Standard Operating Procedure
Room XXX Stanley Hall
Fiber Array Package (FAP) Coherent Laser System
(60 Watt CW, 795nm)
10/31/2007.V1

I. Purpose
This Standard Operating Procedure (SOP) outlines requirements to be considered by an authorized user of the FAP Coherent Laser System as well as describes the normal operation of the laser and any hazards that may be encountered during normal operation. Finally, the SOP explains how to minimize any hazards and how to respond in an emergency situation.

II. Personnel
A. Authorized Personnel: The FAP Coherent Laser System may be operated only by authorized personnel who are fully cognizant of all safety issues involved in the operation of such a device. These personnel are to ensure that the laser is only operated in the manner laid out in this document. To become an authorized user, one must:

1. Complete Environment, Health & Safety (EH&S) Laser Safety Training
2. Take a baseline ophthalmologic examination
3. Read and fully understand this SOP
4. Receive training on the FAP Coherent Laser System by an authorized user.
5. Sign the authorized user sheet to affirm that the above steps have been completed.

B. Unauthorized personnel: No unauthorized personnel may enter Room XXX Stanley during laser alignment procedure unless accompanied by an authorized user. All visitors must be briefed on proper safety protocol and must wear appropriate laser protective eyewear located on the premises.

III. Hazards
A. Laser Hazards: The FAP Coherent Laser System is a class 4 laser. Severe eye damage (including blindness) and skin damage can result from direct beam and specular reflections. Eye damage can also result from diffuse reflections.

B. Electrical Hazards: electrical shock or electrocution could result from direct contact with high voltage. No further electrical hazard other than the 110V input power.

C. Chemical: No.
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D. Pressure Hazards: No.

E. Other: No.

IV. Hazard Controls

A. Lasers
1. Only authorized personnel will operate lasers.
2. The laboratory doors will be closed when the laser is operating, and curtain will be drawn.
3. During alignments, the laboratory doors will be closed and a sign posted stating
5. Unauthorized personnel will be only allowed entry to the laboratory during
6. laser operation with the supervision of an authorized user under the terms specified in section 2.
7. Laser protective eyewear for sufficient protection against 795 nm are available and are located at the front entrance and on the laser table. Laser protective eyewear must always be worn when the laser is in operation. No filters or other optics will provide suitable protection; use only laser safety protective eyewear.
8. Specular and diffuse reflections will be controlled using apertures, beam housings and enclosures, and optics. All of these control methods must be in place during normal operation.
9. Laser alignment must be performed only by following the steps outlined in the alignment procedure supplement or alignment section.
10. Perform physical surveys to determine if there are stray beams (specular or diffuse) emanating from the laser head and its optics, and then document the beam surveys in the polarizer logbook noting the location of stray beams and the measures taken to control them.
11. If the beam path must be changed significantly by relocating the laser or optics, all users must be notified of the change.
12. The same precautions that are taken for safe operation of the laser must also be followed when adjusting any of the optics in use with the apparatus.
13. When a new principal researcher takes over use of the laser system, the new user must conduct a survey for unwanted stray or diffuse beams.

B. Electrical (No customer serviceable electric parts on this laser.)

C. Chemical No.

D. Pressure No.

E. Other No.
V. Normal Operation

1. Complete the “check-in” portion of the checklist included in this document as Appendix A. The checklist serves to confirm that all basic systems are operating within expected parameters and that basic safety mechanisms are in place. The laser run log is a set of forms adjacent to the experimental set up and is used to ascertain the current state of the laser. Log all use and add individual notes as necessary. Also, replacement of optics and other routine maintenance should be noted in the log. Once the checklist is complete, the laser may be turned on.

2. Turn on the main power switch (i.e. switch needs to be placed in the “on position”), which is integral to the line cord power entry module on the rear panel. This switch need not be turned off and can be left in the “on position” for extended periods of time. Furthermore, main power can be turned on with a key-switch located in the bottom left corner of the front panel (i.e. the key-switch has to be turned to the “on state”).

3. Depressing the front panel mounted laser on/off switch will place the system in the “laser enabled” operational state, and the laser on indicator LEDs start to blink slowly. After a short period of time the blinking speeds up and the system is ready to go to “laser on” operational state. Depressing the laser on/off switch again will place the system in the “laser on” state, in which laser emission will generated.

4. System alignment. See the attached alignment procedure supplement/alignment section for details.

5. Shutdown laser system. The laser emission is turned off using the laser on/off switch. The unit can then be left in the “power on” state. However, we recommend placing the unit in the “off” operational state if no emission is required for several hours (for example, overnight). Turing the key switch to the “0” position will place the unit in the “off” operational state.

6. Record any change of settings and any anomalous behavior of the laser in the polarizer logbook.

VI. Emergency Procedures

A. Laser accidents: Follow the steps outlined in the Procedure for Laser Accidents in Appendix B.

B. Power outage: If there is a power outage, turn off the laser to avoid a hazardous situation when power is restored.
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Authorized Users
I have read and understood the Standard Operating Procedures for FAP Coherent Laser System

<table>
<thead>
<tr>
<th>Name (print)</th>
<th>Signature</th>
<th>Date</th>
<th>PI Initial</th>
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Appendix A – Checklist for using FAP Coherent Laser System

- Ensure that all beam enclosures are placed properly in the work area.
- Door is closed and all personnel are wearing the proper safety eyewear.

- Inspect the apparatus for any blockages or apparent misalignment.
- Confirm that the beam path is set up to hit the sample properly.
- Record any anomalous behavior in the logbook.
Appendix B – Procedure for Laser Accidents

In the event of a laser accident, follow the procedure below:

1. Ensure that the laser is shut off. In the event of an emergency, a large red emergency turn-off switch is provided on the unit’s front panel. Depressing this switch will immediately place the unit in the “off” operational state, terminating the laser emission. After use the emergency “off” switch must be reset by twisting it, which will cause the switch to pop out to its arm position.

2. Provide for the safety of the personnel (first aid, evacuation, etc.) as needed. Note — if an eye injury is suspected, have the injured person keep his/her head upright and still to reduce bleeding in the eye. A physician should evaluate laser injuries as soon as possible.

3. Obtain medical assistance for anyone who may be injured.
   - UC Optometry Clinic (Normal Hours) 642-2020
   - UC Optometry Clinic (24 Hour Emergencies) 642-0992
   - University Health Services (Emergency) 642-3188
   - Ambulance (urgent medical care) 9-911

4. If there is a fire, pull the alarm, and contact the fire department by calling 9-911. Do not fight the fire unless it is very small and you have been trained in fire fighting techniques.

5. Inform the Office of Environment Health, & Safety (EH&S) as soon as possible.
   During normal working hours, call the following:
   - EH&S Office 642-3073
   - Laser Safety Officer 643-9243
   - EH&S Health & Safety Manager 642-3073
   After normal working hours, call 642-6760 to contact the UC Police Department who can contact the above using their emergency call list.

6. Inform Alex Pines and the current group laser safety officer (name) (phone number) as soon as possible. If there is an injury, Alex Pines will need to submit a report of injury to the Worker’s Compensation Office.

7. After the incident, do not resume use of the laser system until the Non-Ionizing Radiation Safety Committee has reviewed the incident and approved the resumption of research.
Appendix C - Alignment Procedures

A. Procedural Considerations

1. To reduce accidental reflections, watches, rings, dangling badges, and other reflective jewelry must be taken off before any alignment activity begins.
2. Use of non-reflective tools should be considered.
3. Access to the room/area is limited to authorized personnel only.
4. Perform alignments with a colleague or “buddy.”
5. Review alignment procedures.
6. Identify equipment and materials necessary to perform alignment.
7. Remove all unnecessary equipment, tools, and combustible materials to minimize the possibility of stray reflections and non-beam accidents.
8. Persons conducting the alignment have been authorized by the PI.
9. A ‘Notice” sign is posted at the entrance when temporary laser control areas are set up or unusual conditions warrant additional hazard information.

B. External Optics

1. Ensure that all users are wearing laser protective eyewear, warning signs are posted, and laboratory doors are closed. Check that the laser path will be blocked.
2. Place the laser pointer on the first mount right in front of the laser head.
3. Adjust the position of the laser point so that its output goes through the first two irises.
4. Align the optics to ensure the beam goes through the end photodiodes.
5. Remove the laser pointer. Rough alignment accomplished.
6. Turn on the key on the laser power supply.
7. Turn to current mode; set the start-up current at 26 mA (low power).
8. Press the laser on/off button to turn on the laser.
9. Put on IR viewer. Hold a business card in hand to trace the beam.
10. Block the beam path after the irises. Adjust the mirrors so that the laser goes through the center line of the irises, as well as the center of mirrors.
11. Put a beam block after the first polarizer. Remove the previous beam block.
12. Continue alignment until the laser goes into the photodiodes.
13. Check for stray beams/unwanted reflections at each step and again after completing all alignment steps.
14. Enclose the whole optical path, including the laser head.
15. Turn off laser. Switch to power mode if desired.
16. Record any modifications on the optics and anomalous behavior of the laser in the polarizer logbook.