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标题: Single-cycle terahertz pulses with amplitudes exceeding 1 MV/cm generated by optical rectification in LiNbO3 and applications to nonlinear optics
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摘要: Using a tilted-pump-pulse-front scheme, we generate single-cycle terahertz (THz) pulses by optical rectification of femtosecond laser pulses in LiNbO3. In our THz generation setup, to obtain optimal THz beam characteristics and pump-to-THz conversion efficiency the condition that an image of a grating coincides with a tilted-optical-pulse front is fulfilled. Generated THz pulses have spectra centered at around 1 THz. A designed focusing geometry enables tight focus of the THz beam with a spot size close to the diffraction limit, and the maximum THz electric field of 1.2 MV/cm is obtained. In addition, the nonlinear interactions of GaAs quantum wells with the intense THz pulses have been studied. Here we show that the intense THz pulse, unlike a DC bias, can generate a substantial number of electron-hole pairs forming excitons that emit near-infrared luminescence. The bright luminescence associated with carrier multiplication suggests that the carriers coherently driven by a strong field can efficiently gain enough kinetic energy to induce a series of impact ionizations, which we demonstrate can increase the number of carriers by about three orders of magnitude on picosecond timescale.
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