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标题: Harmonic Generation of Externally Applied Signal in a Biased Photoconductive Terahertz-Wave Emitter
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摘要: A generation effect of higher harmonics for an externally applied signal in a photoconductive (PC) terahertz (THz)-wave emitter has been found. This effect is applicable to accurately measuring for frequencies of THz waves. This paper describes reasons why higher harmonics are generated in a PC device. The dependence of the photoconductance on the applied voltage in the PC device consists of a flat range and a negative slant range, and one sharply bending point is then formed at the boundary between the flat and slant ranges. When the PC device is irradiated by two laser beams with slightly different optical frequencies, the photoconductance is strongly modulated at the optical beat frequency in the THz region by photomixing the two laser beams. As a result, three bending points are formed in the average photoconductance (introduced as the average of the temporal photoconductance varying at the THz frequency). The slants comprised of the three bending points are different from each other. When the variation range of the applied voltage driven by the signal input on the biased voltage covers the voltage of one of the bending points, the photoconductance (or the average photoconductance in optical beating) varies along the different two slopes, the resultant temporal photocurrent is largely distorted, and then the harmonics of the signal input are generated in the photocurrent. The following features are clarified: (1) the harmonics of the signal input are generated by appropriately adjusting the bias voltage and the amplitude of the signal input, regardless of the presence/absence of optical beating; (2) the efficiency of the harmonic generation is about 10(-4)-10(-5); and (3) the harmonics over 35th order with almost flat amplitudes (-3.8 dB/octave) are generated.
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