# T.C.

# GEBZE TECHNICAL UNIVERSITY

# PHYSICS DEPARTMENT

# OPTICS LABORATORY

# EXPERIMENT REPORT
# MALUS' LAW

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DATA and RESULTS

Name:_____ TA:_____

Department:_____

Partners:_____

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$I_0 =$

| $\theta$ | $I(\quad)$ *measured* | $I(\quad)$ *calculated* | $\theta$ | $I(\quad)$ *measured* | $I(\quad)$ *calculated* |
|---|---|---|---|---|---|
| 0 | | | 100 | | |
| 10 | | | 110 | | |
| 20 | | | 120 | | |
| 30 | | | 130 | | |
| 40 | | | 140 | | |
| 50 | | | 150 | | |
| 60 | | | 160 | | |
| 70 | | | 170 | | |
| 80 | | | 180 | | |
| 90 | | | | | |

1. Calculate the intensity I using equation 17 and compare with the measured values and find the percentage error, explain the source of errors.

2. Plot I versus $\theta$ graphs for experimental and theoric data and make comments.

3. Starting from its electric field componenets: $E_x = E_{x0}\cos(\omega t + \varphi_x)$ ; $E_y = E_{y0}\cos(\omega t + \varphi_y)$ derive the following general expression for polarization of light:

$$\frac{E_x^2}{E_{x0}^2} + \frac{E_y^2}{E_{y0}^2} - 2\frac{E_x}{E_{x0}}\frac{E_y}{E_{y0}}\cos\delta = \sin^2\delta$$

where $\delta = \delta_y - \delta_x$.

4. By using above polarization equation, show that (i) $\delta_x = \delta_y$ , (ii) $\delta = \pi/2$, (iii) $\delta = \pi/2$ and $E_{x0} = E_{y0}$ corresponds to linearly, elliptically and circularly polarized light respectively.

5. Define s and p–type polarization for light waves. Define Brewster's angle and propose a method to determine it.

6. What are the practical methods of producing polarized light? Explain these methods from physical fundamentals.

# DISCUSSION & CONCLUSION

1. What are the possible errors in the experiment?
2. What kind of approximations did you take into consideration while you were obtaining the physical quantities and how do they affect your results?
3. What discrepancies did you encounter between the calculated quantities and theoretical or literature values?
4. What is your overall conclusion?