Puerto Rico Photonics Institute
UNIVERSIDAD METROPOLITANA

LABORATORY CONTENT

CERTIFICATE IN PHOTONICS & LASERS TECHNICAL SPECIALIST

OPSC 102 – LASER SYSTEMS & APPLICATIONS I

HeNe Laser Setup, Alignment, and Characterization

This laboratory requires students to set up, operate and characterize a Helium-Neon (HeNe) laser. Primary directions for performing the tasks in this laboratory come from the guide that accompanies the laser and which forms the basis of the laboratory setup. The HeNe laser has been displaced by red diode lasers for most industrial applications. Nevertheless, it presents many advantages over diode lasers for applications requiring precision focus and a highly-collimated light source, it its beam quality is generally very high. This laboratory presents students with a unique opportunity to align a laser from the very initial steps through optimum performance. They will place the laser components, align them, and establish laser operations. Following that, they will make measurements of beam characteristics such as mode profile, gain curve and spectrum.

Objectives

1. Learn how to set up the components of the HeNe laser.
2. Align and optimize the laser for highest output power.
3. Measure, analyze, and plot the output power dependence on the laser tube current.
4. Plot laser power vs. tube current
5. Use a spectrometer or wavemeter to measure the output spectrum of the laser.

Safety Precautions

Determine and follow proper laser safety practices for operating class 3B lasers.

Materials

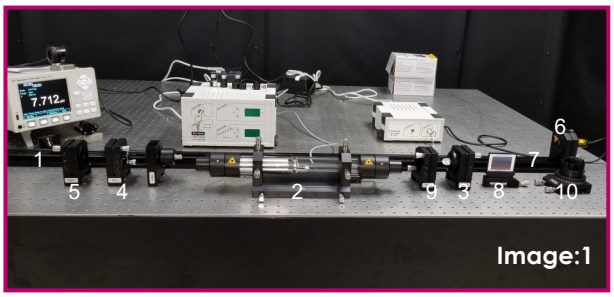

Image:1

HeNe laser system materials include: 1. 1500 mm reinforced flat rail with scale; 2. LTS1500 HeNe tube controller with photodiode amplifier; 3. Right kinematic mirror adjuster-holder on rail carrier; 4. Left kinematic mirror adjuster-holder on rail carrier; 5. Photodetector in holder on carrier with BNC coaxial cable; 6. Alignment laser (green DPSS module) in holder on rail carrier with power supply. Full Version packages add the following: 8. Littrow prism in pitch-yaw mount on rail carrier; 9. Single-mode etalon in adjustable holder on rail carrier; 10. Set of three (3) mirrors in the Basic system, five (5) mirrors in the Full version.

Procedure

After discussing the objectives and safety rules, study the system documentation to recognize the components and their functions (image 1). Subsequently, follow the assembly and alignment procedures to initiate the laboratory, as illustrated in images 2, 3, and 4. Image 1 shows the laser components laid out on the optical bench. Image 2 shows the laser during the initial alignment step. Image 3 shows the laser with the tube discharge turned on and a beam transmitted on the white card to the right. Image 4 shows one of the laser measurements: the emission spectrum.

Reference

PI MiCOS, Campus Laser Education Kit CA-1230 Nd:YAG Laser User Manual, © 2013, Eschbach, Germany.

Procedure

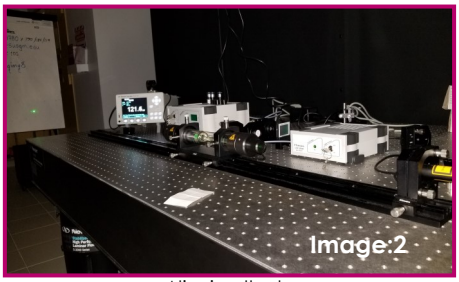
Image:2
Aligning the laser

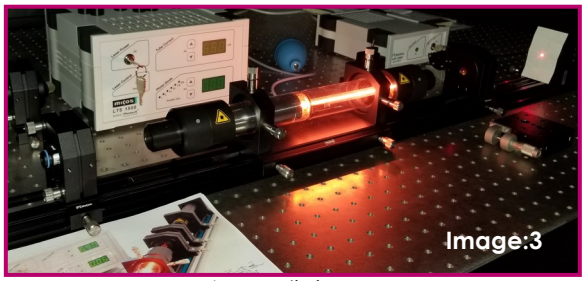
Image:3
Laser optimize

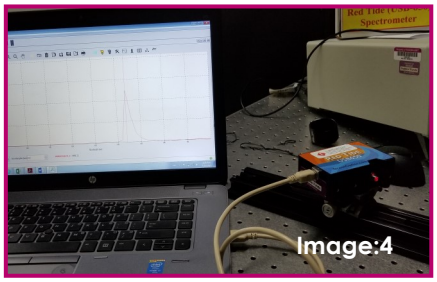
Image:4
Laser spectrum

This program is offered at the UMET Cupey campus, with laboratories at the PRPI labs in Barceloneta
Project New Horizons: Puerto Rico Lasers and Photonics Career Pathways
http://umet.suagm.edu/prpi | http://umet.suagm.edu/new_horizons

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The Certificate in Photonics & Lasers Technical Specialist is part of New Horizons: Puerto Rico Lasers and Photonics Career Pathways, a project funded by the United States Department of Labor – Employment and Training Administration – Trade Adjustment Assistance Community College and Career Training Grant (TAACCCT) Round 4. TC-26472-14-60-A-72. The program materials were created by Puerto Rico Photonics Institute (PRPI)/ UMET and do not necessarily reflect the official position of the U.S. Department of Labor.
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