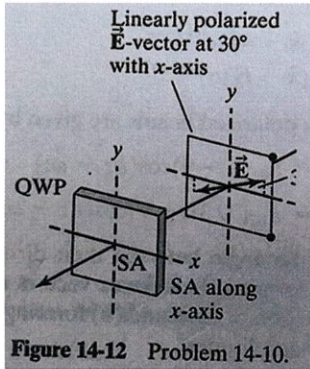


Quiz#9

EC5103

2021.06.07

Linearly polarized light with an electric field \vec{E} is inclined at -30° relative to the x-axis and is transmitted by a QWP with SA horizontal. Describe the polarization mode of the product light.



I. Linear polarizers			
TA horizontal	$\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$	TA vertical	$\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$
		TA at 45° to horizontal	$\frac{1}{2} \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$
II. Phase retarders			
		General	$\begin{bmatrix} e^{i\phi_x} & 0 \\ 0 & e^{i\phi_y} \end{bmatrix}$
QWP, SA vertical	$e^{-i\pi/4} \begin{bmatrix} 1 & 0 \\ 0 & i \end{bmatrix}$	QWP, SA horizontal	$e^{i\pi/4} \begin{bmatrix} 1 & 0 \\ 0 & -i \end{bmatrix}$
HWP, SA vertical	$e^{-i\pi/2} \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$	HWP, SA horizontal	$e^{i\pi/2} \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$
III. Rotator			
Rotator	$(\theta \rightarrow \theta + \beta)$		$\begin{bmatrix} \cos \beta & -\sin \beta \\ \sin \beta & \cos \beta \end{bmatrix}$

- Find out the Jones vector of the output fields.
- Draw the output field polarization direction in Fig. 14-12.
- Denote the output field's polarization characteristics: horizontal, elliptical, or circular.

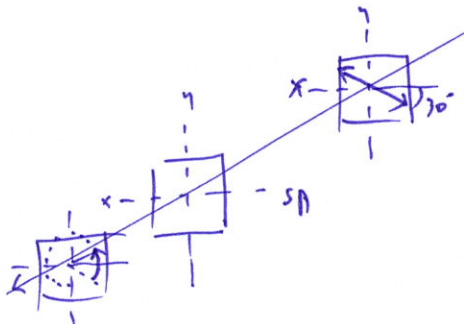
Sol.) Using Jones vector and Jones matrix notations,

$$QWP: e^{i\pi/4} \begin{bmatrix} 1 & 0 \\ 0 & -i \end{bmatrix} \times \text{Input Light: } \begin{bmatrix} \cos 30^\circ \\ -\sin 30^\circ \end{bmatrix} = \frac{1}{2} \begin{bmatrix} \sqrt{3} \\ -1 \end{bmatrix}$$

(a) The output field polarization:

$$[\text{output}] = [QWP][\text{Input}] = \frac{1}{2} e^{i\pi/4} \begin{bmatrix} 1 & 0 \\ 0 & -i \end{bmatrix} \begin{bmatrix} \sqrt{3} \\ -1 \end{bmatrix} = \frac{1}{2} e^{i\pi/4} \begin{bmatrix} \sqrt{3} \\ i \end{bmatrix}$$

(b)



(c) counterclockwise elliptical polarization.