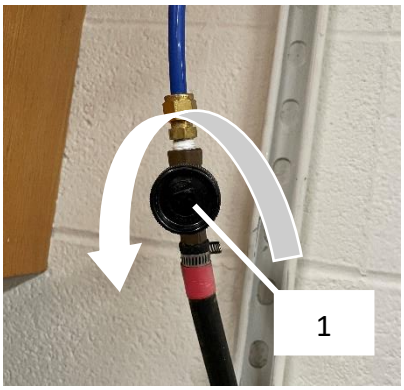
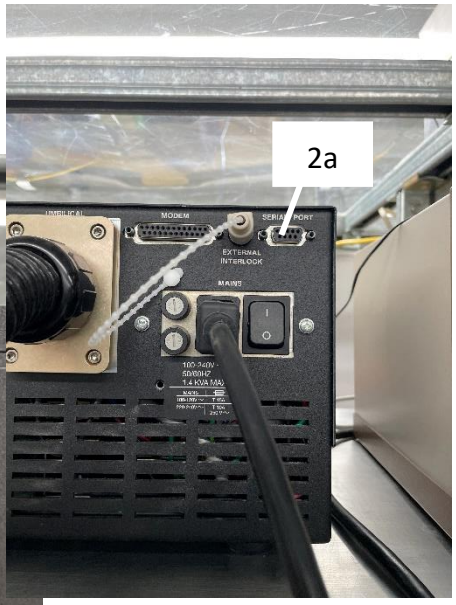
10 Hz Laser Start-Up Procedure – SHL 014A



Step 1: Turn on the cooling water. Turn the black valve next to the sink counterclockwise (to the left) until you cannot turn it any longer. Check the tube in the sink to ensure that water is flowing **BEFORE** starting the oscillator.

Step 2: Start the oscillator pump.

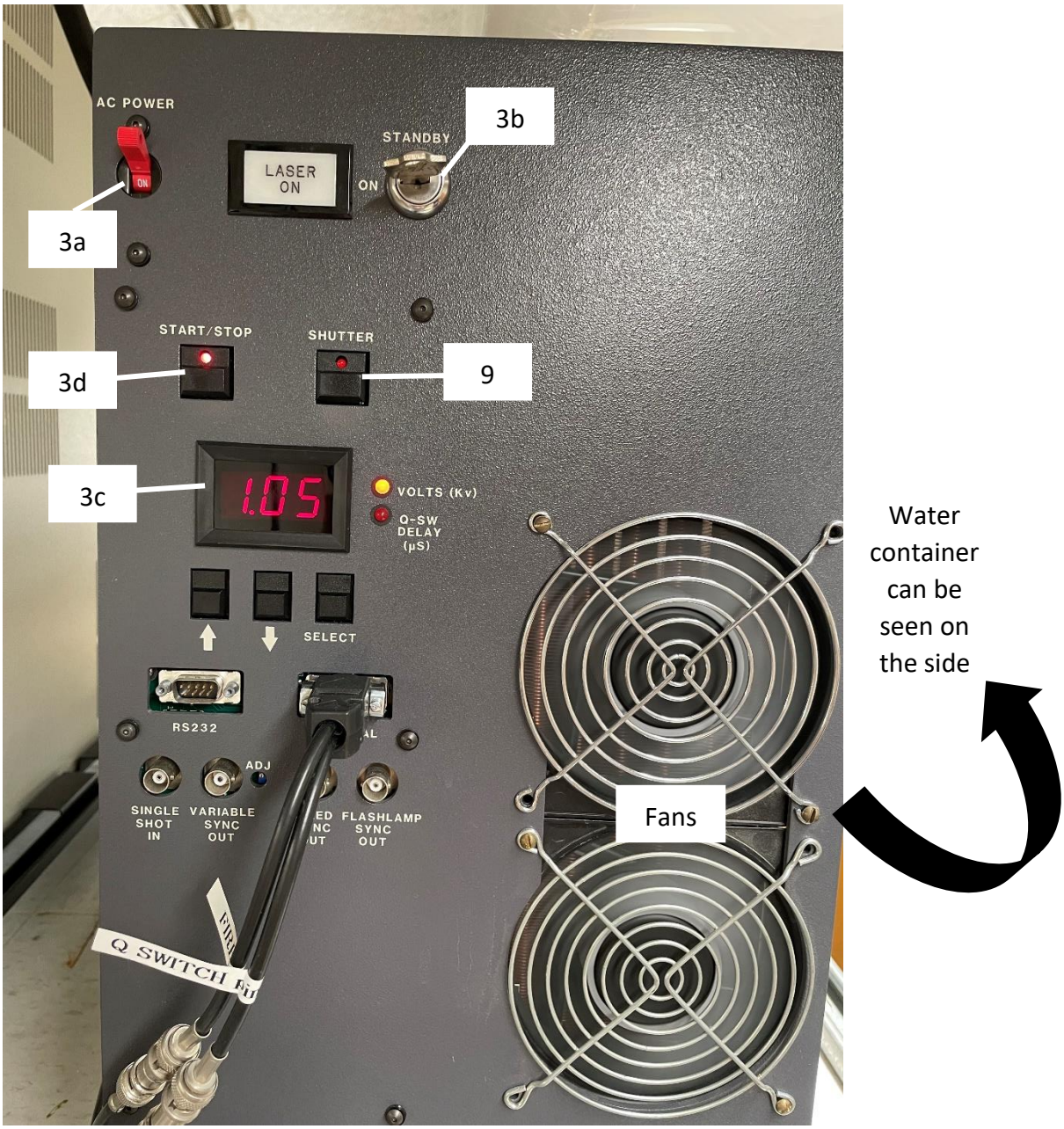


Flip to back

a. If it is not already, power on the Oscillator. On the back of the Oscillator power supply, toggle on the power supply under "MAINS" by switching it from "O" to "I". **Wait** until it no longer says "WARMING UP" in the upper righthand corner before continuing.
b. Turn the key switch on the control/power supply model to "ON" position. This will initiate the short warm-up cycle.
c. **Wait** until the diode current ramps up to about 14.20 A.
d. Press the "SHUTTER OPEN" button (light should come on).
e. **Wait** a few seconds and then press the "POWER LEVEL 2" button (light should turn on). This will set the laser output power to 1.89 W and current to about 15.80 A. **DO**

NOT try to mode lock the oscillator at this point. It will take several minutes for the cavity to warm up (> 15 minutes). Proceed to the next step while you wait.

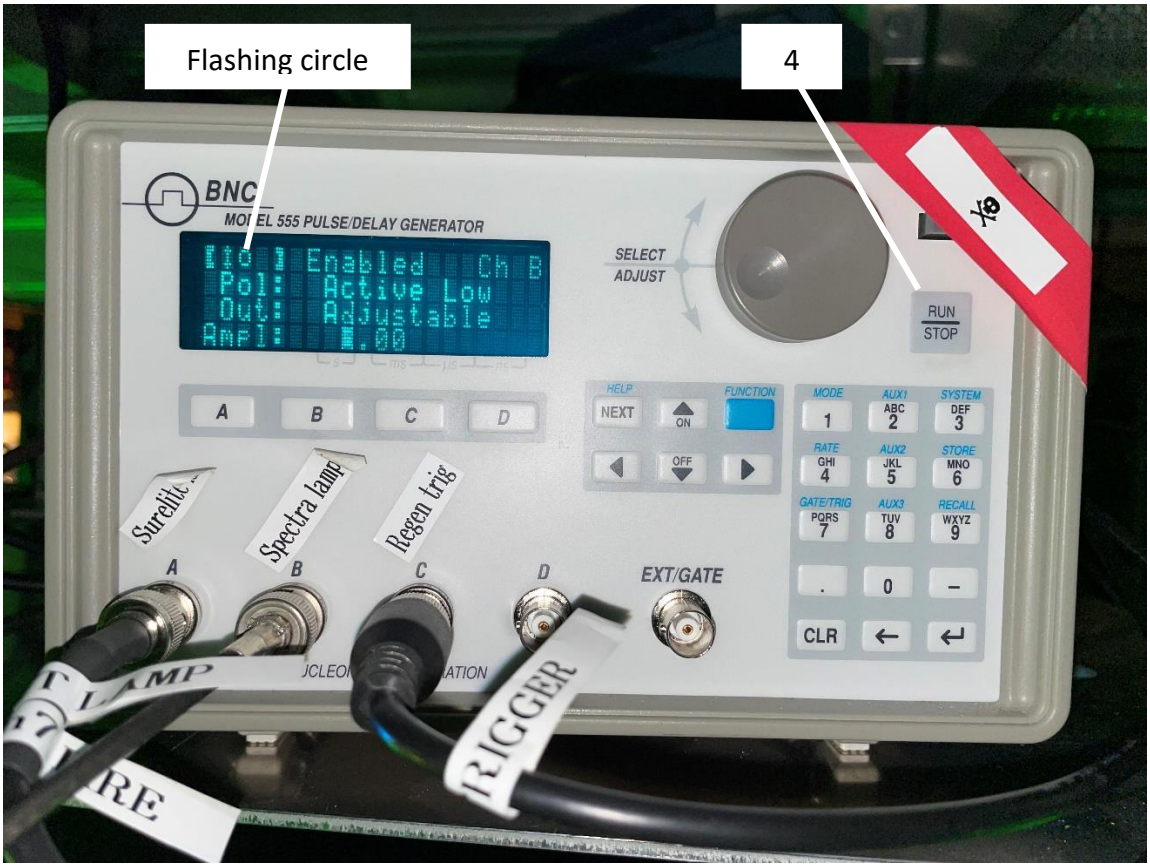
Step 3: Start the Regenerative (Regen) pump laser ("Surelite").



a. Flip the red "AC POWER" switch to the "ON" position.
b. **Wait** a few seconds for the digital screen to say "OFF" and then turn the key switch from "STANDBY" to "ON".
c. **Wait** for the digital screen to go through the numbers and the fans to turn on. Check that the water is flowing.
d. Press the "START/STOP" button.

e. **<u>WAIT 20 MINUTES</u>** before opening the Regen shutter by pressing the “SHUTTER” button. Proceed to the next step while you wait.

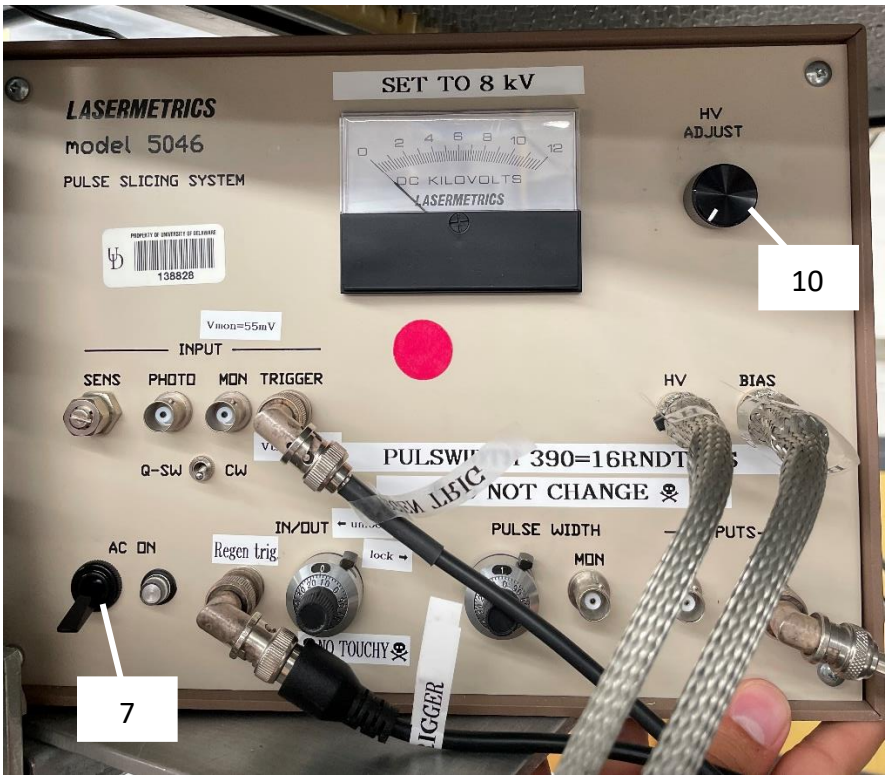
<u>Step 4</u>: Press the “RUN/STOP” button on the BNC Model 555 Pulse/Delay Generator (above the oscillator cavity). A small circle should be quickly flashing inside the brackets next to “ENABLED” on the digital screen. You should hear the lamps from the Regen clicking, but no light should be coming out of the laser yet.



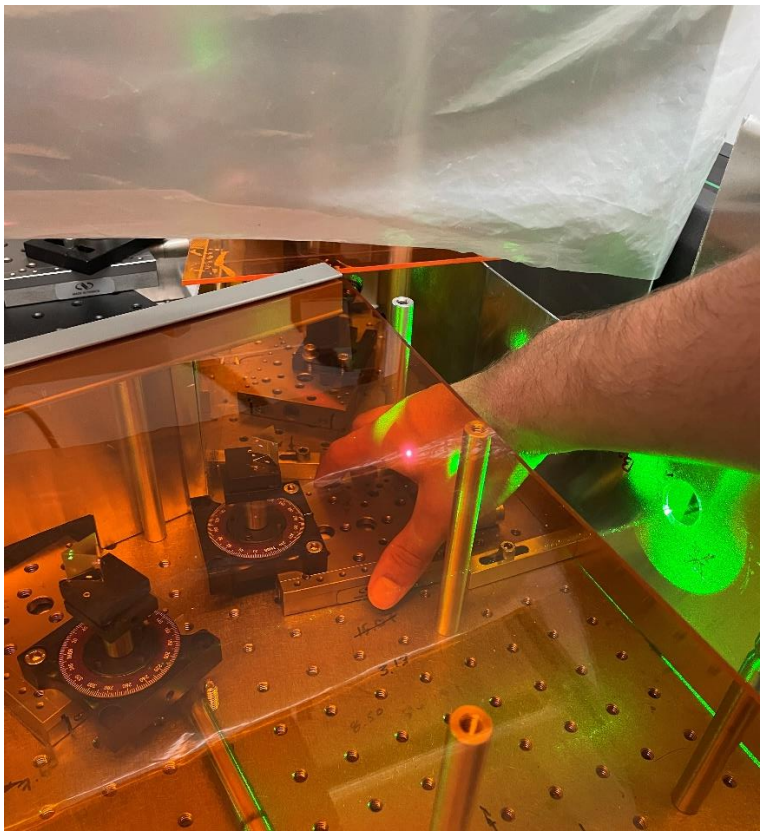
<u>Step 5</u>: Turn on the oscilloscope for the Regen amplifier output and oscillator (above the Regen amplifier).

<u>Step 6</u>: Turn on the two “Four Channel Digital Delay/Pulse Generator” timing boxes (above the Regen amplifier) by pressing the “ON/OFF” power button on the right side.

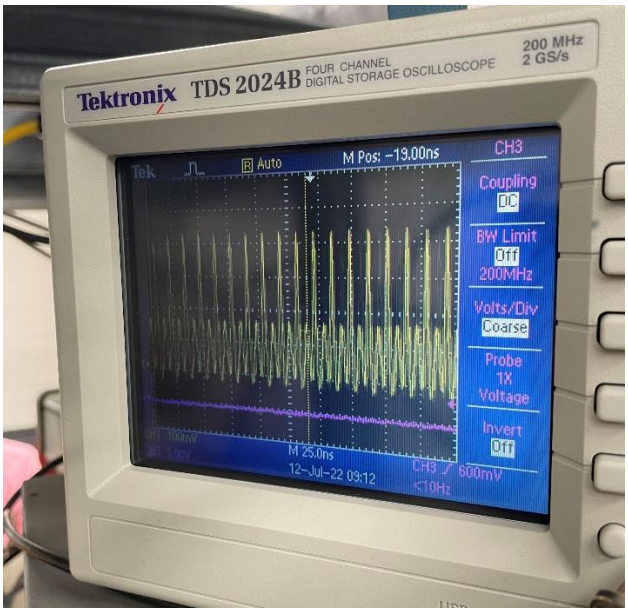
<u>Step 7</u>: Turn on the “Lasermetrics: Model 5046” high voltage generator by flipping the black AC power switch in the bottom left-hand corner (green light should turn on). Do NOT increase the high voltage yet.



Step 8: If the oscillator cavity is fully warmed-up (~15-20 minutes since the initial start-up), you can mode lock the oscillator.



a. To mode lock the oscillator, ***carefully*** remove the rectangular piece orange acrylic covering the cavity on the far right (closest to the laser). ***Carefully***, insert your hand to reach the translation stage holding a prism closest to the laser. DO NOT TOUCH THE BEAM! Grip the stage and pull backward so the stage is shifted. The oscillator is mode locked when the oscilloscope shows a stable pattern of pulsed waves (see below).



b. You may also use a power meter to assist in mode locking. Before mode locking, the power should read approximately .100 W – 0.125, but after it is mode locked the desired power reading should be around 0.140 W. You may need to adjust other optics in the cavity if the power too low, but **consult an expert first**.
c. **IMPORTANT**: Request an expert's help if you cannot get the cavity to mode lock after a few tries. Do not try to kill yourself (or the laser) on this matter! Life is hard! ☹

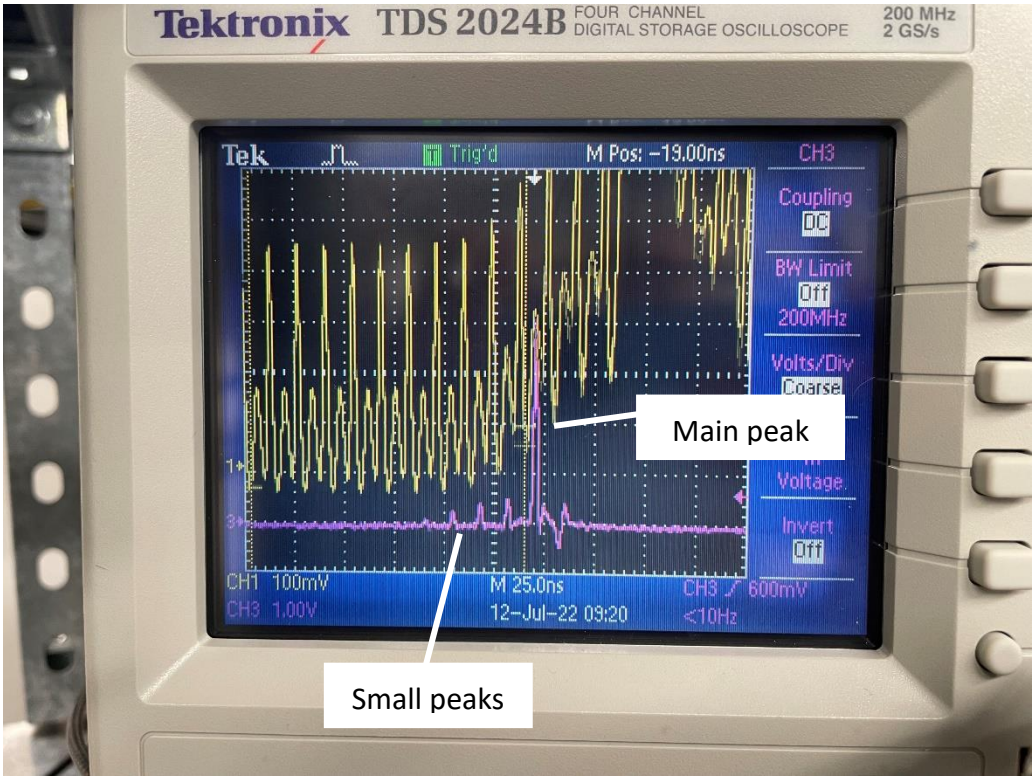
Step 9: If it has been 20 minutes since hitting the "START/STOP" button on the Regen, you may now press the "SHUTTER" button to the right of the "START/STOP" button. If not, **YOU MUST WAIT FOR AT LEAST 20 MINUTES** to pass before continuing, no exceptions!

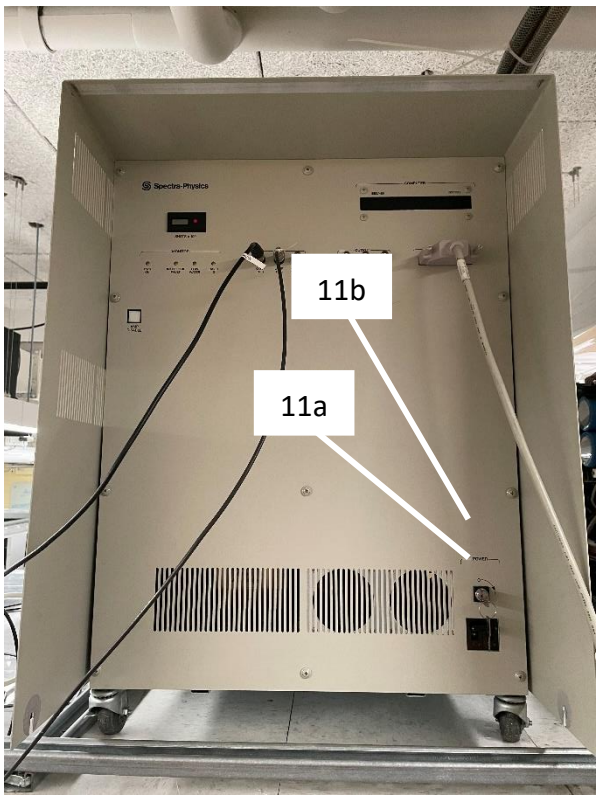
a. The green light from the Regen should have an energy of 20-32 mJ per pulse.

Step 10: Once the Regen is shuttered, increase the high voltage on the "Lasermetrics" to 8 kV by turning the black "HV ADJUST" knob.

a. Using an index card (or other piece of paper), you should be able to see a red beam of amplified spontaneous emission coming out of the Regen amplifier containment.
b. The output on the Regen oscilloscope should be stable, consisting of one main peak and several smaller peaks to the left (see below). The smaller peaks should increase slightly in height, but remain much smaller than the main peak. If the main peak is

unstable and seems to be to be between two peaks, the number of roundtrips will need to be adjusted. If the small peaks decrease in height closer to the main peak (making a hill shape), then the Regen is over pumping and the channel B & C timing on the BNC model 555 pulse/delay generator will need to be adjusted.



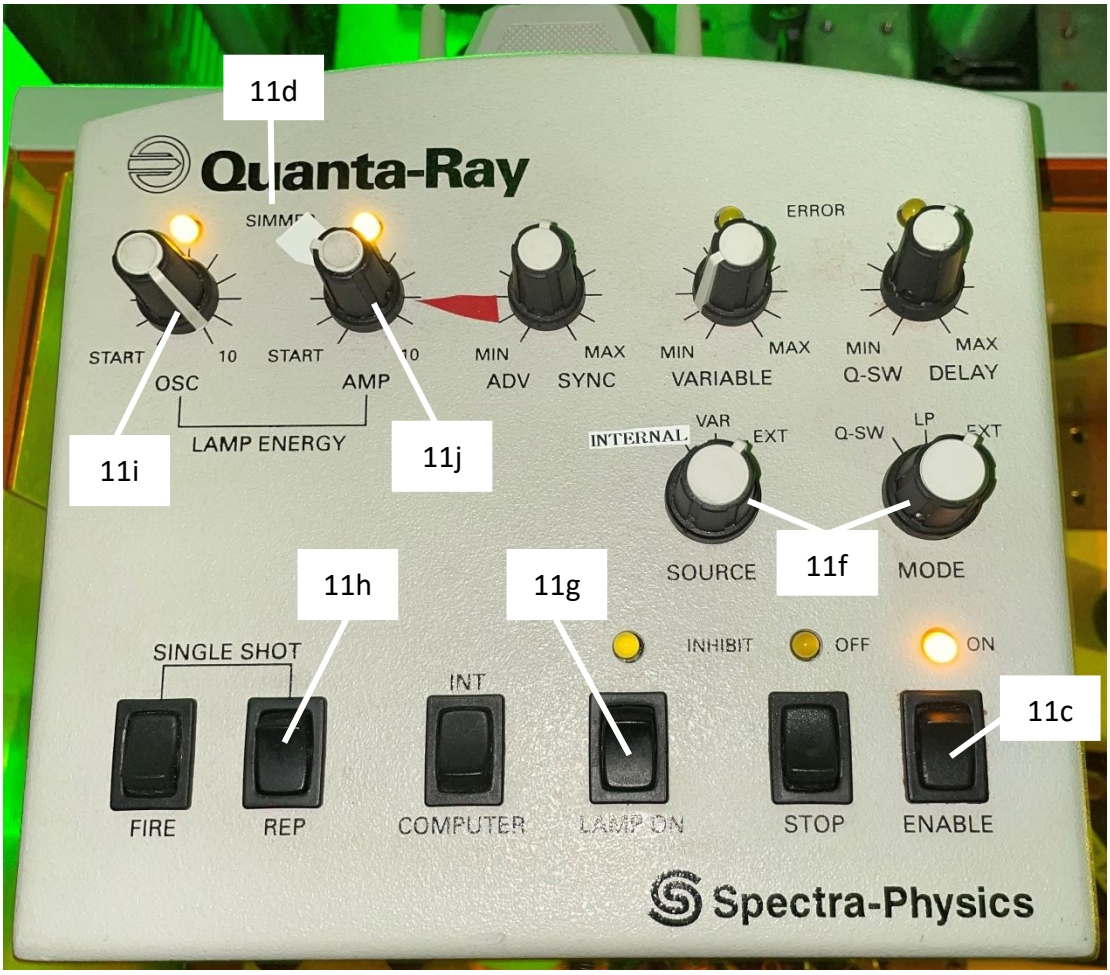


<u>Step 11</u>: Turn on the pump later for the multipass amplifier, the “Spectra Physics” box above the multipass amplifier.

a. Flip the power switch to the “ON” position.
b. Turn the key switch from “O” to “I”.
c. Turn on the “Quanta-Ray: Spectra Physics” controller by flipping the switch labeled “ENABLE”. The “ON” light above the “ENABLE” switch should light up.
d. The two “SIMMER” LEDs at the top left (above the “OSC” and “AMP” knobs) will flash during the initial warm-up routine. **Wait** until they both stay on.
e. Make sure both the “OSC” and “AMP” knobs (upper left corner) are in the “START” position.
f. Set both the “SOURCE” and “MODE” knobs to “EXT”.
g. Turn the flash lamps on by flipping the “LAMP ON” switch downward. The lamps are **<u>ON</u>** when the LED above it is **<u>OFF</u>**!
h. Flip the “REP” switch downward.
i. Slowly turn up the “OSC” dial to 10.

11c

j. Turn up the “AMP” dial to 2. **<u>Wait 10 seconds</u>**. Then turn up the “AMP” dial to mark around 8.



Congratulations! The laser is now on. I wish you great fun (and luck!) in aligning it, fixing it, shooting it at things (not at people!), opening and closing the chamber, etc. etc.