Laser Standard Operating Procedure

The University of Connecticut Laser Safety Program

NOTICE: If entering data in MS Word format do not change form content

1. LASER DATA:

Type: Excimer | Wavelength(s): 308nm, 193nm | Classification: IV

Manufacturer: Lambda Physik | Model: EMG 101 MSC | Serial #: 8505E1561

Location Building: BSP | Room: G39A | UConn Laser #: Z84228

Beam Diameter: Hor. 22mm, Vert. 6-10mm | Beam Divergence:

(√) Pulsed:

Q-Switched: No | Max. Energy per pulse: 500 mJ

Pulse Duration: 4-90ns | Repetition Rate: 50 Hz MAX

( ) Continuous Wave:

Max. Power:

2. LASER SAFETY CONTACTS: ***Emergencies: 911***

Primary Laser Researcher (PLR): Dr. Richard T. Jones | Department: Physics

Campus Phone: 6-3512 | Alternative Phone: 6-5081

Department of Environmental Health & Safety Laser Safety Officer (LSO): Martin C. Grahan

Campus Phone: 860-486-3613

Notify the Laboratory PLR and University LSO of all laser-related injuries.

3. LASER SAFETY PROGRAM:

Reference the University of Connecticut Laser Safety Manual for the following:

- Responsibilities of the Laser Safety Committee, Laser Safety Officer, Primary Laser Researcher (PLR), and Laser Users.
- Training requirements.
- Class 3b and Class 4 laser registration and disposal/transfer requirements.
- Medical screening (eye examination).
- Personal Protective Equipment (PPE), including protective eyewear.
- Standard Operating Procedures (SOPs).
- Signage and labeling requirements.
- Non-radiation hazards.

4. LASER APPLICATION SUMMARY (complete a short summary of intended laser use)**:**

Our experimental nuclear physics group at the University of Connecticut is constructing a scintillating fiber hodoscope to instrument the focal plane of a high-energy photon tagging spectrometer. The tagger is used to monochromate a 12 GeV photon beam that has passed through a 20 micron thick diamond wafer. It is our intention to use the Lambda Physik EMG 101 MSC Excimer laser to thin the diamond to said thickness by means of laser ablation. The sample is mounted in a computer-controlled *XY* translation stage which holds the diamond in a precise position with respect to the beam. The laser produces a beam of 192 nm light (excimer ArF source) which is focused using a fused silica lens down to a spot on the diamond that is approximately 200 microns x 50 microns. The power in each laser pulse is monitored using a sensor and fed back to the power supply to maintain the desired power level for ablation. The translation stage moves the sample in a raster pattern across the beam, with a step size much smaller than the beam spot in order to ensure as flat as possible a cut surface.

5. HAZARDS PRESENT:

Y/N	Hazard	Comments
N	Open/accessible laser beam.	
Y	Laser operations at eye level (standing or sitting).	Sitting
Y	Ultraviolet radiation/blue light exposure.	
N	Non-beam related reflective surfaces (e.g. computer monitors, etc.) in vicinity of laser/laser beam(s).	
N	Stray beam(s)	
N	Exposed high voltage power supplies.	
N	Exposed capacitors.	
N	Collecting optics (e.g. microscopes, telescopes, etc.)	
N	Fumes/vapors.	
N	Plasma radiation.	
Y	Compressed gases.	Helium, Argon, Fluorine
Y	Hazardous chemicals.	
N	Hazardous waste.	
Y	Fire/Combustible Materials.	
Y	Researcher conducted laser maintenance (routine adjustments etc. not to include servicing).	Refill of gas reservoir
N	Poor housekeeping.	

	Other:	

6. CONTROLS:

Applicability Y/N	Control	Deficiency Y/N	Comments
Y	Entryway controls established (Engineered or Administrative).		
Y	Control Area designated and appropriately posted.		
Y	Nominal Hazard Zone (NHZ) established.		
Y	Laser master switch (key or computer code). Key removed from laser system when not in use.		
Y	Laser beam enclosure utilized.		
Y	Laser beam enclosure interlocks operational.		
Y	Laser housing cover interlocks operational.		
	Appropriate beam attenuators (stops/dumps) utilized.		
Y	Laser secured to base.		
Y	Laser associated equipment secured to base.		
	Protective barriers (e.g. curtains, partitions).		
Y	UConn Laser Safety Manual available.		
	Alignment Procedure Established		
Y	Emergency off/stop (i.e. panic button) identified.		
Y	Rapid egress and emergency access satisfactory.		
Y	Personal Protective Equipment (PPE)		
N	Non-beam hazards addressed satisfactorily.		

	Training requirements completed for all lab personnel.		

7. EYEWEAR CRITERIA: (Discard damaged or unfit eyewear!)

Eyewear Criteria	Y/N	Comments
Sufficient pairs available.	Y	
Eyewear specific to laser wavelength(s).	Y	
Optical Density (OD) appropriate for all ranges of laser energy/power operations.	Y	OD 5+ @ 190-375nm
Proper fit.	Y	
Free of damage and or excessive scratches.	Y	

LASER EYEWEAR USE CHART

For this laser:			**Wear this eyewear:**			
Type of Laser	Wavelength (nm)	Notes	Designation/ Manufacturer	Wavelength attenuated (nm)	Optical Density (OD)	Notes
Class IV	192nm		Trinity Technologies	OD 5+ @ 190 - 375nm		

8. OPERATING PROCEDURES:

- Initial preparation of lab environment and laser for normal laser operation (e.g. key position, interlock activated, outside warning signal on, identification of personnel, operational log, etc.).

- Alignment procedure:

- Target area preparation:

Once proper alignment is complete, check to ensure that nothing blocks the beam path.

- Operational procedure (power settings, Q-switched mode, pulse rate, other):

Turn the key switch to ON. Turn on the main power supply and allow the laser to warm up for ten minutes, firing the laser before the warm up timer turns off may destroy the thyratron. . Set the “Ext. trigger” push-button to the internal trigger mode. Turn the toggle switch below the digital display towards the rep rate knob and rotate until the display reads 2 Hz. Push the “HV ON’ button and turn the toggle switch below the display towards the “HV Level” knob and turn it all the way counter-clockwise setting the voltage to zero. Push the “Laser ON” button and turn the “HV Level” knob clockwise until the display reads the high voltage value which is given in the test sheet for the particular gas being used (ArF = 24-25kV) . The laser will now fire at 2 Hz and can be turned off by pressing the “Laser OFF” button located on the HV power supply.

- Shutdown procedure:

Press the “Laser OFF” button located on the HV power supply to stop the laser. Then turn off HV by pressing “HV OFF” also located on the HV power supply. Turn key switch to the off position.

- Special procedures (e.g. servicing, maintenance, safety tests, interlock bypass, etc.):

The laser gases must be refreshed which is outlined in the operational manual.

- Emergency shutdown procedure:

  Press the red “Laser OFF” button located on the HV power supply.

- Hazardous waste disposal procedures (if applicable):

  No waste will be generated during the normal operation of the laser.

9. LABORATORY PERSONNEL LISTING:

Laser Users:	**training completed**	**Laser Non-users:**	**training completed**
1. Richard T. Jones	**( )**	**1.**	**( )**
2. Brendan Pratt	**( )**	**2.**	**( )**
3. Igor Senderovich	**( )**	**3.**	**( )**
4. Jim McIntyre	**( )**	**4.**	**( )**
5. Chris Pelletier	**( )**	**5.**	**( )**
6. Mitchell Underwood	**( )**	**6.**	**( )**
7.	**( )**	**7.**	**( )**

8.	**( )**	**8.**	**( )**
9.	**( )**	**9.**	**( )**
10.	**( )**	**10.**	**( )**
11.	**( )**	**11.**	**( )**
12.	**( )**	**12.**	**( )**
13.	**( )**	**13.**	**( )**

10. LASER USER SOP REVIEW:

I have read this Standard Operating Procedure, understand the contents, and will utilize this procedure each time I use this laser or laser system.

Name (print)	Signature	Date
Brendan Pratt		
Igor Senderovich		
Jim McIntyre		
Chris Pelletier		
Mitchell Underwood		

- **This SOP shall be:**
    - **Read and understood by <u>laser users</u> prior to their initial use of the listed laser.**
    - **Reviewed by all <u>laser users</u> following any modifications to the laser or laser system that affects operational parameters.**
    - **Reviewed annually by all <u>laser users</u>.**
- **This SOP must be readily accessible and available for reference by laser users.**
- **Modifications to this SOP must be reviewed and approved by both the PLR and the LSO.**

LSO REVIEW:

( ) Approved in Full or ( ) Deficiencies Noted

Date:

Name:

Signature:

PLR REVIEW:

Date:

Name:

Signature: