FIVE-WAVES APPROXIMATION IN THE THEORY OF STIMULATED LIGHT SCATTERING

N. E. Kornienko

Taras Shevchenko Kyiv National University,
Physics Faculty
(*6, Academician Glushkov Prosp., Kyiv 03127, Ukraine)*

S u m m a r y

Quasistationary stimulated scattering of light (SRS, SMBS) is theoretically investigated within the frame of the five interacting waves approximation taking into account all the possible four-photon processes $\omega_n + \omega_{n+i} = \omega_{n-1} + \omega_{n+i+1}$ ($n = 1 \div 4$; $i = 0, 1, 2$). A general system of nonlinear differential equations for the complex amplitudes of interacting waves is obtained with regard for a change in the population of resonant states. The generation of various numbers of Stokes and anti-Stokes waves is considered in case of the exact combination resonance and phase synchronisms for parametric processes. The spatial change of wave amplitudes is studied. The wave enlightenment is shown to take place in the processes of stimulated scattering. The intensity of laser pumping is distributed over many spectral components. We found the coherent superposition of waves with the definite relations of their amplitudes and phases, at which the nonlinear interaction and wave absorption are stopped in substance, and waves spread in the medium freely. For the first time, a possibility of energy concentration in one of the stimulated scattering components is shown. The results obtained can be used in laser devices and for understanding some biophysical processes.