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The task of establishing the conditions for the generation and detection of high-frequency gravitational waves in material media under laboratory conditions is considered. An important advantage of the high-frequency parametric process of detecting gravitational waves, compared with the known method based on detection of low-frequency (10-100 Hz) mechanical oscillations of stars, is the factor of the sixth degree of frequency in the formula for the intensity of gravitational radiation.

The possibility of detecting high-frequency gravitational waves in the laboratory, planned for research, is based on the use of intense pulsed laser light sources as excitation radiation. The sources make it possible to record the radiation at the tripled frequency in dielectric media and in photonic crystals. It is supposed to use lasers that provide the possibility of generating ultra short, i.e. picosend and femtosecond, pulses of light radiation with wavelengths in the region of one micron or 0.5 micron, for which the third optical harmonic corresponds to the visible or ultraviolet range suitable for detection by sensitive radiation receivers. The conditions for the observation of two-photon-excited photoluminescence in condensed dielectrics are analyzed, during which at the first stage two-photon absorption occurs in a dielectric medium with the formation of real states in crystals whose symmetry coincides with the symmetry of gravitational waves. At the second stage, the process of adding the frequencies of the exciting radiation and the two-photon state with the generation of radiation at the frequency of the third optical harmonic is carried out.