

Fig. 1 Scheme of the lower energy levels of the renormalized spectrum (\mathcal{E} in Ω units) for main ($n = 0$) and phonon satellite ($n = 1, 2, 3, \dots$) states of one-mode system (a) and average number of phonons $N_1(\alpha, n)$ in these states as functions of coupling constant α (b)

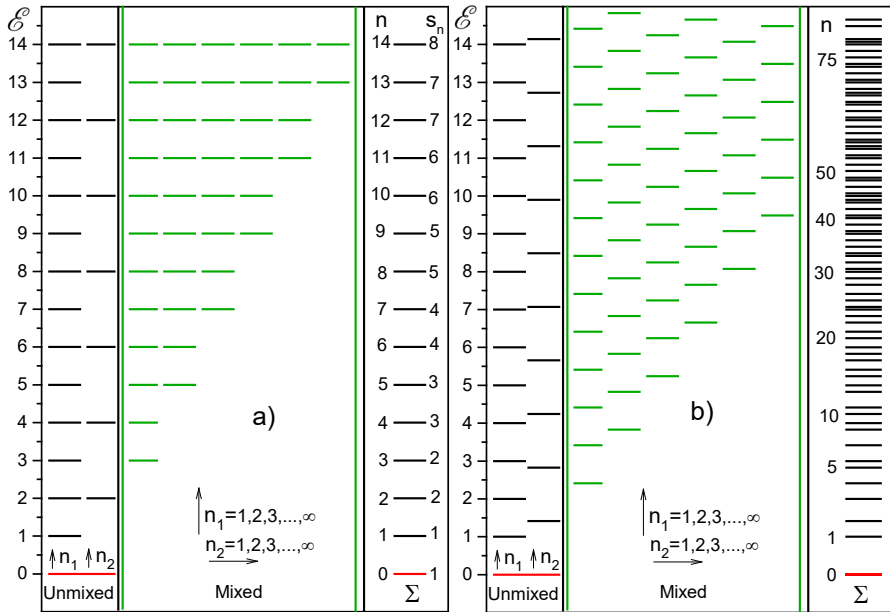


Fig. 2 Scheme of lower levels of the renormalized energy spectrum (\mathcal{E} in Ω_1 units) of main ($n = 0$), partially degenerate (a) and non-degenerate (b) phonon satellite states ($n_1, n_2 = 1, 2, 3, \dots$) for two-mode system. Main level (red line), unmixed (black line) and mixed (green line) satellite levels, Σ - complete spectrum, n is the number of the level in complete spectrum, s_n is a degree of degeneracy, n_λ is a number of the level produced by λ -th mode. $\Omega_1 = 1$; $\Omega_2 = 2$; (a) and $\Omega_1 = 1$; $\Omega_2 = \sqrt{2}$ (b)

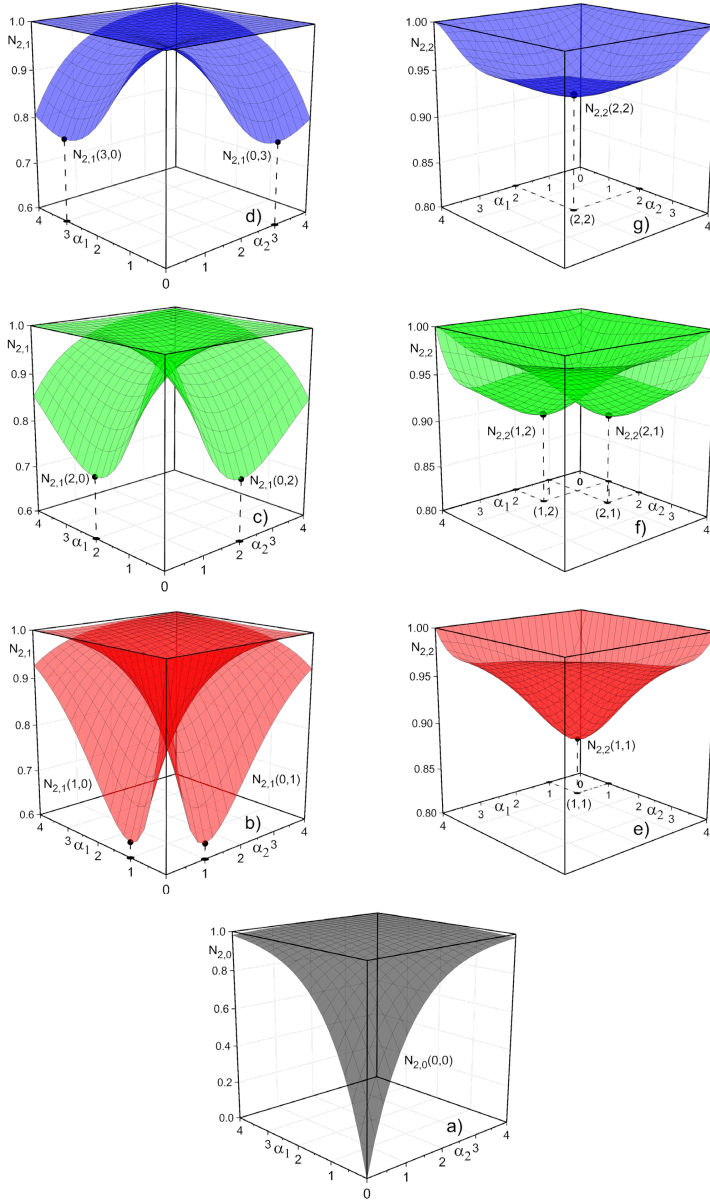


Fig. 3 Average numbers of phonons ($N_{\tau,s}(n_1, n_2)$) as functions of coupling constants (α_1, α_2) for the main (a) and lower satellite states of the two-mode system: unmixed (b, c, d) and mixed (e, f, g)

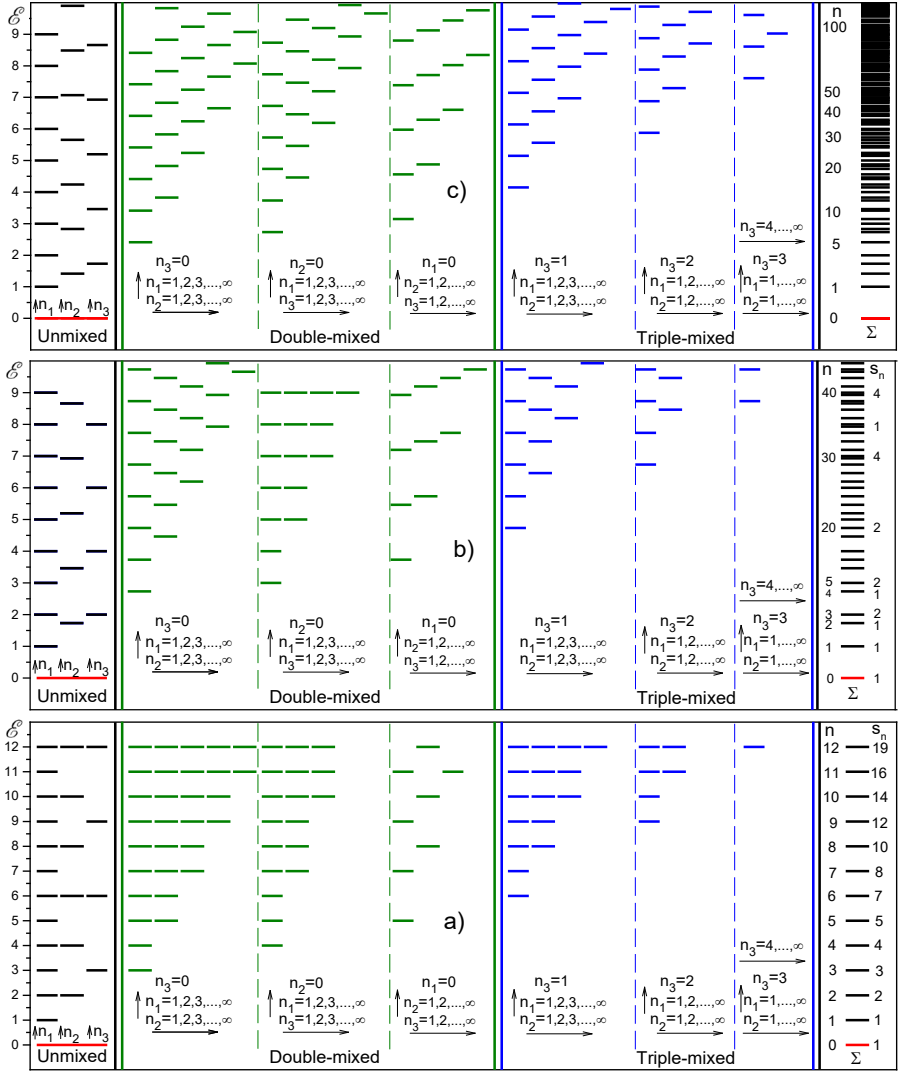


Fig. 4 Scheme of the main and lower satellite levels of the renormalized energy spectrum \mathcal{E} (in Ω_1 units) for three types of three-mode systems: the main and the first satellite levels are non-degenerate and the rest are degenerate (a); the complete spectrum is partially degenerate (b); the spectrum is non-degenerate (c). The main level (red line), unmixed (black line), double-mixed (green line), triple-mixed (blue line) satellite levels, Σ - complete spectrum, n is the number of the level in complete spectrum, s_n is a degree of degeneracy, n_λ is the number of the level produced by λ -th mode. Dimensionless parameters of the systems: $\Omega_1 = 1$; $\Omega_2 = 2$; $\Omega_3 = 3$; (a), $\Omega_1 = 1$; $\Omega_2 = \sqrt{3}$; $\Omega_3 = 2$; (b), $\Omega_1 = 1$; $\Omega_2 = \sqrt{2}$; $\Omega_3 = \sqrt{3}$ (c)