This Laser Standard Operating Procedure has been written to aid with the safe use of the laser(s) identified below. Laser Supervisors and Laser Users must follow this procedure for each laser use.

1. LASER SAFETY CONTACTS

Laser Supervisor:	George P. Burdell	**Phone:**	404-555-5555	**Mobile:**	404-555-5556
Primary Laser User:	Buzz	**Phone:**	404-555-5557	**Mobile:**	404-555-5558
Laser Safety Officer:	Gary Spichiger	**Phone::**	404-894-8847	**Mobile:**	770-364-0824
Medical Emergencies and Fire:	Georgia Tech Police	**Phone:**	**911 or 404-894-2500**		
Note: *If 911 is dialed from a cell phone, immediately mention Georgia Tech and you will be transferred to the Georgia Tech Police. Dialing 911 from a campus phone will directly connect you with the Georgia Tech Police.*					

2. LASER DESCRIPTION

Location	
Department:	Georgia Tech Department
Building:	Georgia Tech Building
Room Number:	Building Room Number

Laser Type	Laser Model	Emission	Wavelength(s) or Wavelength Range (nm)	Power (W)	Pulse Energy (J)	Pulse Duration (sec)	Pulse Frequency (Hz)
Test Laser	Test Model	☐ CW ☒ Pulsed	1064	10	0.5	5E-9	20
		☐ CW ☐ Pulsed					
		☐ CW ☐ Pulsed					
		☐ CW ☐ Pulsed					
		☐ CW ☐ Pulsed					

☒ Area diagram attached showing laser location, beam path, emergency shutdown location(s), fire extinguisher, laser eye protection, and barriers.

Brief Description of Laser Use:
This laser setup is used to analyze small-scale surface features of various materials.

3. LASER SAFETY PROGRAM

Please refer to the Georgia Tech Laser Safety Policy Manual available at http://ehs.gatech.edu/radiation/laser/documents for the responsibilities of the Laser Supervisor and Laser User, a basic description of hazard control measures, warning sign requirements, laser safety training, and laser registration.

4. SETUP, ALIGNMENT AND OPERATING PROCEDURES

A. Alignment/Setup
(Include specific beam alignment/visualization aids to be used as well as PPE.)

1. Make sure only individuals involved in the alignment are present.
2. Ensure laser warning sign at entry includes the laser type, wavelength, and OD for the laser(s) getting ready to be used.
3. Turn on the entryway laser in use warning light.
4. Close the laser curtain at the entryway.
5. Ensure miscellaneous reflective objects are removed from the optical bench.
6. Remove any watches, jewelry, objects in shirt pockets, or lanyards that are reflective.
7. Place beam blocks/dumps at locations on the optical bench to prevent the beam from leaving the bench.
8. Wear laser eye protective at all times during the alignment. Make sure that the OD is appropriate to the wavelength for the alignment of the laser. Refer to the table in Section 5. Laser Eye Protection (LEP) for the correct alignment eyewear.
9. No laser eyewear is required for alignment if there is only a visible beam < 5 mW present.
10. Use the back of a white business card to make dim visible beams appear brighter.
11. Use phosphor cards or image converter viewers to see invisible UV and IR wavelengths. For some UV wavelengths, the back of a white business card will fluoresce and render the beam location visible.
12. Ensure laser emission shutter is closed until beam is needed.
13. Indicate the laser settings for alignment here…
14. Proceed with laser settings and steps to turn on the laser according to the manufacturer's user manual.
15. Adjust optics.
16. Routinely check for stray reflections terminate them with a laser barrier. Ensure all stray reflections and direct beams are properly terminated before high power operations.
17. Turn off laser.
18. Remove laser eyewear. Place it back in the eyewear storage location.
19. Turn off laser in use warning light.

B. Start-up and Operation
(List the basic sequential events that describe the complete operation, including when to don laser eye protection, turn on the laser warning light, laser settings, etc. The procedures shall be written for the benefit of the Laser User who must read and understand them to perform the operation safely.)

1. Turn on the entryway laser in use warning light.
2. Ensure laser warning sign at entry includes the laser type, wavelength, and OD for the laser(s) getting ready to be used.
3. Close the laser curtain at the entryway and/or place all necessary laser barriers in position.
4. Notify all individuals in the lab that the laser will be starting.
5. Ensure miscellaneous reflective objects are removed from the optical bench.
6. Remove any watches, jewelry, objects in shirt pockets, or lanyards that are reflective.
7. Place beam blocks/dumps at locations on the optical bench to prevent the beam from leaving the bench.
8. Wear laser eye protective at all times during operation when line of sight to any part of the beam path is possible. Make sure that the OD is appropriate to the wavelength for the operation of the laser. Refer to the table in Section 5. Laser Eye Protection (LEP) for the correct operation eyewear.

9. Ensure laser emission shutter is closed until beam is needed.
10. Proceed with laser settings and steps to turn on the laser according to the manufacturer's user manual.
11. Acquire data.
12. Turn off laser.
13. Remove laser eyewear. Place it back in the eyewear storage location.
14. Turn off laser in use warning light.

C. Shutdown
(Describe normal and emergency shutdown procedures)

Normal Shutdown
1. List proper sequence for safely powering down the laser…

Emergency Shutdown
1. If any emergency situation occurs that requires the beam to be turned off immediately, turn off the laser at the location marked "Emergency Shutdown for Laser" or similar. (Note: Only Class 4 lasers are required to have an emergency shutdown mechanism labeled).
2. Describe where and how to operate the emergency shutdown mechanism.

Laser Hazard Control Measures		
Check if used	**Control**	**Comments**
☐	Entryway (door) interlocks	
☒	Emergency stop/panic button	A red mushroom-type emergency stop button is connected to the laser interlock circuit. The button is located on the back, right edge of the optical bench
☒	Master switch (operated by key or computer password)	Key
☒	Beam stops/attenuators	Beam stops/beam dumps are placed at beam path turning points to prevent the beam from leaving the optical bench
☐	Beam path enclosure (e.g., light pipe)	
☐	Interlocks, filters, attenuator on collecting optics (e.g., microscopes)	
☒	Protective barriers (entryways, windows, etc.)	Laser curtains protect the entryway
☒	Warning signs	A current laser warning sign is posted outside the lab on the entry door.
☒	Warning lights	A "laser in use" light box is mounted by the door on the outside of the lab entry
☐	Other (specify):	

5. PERSONAL PROTECTIVE EQUIPMENT

Laser Eye Protection (LEP)

WEAR THIS EYEWEAR				
Eyewear Manufacturer	**Protected Wavelength(s)**	**Optical Density (OD)**	**Used for (Alignment or Normal Operation)**	**Eyewear Description**
Laser Eyewear Co.	1035-1070 nm	6	Alignment and Operation	Light gray lenses

Other Protective Equipment

Describe other protective equipment used. This might include the use of lab coats and/or sunscreen for UV laser use.

6. NON-BEAM HAZARDS OF THIS SYSTEM (CHECK ALL THAT APPLY)

Check all non-beam hazards that apply and provide a brief description of the control measure(s) implemented to control the hazard.

☒ Chemical (dyes, solvents, etc.); attach applicable Material Safety Data Sheet (MSDS)

Ethanol-based optics cleaning solutions; safety glasses, lab coat, and nitrile gloves are worn when handled

☒ Electrical (high voltage, large current, capacitors, etc.)

Access to the high voltage components inside the laser head and laser controller is not readily possible. All Laser Users are instructed to never open the laser head or the laser controller housing.

☐ Laser Generated Air Contaminants

☒ Compressed gases or cryogenic liquids

Nitrogen gas cylinders used to float the optical bench are secured to the wall

☒ Fire/ignition source

All laser beam dumps, blocks and barriers are laser rated material

☐ Plasma/blue light exposure

☐ Other (specify):

EMERGENCY PROCEDURES

In Case of Emergency

1. Stop all work in the lab.
2. Shut down laser (if it is safe to do so).
3. If there is a fire or medical emergency, call the Georgia Tech Police.
    a. Laser induced medical emergencies include severe injuries from beam exposure such as suspected eye exposure, vision loss, bleeding from the eye and burns to areas around the eyes or on the face.
4. Non-emergency injuries
    a. For guidance on where to seek treatment for non-emergency injuries, contact the Laser Safety Officer at 404-894-8847 or laser@ehs.gatech.edu.
5. Do not alter the laser setup. Analysis of the setup as it existed at the time of injury can help to find the cause of the accident and in the development of corrective actions to prevent a recurrence.
6. Call the Laser Supervisor and the Laser Safety Officer.
7. Refer to Section 10 of the Georgia Tech Laser Safety Policy Manual for accident and injury reporting requirements.

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NOTE: Ensure that the emergency contacts listed above are also posted on an emergency contact posting located at the entry to the lab. Please use the EHS "Pink Card" available at http://ehs.gatech.edu/chemical/lab-signage.

Laser User Review:

I have read and understand this procedure and have been trained on implementing its contents.

Name (Printed)	Signature	Date
1. George P. Burdell	George P. Burdell	9/26/2018
2. John Student	John Student	9/27/2018
3. Mary Student	Mary Student	9/27/2018
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Laser Lab Area Diagram