Report on Advanced Photon Science XVI

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Submitted to Room 208(教務), Science Buiding 1

1. Explain why wave-mixing processes such as second-harmonic generation and sum/diference frequency generation can be efficient only if the phase-matching relation is satisfied.

2. In DFG, input optical fields of ω_1 and ω_2 couple with the pump field ω_3 and their amplitudes A_1, A_2 and A_3 along the propagation direction z are given by the folowing equatins.

$$\begin{cases} \dfrac{dA_1}{dz} = i\kappa_1 A_3 A_2^* e^{-i\Delta kz} & (1) \\ \dfrac{dA_2}{dz} = i\kappa_2 A_3 A_1^* e^{-i\Delta kz} & (2) \\ \dfrac{dA_3}{dz} = i\kappa_3 A_1 A_2 e^{i\Delta kz} & (3) \end{cases}$$

where $\omega_3 > \omega_2 > \omega_1$.

Assuming $A_3 \gg A_1$ and A_2 ($dA_3/dz = 0$), show graphically the spacial change of the intensities of the optical fields of ω_1 and ω_2 along z direction.