HCIFS WFSC Experiment Manual

*He Sun 09/19/2019*

1. Collect the flat filed images and run the data cube extraction

(Related files:

(a) “C:/Lab/FPWCmatlab/IFS/take\_flatfield\_images.m”;

(b) “C:/Lab/crispy/crispy/HCIFS/cube\_extraction.py”)

1. Install the integrating sphere, remove lens and pickoff mirror. (two bolt side of lens goes towards IFS)
2. Initialize the filter wheels and the starlight express camera

(run Sec #1 and Sec #2 in file (a))

1. Turn off the superK laser (use the key), and take the dark frame image

(run Sec #3 in file (a))

1. Turn on the superK laser (please wait until the laser stabilized), and take the flat field images (20 mins)s
2. create a folder “C:/Lab/FPWCmatlab/IFS/flat#”
3. run Sec #4 in file (a)
4. Change the directory to that folder in step (3i) save the flat field images
5. Run Sec #5 in file (a)
6. Run the data cube extraction Python file
7. Start an Anaconda Prompt terminal;)
8. Change directory to “C:/Lab/crispy/crispy/HCIFS/;)
9. Activate the Python 2.7 environment, use the command “activate py27”;)
10. Remove all the files in “C:/Lab/FPWCmatlab/IFS/data” and “C:/Lab/FPWCmatlab/IFS/flags”;)
11. Change path in file (b) to match file path created in (3i)
12. Run the file (b), use the command “python cube\_extraction.py”.)
13. Restore the IFS layout (plug the lens and pick-off mirror back);
14. Re-align pick-off mirror:
    * 1. Change filter wheel to position 12 (Broad band) and put on goggles or use thorlabs laser
      2. Run Sec #3 in SXcam\_cont.m
      3. Move PSF centre to centre of focal plane [568,512]
15. Start system identification in python if you want to improve your model

(Related files:

(c)“C:/Lab/FPWCmatlab/Initialization\_broadband.m”,

(d)“C:/Lab/FPWCmatlab/runEFC\_broadband.m”,

(e) “C:/Lab/FPWCpy/HCIL\_broadband\_EM.**py**”

1. Create a folder “C:/Lab/FPWCmatlab/dataLibrary/\*” where you want to save your control data. Typically, the folder name is the date of the experiment;
2. Change the “folder.dataLibrary” of case “ultron” in file (c) Sec #1 to be the folder you just created;
3. Change the “folder” in file (e) to be the folder you just created;
4. Change the “systemID\_flag” in Sec #1 of file (d) to be “true”;
5. Make sure “n\_EMitr” in file (**e**) equal to “n\_systemID” in file (**d**) (should be <5-10 ish for now)
6. Run the system identification Python file
7. Start another Anaconda Prompt terminal;)
8. Change directory to “C:/Lab/FPWCpy/”;)
9. Activate the Python 3.6 environment, use the command “activate py36”;)
10. Run file (e), use command “python HCIL\_broadband\_EM.py”, once \*\*\*Itr # 0 \*\*\*\* appears, start experiment
11. Run the main file for wavefront sensing and control

(Related files:

(c) “C:/Lab/FPWCmatlab/Initialization\_broadband.m”,

(d) “C:/Lab/FPWCmatlab/runEFC\_broadband.m”,

(f) “C:/Lab/FPWCmatlab/hardware/lab\_initialization.m”)

1. Conduct Step 2.(1), 2.(2) if you didn’t do Step 2.
2. Change the “systemID\_flag” in Sec #1 of file (d) to be “false” if you didn’t do step 2;
3. Run Sec #1 and Sec #2 in file (d)
4. Delete old files in IFS/data/ and IFS/flags/ except crispyflag.txt
5. Calibrate the “camera.IFSflux” and “camera.center” in file (c) Sec #4;
6. Run Sec #1 in file (f) to initialize the DM;)
7. Move mask to open position
8. Run Sec #7 in file (f). Please make sure the image “imgIFS” is not saturated (exp ~0.008)
9. Record the PSF center location by checking the plot of the “datacube” variable, and assign the center to “camera.center” in file (c) Sec #4 (row = y, col = x)
10. Assign the normalized peak values of PSFs of different wavelengths (variable “IFSflux”) to “camera.IFSflux”;)
11. Move mask position back to mask (make sure DMs are initialized) using Sec #8 in file (f)
12. Run Sec #1 in file (d) to initialize the parameters for broadband control, make sure “simOrLab = ‘lab’”;
13. Run Sec #2 in file (d) to initialize the DM and camera (if you have not started the camera);
14. Run Sec #4 in file (d) to compute the state space model of the system, or load the pre-computed state space model;
15. Run Sec #5 to start the system ID loop;
16. Turn off the lab hardware

(Related file: (d) “C:/Lab/FPWCmatlab/runEFC\_broadband.m”)

1. Run Sec #3 in file (d) to finalize the DM;
2. Close the “MaxIm DL Pro 5” API;
3. Turn off the superK laser.
4. Power down DM controller