

SIMULATION OF LOCALIZATION MICROSCOPY METHOD UTILIZING QUANTUM DOT BLINKING

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INTRODUCTION

The use of quantum dots as fluorescence markers in biological imaging offers advantages like photostability, narrow but tunable emission spectra, and a broad spectral excitation cross-section. It is possible to use the characteristic blinking of the quantum dots (QD) to enhance the localization accuracy of them [1]. If the signal of an individual fluorescent marker can be distinguished from that of the other fluorescent markers, the source can be localized with an accuracy of few nanometers. The high-resolution image can be formed by localizing of thousands of markers.

SIMULATION RESULTS

Experimentally determined statistics [2] was used to simulate the blinking dynamics of individual quantum dots. A time series of 2000 images was created with nine quantum dots using a diffraction-limited point-spread-function width of 250 nm. Blinking events were detected from the image series, and center positions of the events were recorded. As a result, the original positions of the nine quantum dots became visible despite of the blurry background created by the faulty detected events.

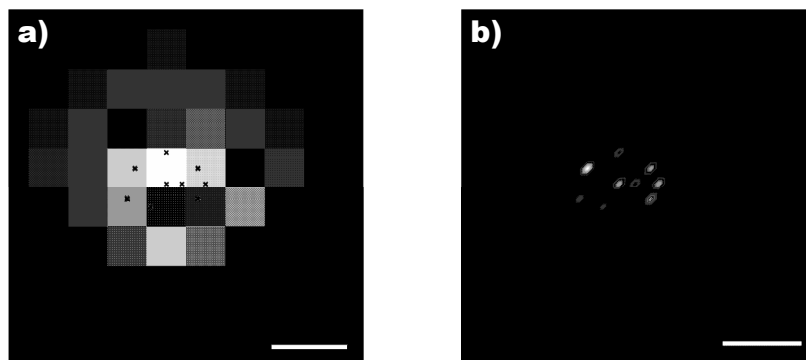


Figure 1. Simulated data of 9 randomly placed QDs. a) Original position of QDs and diffraction-limited image of them. b) Resulted image after localization of QDs from 2000 diffraction-limited images. Scale bar is 200 nm.

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[2] M. Pelton, G. Smith, N. F. Scherer, and R. A. Marcus, “Evidence for a diffusion-controlled mechanism for fluorescence blinking of colloidal quantum dots”, *PNAS*, **104**, 14249-14254 (2007).