VUMC Laser Inventory Form

Instructions:

1) Provide all applicable information requested in this form

2) Save and submit this form using the button below or manually save and send to radsafety@vumc.org

Name: _____ VUnetID: _____

Vanderbilt Email Address: _____ Department: _____

Do you work with lasers in your department? _____

Which PI's/Laboratories possess the lasers? _____

How many lasers do the PI's/Laboratories possess? _____

How many lasers are actively being used? _____

How many lasers are class 3B or 4? (see laser classification scheme below and reference tables on the following page)

_____

Approximately how many operators are using each laser? _____

Please fill in the following information for Class 3b and 4 lasers:

Laser Location (Building & Room No.)	Laboratory	Class 3B	Class 4
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐
		☐	☐

Comments or additional information:

Laser Classification Scheme

Type	Risk or Injury	Risk Level
Class 1	Low energy levels, not hazardous to skin or eyes & safe during normal operation.	Low
Class 1M	Same as Class 1 but may cause injury if viewed with an optical instrument.	Low - Medium
Class 2	Visible wavelengths only, blink response provides eye safety. Will not burn skin.	Low – Medium
Class 2M	Same as Class 2 but can be hazardous if viewed through optical instruments.	Medium
Class 3R	Transitional zone between safe and hazardous lasers. Direct viewing of beam may be hazardous as well as certain specular reflections.	Medium - High
Class 3b	Direct viewing of specular reflections can cause eye injury. Diffuse reflections are usually safe.	High
Class 4	Can cause severe skin and eye injury through any direct exposure, specular reflections and sometimes from diffuse reflections. Often a fire hazard as well.	Extreme

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Table C1 & C2 show examples of lasers in various hazard classes from the American National Standards Institute (ANSI) Z136.1. [2014]

Table C1. Typical Laser Classification – Continuous Wave (CW) Point Source Lasers

Wavelength (nm)	Laser Type	Wavelength (nm)	Class 1 [a] (W)	Class 2 (W)	Class 3 [b] (W)	Class 4 (W)
Ultraviolet						
180 to 280	Neodymium: YAG (Quadrupled)	266	$\leq 9.6 \times 10^{-9}$ for 8 hours	None	> Class 1 but ≤ 0.5	> 0.5
	Argon	275				
Ultraviolet						
315 to 400	Helium-Cadmium	325	$\leq 3.2 \times 10^{-6}$	None	> Class 1 but ≤ 0.5	> 0.5
	Argon	351, 363, 350.7,				
	Krypton	356.4				
Visible						
400 to 700	Helium-Cadmium	441.6 only	$\leq 4 \times 10^{-5}$	> Class 1 but $\leq 1 \times 10^{-3}$	> Class 2 but ≤ 0.5	> 0.5
	Argon (Visible)	457	$\leq 5 \times 10^{-5}$			
		476	$\leq 1.3 \times 10^{-4}$			
		488	$\leq 2 \times 10^{-4}$			
		514				
	Krypton	530	$\leq 2.2 \times 10^{-4}$			
	Neodymium: YAG (Doubled)	532				
	Helium-Neon	543				
		400 - 500	$\leq 0.4\ C_B \times 10^{-4}$			
	Dye	460 - 500				
	Helium-Selenium		$\leq 4 \times 10^{-4}$			
	Dye	550 - 700				
	Helium-Neon	632				
	InGaAlP	670				
	Ti:Sapphire	350 –500				
	Krypton	647.1, 676.4				
Near Infrared	GaAlAs	780	$\leq 5.6 \times 10^{-4}$	None	> Class 1 but ≤ 0.5	> 0.5
700 to 1400	GaAlAs	850	$\leq 7.7 \times 10^{-4}$			
	GaAs	905	$\leq 1.0 \times 10^{-3}$			
	Neodymium: YAG	1064	$\leq 1.9 \times 10^{-3}$			
	Helium-Neon	1080	$\leq 1.9 \times 10^{-3}$			
		1152	$\leq 2.1 \times 10^{-3}$			
	InGaAsP	1310	≤ 0.03			
	Nd:YAG	1319	≤ 0.025			
Far Infrared	InGaAsP	1550	$\leq 9.6 \times 10^{-3}$			
1400 to 10^3 µm	Holmium	2100				
	Erbium	2940				
	Hydrogen Fluoride	2600 - 3000				
	Helium-Neon	3.390 µm only				
	Carbon Monoxide	5.000 - 5.500 µm				
	Carbon Dioxide	10.6 µm				
	Water Vapor	118 µm	$\leq 9.5 \times 10^{-2}$			
	Hydrogen Cyanide	337 µm				

[a] Assumes no mechanical or electrical design incorporated into laser system to prevent exposures from lasting up to T_{max} = 8 hours (one workday); otherwise the Class 1 AEL could be larger than tabulated.

[b] See 3.3.3.1 for definition of Class 3R.

Table C2. Typical Laser Classification – Single-Pulse Point Source Lasers

Wavelength (nm)	Laser Type	Wavelength (nm)	Pulse Duration (s)	Class 1 (J)	Class 3B (J)	Class 4 (J)
Ultraviolet						
180 to 400	Excimer (ArF)	193	20×10^{-9}	$\leq 2.4 \times 10^{-5}$	> Class 1 but ≤ 0.125	> 0.125
	Excimer (KrF)	248	20×10^{-9}	$\leq 2.4 \times 10^{-5}$		
	Neodymium: YAG Q-switched (Quadrupled)	266	20×10^{-9}	$\leq 2.4 \times 10^{-5}$		
	Excimer (XeCl)	308	20×10^{-9}	$\leq 5.3 \times 10^{-5}$		
	Nitrogen	337	20×10^{-9}	$\leq 5.3 \times 10^{-5}$		
	Excimer (XeF)	351	20×10^{-9}	$\leq 5.3 \times 10^{-5}$		
Visible						
400 to 700	Rhodamine 6G (Dye Laser)	450-650	1×10^{-6}	$\leq 7.7 \times 10^{-8}$	> Class 1 but ≤ 0.03	> 0.03
	Copper Vapor	510, 578	2.5×10^{-9}			
	Neodymium: YAG (Doubled) (Q-switched)	532	20×10^{-9}			
	Ruby (Q-switched)	694.3	20×10^{-9}			
	Ruby (Long Pulse)	694.3	1×10^{-3}	$\leq 3.9 \times 10^{-6}$		
Near Infrared						
700 to 1400	Ti: Sapphire	700-1000	6×10^{-6}	$\leq 8.4 \times 10^{-8}$		
	Alexandrite	720-800	1×10^{-4}	$\leq 7.6 \times 10^{-7}$	> Class 1 but ≤ 0.033	> 0.033[a]
	Neodymium: YAG (Q-switched)	1064	20×10^{-9}	$\leq 7.7 \times 10^{-7}$	> Class 1 but ≤ 0.125	> 0.125
Far Infrared	Erbium: Glass	1540	10×10^{-9}	$\leq 7.9 \times 10^{-3}$	> Class 1 but ≤ 0.125	> 0.125
1400 to 10^3 µm	Co: Magnesium-Fluoride	1800-2500	80×10^{-6}	$\leq 7.9 \times 10^{-4}$		
	Holmium	2100	250×10^{-6}	$\leq 7.9 \times 10^{-4}$		
	Hydrogen Fluoride	2600-3000	0.4×10^{-6}	$\leq 1.1 \times 10^{-4}$		
	Erbium	2940	250×10^{-6}	$\leq 5.6 \times 10^{-4}$		
	Carbon Dioxide	10.6 µm	100×10^{-9}	$\leq 7.9 \times 10^{-5}$		
	Carbon Dioxide	10.6 µm	1×10^{-3}	$\leq 7.9 \times 10^{-4}$		

[a] Class 3B AEL varies from 0.033 J to 0.048 J corresponding to wavelengths that vary from 720 nm to 800 nm.