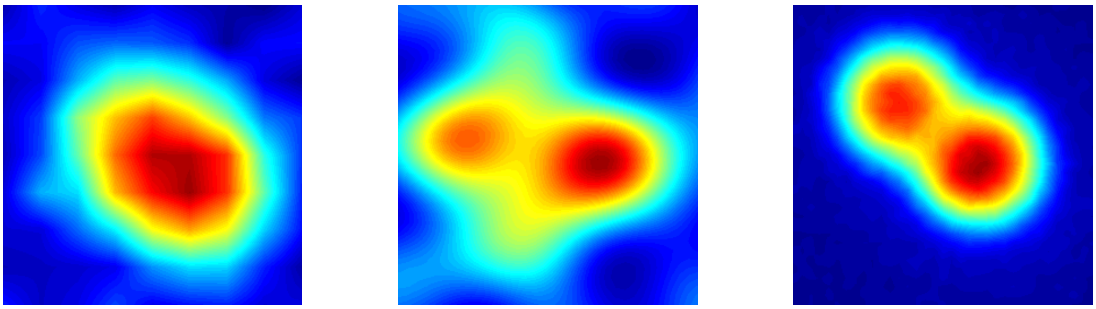
1 Progress on Synthetic Aperture Microscopy



(a) (b) (c)

Figure 1: Demonstration of SAM super-resolution. Two fluorescent beads with 500 nm radius that are close to each other are imaged in three different way. (a) Diffuse illumination using Zeiss 10x objective with N.A. of 0.20. Optibar was used to increase the effective magnification from 10 to 25. (b) Structured illumination using Leitz 10x objective with N.A. of 0.25. Total number of beams was 31, which results in sampling of 931 Fourier coeffient non-uniformly placed in the Fourier space. For reasons not shown here, only part of the 931 coefficients were estimated. (c) Diffuse illumination using Zeiss 50x objective with N.A. of 0.65. Optibar was used to increase the effective magnification from 50 to 125. Orientation of the camera relative to the sample was different between (b) and (c), which explains different orientation of the bead pair. For visualization purpose, bilinear interpolation was performed for all three images.

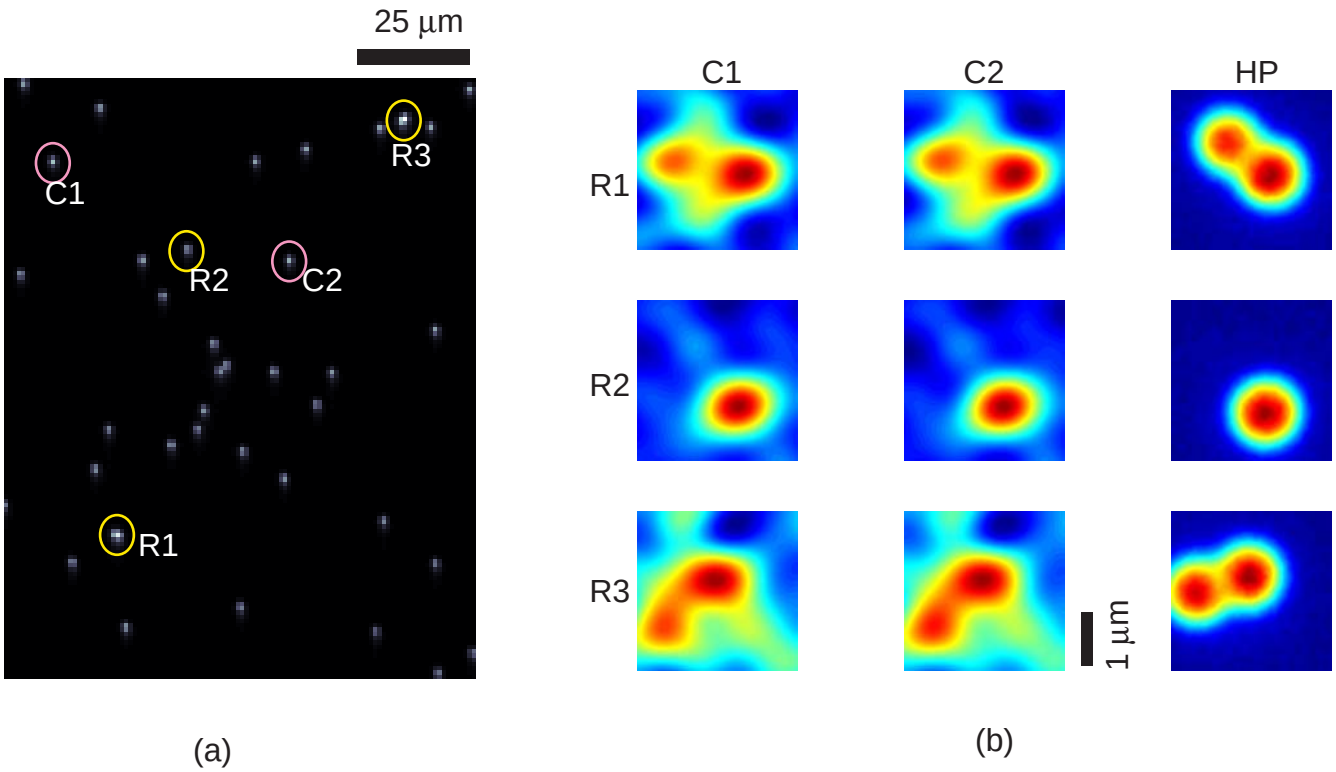


Figure 2: Consistent reconstruction of images were obtained using different bead as calibration target. (a) Low resolution image of the sample showing two different calibration beads (C1 and C2) and three reconstruction locations (R1, R2, R3). Image was acquired with Leitz 10x objective with N.A. of 0.25. (b) Reconstruction results using C1 and C2 as the calibration target. For example, the image at the row R2 and the column C1 is the reconstructed region R2 using C1 as the calibration target. The third column (HP) shows the images of the exactly same target acquired with Zeiss 50x objective with N.A. of 0.65 for verification purpose. Notice, for the case of R1 and R3, the same angular rotation relationship between reconstructed image and image in the third column holds.