

Microscopy resolution analysis when Fourier Ptychography is combined with laser illumination

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Fourier Ptychography is a computational imaging technique which makes use of a matrix array illumination to acquire a set of low-resolution images, that are used to reconstruct a complex image, resulting in a high space-bandwidth product. When utilizing the LED matrix in experimental settings that requires the acquisition of a large number of images, different LEDs encounter different optical paths, thus producing an image that is out of focus. In order to improve the quality of the separate images we implement autofocus algorithms. A second improvement is done by substituting the LED illumination with laser illumination. Good quality of the images were successfully acquire while using a rotating diffuser. Once all the acquired images are adjusted for the variance of the working distance, the overall reconstructed image shows a better spatial resolution. Also, we report successful Fourier ptychography employing laser illumination.

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References

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Figures

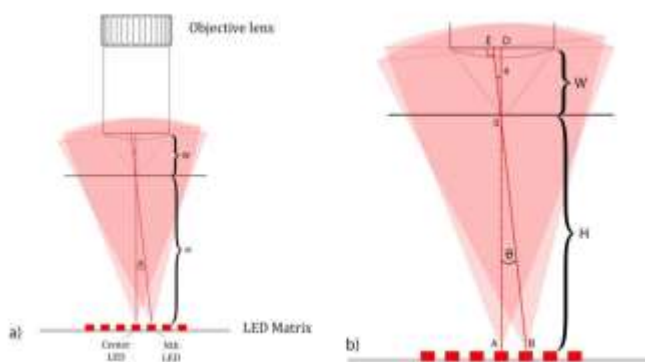


Figure 1. a) Representation of the angular illumination intensity shift when different LEDs are used b) closer view of the similar triangles that form above and below the sample

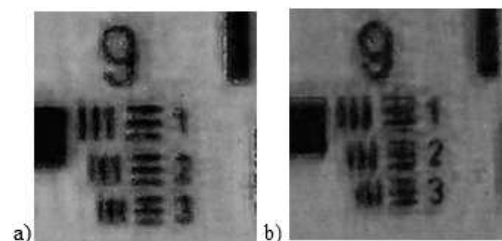


Figure 2. a) Without refocusing b) With refocusing