Experimental Competition
27 April 2010

Student Code ☐☐☐-☐

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ANSWER SHEET

Exp. II-A：Light response of the photoconductor

(1) Define θ_P to be the relative angle between polarization axes of P1 and P2. By varying the angle θ_P from $0°$ to $180°$ in step of $5°$. Record the measured PC resistance (R) and θ_P in the data table. Transform the measured R values into conductance (C) values and record them in the data table.

θ_P	R	C		

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(2) Plot the PC conductance values as a function of θ_P on a graph paper.

ANSWER SHEET

Exp. II-B：The fraction of the linearly polarized laser light

(1) Find the maximum and minimum values of PC resistance (R_{max} and R_{min}) by rotating P1 360 °. Transform R_{max} and R_{min} into the minimum and maximum values of PC conductance C_{min} and C_{max}. Record the data in the data table.

$R_{\min}$	$R_{\max}$	$C_{\max}$	$C_{\min}$		

(2) Utilizing the conductance versus θ_P graph in Exp. II-A-(2) to determine the relative intensities J_{max} and J_{min} corresponding to C_{max} and C_{min}. Write down the result.

J_{min}= , J_{max}=

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(3) Calculate β and write down the result on the answer sheet.

$\beta =$

ANSWER SHEET

Exp. II-C： The differential quantum efficiency of the collimated laser diode

(1) Control the CLD current (I) and measure the corresponding PC resistance (R) values. Record the data in the data table. Transform your data and plot the PC conductance (C) versus CLD current on a graph paper.

I	R	C		

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(2)Based on the graph of step (1), choose a region (ΔI ~ 3 mA) centered around the maximum slope. By using the conductance versus θ_P graph in Part II-A-(2), transform and record the data of this region in the table of step (1) into the relative light intensity (J). Plot the relative light intensity (J) versus CLD current (I) in a graph paper.

(3) The maximum radiating power of the CLD is assumed to be exactly $P_{\max} = 3$ mW. Extract the maximum slope from the graph in step (3) and transfer it to the value of $G \equiv \left.\frac{\Delta P}{\Delta I}\right|_{Max}$, which is the maximum ratio of the increased amount of radiating power and the increase amount of input ampere. Write down your analysis and the calculated value G on the answer sheet. Estimate the error of G. Do not include the error of the P_{max}. Write down your analysis and the calculated value ΔG on the answer sheet.

$G = \left.\frac{\Delta P}{\Delta I}\right|_{Max} =$, $\Delta G =$

ANSWER SHEET

(4) The **Quantum Efficiency** equals the probability of one photon being generated per electron injected. From a particular bias current of the laser, a small increment of electrons injected would cause a corresponding increment of photons. The **Differential Quantum Efficiency** η is defined as the ratio of the increased number of photons and the increased number of injected electrons. Determine η of your CLD by using the value of G obtained in step (3). Write down your analysis and the calculated value η on the answer sheet. Estimate the error of η. Write down your analysis and the calculated value $\Delta\eta$ on the answer sheet. (Laser wavelength = 650 nm. Planck's constant = $6.63\times10^{-34}\ J\cdot s$. Light speed $=3.0\times10^{8}\ m/s$)

η = , $\Delta\eta$ =