Laser Standard Operating Procedure Template

Principal Investigator or responsible party:	
Laser:	**Date:**
Department/Division:	**Location:**

LASER SAFETY CONTACTS

Laser Safety Officer _____ Phone:_____
Maintenance/Repair _____ Phone:_____
Medical Emergencies _____ Phone:_____

1. LASER DESCRIPTION

- Location of laser or laser system (site, building, room).
- Diagram of area layout (attachment).
- Description of each laser, including classification, lasing medium (dye), beam characteristics (divergence, aperture diameter, pulse length, repetition rate, and maximum output, as applicable).
- Purpose/application of beam(s).

2. LASER SAFETY PROGRAM

Clearly outline each category below:

- Responsibilities of the laser operator(s).
- Laser Training Requirements.
- Laser Registration Requirements.
- Engineering Controls.
- Personnel Protective Equipment Requirements.
- Disposal Requirements.

3. OPERATING PROCEDURES

- Initial preparation of laboratory environment for normal operation (key position, outside status indicator on, interlock activated, warning sign posted, personnel protective equipment available, other).
- Target area preparation.
- Special Procedures (alignment, safety tests, maintenance tests, other).
- Operating procedures (power settings, Q-switch mode, pulse rate, other) are as follow.
- Shutdown procedures.

4. CONTROL MEASURES

LASER/LASER SYSTEM CONTROLS		
Check if applicable	**CONTROL**	**COMMENTS**
[ ]	Entryway (door) interlocks or controls	
[ ]	Laser enclosure interlocks	
[ ]	Laser housing Interlocks	
[ ]	Emergency stop/panic button	
[ ]	Master switch (operated by key or code)	
[ ]	Laser secured to base	
[ ]	Beam stops/beam attenuators	
[ ]	Protective barriers	
[ ]	Warning signs	
[ ]	Reference to equipment manual	
[ ]	Extra eyewear available	

COMMENTS:

HAZARDS AND CONTROLS		
Check if applicable	**HAZARD**	**CONTROLS**
[ ]	Access to direct or scattered radiation.	
[ ]	Unenclosed beam.	
[ ]	Laser at eye level of person sitting or standing.	
[ ]	Ultraviolet radiation/blue light exposure.	
[ ]	Reflective material in beam path.	
[ ]	Hazardous materials/waste (dyes, solvents, other).	
[ ]	Fumes/vapors.	
[ ]	Electrical.	
[ ]	Capacitors.	
[ ]	Compressed gases.	
[ ]	Fire.	
[ ]	Housekeeping.	
[ ]	Trip hazard.	

COMMENTS:

5. **PERSONNEL PROTECTIVE EQUIPMENT**

A. Eyewear

LASER EYEWEAR					
For this laser….			**…Wear this eyewear**		
Make & Model#	Type	Wavelength(s) (nm)	Wavelength(s) Attenuated (nm)	Optical Density(OD)	Mfg.
Example	Nd:YAG	1064,532	1064,532	5+	UVEX

Use this equation to determine the proper optical density for eyewear in your laser area.

$$OD = \log_{10} \frac{H_0}{MPE}$$

H_0 = Anticipated worst-case exposure (J/cm^2 or W/cm^2)
MPE = Maximum permissible exposure level expressed in the same units as H_0

Example:

The minimum optical density at a 0.514 μm argon laser wavelength for a 600-second direct intrabeam exposure to the 5-watt maximum laser output can be determined as follows:

Where:

H_0 = [Power/Area] = $\phi/A = 4\phi/\pi d^2$
= $[(4)(5.0)/\pi(0.7)^2]$
= $12.99\ W/cm^2$

Computing the worst-case exposure H_0:

Power = 5 Watts
MPE = *16.7 W/cm^2 (using 600-second criterion)
Distance = 7 mm (worst-case pupil size)

Substitution gives:

$OD = \log_{10}[(12.99)/(16.7 \times 10^{-6})]$
$= 5.9$

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* From Table III: 6-6 MPE Values http://www.safety.vanderbilt.edu/pdf/laser_exposure_limits.pdf

B. Establishment of Nominal Hazard Zone (NHZ)

The NHZ relates to the space within which the level of direct, reflected, or scattered radiation during normal operation exceeds the appropriate MPE. Exposure levels beyond the NHZ are below the appropriate MPE level, thus no control measures are needed outside the NHZ. The NHZ may be calculated using the following formula:

$$NHZ = \frac{1}{\phi}\left[\left(\frac{4\Phi}{\pi * MPE}\right)^{1/2} - a\right]$$

Where is the emergent beam divergence measured in radians; is the radiant power (total radiant power for continuous wave lasers or average radiant power of a pulsed laser) measured in watts; and a is the diameter of the emergent laser beam, in centimeters.

Other Protective Equipment Required within Nominal Hazard Zone

ITEM	LOCATION	USAGE CONDITION
_____	_____	_____
_____	_____	_____

6. OPERATOR REVIEW

I have read and understood this procedure and its contents, and agree to follow this procedure each time I use the laser or laser system.

Name (print)	Signature	Date
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____