

# Nonlinear Optics

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# Basic Linear Optics

## Maxwell's Equation

# Maxwell's Wave Equation

# Plane wave and solution of the wave equation

# Monochromatic and Non-monochromatic waves

# Electric displacement, electric polarization, and refractive index



# Direction of $E$ , $D$ , and $k$ in an isotropic medium

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# Linear response and polarization

# Dielectric Susceptibility

# Nonlinear Optics

## Introduction

# Classical Origin of nonlinearity

# Miller's Rule

# Dimensions of higher order susceptibilities

# Second Harmonic Generation (SHG)

# Optical REctification



# Linear Electro-optic effect

# Sum and Difference Frequency Generation

# Nonlinear Maxwell's Equation

# Theory of SHG

# Phase Matching

# Gain Bandwidth

# Manley-Rowe Relation

# Energy Conservation in SHG



# Different kinds of phase matching

# Birefringence phase-matching

# Type I Phase Matching

# Type II Phase Matching

# Symmetry in nonlinear susceptibility

# Kleinman's Symmetry

# Neumann's Principle