VIBRATIONAL PHASE IMAGING
IN AN EXTREMELY FOLDED BOX-CARS GEOMETRY

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We present a method which allows one to extract the real and imaginary part of the third order susceptibility in a wide-field CARS set-up by using a quadriwave lateral shearing interferometer (QWLSI) [1] and the non-resonant contribution of the surrounding solvent as a reference to measure the phase of the CARS signal. This permits the retrieval of the Raman spectrum and the removal of non-resonant signal from the surrounding medium, which otherwise may overwhelm weak resonances.

Proof of concept experiments were conducted in a collinear wide-field P-CARS geometry to control the level of non-resonant background [2] which causes long acquisition times due to the reduction of the resonant signal and introduces distortions to the spectrum.

We use QWLSI in an extremely folded box-CARS geometry, which reduces the axial extent of the illuminated volume. In addition an SLM is used to fine tune the phase-matching condition, which allows controlling the contribution of the solvent [3]. This avoids distortion of the retrieved Raman spectrum and acquisition times are significantly reduced due to higher resonant signal strengths.

Fig.1: CARS measurements of a 4.5 µm polystyrene bead showing intensity and phase on resonance (Ω = 3050 cm⁻¹) and off resonance (Ω = 3200 cm⁻¹).