2D spectroscopy steps

Given the still-limited bandwidth of our pump, our main focus in a first set of measurements is the off-diagonal peaks. We could look at homogeneous linewidths if we were to then scan the pump frequency enough to cover a region beyond the inhomogeneous linewidth of interest.

1. Optimize and characterize light source if needed
   1. Optimize OPA power
   2. Confirm alignment into and calibration of AOM system
   3. Measure pump fluence—power and spot size (if we do not have a sufficiently sensitive power meter at present, then we can just rely on previous measurement of the pump spot size at the sample, since this shouldn’t change much day-to-day).
   4. Measure probe spot size
2. Collect spectra of the pump and of the probe. The pump is especially important, since the shape of 2D spectral features will depend on the bandwidth and shape of the pump. As we have seen, the 2D features are only as wide as the pump bandwidth. We would like data that can be plotted, not just images; presumably we can get this from the LabView program if a measurement is configured appropriately.
3. Perform TA measurements. The goal is three-fold
   1. Have a clear record of where the zero-delay is. Because of probe chirp, this will be probe-wavelength-dependent, so we would like to see the TA spectrum versus time.
   2. Have a clear measure of where the limits of the single-exciton regime are.
   3. See what single-exciton population dynamics are, since these may have an impact on the interpretation of 2D spectra (if, for example, there is a rapid decay in the TA spectrum due to carrier trapping).
4. Execute 2D spectroscopy measurements
   1. The probe should come after the second of the pump pulses out of the AOM for all pump delays. 2D spectra in the single-exciton regime for two different pump fluences. The 2D spectra should then have the same shape, since only the number of dots with single excitons is different between the two fluences.
   2. 2D spectra for at least two different probe delays. We would like to see that the 2D spectra decay much faster than the TA spectra.