLY, Texas A&M University, TAMU FEMTOLAB TEAM — We introduce a concept of controlling the propagation velocity of a laser pulse's intensity peak. This is achieved by preparing, at the input of an ordinary dispersive medium, a special pulse shape. For example, a sequence of pulses with a varying amount of negative pre-chirp can be used, such that each pulse compresses to a transform-limited shape at a certain distance into the dispersive medium. Then, when the pulse delays are properly adjusted, one will be able to achieve a situation when these pulses produce an overall intensity peak, and therefore (possibly) a nonlinear excitation, which propagate at an arbitrary controlled speed, forward or backward, *i.e.* at -*c*. We implement this idea to show that the directionality of lasing can be controlled through pump pulse shaping and timing. In our proof-of-principle experiments, we use a laser dye solution pumped through a nonlinear (two-photon) excitation, and demonstrate that mirror-less lasing in this system can be forced to preferentially occur in the backward direction. In general one can consider setting the velocity of the pulse peak anywhere from plus infinity to minus infinity, and matching the excitation speed to for example speed of sound, or making this speed variable and allowing acceleration.

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