Task EO3 / Home Assignment

Published | Edit | ⋮

Hand-in deadline: Mon 25 feb, 23:59

to Katia, in electronic form (via CANVAS) or paper

1. Write the coupled-mode equations for a degenerate parametric amplifier operating in a $\chi^{(2)}$ medium with a pump at frequency ω_p and a signal-idler mode (fully degenerate) at $\frac{\omega_p}{2}$, by using coupled-mode theory in the SVEA with plane monochromatic waves. Please define all parameters and relevant physical quantities appearing in your equations and provide their physical dimensions.
2. Consider the case in which the process is perfectly phase-matched and occurs in a crystal of length $L = 2\ cm$, nonlinear coefficient $d_{eff} = 20\ pm\ V^{-1}$ and refractive index $n = 2.2$ (for both waves, i.e. neglecting dispersion), with a pump wavelength $\lambda_p = 1\ \mu m$ and input intensities $I_p = 100\ kW cm^{-2}$ and $I_s = 10\ \mu W\ cm^{-2}$, for the pump and signal fields, respectively. Determine then the maximum and minimum values in dB of the amplification experienced by the signal ($\frac{I_s(L)}{I_s(0)}$) when the input phase of the pump wave is fixed, while the one of the signal is sweeped between 0 and 2π.
3. Write the coupled mode equation for a phase sensitive amplifier operating in a $\chi^{(3)}$ medium with two pumps, at frequencies ω_{p1} and ω_{p2}, and a signal at $\omega_s = \frac{\omega_{p1}+\omega_{p2}}{2}$. Please consider plane monochromatic waves and define all parameters and physical quantities in your equations.

Points 1

Submitting a file upload

Due	For	Available from	Until
25 Feb	Everyone	8 Feb at 0:00	18 Mar at 23:59

+ Rubric