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Generalities on the optical line

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Abstract

I present here some general notions about the optics line we developed during summer 1999. The aim of this document is to permit to everybody to quickly check the state of the optical line, turn on the lasers, or set up another line.

1 Quick start

The first task to learn is how to turn on the optics line and what to do to follow its evolution when the lasers are pumping. But, let us begin by few notions about safety since lasers may be dangerous.

1.0.1 Safety

Here is written the main procedure to follow and the main cautions to take:

- First, always check that the signs are installed on the door before turning on the lasers.
- Two couples of goggle and three spectacle eyewears are available. The operator, who is working on the optical line, *must* wear goggle, whereas the other people who are working in the same place, wear spectacle eyewears. In all the case, none of them must remove his eyewear as long as the lasers are on.
- *Never* look at directly the beam or cross the beam (dangerous for the skin), especially at high power (i.e above 15 A).

1.0.2 Turning on the lasers

The procedure is very easy and simple to remember:

- Plug and turn the key (except for the 15 W laser). The laser is then in position **standby**. Two digital screens indicate the temperature inside the cavity and the injected current.
- Near each of the screen, a knob enables to check the actual parameter (unpress) and the value you expect when you turn on the laser, the set parameter (press). Always check that the set current is not too high (better if it is 0.1 A). Table 1.1 resume the expected parameters for different lasers when running. We can always set the temperature at the beginning (i.e now) and check that the actual temperature is never more than two degrees above the set temperature (overheating).
- Once the set current and temperature are checked, you can press the **ready** button (delay of 2 or 3 s sometimes before the diode light on). Finally you can press the **On/Off** button and increase steadily the current (not too fast to avoid a too important temperature increase) up to the expected value.
- To turn off repeat the same points in the other way.

The numbers given for the laser 129 were those used at Jlab. The current given for the 15 W laser is casual since this laser is unable to emit wavelength at 795 nm.

Laser	Actual current (A)	Set temperature (°C)
135	25	20
129	27.6	28.3
15 W	25	25

Table 1: Laser configuration and settings.

1.1 Check the state of the optics line

The state of the optics line is checked thanks to three devices:

- The spectrometer S2000 from Ocean Optics enables to check if the laser emits light at the good wavelength 795 nm. However, we cannot put it directly in one of the main beams, since we are working at high power and the spectrometer saturates quickly. In order to reflect a little part of the beam, a perfect window is installed in one of the beam. The part reflected can then be used by the spectrometer. The software which permits to plot the spectras, is named OOIBase.
- If you need to check the quality of the polarization, you can always instal the motorized polarizer and the little powermeter (ILX Lightwave OMH 6720B) either in one of the main beam if the power emitted is low (7 A) or in the little part reflected at high power. The results to expect with the different waveplates are shown on the table below. The program to check

Waveplate	Polarization to expect (%)
QWP1	99.9
QWP2	98
QWP3	98

the polarization is named “polarizer.vi” on Labview. To run the stepper motor use pcRunner.

- In order to check the power emitted in a line, we can install the powermeter from Newport 1835-C directly in the beam, since it works up to 30 W.

2 Settings

2.1 How to do the settings

Here is presented the procedure to follow to set up the line. All the settings are done at low power (7 A).

- Choose an heigth for the laser fiber and let it always the same. The next step is the settings for the lens. Tilt a little the lens such as a little reflexion

occurs and move it vertically till the reflexion is at the same heigth than the fiber. Finally, turn slowly the lens mount till the reflexion is centered in the fiber.

- Set up the beamsplitter at the heigth and the good angle (shoot at nearly the center of the mirror). Be careful, don't shoot exactly at the center of the mirror. Always tilt a little it, so that we avoid a reflexion directly in the optics fiber which could be burned.
- Check that the heigth of the mirror is alright. Then move the 0° mirror such as the beam is perfectly straight. Turn the 45° mirror till the two beams shoot at the same position in the target.
- Place the polarizer (without the motor) and the little powermeter (ILX) at the end of the beam. Turn the polarizer till it reaches a minimum. In order to find the right angle for the waveplates, install successivly the differrent quarter waveplates just after the 0° mirror and turn the waveplate till you obtain a maximum. Remember that the slow axis is the one which is indicated on the waveplate and try to place it near 0° .
- Place the half waveplate just behind the beamsplitter and turn the knob of their mount till you obtain a maximum. Now that you know all the positions of the axis of the waveplates, you can place them at their right position.
- Check the polarization along each line, remove the polarizer and the powermeter, move the distance between the lens and the laser till you focus in the target, and install the perfect window with the right angle. Finally you can increase the current.

2.2 What order to set up another line

In the table following are presented the elements to order, so that we can set up the second line. The two beamsplitter mounts have to be mounted on the last

Item	Number	Code	Company	Price per item
Mirror 0°	1	TLM1-795-0-2037	CVI	330
Mirror mount	1	625-RC2	Newport	274
Beamsplitter	1	10BC16++ (special order)	Newport	\approx 600
BS mount	2	M-300-P	Newport	167
Quarter waveplate	3	MWPS-800.0-20-4	CVI	295
Half waveplate	2	MWPS-800.0-20-2	CVI	295
Rotary stage	5	RSP-2T	Newport	206

Table 2: List of the items to order.

rod. The beamsplitter is a special order where we have to specify the size 2".

To clean the optics use alcohol (methanol) and ask to the optics department for more questions. Below are cited the main contacts to Newport and CVI:

1. CVI: Natasha Vretenar, Sales Engineer,
CVI Laser Corporation
200 Dorado Place SE
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Phone: 505-296-9541 ext. 1194
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2. Newport: Robert Tesoro, Sales Engineer,
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3. Newport: Anna Wang, Technical Engineer, AWang@Newport.com