1 Objective:

This Standard Operation Procedure states how the femtosecond laser system should be operated.

2 Responsibilities:

2.1 Director / HOD / PI

The Director/HOD/PI has overall responsibility for ensuring the system is established for the safe use of the femtosecond laser system.

2.2 Designated Person

There shall be a designated person to oversee the correct operation procedures of the femtosecond laser system.

a. The person shall periodically inspect the femtosecond laser system to ensure its operational performance.
b. He/she will make necessary arrangements for repair works of the femtosecond laser system.
c. He/she will report to the Director/HOD/PI unsafe practice by the users of the femtosecond laser system.

2.3 Staff/ Research personnel

a. Users shall report any injuries, defects or breakdowns to their supervisor.

3 Procedures

1. Start the Verdi-10 pump laser

A. Daily operation:

1) Turn on water chiller
2) Set the keyswitch on Verdi controller from “Standby” to “Laser Enable”
3) Open the Verdi shutter, after a minute or two there will be green light emitting out from the Verdi cavity

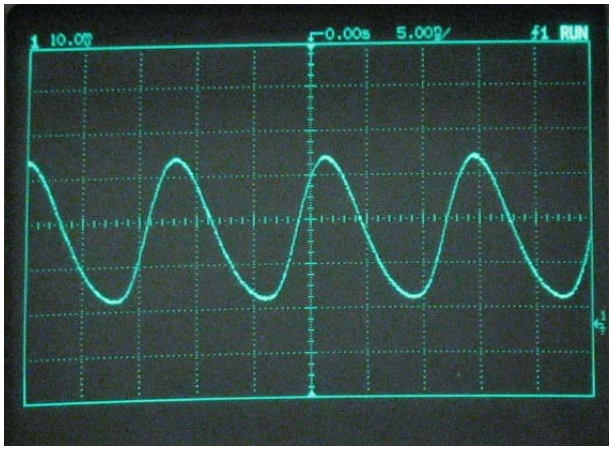
B. Cold start:

1) Set the keyswitch on Verdi controller to “Standby” position
2) Set the power switch on the power supply rear panel of Verdi controller to “on”. The AC power and LASER EMISSION indicators will light. The power supply display will then indicate “System Warming up”
3) Turn on the chiller
4) Verify the chiller water temperature is set to 18°C
5) Wait about 30 minutes before the Verdi works properly
6) Set the keyswitch on Verdi controller from “Standby” to “Laser Enable”

7) Open the Verdi shutter, after a minute or two there will be green light emitting out from the Verdi cavity

2. Generation of femtosecond pulses with MIRA-900

Turn on the Mira controller and set the CW/ML/β-Lock switch to ML. Check through oscilloscope whether it's modelocked. A modelocked signal looks like this:



And on Mira controller no CW signal is indicated:

In the case when it's not modelocked, do the following:

2.1 Maximize the power:

1) Set the CW/ML/β-Lock switch on Mira controller to CW
2) 

3) Close up the output slit width until the CW signal on the controller is sufficiently small but don't fully close the slit
4) While monitoring the signal strength on the Mira controller, adjust the horizontal and vertical control of the mirror, as well as the output slit position control to maximize the laser power
5) Fully open up the output slit

2.2 Mode-locking

1) Set the CW/ML/β-Lock switch on Mira controller to ML
2) Decrease the output slit opening slowly until the modelocking signal appears
3) Adjust the prism while monitoring the oscilloscope to find the optimized waveform

2.3 Change centre wavelength (optional)

1) To move to longer wavelength, rotate wavelength control counterclockwise and prism knob clockwise
2) To move to shorter wavelength, rotate wavelength control clockwise and prism knob counterclockwise

2.4 Change pulse width (optional)

1) To set a shorter wavelength, rotate the prism knob counterclockwise. Spectrum can be monitored through spectrometer. Pulse width will get shorter and shorter before modelocking is lost (linewidth will get larger and larger)
2) To set a longer wavelength, rotate the prism knob clockwise. Spectrum can be monitored through spectrometer. Pulse width will get larger and larger before modelocking is lost (linewidth will get smaller and smaller)

3. Stop the Verdi-10 pump laser

A. Daily operation:

1) Close the Verdi shutter
2) Set the keyswitch on Verdi controller from “Laser Enable” to “Standby”
3) Standby the water chiller

B. Complete shutdown:

1) Set the keyswitch on Verdi controller from “Laser Enable” to “Standby”
2) Access and select the LBO Settings submenu. Press the MENU SELECT pushbutton to start the LBO cool-down cycle.
3) During the cool-down cycle, the LBO temperature can be monitored from the main screen or the LBO Settings submenu. When the LBO temperature decreases below 40°C, turn the AC power switch on the power supply rear panel to the OFF position.
4) Turn off the water chiller.

4 References:

Manuals of Verdi-10 and Mira-900 kept in the OMAD lab.

5 Risks and Controls:

1. Laser light shining directly into eyes can cause permanent blindness. Therefore, the optical setup is surrounded and protected by black non-

reflective boards. During experiment, all users are required to wear safety laser goggles.

2. Fire risks. The unfocused laser spot from the laser can ignite paper, cloth, etc or cause skin burn. Therefore, the laser shutter should be closed whenever the experiment is not being done. Furthermore, the laser light path should be kept clear at all time.