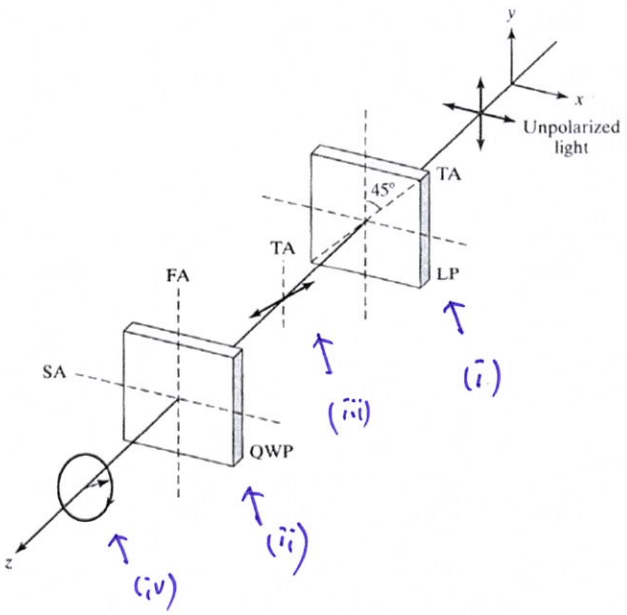
Quiz 8

EC5013 June 7, 2017

1. Using a linear polarizer and a quarter wave plate, a circularized light can be made from unpolarized light. Using Jones vectors and Jones Matrices of the following scheme prove it. Is the output RCP or LCP? Does the E_y leads or lag E_x ?



Sol). · TA 45° polarizer Jones Matrix : $\frac{1}{2}\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}$ (i)

· SA horizontal QWP : Jones Matrix : $e^{i\pi/4}\begin{bmatrix}1 & 0\\ 0 & -i\end{bmatrix}$ (ii)

$$\rightarrow \frac{1}{\sqrt{2}}\frac{1}{2}e^{i\pi/4}\begin{bmatrix}1 & 0\\ 0 & -i\end{bmatrix}\begin{bmatrix}1 & 1\\ 1 & 1\end{bmatrix}\begin{bmatrix}1\\ 1\end{bmatrix} \Rightarrow$$

← Input

$$\rightarrow \frac{1}{\sqrt{2}}e^{i\pi/4}\begin{bmatrix}1 & 0\\ 0 & -i\end{bmatrix}\begin{bmatrix}1\\ 1\end{bmatrix} = \frac{1}{\sqrt{2}}e^{i\pi/4}\begin{bmatrix}1\\ -i\end{bmatrix} \quad \text{: output}$$

(iii) (iv)

$E_x = E_{ox}e^{-i\omega t}$

$E_y = E_{oy}e^{-i(\omega t-\varepsilon)} = E_{oy}e^{-i\omega t}\,e^{i\varepsilon}$

$\varepsilon \equiv \Delta\phi = \phi_y - \phi_x < 0 \Rightarrow -i$

$\Rightarrow \epsilon = -\frac{\pi}{2}$

★ Right circularly polarized light (V)

★ E_y leads E_x. (V)