**Directions on How to Use the Automated Cooling System**

1. Turn on the vacuum pump, shutter controller, Jaz spectrometer, cooling laser diode controller, and PL laser diode controller (both the cooler and current). The Cooling laser should be set to 200 mA and the PL laser should be set to about 160 mA with the temperature set to about 10 ºC.
2. Open up MacAfee VirusScan console (Right click, then virus console). Make sure Access Protection and On-Assess Scanner is disabled.
3. Open the Anaconda Prompt
4. Type “activate offNSWCCD”. This opens the Python environment that has all the required packages installed.
5. Type “spyder.exe”. This opens Spyder which is the Python IDE.
6. Run automatedSoftware.Py located in “C:\Users\FontenotRS\.spyder-py3\Luminescence\Automated Setup”
7. Initialize the spectrometer. The button will turn green and the output box (bottom box) will spectrometer is initialized when the spectrometer is ready to go.
8. Push the set integration time button. It is hardwired for 800 ms. Wait for the button to turn green.
9. Change the directory location to where you want to save the data.
10. Close the shutter located in front of the PL laser.
11. Make sure the laser box is closed.
12. Push the start button located at “Begin Taking Spectra.”
13. Push the Set background button. It may take a few seconds to show that it is working. The button will turn green when the background spectra has been saved.
14. Click on the subtract background button. The button will turn green and the spectrum will look flat when it is completed.
15. Push the yellow stop button located at “Begin Taking Spectra.” This will pause the spectra and allow for the setup to continue faster.
16. Ignore Step 8: Save the spectra. Software now does this automatically.
17. Initialize the PMT. The button will turn green when it is successful.
18. Set the number of experimental runs. The default is 4. When you push set button, it will turn green and become disabled so you will no longer be able to modify the number of runs.
19. Set the cooling time. The default is 30 minutes. When you push the button, it will turn green and become disabled.
20. Set the PL time. This is the time that you want to measure the PL before and after cooling. The default is 20 minutes. When you push the button, it will turn green and become disabled.
21. Set the equilibrium time between runs. This is the amount of time you leave for the sample to reach equilibrium inside the chamber between experimental runs. The default is 120 min (2 h). When you push the button, it will turn green and become disabled.
22. Set the laser equilibrium time. This is the time it takes for the PL and Cooling lasers to reach a steady power. This only affects the first run of the day. The default time is 120 min (2 h). When you push the button, it will turn green and become disabled.
23. Push the Enable Shutter button. This will establish communications with the shutter controllers. The output box will say “Shutters are now connected and closed.” when communication has been established.
24. Push the Begin Cooling Experiment button to start the experiment. This will disable all buttons and begin the experiment. The status boxes on the bottom right will keep you informed on the progress. You can now go and do other things. You only need to check on the experiment from time to time to make sure no errors have occurred.