Semiconductor Lasers

Experiment Notice Complement

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1 Introduction

The goal of this lab is to compare the characteristics of classic laser diodes with those of vertical-cavity-surface-emmiting laser diodes (VCSELs). The proposed characteristics to study are the input current-output power curve and the emission spectrum.

This document's intent is to complete the original experiment notices by Robin Hannema and Axel Kuonen ([1] and [2]). It is not meant to replace the original notices, neither to be a complete description of the experiments, but should merely provide information about details and "traps" the experimenter may encounter.

2 Input Current - Output Power Curve

This experiment's goal is to establish the input current-output power (I/P) curve of the two kinds of laser diodes.

2.1 VCSEL I/P

As the plotter measures only voltages, a resistance of about 100Ω after the current source is needed to convert the input current to a voltage. The photodiode should also be connected to a resistance of about 1kΩ. The formula of the power is then given by:

$$P_{out} = \frac{V_0}{RR_\lambda}$$

where R is the resistance and R_λ is the photodiode's responsivity (in A/W) for the laser's wavelength. The responsivity is given on the diode's data sheet. Figure (1) shows a basic scheme of the setup.

If no current passes once the connections are done, check the polarity of the mibots.

2.2 In-plane (classic) laser diode I/P

VERY IMPORTANT: When you change the connections on the THORLAB laser socket between AG and CG, you have to push the corresponding button on the laser power supply, e.g. if AG is selected for the photodiode on the laser socket, make sure that the power supply also indicates AG in the photodiode control section (bottom right). In the case the polarities are incorrect, the power supply will indicate that the circuit is open.

3 Spectrometry

Refer to the original experiment notice for this part of the lab. Nevertheless, make sure to not saturate the spectrometer. If this is the case, incline the laser beem as to diminish the intensity received by the spectrometer.

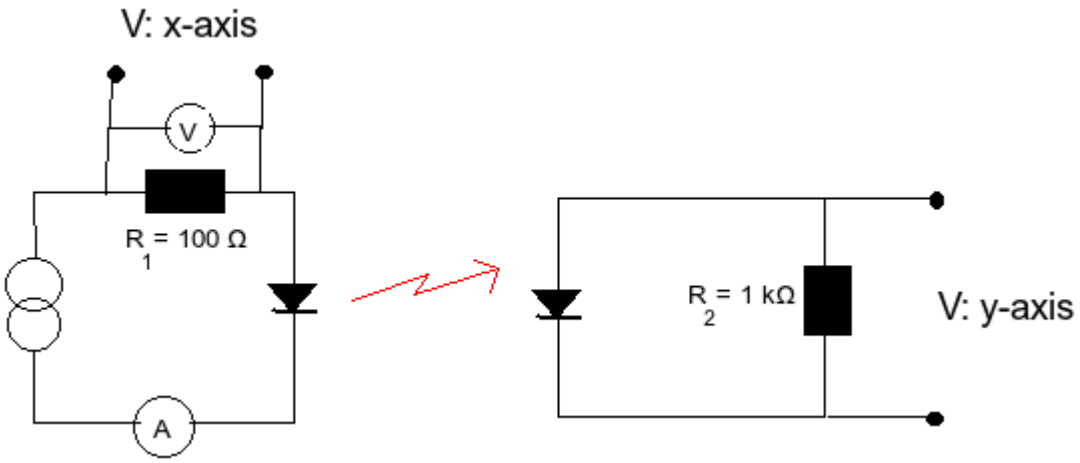

Figure 1: Basic scheme of the setup.

4 Conclusion

As a general rule, make sure to always earth yourself before manipulating diodes, they are very sensitive to static electricity!

References

[1] R. Hannema and A. Kuonen, "Notice TPA: VCSEL," September 2012.

[2] R. Hannema and A. Kuonen, "Notice TPA: Comparaison de lasers a semi-conducteurs classique et VCSEL," August 2012.