Label-free super-resolution imaging below 90-nm using photon-reassignment

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Confocal microscopy is one of the most used microscopy technique as it offers some advantages such as its resolution and optical sectioning properties. Fluorescence CM using a single point detector is the most current version in confocal microscopy. However, CM has been evolving from using a single point detector to use a CCD for photon reassignment [1]. The idea of pixel reassignment has been implemented for fluorescence confocal microscopy, [2] Raman microscopy, [3] even for two-photon microscopy [4]. Here we propose an adaptation of photon reassignement at ultra-high resolution and with label-free sample using confocal reflectance microscopy (CRM) in a rescanned mode. The resolution of the microscope is enhanced x2 using photon reassignment by projecting (rescanning) the image directly to a CCD instead of a single point detector. It is shown that the re-scan confocal reflectance microscope can achieve a maximal lateral resolution of 86 nm and 248nm axial, using a wavelength of 445nm (Fig 1).

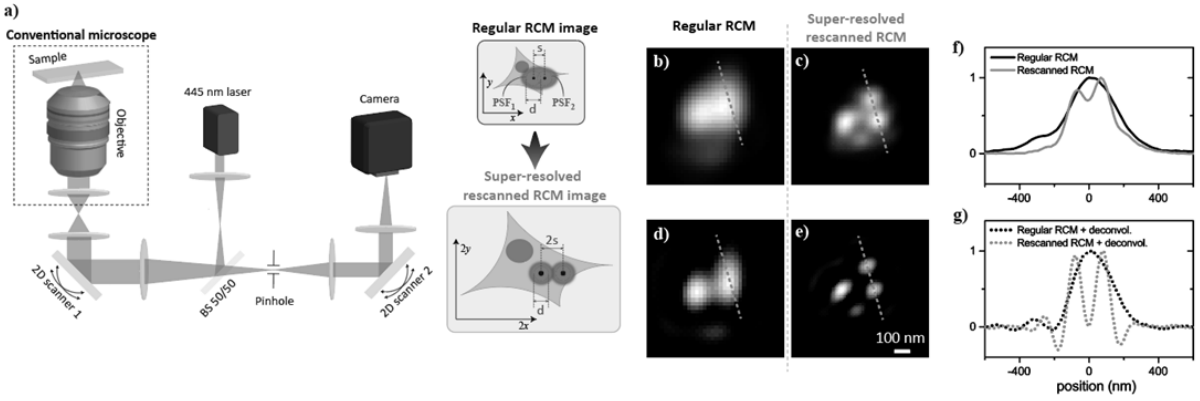

Figure 1: Resolution comparison of the RCM and Rescanned RCM, (a) Setup used. (b) 60-nm gold beads observed with conventional RCM. (c) Deconvolution of (b). (d) Same zone as for (b) observed with rescanned-RCM. (e) Deconvolution of (d). (f) Line-out of (b,d). (g) Line-out of (c,e).

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