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Author

Suchowski, H (Suchowski, H.); Bruner, BD (Bruner, B. D.); Ganany-Padowicz, A (Ganany-Padowicz, A.); Juwiler, I (Juwiler, I.); Arie, A (Arie, A.); Silberberg, Y (Silberberg, Y.)

Title

Adiabatic frequency conversion of ultrafast pulses

Source

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Abstract

A new method for efficient, broadband sum and difference frequency generation of ultrafast pulses is demonstrated. The principles of the method follow from an analogy between frequency conversion and coherent optical excitation of a two-level system. For conversion of ultrafast pulses, the concepts of adiabatic conversion are developed further in order to account for dispersion and group velocity mismatch. The scheme was implemented using aperiodically poled nonlinear crystals and a single step nonlinear mixing process, leading to conversion of near-IR (similar to 790 nm) ultrafast pulses into the blue (similar to 450 nm) and mid-IR (similar to 3.15  $\mu$ m) spectral regions. Conversion bandwidths up to 15 THz FWHM and efficiencies up to 50% are reported.