Dense multifocal structured illumination microscopy

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ABSTRACT: In conventional structured illumination microscopy(SIM), the specimen is excited by a sequence of sinusoidal fringe patterns[1,2]. In recent years, except for sinusoidal fringe patterns, spot-like patterns are also employed to enhance the resolution, such as image scanning microscopy (ISM), multifocal structured illumination microscopy (MSIM), etc. However, fringe pattern illumination still remains more attracting in living cell observation, because it possesses the merits of fast imaging rate and low phototoxicity brought by wide-field excitation. Besides, the resolution of conventional SIM is also slightly superior to that of these spot-pattern-based SIM techniques[3]. Here, we propose a new SIM technique by introducing a dense multifocal structured illumination. Different from the above mentioned MSIM, this technique can provide an equivalent spatial resolution and imaging speed with conventional SIM. Performance of this setup is verified by observing a Drosophila S2 cell expressing α-tubulin–EGFP. This new technique is anticipated to provide an alternative tool for super-resolution observation of live cells.

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