

Annular aperture detection scheme in coherent anti-Stokes Raman scattering (CARS) microscopy for high contrast vibrational imaging

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Abstract:

We report on a unique annular aperture detection scheme in coherent anti-Stokes Raman scattering (CARS) microscopy to effectively remove the solvent background for high contrast vibrational imaging. Our finite-difference time-domain (FDTD) calculations show that the far-field CARS radiation from the scatterer with size comparable to the excitation wavelength is stronger than that from the solvent at large cone angles. The annular detection provides about at least 10-fold higher contrast for both forward and backward detected CARS imaging. Different polarization effects are also considered including both linear polarization and radial polarization. These results will be demonstrated by imaging polystyrene beads immersed in water as well as living cells.