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Controlled Interactions of Femtosecond Light Filaments in Air
BONGGU SHIM, SAMUEL SCHRAUTH, CHRISTOPHER HENSLEY, PUI HUI, LUAT VUONG, AMIEL ISHAAYA, ALEXANDER GAETA, School of applied and engineering physics, Cornell University — We report on the controlled interactions of two copropagating long-range light filaments in air generated by ultrafast, high-power laser pulses with parallel linear polarizations. In experiments, 800 nm, 50 fs Ti:Sapphire laser pulses (0.5 TW peak power, 10-Hz repetition rate) are interferometrically combined with a motorized delay stage precisely controlling the relative phase (time delays) and separation between beams. Using two collinear beams, each with approximately 20GW peak power and 800 um radius spot sizes, separated by 1 mm, we observe that the self-channeling beams demonstrate fusion, repulsion and energy transfer depending on the relative phase between beams. We compare our experimental results with simulations based on the time-averaged (2D+1) Nonlinear Schrodinger equation. We also present pulse splitting and spectrum measurements of two interacting air filaments. Our method can be applicable to precise control in long range propagation of femtosecond light filaments including remote sensing.

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