Nonlinear microscopy [1] is an important tool that is increasingly used in biological research due to its ability to produce 3D images of complex samples. The widespread availability of ultrashort broadband (> 100 nm) lasers makes possible new multiplex imaging methods for chemically selective microscopy of biological systems. Coherent control has thus been shown to be a powerful method for the acquisition of selective images in coherent anti-Stokes Raman scattering (CARS) microscopy [2].

We have demonstrated a simple method for acquiring images resolved both in frequency and spatial domains that relies on the use of a sequence of two ultrashort pulses, similarly with impulsive stimulated Raman scattering [3]. By varying the time delay between the two-pulses and through a Fourier transform, it is thus possible to obtain frequency domain data. The figure on the left [4] shows an image of a polystyrene bead in a solvent resolved in frequency and in one spatial dimension, as obtained by using a Michelson interferometer and a laser scanning microscope.

“Nonlinear magic: multiphoton microscopy in the biosciences”

“Single-pulse coherently controlled nonlinear Raman spectroscopy and microscopy”

“Impulsive stimulated light-scattering : 2. comparison to frequency-domain light-scattering spectroscopy“

“Fourier transform Coherent Anti-Stokes Raman Scattering microscopy”