

# SCAN-LESS DUAL-COMB MICROSCOPY FOR CONFOCAL AMPLITUDE AND PHASE IMAGING

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Confocal microscopy is a proven modality for three-dimensional imaging with high spatial resolution. In this study, we proposed a novel confocal microscope using optical-frequency-comb (OFC) for highly resolved-three-dimensional amplitude and phase imaging without the need of mechanical scanning system[1]. The concept of the proposed method is shown in Fig. 1a. This approach encoded the confocal image of a sample on OFC spectrum by using a wavelength disperser (Grating and VIPA). The image-encoded OFC is decoded with dual-comb spectroscopic method that employs two OFC lasers having slightly different repetition rates, allowing Fourier transform spectroscopy. Therefore, the proposed imaging method enables confocal amplitude and phase imaging without any mechanical scanning system via spectral information. We confirmed the imaging capability of the proposed method by using nanometer-step sample as shown in Fig. 1b. These results suggest the potential of the scan-less dual-comb microscopy, and we expect that this method could become a key technique for imaging.

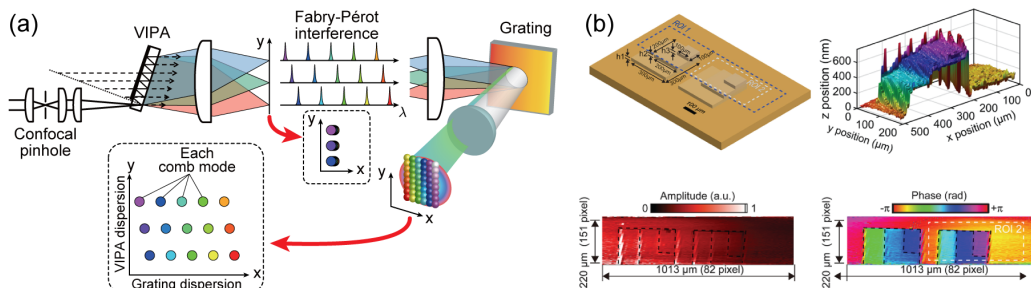


Fig. 1 Scan-less dual-comb microscopy. (a) The concept of scan-less dual-comb microscopy with comb mode/space conversion. (b) Confocal amplitude and phase imaging of a nanometer-step sample.

[1] E. Hase, T. Minamikawa, et al., "Scan-less confocal phase imaging based on dual-comb microscopy", *Optica*, **5** (5), 634-643 (2018).