Resonon Shadowing Characterization / Calibration
23 May 2012

This is a brief status report and suggestion of where I think we're at. This is a plan!

We have 14 inputs on each Resonon. At least one of the 14 will be permanently connected to a broadband LED source for stability (Ocean Optics BluLoop or LLS Cool White). There is an Es foreoptic coupled with a short fiber, and the other fibers are long and go to the fork, either bare fiber or attached to a disk. I have made a preliminary track/purpose table (see below)

The stability channel is directly coupled to the LED light source (SMA or FC).
The Es channel is coupled to a TBD Es foreoptic
The in-water bare or disc'd channels have a lens to set the FOV to 5deg

We will calibrate the system. However, we plan to rely on the stability of the system responses – all 14 of them, so one of the long fiber channels will be used as a reference. Implementation of the reference normalization will be an option in the processing software.

We will be changing integration time, but as a goal we'd like to set the iris' that are in the shutter block so that the inputs are balanced and we are on about the same integration time for every channel. We'll need to do this in the lab based on calculations.

So here are what I consider to be the tall poles in the characterization:
1) No light leaks
2) No (or known) sensitivity to ambient conditions (temperature, humidity, vibration)
3) Repeatability and Stability of the channels
4) Identical, or known ratios of the FOVs
5) No saturation issues especially if we do onboard binning and don't pull full images
6) Known warm up interval
7) Known cross track scattering, although we'll leave empty tracks between critical ones
8) Wavelength calibration is channel dependent
9) sync error for the two cameras
10) stability of the LED fiber coupled sources

Comments on 1 to 10:
1) we need to permanently cover the ferrule where it leaks. See Mark's earlier tests and do them after this fix.
3) requires a stable, uniform source (OL455). We'll use the jigs. See Al's suggested tests. We can rotate the jig or rearrange the fibers to add reproducibility. Repeatability can be done now, with just the Romack, but it should be repeated pre and post experiments. Do 1/r2 to test alignment.
4) seems to me is critical – even if the radiance response is known the FOV sets the "overlap" of what the instrument sees and the shadow. We are assuming the difference is only from the size of the disc, but if the FOVs are different then we have a problem. I

don’t know the sensitivity coefficient for this effect but it probably depends on global/diffuse, wavelength, zenith angle, disc size, etc. I have some ideas about how to measure, but this can’t be done until the system is integrated.
5) We do need to determine a value and at what pixel of ADU that saturates each channel, as well as what is the shortest integration time we are comfortable with w/o doing a full characterization
7) we can get data using the broad band sources

Additional Characterizations (may not be Tall Poles)
11) along track (spectral) cross talk
12) linearity with flux
13) integration time correction factors

these are important but my guess is we can find the sweet spots without detailed characterizations, and that these characterizations can be done later.

Track/Purpose Table
fill in tomorrow