

Dr. Mohammad Aslam, Dept.
Of physics, B.Sc. part-2 physics
(Hons) paper-iii, Lecture no-66

Topic: Linear, Circular and Elliptical Polarization

Light is an electromagnetic wave, and the electric field of this wave oscillates perpendicularly to the direction of propagation. Light is called unpolarized if the direction of this electric field fluctuates randomly in time. Many common light sources such as sunlight, halogen lighting, LED spotlights, and incandescent bulbs produce unpolarized light. If the direction of the electric field of light is well defined, it is called polarized light. The most common source of polarized light is a laser.

Depending on how the electric field is oriented, we classify polarized light into three types of polarizations:

- Linear polarization: the electric field of light is confined to a single plane along the direction of propagation (*Figure 1*).

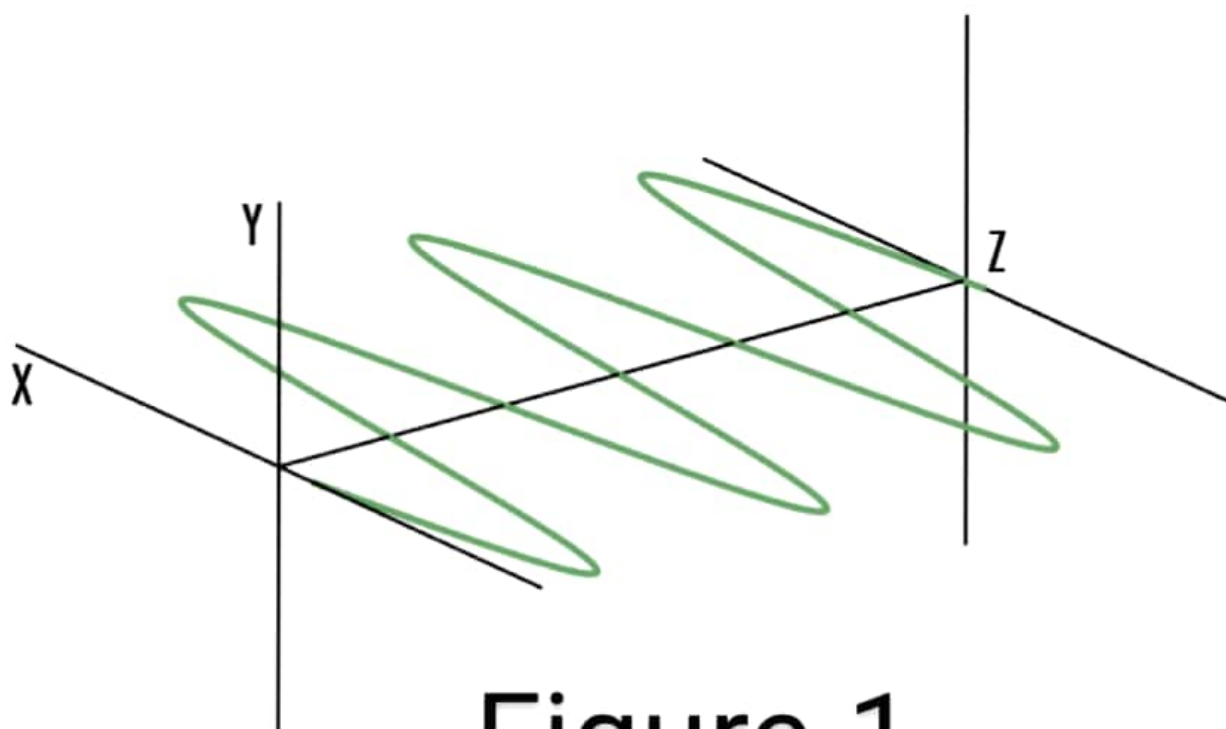
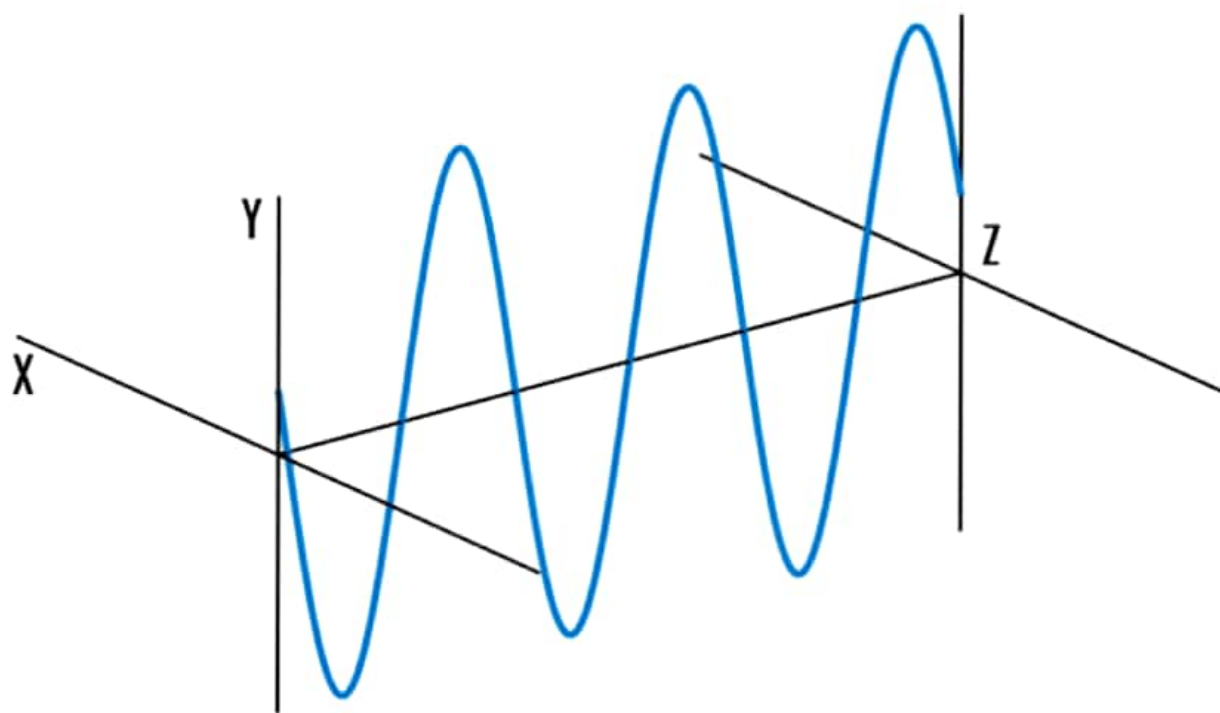


Figure-1

- Circular polarization: the electric field of light consists of two linear components that are perpendicular to each other, equal in amplitude, but have a phase difference of $\pi/2$. The resulting electric field rotates in a circle around the direction of propagation and, depending on the rotation direction, is called left- or right-hand circularly polarized light (*Figure 2*).

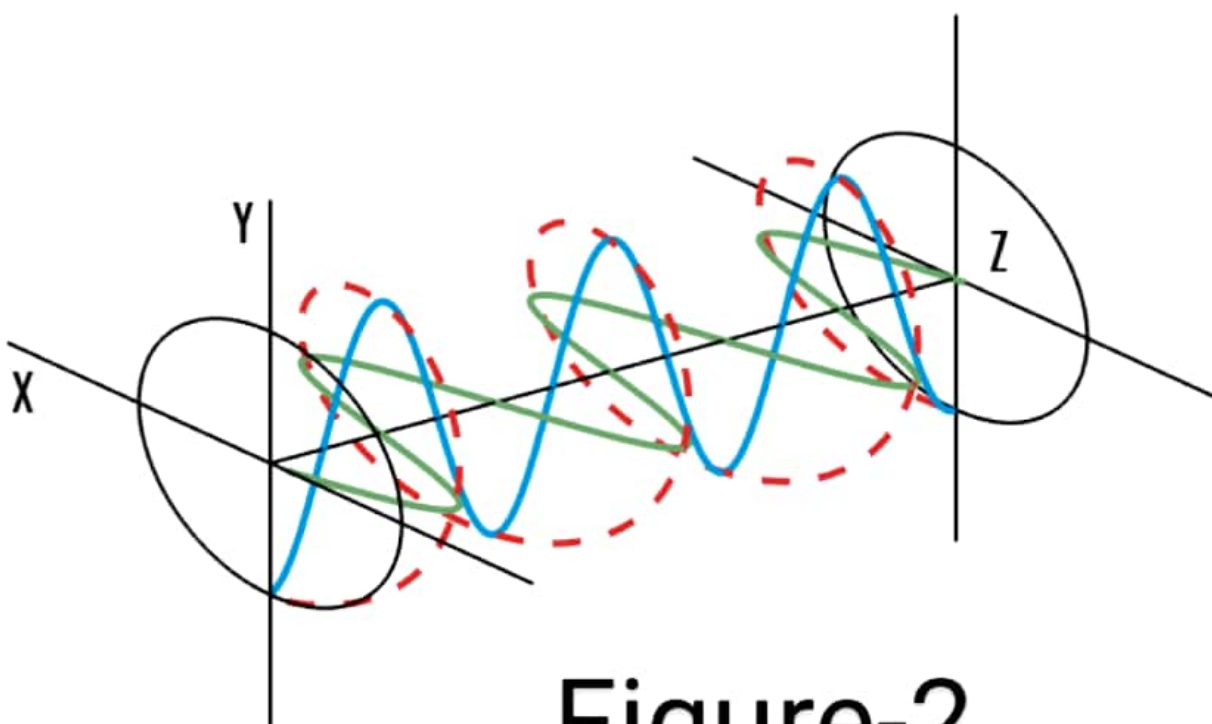
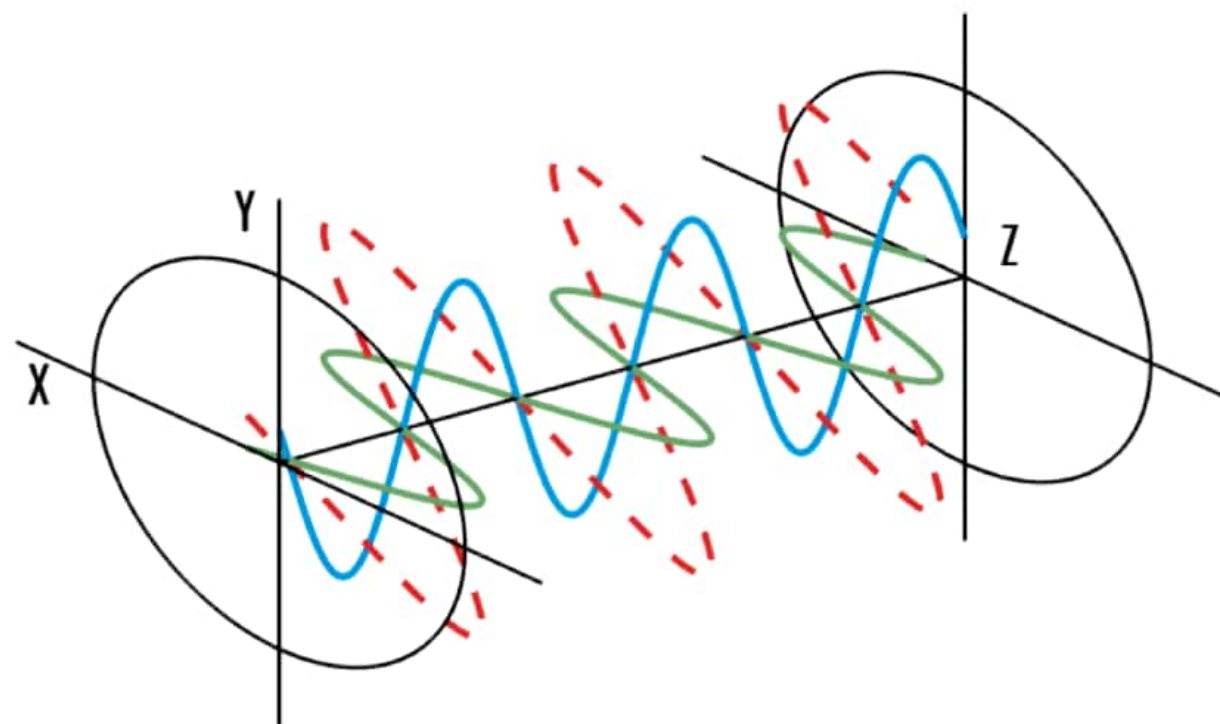


Figure-2

- Elliptical polarization: the electric field of light describes an ellipse. This results from the combination of two linear components with differing amplitudes and/or a phase difference that is not $\pi/2$. This is the most general description of polarized light, and circular and linear polarized light can be viewed as special cases of elliptically polarized light (*Figure 3*).

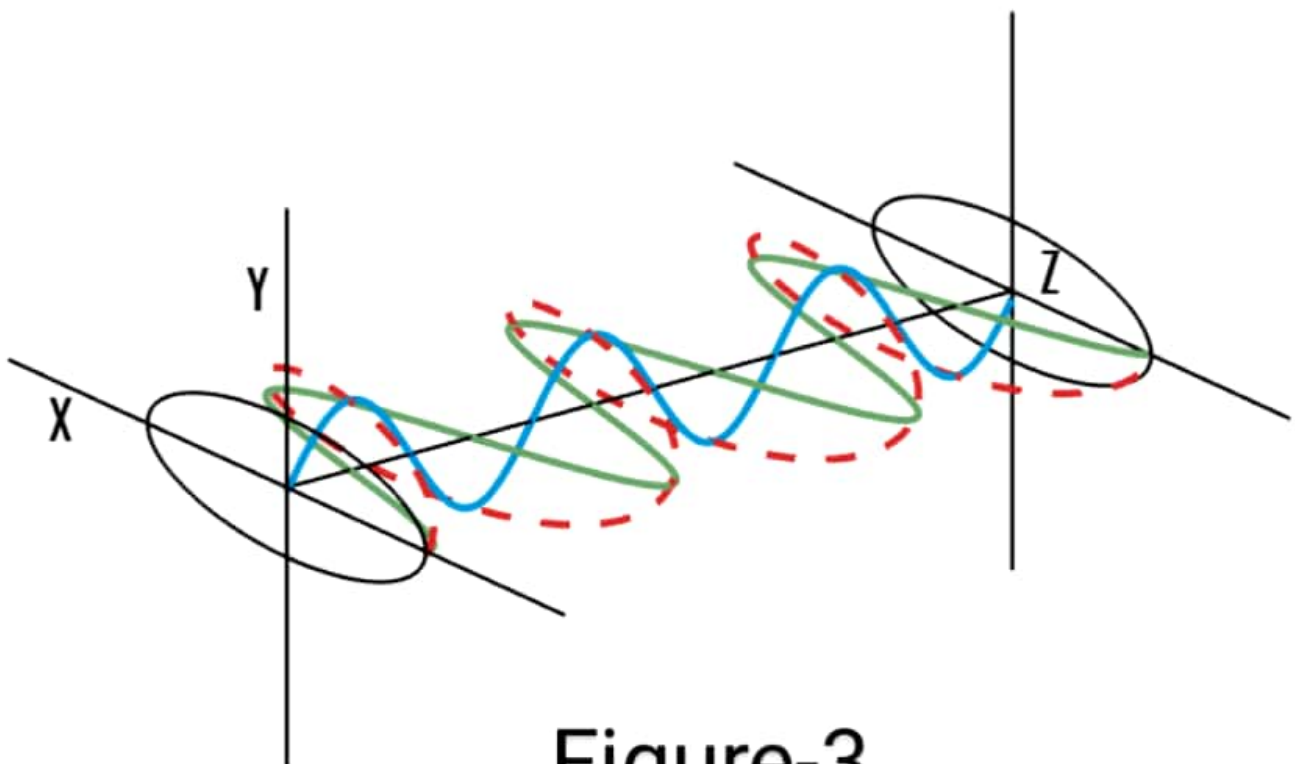
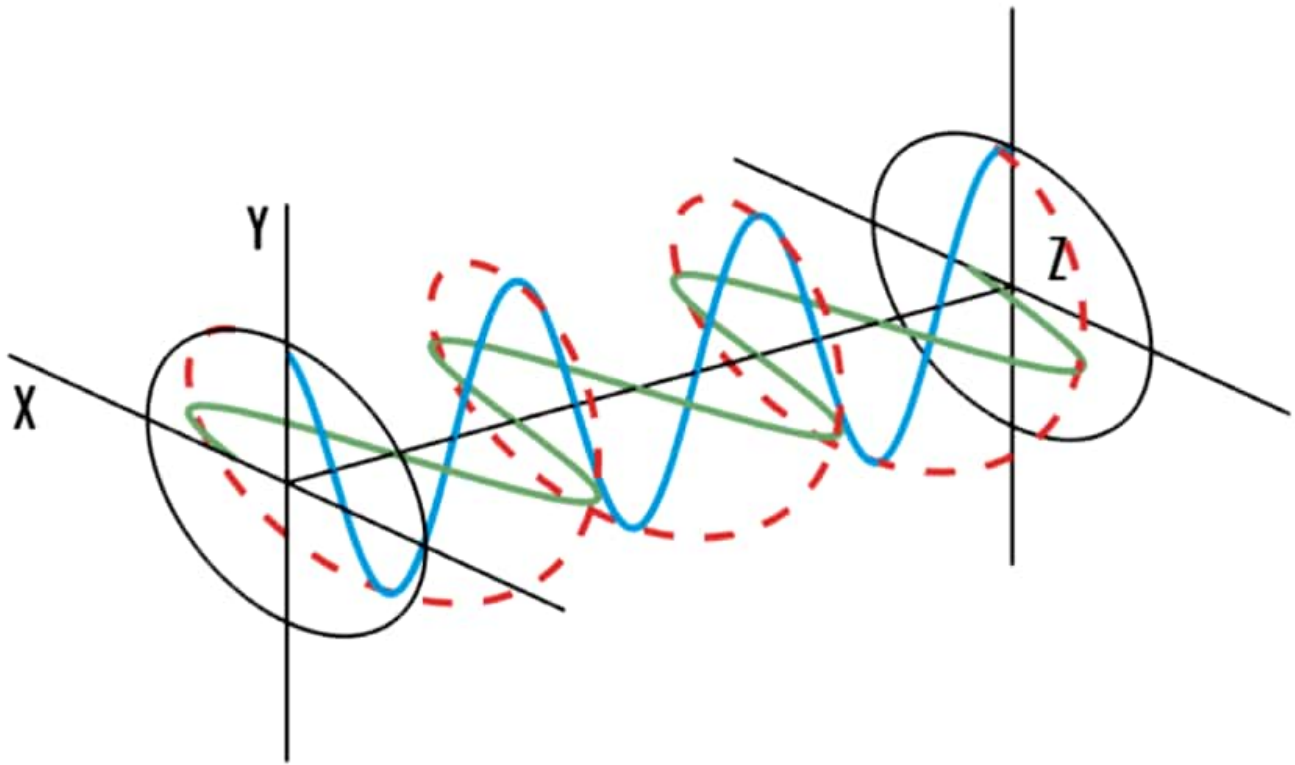


Figure-3