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Extracting a vibrational Raman spectrum from a broadband Coherent Anti-Stokes Raman Scattering measurement

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Probing the vibrational energy states of molecules can be done by Coherent Anti-Stokes Raman Scattering (CARS) Spectroscopy. Traditionally two or three different laser beams are employed to pump and probe the vibrational spectrum of molecules, probing the molecules one wavelength at a time. With the introduction of a coherent broadband light source it is possible to pump and probe multiple states simultaneously, with a single broadband beam. Increasing the pump bandwidth has the disadvantage of increasing the non-resonant CARS signal which drowns out and masks the spectrum-containing resonant signal. For broadband single beam CARS, the question is: how does one extract the Raman spectrum from the mix of resonant and non-resonant CARS? In this presentation we introduce novel techniques that answer this question. We simulate these techniques to illustrate the expected single beam CARS measurements and how a vibrational Raman spectrum can be extracted. Comparisons are made between these simulations and experiments on liquid and crystalline samples to prove the techniques.

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