Seventh lecture

Acousto-optics

Faraday effect

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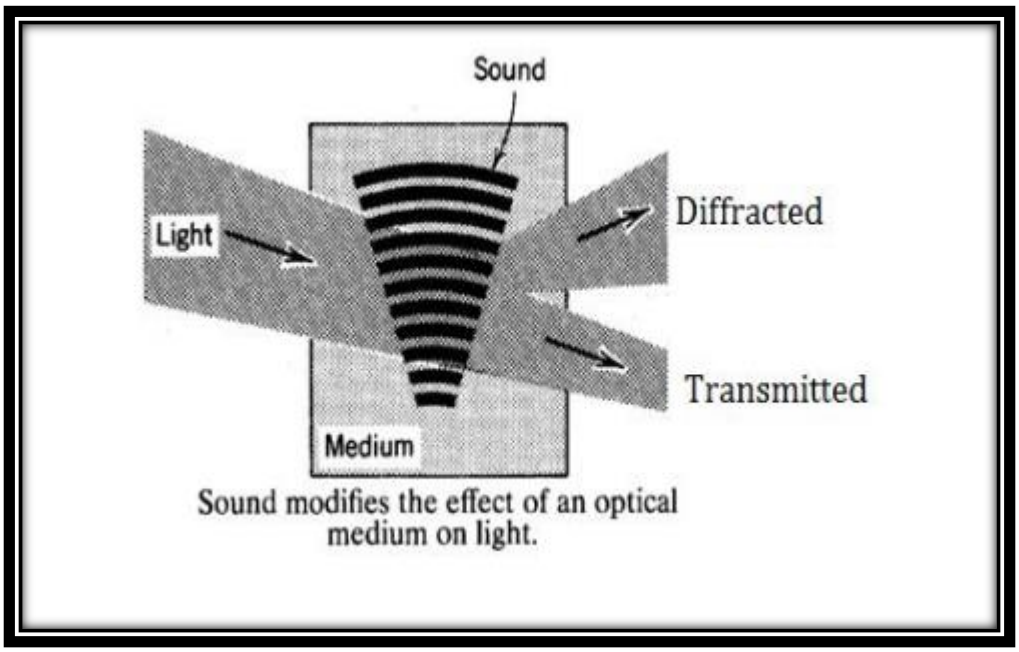
What is the Acousto-optics

Acousto-Optic Effect (AOE) It is the interaction between sound waves and light waves in an acousto- optic medium. Essentially it is the diffraction of Laser by Ultrasound. AOE are based on the change of the refractive index of an optical medium due to the presence of sound waves in that medium. Thus sound alters the refractive index of the medium and therefore modifies the effect of medium on the light. (i.e.) Sound can control light. Sound is a dynamic strain involving molecular vibrations that takes the form of waves which travel at a velocity determined by the medium. When it is passed through fluid, compressions and rarefactions are produced. In those regions where the medium is compressed the density is higher and refractive index is larger.



Sound modifies the effect of an optical medium on light.

Acousto-Optic Materials

- Fused Silica
- Lithium Niobate
- Arsenic Trisulfide
- Tellurium dioxide
- Telluride glasses
- Gallium Phosphide

The selection of acousto optic material depends upon the specific application. An AO material suitable for one application may not applicable to another.

Acousto-optic devices

1. Acousto-optic modulator

By varying the parameters of the acoustic wave, including the amplitude, phase, frequency and polarization, properties of the optical wave may be modulated. The acousto-optic interaction also makes it possible to modulate the optical beam by both temporal and spatial modulation.