Experimental Competition
27 April 2010

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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.

$ heta_{\scriptscriptstyle P}$	R	С	

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		ANSWER SHEET		ı
Plot the PC o	conductance values a	as a function of θ_n	on a graph paper.	
		w	# 8-n-1 F-n-1	

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		ANSWER S	HEET		
Exp. II-B:	The fraction of	the linearly	polarized la	aser light	
(1) Find the ma	aximum and minim	um values of P	C resistance	$(R_{max} \text{ and } R_{mi})$	n) by rotating P1
360 °. Tra	Insform R_{max} and	R_{min} into the	minimum a	nd maximum	n values of PC
conductance	e C_{min} and C_{max} . Re	cord the data in	n the data tabl	e.	
R_{\min}	R_{max}	C_{max}	C_{\min}		
(2) Utilizing th	e conductance vers	us $ heta_n$ graph i	n Exp II-A-C	2) to determir	ne the relative
	J_{max} and J_{min} corr	-			
	- min	1 000	· · · · · · · · · · · · · · · · · · ·		-
$J_{min}=$,	$J_{max}=$		
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ANSWER SHEET

(3) Calculate β	and write down the result on the answer sheet.
$\beta =$	

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		ANSWER S	SHEET	
Exp. II-C	C: The differer	ntial quantum	efficiency of the	collimated laser
	diode			
Record		able. Transform y		esistance (R) values. e PC conductance (C)
I	R	C		
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ANSWER SHEET

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ANSWER SHEET

- (2)Based on the graph of step (1), choose a region ($\Delta I \sim 3$ 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 $P_{\text{max}} = 3$ mW. Extract the maximum slope from the graph in step (3) and transfer it to the value of $G = \frac{\Delta P}{\Delta I}\Big|_{\text{Max}}$, 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.

$$G = \frac{\Delta P}{\Delta I}\Big|_{M \ a:} =$$
 , $\Delta G =$

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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 = $6.63 \times 10^{-34} J \cdot s$. Light speed = $3.0 \times 10^8 \ m/s$)

$\left \begin{array}{cccccccccccccccccccccccccccccccccccc$, $\Delta \eta =$