

Theoretical Physics, Problem Set 11.

FS15

Hand in: 13.05.15

1. Optical devices

A vertically (V) polarized light ray successively passes

- a) a V-polarizer,
 - b) a 45° -polarizer,
 - c) an H-polarizer,
 - d) a 45° Faraday-rotator, which rotates the polarization,
 - e) a $\lambda/4$ -plate, which increases the phase of the horizontal component by $\pi/2$ relatively to the vertical one,
 - f) a -45° -polarizer.
- i) Let the incoming wave have the amplitude $\vec{E} = E \begin{pmatrix} 0 \\ 1 \end{pmatrix}$. What are the complex amplitudes \vec{E}_i after the i -th experiment, $i = \text{a, b, } \dots \text{ f}$?
- ii) What is the transmission probability for a V-photon after the i -th experiment, $i = \text{a, b, } \dots \text{ f}$?
- iii) Find permuted arrangements of the experiments with the same and with different transmission probability.

2. Bra $\langle |$ and ket $| \rangle$

Show that $(|\varphi\rangle\langle\psi|)^* = |\psi\rangle\langle\varphi|$.