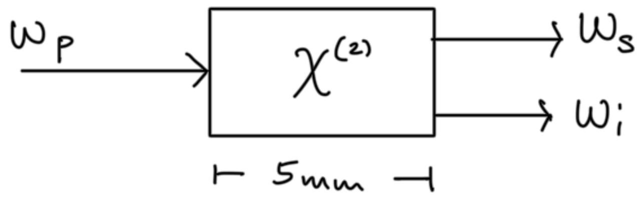
Assignment - 4

Down conversion $(o \rightarrow e\,o)$



for down conversion $\omega_s = \frac{\omega_p}{2}$ & $\omega_i = \frac{\omega_p}{2}$

$\lambda_p = 515\,nm$ (say λ_0) $\quad \therefore \lambda_s = \lambda_i = 1030\,nm$

Grating Period $(\Lambda) = \frac{2\pi}{\Delta k}$

Now,

$Y \longrightarrow ZY$

$$\Rightarrow \Delta k = \left[\frac{\omega_p n_y(\omega_p)}{c} - \frac{\omega_s n_y(\omega_s)}{c} - \frac{\omega_i n_z(\omega_i)}{c} \right]$$

$$= 2\pi \left[\frac{n_y(\lambda_0)}{\lambda_0} - \frac{n_y(2\lambda_0)}{2\lambda_0} - \frac{n_z(2\lambda_0)}{2\lambda_0} \right]$$

at $20^\circ C$ (say T_0)

Now,

$$n(T) = n(T_0) + \frac{\partial n}{\partial T} \cdot \Delta T$$

where $\Delta T = T - T_0$

$$\therefore \Delta k = \frac{2\pi}{\lambda_0} \left[n_y(T, \lambda_0) - \frac{n_y(T, 2\lambda_0)}{2} - \frac{n_z(T, 2\lambda_0)}{2} \right]$$

$$\Rightarrow \Lambda = \frac{2\pi}{\Delta k} = \frac{2\lambda_0}{2n_y(T, \lambda_0) - n_y(T, 2\lambda_0) - n_z(T, 2\lambda_0)}$$

Then,

$$\frac{I}{I_0} \propto \left[\frac{\sin(\tilde{\Delta k}\, L/2)}{\tilde{\Delta k}\, L/2}\right]^2$$

where $\tilde{\Delta k} = \Delta k - k_\Lambda$; $k_\Lambda = \frac{2\pi}{\Lambda}$

$$\therefore \tilde{\Delta k}(\lambda) = \Delta k(\lambda) - k_\Lambda(\lambda_0)$$

$$\left[\Delta k(\lambda_0) = k_\Lambda \Rightarrow \tilde{\Delta k}(\lambda_0) \to 0 \right]$$

* Sellmeier equation for KTP

$$n^2 = A + \frac{B}{1 - (C/\lambda)^2} - D\lambda^2$$