Defect causes reflections in an input electrical signal.

**Basics of Phase and Frequency Modulation**

Then, in special cases of angle modulation, when a complex envelope is given by

\[ j \theta(t) = A e^{j \omega t} \]

The real envelope is

\[ R(t) = j \theta(t) = A \cos(\omega t + \phi(t)) \]

where \( A \) is a linear function of the modulating signal, \( \omega(t) \) is the angular signal given by

\[ R(t) = A \cos(\omega(t) + \phi(t)) \]

For phase modulation, \( \phi(t) = D p \cdot m(t) \)

where \( Dp \) is the phase sensitivity.

For frequency modulation, \( \phi(t) = Df \int_0^t \omega(t') dt' \).

To get \( m(t) \),

\[ Dp \int_0^t m(t') dt' = Df \int_0^t \omega(t') dt' \]

\[ m(t) \Rightarrow Df \int_0^t \omega(t') dt' \]

Relationship between \( m(t) \) and \( m_f(t) \) - phase modulation or frequency modulation sign.

\[ \omega_f \cdot \text{modulation frequency} \]

\[ \omega_f \cdot \text{carrier frequency} \]

Input optical beam

[Diagram of optical setup with labels: \( \lambda_0, \lambda \), \( m_0+1 \), \( \lambda_{0,N} \), \( m=1 \), \( m=N \), \( \lambda_{0,1} = N \lambda_0 \)]

Raman-Nakagami and optical (dynamical generation)
The frequency of the diffracted beam is given by

$$\omega_n = \omega_i \pm n\Delta\omega$$

The angle of separation between the mth diffracted beam and the undiffracted beam is given by

$$\theta_m = \theta_{m+1} = \frac{\lambda}{2\pi K}$$

Where $\lambda$ is the light wavelength, $K$ is the wave number of the undiffracted beam, and $m$ is a positive integer.

Consider the Klein-Gordon paradox for $m=0$

$$\theta = \frac{k_0 L}{k_0 \cos \theta_0}$$

About $40$

Couple each radiation optical as zeroth order in the beam,

$$\frac{1}{2L} \left( E_{m+1} - E_{m-1} \right) = \frac{1}{2L} \int \frac{m K_0}{2\pi} - \sin \theta_0 \cdot \phi_m$$

Where $E_m$ is the electric field of the mth order beam.

Number intensity of the mth order beam is given by

$$I_m = \frac{I_m}{I_0} = \int \frac{I_0 \sin^2 \left( \frac{K_0 L \tan \theta_0}{2} \phi \right)}{\left( L_2 L \tan \theta_0 / 2 \right)^2}$$
In practical applications, only one diffraction is utilized.
The criterion for Bragg's diffraction is that $\theta > \frac{\lambda}{d}$, where the grating is no longer thin, and the interference no longer depends on the incident angle.

For Bragg's diffraction, the diffracted beam intensity is maximum.

$$I_{1m} = \sin^2 \left( \frac{\theta}{2} \right)$$

Discussion: the grating model relates with:

Fred an equation relating diffraction angle to intensity and the signal power (waves).

1. How do we get Bragg's signal from $\theta$? What is the relationship between Bragg's signal, power high $\theta$ and the diffraction we get?