VE438: Advanced Lasers and Optics Laboratory

Laboratory manual
Lab 7: Liquid Crystal Display[1]

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[1]Edited based on the material and feedback from course instructor and previous TAs: Feng Yaming, Cao Jianjun and Shang Ce. Last Updated by Yang Jianfan(June 17, 2019)

1 Pre-lab Questions

1. Show the scheme of a LCD and explain how it works.
2. Find out the polarization dependence of light passing through liquid crystal with respect to the voltage applied.

2 Procedure

NOTICE:

- Pay attention to all lab safety instructions. Lasers used in the lab may hurt your eyes if you look into the beam directly.
- Equipment used in optics experiments such as mirrors and prisms are very fragile thus special operating rules need to be followed. Your grade for in-lab operation will be deducted for improper operations.
- Make sure the checklist below is clear before leaving the lab:
  - ☐ The experiment setup have been shown to the TA;
  - ☐ The data sheet has been checked and signed by the TA;
  - ☐ The equipment have been restored;
- TA will give a question to one of the group member to check your understanding on lab content. Grade for in-lab operation and the question will be shared among the whole group.

PART A: Phase Shift caused by Liquid Crystal

1. Build up a Mach-Zehnder interferometer;
2. Connect the liquid crystal to the function generator(Sinusoidal wave, high voltage 4V, low voltage 0V, frequency 1Hz) and check the working position on the LCD panel;
3. Put the liquid crystal in one arm of the interferometer. Make sure that the beam passes through the working position of LCD.
4. Observe the interference pattern when turn on/off the function generator.

PART B: Polarization Change caused by Liquid Crystal

1. Put the LCD between two perpendicular oriented polarizers. Make sure the beam passing through the working position of the LCD.
2. Observe the output of the second polarizer.

3 Post-lab Questions

1. What's the frame rate for a computer LCD?
2. Can we replace the liquid crystal layer between the polarizers with another optical component to control the transmission? Explain you answer.