PHASE CONTRAST IN WIDE FIELD COHERENT ANTI-STOKES RAMAN SCATTERING MICROSCOPY

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Coherent anti-Stokes Raman scattering (CARS) microscopy is shown to be a powerful method in label free imaging. This approach employs two light fields, called pump and Stokes. The frequency difference of these exciting fields is tuned to a Raman active transition of a specific molecule in the sample. As a consequence, a resonant signal called anti-Stokes is emitted. However, this signal is affected by an electronic nonresonant background which decreases the contrast and distorts the spectrum as compared to Raman scattering.

The classic CARS microscopy implementation uses focused beams and raster scanning, nevertheless several works have also report wide field implementation that is faster and easier to implement [1][2]. Our work takes place into this wide field CARS scheme where the illuminated area is much larger than diffraction limits and high sensitive camera are used to collect the CARS signal. In wide field CARS the nonresonant background is still a problem and non collinear illumination [1] or non phase matching [2] detection scheme has been reported to decrease this unwanted radiation and to limit the axial resolution (z).

In this work, we propose a relatively simple way to decrease the non resonant background in wide field CARS microscopy. Instead of measuring the intensity of the CARS signal [1][2], we measure its phase in the CARS image plane thanks to a sensitive wavefront analyser [3]. Indeed, the resonant CARS signal is out of phase compared to the non resonant one. Moreover we find that this effect can be used to enhance the CARS contrast.

References