THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

Office of Laboratory Safety
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Laser Safety

Standard Operating Procedure (SOP)

Department/Laboratory: ***insert PI's Name Lab*** **Date:** **January 11, 2015**

- **This procedure shall be read and signed annually by all persons who use lasers listed in the SOP.**
- **This procedure shall be reviewed *annually* by LSO/LSS to ensure it reflects the most current conditions.**

1. LASER SAFETY CONTACTS

- Laboratory Laser Safety Supervisor (LSS): *usually the PI*

  Phone number: 202-994-####
- Deputy Laser Safety Officer: *Designated Researcher*

  Phone number: 202-994-####
- Maintenance/Repair: _____

  Phone number: _____
- Medical Emergencies: 1. call 911
  2. Notify the Laser Safety Officer of all laser-related injuries ASAP

2. LASER DESCRIPTION

Laser Type	Model	Manufacturer	Serial No	Laser Class	Wavelength (nm)	Output Energy (mJ)	Emergency Contact
N_2 laser		Spectra-Physics		3b	337	>0.175	
N_2 laser	79111	Newport		3b	337	1	
Nd:YAG		EKSPLA		4	266 355 532 1064	3 8 15 30	
Nd:YAG		PASSAT		3b	355	0.25	
OPO	Vibrant IR	OPOTEK		4	2700-3200	10	
Er:YAG		Bioptic Laser Systeme AG,		4	2940	Max 7	

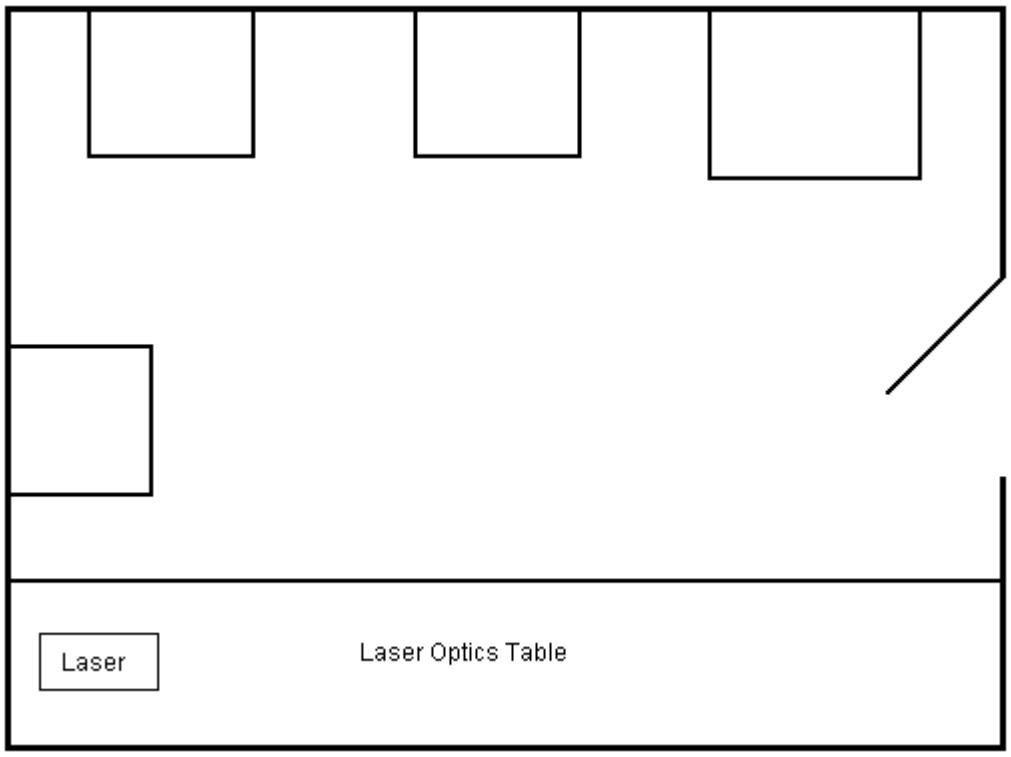
		Berlin					
Nd:YAG	Opolette 100	OPOTEK		4	2700-3100	Max 2	
N_2 laser	VSL337ND	Laser Science Inc.		3b	337	Max .4	
HeNe	HRP008-1	Thor Labs Inc.		3a	633	.8	

3. LAB ROOM Description

a. Laser location - *The George Washington University, 420 Any Hall, (e.g.: principal investigator Lab Name)*

b. Diagram of Room

Insert diagram of the room(s) here or indicate and attach to the end of the SOP
Indicate beam direction, windows, curtains, warning lights, signs and interlocks



4. LASER SAFETY PROGRAM REQUIREMENTS

See the Laser Safety Program for:

- Responsibilities of the laser operator/user, and Laser Safety Supervisor
- Laser Permit Requirements
- SOP, Training Requirements, and Interlocks
- Eyewear Requirements, including annual eyewear inspections
- Sign and Labeling Requirements
- Non-radiation Hazards

4. HAZARDS & CONTROLS

Check if applicable	HAZARD	CONTROL(S)
X	High Voltage	Only authorized serve personnel allowed access to high voltage
	Capacitors	
X	Unenclosed Beam/ Access to Beam	All persons in the room must wear personal protective equipment
	Fumes/Vapors	
X	Ultraviolet Radiation or Blue Light	Long sleeved lab coats required
X	Compressed Gases	Cylinders chained against the walls
	Hazardous Chemicals/Waste	
	Housekeeping	
	Reflective Material in Beam Path	
X	Fire	Two 15 lb ABC fire extinguishers
	Laser at eye level of person sitting or standing	
X	Infrared Lasers	Eyewear

COMMENTS:

ADDITIONAL CONTROLS

Check if applicable	CONTROL	COMMENTS
	Entryway (door) Interlocks or Controls	
X	Laser Enclosure Interlocks	
X	Laser Housing Interlocks	
	Panic Button Emergency Stop	
X	Beam Stops	Beam stop installed
X	Master Switch (operated by key or computer code)	Requires computer password to start
X	Laser Secured to Base	Mounted on optical table or breadboard

COMMENTS:

5. **PERSONAL PROTECTIVE EQUIPMENT**

A. Laser Eyewear

Wear the following eyewear when required:		
Laser Make Model	**Wavelength Attenuated (nm)**	**Optical Density (OD)**
N_2 laser	190-532	7
Nd:YAG	190-532	7
IR-OPO	2850-10600	4+
Er:YAG	2850-10600	4+
Nd:YAG	190-400 750-1064	6+ 7+
HeNe laser	625-850 nm	4+

Each set of laser protective eyewear is identified with a unique designation (name or number) and stored in a separate cabinet, drawer or container.

The following check shall be done annually. Discard unfit eyewear.

Item	**Comments**	**Date/Initial**
Adequate pairs of eyewear for all needs.		
Eyewear specific to wavelength		
OD appropriate for full range of power; alignment to power ops		

Fit snugly		
Labeled for wavelength and OD		
Free of damage excessive scratches		

What (item):	And is available from (where)	which must be worn (when):

6. **OPERATING PROCEDURES**

A. Initial preparation of lab environment for normal operation (key position, warning light on, interlock activated, identification of personnel, other)

B. Target area preparation

C. Operation procedures are as follows:

Laser Type	Manufacturer	Operation Procedure
N_2 laser	Spectra-Physics/Newport	Turn on the key (or/and switch); open the shutter
Nd:YAG	EKSPLA	Turn on Chiller #1; turn on LASER POWER (Key); wait for Temperature to reach ~27ºC; turn on "Trigger"; fire laser with control pad (Red button); increase and decrease fluence via arrows on control pad; check fluence with power meter (~1.3mJ); align laser spot to target; record time!
Nd:YAG	PASSAT	Turn on the switch; start the control software
IR-OPO	OPOTEK	Pull out the capacitor discharge switch; turn on the key, wait 15 mins for water temperature to stabilize; turn on the power switch; start the control software and wait another 30 mins for lamp warming-up
Er:YAG	Bioptic Laser Systeme AG, Berlin	Turn on power switch; enable cooling pump (panel); turn on the key; select running and triggering mode (panel); enable lasing (panel)
Nd:YAG	OPOTEK	Turn on the power switch; start the control software
N_2 laser	Laser Science Inc.	Turn on the key; open the shutter; adjust the frequency
HeNe	Thor Labs Inc.	Turn on the key; open the shutter

D. Shutdown procedures for the lasers are as follows:

Laser Type	Manufacturer	Operation Procedure
N_2 laser	Spectra-Physics/Newport	Turn off the key (or/and switch)
Nd:YAG	EKSPLA	Stop firing laser with control pad; turn "Trigger" off; turn off LASER POWER (Key); turn off Chiller #1
Nd:YAG	PASSAT	Exit the control software; turn off the switch;
IR-OPO	OPOTEK	Exit the control software; turn off the power switch; turn off the key; Push back the capacitor discharge switch
Er:YAG	Bioptic Laser Systeme AG, Berlin	Stop lasing (panel); turn off key; stop cooling pump (panel); switch off power switch
Nd:YAG	OPOTEK	Exit the control software; turn off the power switch;
N_2 laser	Laser Science Inc.	Turn the frequency to zero; close the shutter; turn off the key
HeNe	Thor Labs Inc.	Close the shutter; turn off the key

E. Special procedures (alignment, safety tests, interlock bypass, emergency, etc.)

7. **OPERATOR REVIEW (General Laser Safety Training Certificate, System specific training by Laboratory DLSO)**

I have read this procedure and understand its contents.

Name (print)	Signature	Date