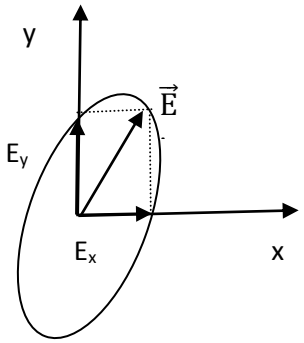
Answer on Question #65195, Physics / Optics

Show that plane polarised light and circularly polarised light are special cases of elliptically polarised light.

Solution:

Consider two coherent and plane polarized light waves. The plane of oscillation of first wave is perpendicular to the plane of oscillation of the second wave. Fluctuations in first wave are located along the axis x. Fluctuations in second wave are located along the axis y.



Projections of light vectors of these waves:

$E_x = A_1 \cos \omega t$ (1)

$E_y = A_2 \cos(\omega t + \varphi)$ (2),

where A_1 and A_2 are amplitudes, ω is cyclic frequency, φ is phase difference.

Light vector $\vec{E}$ is a result of the addition of these two oscillations. Equations (1) and (2) describe movement of light vector $\vec{E}$. This is a equation of ellipse. In this way, light is elliptically polarised.

If phase difference φ multiple of π, then ellipse turns into a straight line. In this way, light is plane polarised.

If phase difference φ equal to odd numbers $\frac{\pi}{2}$ and amplitudes A_1 and A_2 are equal to each other (A_1=A_2), then ellipse turns into a circle. In this way, light is circularly polarised.