MALUS' LAW **Exp-6**

Purpose

- Linear, polarized light passes through a polarization filter. Transmitted light intensity is determined as a function of the angular position of the polarization filter. The plane of polarization of a linear, polarized laser beam is to be determined. The intensity of the light transmitted by the polarization filter is to be determined as a function of the angular position of the filter and Malus' law must be verified.

Related topics

Polarisation, Polariser, Malus' law

Theory and Evaluation

Let AA' be the Polarization planes of the analyzer in Fig. ??. If linearly polarized light, the vibrating plane of which forms an angle θ with the polarization plane of the filter, impinges on the analyzer, only the part

$$E_A = E_0 \cos\theta \tag{16}$$

will be transmitted.

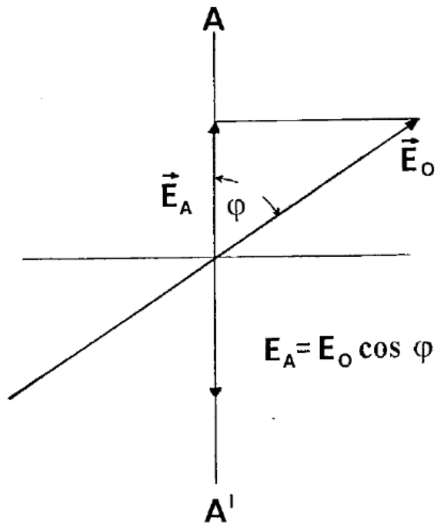

Figure 20: Geometry for the determination of transmitted light intensity [13]

As the intensity I of the light wave is proportional to the square of electric field intensity vector E, the following relation (Malus' law) is obtained [13]

$$I_A = I_0 \cos^2\theta \tag{17}$$

Set-up, Procedure

1. The experiment is set up according to Fig.21. It must be made sure that the photocell is totally illuminated when the polarization filter is set up. If the experiment is carried out in a non-darkened room, the disturbing background current io must be determined with the laser switched off and this must be taken into account during evaluation. The laser should be allowed to warm up for about 10 minutes to prevent disturbing intensity fluctuations.

Figure 21: Experimental set-up: Malus' law [13]

2. Determine the original intensity I_0 of the laser beam and record your value.
3. The polarization filter is rotated in steps of 10° between the filter positions =+/- 90° and the corresponding photocell current I (most sensitive direct current range of the digital multimeter) is determined. Record the data in Table below.