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Heterodyne coherent anti-Stokes Raman scattering for spectral phase retrieval and signal amplification[1] XI WANG, AIHUA ZHANG, MIAOCHAN ZHI, ALEXEI SOKOLOV, GEORGE WELCH, MARLAN SCULLY, Texas A&M University — We study interference between local oscillator and coherent anti-Stokes Raman scattering signal fields by controlling their relative phase and amplitude. This control allows direct observation of the real and imaginary components of the third-order nonlinear susceptibility of the sample. Unlike previous heterodyne schemes, we use broad-band femtosecond preparatory pulses and a narrow-band probe pulse to coherently excite and detect multiple Raman lines simultaneously. In addition, we demonstrate that this heterodyne method can be used to amplify the signal. We also show that the combination of the spectral interferometry and a phase scan reveals how the background resonance affects the detected susceptibility in aqueous methanol solution. Our work has important applications to Raman microscopy and spectroscopy.

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