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P1.2015 Generation of few- and subcycle radiation at combination frequencies of ultrashort multicolor ionizing laser pulse

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We discuss a new method to generate few-cycle pulses from ionization of a medium by twocolor (or, more generally, multicolor) femtosecond fields [1, 2]. The method is based on the parametric excitation of a free-electron nonlinear current at the combination frequencies of ionizing pulses. In contrast to the common parametric frequency mixers using nonlinear crystals, the varying parameter here is the plasma density, and the ionization dominates over other nonlinearities. Since the effect is caused by the motion of free electrons, it may be strong enough even if the particle number and density are small compared to the case of condensed media, so the ionized gases may be used for generation. This significantly expands the range of pump intensities and the frequency range (compared to the wave mixing in nonlinear crystals where dispersion and absorption are generally essential around the numerous resonant frequencies). Moreover, using ambient air provides the possibility for the remote generation of few-cycle pulses since the ionization region may be placed in the immediate vicinity of a target to be irradiated by obtained few-cycle pulses (as realized for the remote laser-plasma terahertz generation in air [3]). Thus, one can avoid the transportation of generated pulses over long distances with inevitable diffraction and dispersion. The highorder nature of nonlinear ionization results in a very short duration of the generated pulse at combination frequencies. This duration coincides with the duration of ionization (i.e., with the characteristic time scale of the plasma density buildup) and is commonly much shorter than the duration of the ionizing pump [4]. The resulting pulse can easily be a few-cycle, or even subcycle, one with the carrier-envelope phase determined by the phase shift between onecolor components of the ionizing pulse.

[1] V.A. Kostin, N.V. Vvedenskii, Phys. Rev. Lett. 120, 065002 (2018).
[2] A.A. Silaev, V.A. Kostin, I.D. Laryushin, N.V. Vvedenskii, JETP Lett. 107, 151 (2018).
[3] C. D'Amico, A. Houard, M. Franco, B. Prade, A. Mysyrowicz, A. Couairon, V.T. Tikhonchuk, Phys. Rev. Lett. 98, 235002 (2007).
[4] V.A. Kostin, I.D. Laryushin, A.A. Silaev, N.V. Vvedenskii, Phys. Rev. Lett. 117, 035003 (2016).

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