Puerto Rico Photonics Institute
UNIVERSIDAD METROPOLITANA

LABORATORY CONTENT

CERTIFICATE IN PHOTONICS & LASERS TECHNICAL SPECIALIST

OPSC 102 – LASER SYSTEMS & APPLICATIONS I

Basic Nd:YAG Laser Setup and Frequency Doubler

The Nd:YAG laser is used in technology applications. For example: nanotechnology, spectroscopy, medicine, materials processing, defense and security. This for your short pulse generation, diode pumping, and a new semiorganic nonlinear crystal. This laboratory requires students to set up, operate, and characterize a PImiCos® diode-pumped Nd:YAG laser, including frequency-doubling to the green. Primary directions for performing these tasks come from the guide that accompanies this laser, and which forms the basis of the laboratory writeup. This laser demonstrates the architecture of common green laser pointers. It includes an 808 nm diode pump laser, collimating and focusing optics, Nd:YAG rod and cavity mirrors, frequency doubler, as well as both passive and active Q-switches (which will be employed in the next laboratory).

Objectives

1. Use proper laser-safety practices when operating Class 4 IR lasers.

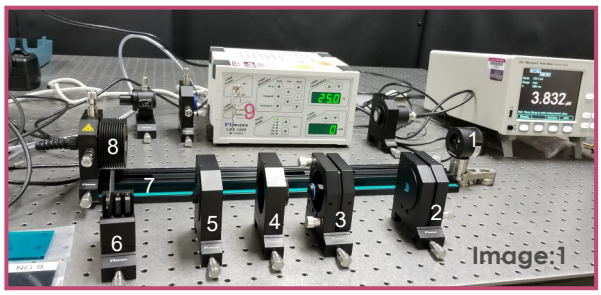
2. Use the equipment manufacturer's user manual to set up, run, and characterize a diode laser-pumped Nd:YAG laser.

3. Set up, run, and characterize a diode laser-pumped *frequency doubled* Nd:YAG laser.

Safety Precautions

Use the appropriate laser safety goggles. This prevent eye damage. For example: DO=6-7 at 1064nm, 808nm and 353 nm. Don't operate these lasers without fully understanding the safety preacutions and rules associated a Nd:YAG laser.

Materials



System the Nd. YAG Laser materials:

Parts: 1. Photo detector in holder on carrier and an adjustment target; 2. Laser mirror holder adjustable on carrier; 3. Nd:YAG crystal in holder adjustable on carrier; 4. Beam focusing in holder on carrier; 5. Beam shaping optics in holder on carrier; 6. Filter holder on carrier with filter RG1000; 7: Flat rail 500 mm with scale; 8. Laser diode 450 mW in X-Y adjustment holderand and the Part 9. Diode laser power supply LDS 1200.

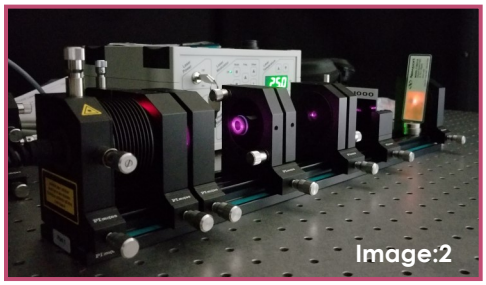
Procedure

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 infrared emission when aligned. Image 3 shows the laser frequency-doubled green emission. Image 4 shows one of the laser measurements: the laser frequency-doubled (green) output power.

Reference

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

Procedure



Nd:YAG laser in operation, showing the beam on an IR phosphor card

Nd:YAG laser setup, alignment, and characterization with Frequency Doubler

Nd:YAG laser setup, alignment, and characterization with Frequency Doubler (Power meter reading shown)

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

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.