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Title: Two alternative approaches to electro-optical detection of terahertz pulses

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Abstract: The electro-optical detection of terahertz radiation is analyzed theoretically. While a conventional detection scheme of this type is based on the measurement of the phase shift of an optical pulse arising from its interaction with the terahertz field in a nonlinear medium, it is shown that both the phase and amplitude of the optical pulse vary because of this interaction. The amplitude modulation carries information on the dynamics of the amplitude and phase of the terahertz field and can be used to measure these parameters. With this energy-sensitive detection scheme, avoiding all restrictions on the symmetry type of the nonlinear medium is much simpler than with the phase scheme. Variants of the electro-optical detection technique using periodically poled crystals with the lithium-niobate symmetry and crystals with the zincblende structure are considered. It is shown that spectral sensitivities of the methods based on measurements of the phase and amplitude modulations are related as the frequencies of the laser and terahertz fields.