Resonon tasks #1

CCD Settings:
Speed- 100khz
gain = 3
Camera CCD set temp at -75 C. Confirm the temperature set point is reached and stabilize camera for 10 minutes before taking data.
Do not cover the camera – it needs free air flow to stay cool.
Use integration times of 0.1 sec or greater

Definitions:
Darked = fiber tip covered to block ambient and source light Darked is with the fiber caps off and the ends of the fibers stuck into the ~10" long Thorlabs 2" od tubing and covered with a fold of black cloth
BI = Background image = CCD setting to take a dark image with the CCD shutter closed On the camera settings, this is "Disable Closed"
FDI = Fiber Dark Image = Image acquired with the CCD shutter active (CCD shutter opens during acquisition) as in Light Image but with individual fiber inputs darked This is normal shutter operation, the shutter opens and closes
FAI = Fiber Ambient Image = Image with some set of fibers exposed to sphere but light source is off, CCD shutter operating as in Light Image (normal mode)
LI = Light Image = image with some fibers exposed to sphere with source on
Image set = A collection of associated images (light/dark/light etc.)
Image Set image sequence for "light" images, example: 10 BI, 10 FDI, 10 LI , 10 BI, 10 FAI, 10 FDI, 10 BI (in close succession)

Leave room lights on or off, however you plan to have them during the work. We are working with the room lights off, inside the opaque soft wall clean room in the RSL

Tests 1 and 2 below should be done each time the setup is moved or significantly reconfigured, though in the future only one or two long integration time FDI scans would likely be required to confirm the absence of light leakage.

1. Check for dark (background) light leakage This tests leaks in the camera housing, the camera shutter is closed through out. The sphere source should be turned **on** because it is a source of ambient light. **The fibers are uncapped but stuck into the tube, the curtains down, the room lights off**
    a. Light sources off, all Fibers darked, Image sequence: BI images only
    b. Take 10 BI images @ 600 second integration time (check the first scan for leaks before proceeding with the full set) Integration time is called Exposure time on the camera software
    c. Take 10 BI images @ 0.1 second integration time
    d. Analysis
        i. Check the BI images (1b) for light leaks
        ii. Images from 1b. are offset + dark current + any light leaks

iii. Images from step 1c. are offset + dark current (zero for short integration times) + leaks (also zero for short Integration times)
iv. 1b - 1c should show a non-spectral shift to higher ADU for the longer integration time images
v. (1b – 1c)/Int time = dark current for CCD @ -75 C
vi. Confirm no light leakage before proceeding. Light leakage here would be from light leaks in the camera housing

2. Check for light leaks with fibers darked This tests for light leaks everywhere, the spectrograph and the camera. The sphere source should be turned **on, the fibers uncapped but stuck into the tube, the curtains down, the room lights off**
    a. Light sources off, all fibers darked
    b. Image sequence for this test: 5 BI, 10LI, 5BI The desired sequence for c and d below. By "5 BI, 10LI, 5BI" we mean take five with the CCD camera closed, 10 with the shutter in normal operation, 5 with it closed.
    c. Take a 10 FDI image set @ 600 second integration time That is, do the 5BI, 10LI, and 5BI at 600 s
    d. Take a 10 FDI image set @ 0.1 second integration time Same as c but 0.1 s
    e. Analysis
        i. Calc light – dark for 2c
        ii. 2c should be similar to 1b
        iii. Check for more ADU in the track area vs dark areas
        iv. Confirm no light leakage before proceeding
        v. (hint – some black rubber caps are not dark in room light
        vi. 2d is for later reference
3. Check CCD cleaning
    a. Source: He/Hg source, Light source on, all fibers illuminated Be sure to let the He / Hg source warm up
    b. Adjust integration time for 55K ADU light signal at spectral peak
    c. Image sequence for this test: 10 BI, 10LI, 10BI
    d. Collect 1 image set at CCD cleaning settings 1,5,10 and Auto cleaning off and on for each setting (6 sets total)
    e. Analysis
        i. Look for residual light signal signature in the second set of darks.
4. Determine Noise at different speed and gain settings
    a. Source: Stable broadband, all fibers illuminated I think we should use the OL420 since the stability of the fiber optic illuminator is unknown
    b. Image sequence for this test: 10 BI, 10LI, 10BI
    c. Integration time for 55K max signal Check at the "cusps" and make sure we are not saturated anywhere

d. Take 1 image set at each speed (100khz, 2Mhz) and gains(1,2,3) at both speeds.
e. Analysis
    i. SNR of spectral Light – dark for one lighted row of pixels for each setting combinations
    ii. Goal is to determine if the 2mhz speed is quiet enough to use for future work since it is much faster.

5. Initial wavelength Calibration
    a. He/Hg source (Or other – yes try a couple of other emission line lamps or the One Light, if it is calibrated for wavelength), Light source on, all fibers illuminated
    b. Image sequence for this test: 5BI, 10LI, 5BI
    c. Acquire one image set for each lamp