

MA4JONES

1. The polarization may be represented by vectors

$$\begin{pmatrix} 1 \\ 0 \end{pmatrix} \text{ horizontal} \quad \begin{pmatrix} 0 \\ 1 \end{pmatrix} \text{ vertical}$$

$$\frac{1}{\sqrt{2}} \cdot \begin{pmatrix} 1 \\ 1 \end{pmatrix} \text{ +45 degrees} \quad \frac{1}{\sqrt{2}} \cdot \begin{pmatrix} 1 \\ -1 \end{pmatrix} \text{ -45 degrees}$$

$$\frac{1}{\sqrt{2}} \cdot \begin{pmatrix} 1 \\ -i \end{pmatrix} \text{ right circular} \quad \frac{1}{\sqrt{2}} \cdot \begin{pmatrix} 1 \\ i \end{pmatrix} \text{ left circular}$$

2. We present devices by matrices, which operate on the light vectors.

$$\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix} \text{ horizontal} \quad \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix} \text{ vertical}$$

$$\frac{1}{2} \cdot \begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix} \text{ 45 degrees polarized} \quad \frac{1}{2} \cdot \begin{pmatrix} 1 & -1 \\ -1 & 1 \end{pmatrix} \text{ -45 degrees polarized}$$

$$\frac{1}{2} \cdot \begin{pmatrix} 1 & -i \\ i & 1 \end{pmatrix} \text{ left circular} \quad \frac{1}{2} \cdot \begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix} \text{ right circular}$$

$$e^{\frac{i\pi}{4}} \cdot \begin{pmatrix} 1 & 0 \\ 0 & -i \end{pmatrix} \text{ Quarter wave plate fast axis vertical} \quad e^{\frac{i\pi}{4}} \cdot \begin{pmatrix} 1 & 0 \\ 0 & i \end{pmatrix} \text{ Quarter wave plate fast axis horizontal}$$

3. Application to half wave plate between crossed polarizers.

$$\begin{pmatrix} 1 & 1 \\ 1 & 1 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} 1 \\ 1 \end{pmatrix} \quad \begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

4. Application to quarter wave plate between crossed polarizers.

$$\begin{pmatrix} 1 & i \\ -i & 1 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ 0 \end{pmatrix}$$
$$\begin{pmatrix} 1 \\ -i \end{pmatrix}$$

$$\begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} 1 \\ -i \end{pmatrix}$$
$$\begin{pmatrix} 0 \\ -i \end{pmatrix}$$