Standing Wave Axial Nanometry (SWAN) for Superresolution Microscopy

APPLICATION AREAS
Imaging for Life Sciences Research, Drug Discovery, Nanotechnology, Materials Science and Optical MEMS Devices.

ABSTRACT
Despite its importance as a research tool for understanding cellular functions, the optical resolution of light microscopy has imposed limitations on observing and measuring cellular components and structures. The advent of superresolution microscopy techniques, which enable imaging of nanostructures and processes at X-Y resolutions of approximately 20 nm, opens new opportunities for exploring cell biology and has many other applications. However, current superresolution microscopy approaches may have limitations with respect to whether live or fixed cells can be imaged because of image acquisition and processing speed, and may also have limitations in terms of resolution along the Z axis. To overcome these drawbacks, ISU researchers have developed a new technique call SWAN (standing wave axial nanometry) for determining the axial location of nanoscale fluorescent objects with sub-nanometer accuracy and several nanometer precision. Unlike other approaches, SWAN does not require custom optics or specially engineered substrates, which makes it easy to use with biological samples and live cells. SWAN can be easily integrated with other super-resolution and super-accuracy techniques to image with nanometer resolution along the lateral and axial directions. As a consequence, this approach has broad utility for a variety of applications, such as life science research (e.g., biomolecular interactions, structure-function studies, cell imaging), drug discovery (e.g., direct observation of targeted drug delivery and drug interactions in vitro and in living cells and tissues), nanotechnology (e.g., characterization of nanoscale materials), material science (characterization of materials with novel optical properties), and optical MEMS devices by improving their efficiency through more accurate and precise imaging.

BENEFITS
- Can be used with biological materials and living cells
- Extends working range
- Enables imaging with nanometer resolution along lateral and axial directions
- Does not require custom optics
- Can be used for single molecule AFM force measurements

REFERENCE:

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INTELLECTUAL PROPERTY STATUS (November 2012)
Patent pending

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