N-SIM S

Super Resolution Structured Illumination Microscope

Request a Quotation

Doubling the conventional resolution limit for live-cell time-lapse imaging.

The N-SIM S Super Resolution Microscope is a unique high-speed structured illumination system that enhances resolution by a factor of two in XY, doubling the resolution of conventional fluorescence microscopy. Due to the spatial resolution of conventional light microscopes (up to 110 nm in XY), combining the N-SIM S and a confocal microscope gives you the flexibility to select a location in the confocal image and switch to super resolution to view the stored part of the location in minute detail.

Download Super Resolution Guide

Key Features

High-speed super-resolution imaging at 15 fps

Nikon's new high-speed structured illumination system utilizes a novel pattern modulation technology to generate fast and precise stacking of fluorescence emission patterns. The N-SIM S achieves incredible acquisition speeds (up to 15 fps*), enabling super-resolution time-lapse imaging of live cells and intracellular dynamics.

* GFP, 488 nm laser, 512 x 512 pixels, 3 slices, Nikon lens, Hybrid

Movie of mitochondria in HeLa cells, acquired with a 100x objective lens (NA 1.49) and an EMCCD camera (iXon Ultra). Mitochondria were labeled with MitoTracker Green FM. Total magnification: 1,000x. Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

Movie of mitochondria in HeLa cells, acquired with a 100x objective lens (NA 1.49) and an EMCCD camera (iXon Ultra). Mitochondria were labeled with MitoTracker Green FM. Total magnification: 1,000x. Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

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Live-cell imaging at double the resolution of conventional light microscopes

The N-SIM S utilizes Nikon's innovative approach to Structured Illumination Microscopy technology. By pairing this powerful technology with Nikon's renowned objectives, which achieve an unparalleled numerical aperture (NA) of 1.49, the N-SIM S can double the resolution (up to 110 nm in XY) of a microscope of conventional light microscopes, enabling detailed visualization of intracellular structures and their interactions.

* This value is the FWHM measurement of 100 nm beads excited with a 488 nm laser in 3D SIM mode. In TIRF-SIM mode, 86 nm is achieved using 40 nm beads excited with a 488 nm laser.

Live-cell imaging of mitochondria

Live-cell imaging of actin

Mitochondria in HeLa cells expressing Lact-mScarlet-i. Total magnification: 1,000x. Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

Actin in HeLa cells expressing Lifeact-7. Total magnification: 1,000x. Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

Live-cell imaging of mitochondria

Live-cell imaging of actin

Cytokeratin 18 in HeLa cells, 3 Z-stacks, Nikon oil immersion objective (100x, NA 1.49), EMCCD camera (iXon Ultra). Total magnification: 1,000x. Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

Cytoskeleton in HeLa cells, 3 Z-stacks, Nikon oil immersion objective (100x, NA 1.49), EMCCD camera (iXon Ultra). Total magnification: 1,000x. Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

Automatic switching between illumination modes

The newly developed high-speed structured illumination technology enables fast acquisition rates, automatic switching between illumination modes, and automatic optimization of structured illumination patterns for different wavelengths and magnifications. This expanded automation enables fast 2-color TIRF-SIM imaging of live samples, automatic 3D-SIM imaging of fixed samples, and automatic switching between conventional workflows, whether it be for single mode or multi-mode imaging experiments.

Acquire larger fields of view

N-SIM S can acquire super-resolution images with a large field of view of 66 µm square. This larger imaging area enables very high throughput for applications simple that benefit from larger fields of view, such as a neuron, reducing the amount of time and effort required to obtain data.

Large FOV TIRF-SIM image of a cell with a 100x objective lens (NA 1.49) and a CMOS camera (Hamamatsu ORCA-Flash4.0 V3). Total magnification: 1,000x. Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

Various observation modes

TIRF-SIM/2D-SIM mode

TIRF-SIM combines the advantages of TIRF illumination (2D images at high speed with excellent contrast. The TIRF-SIM mode enables Total Internal Reflection Fluorescence illumination at double the resolution of conventional TIRF microscopes, facilitating a greater understanding of molecular interactions at the cell surface.

2D SIM image

Structured illumination image

Alpha-tubulin labeled with Alexa Fluor 488 and mounted in ProLong Diamond Antifade Mounting Medium. Total magnification: 1,000x. Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

3D-SIM mode

The 3D-SIM mode generates structured illumination patterns in three dimensions to deliver a two-fold improvement in axial resolution (down to 200 nm) and lateral resolution (down to 100 nm). This is ideal for applications requiring high-resolution imaging in z-axis. Nikon's unique algorithm, speed, and z-focus reconstruction is suitable for imaging living cells at specific depths, as it allows quick super-resolution imaging with optical sectioning at 100 nm resolution. Stack reconstruction, based on Gaussian/Wiener, is suitable for acquisition of volume data as it can image thicker specimens with higher contrast than also recommended.

3D SIM image

3D structured illumination image

Alpha-tubulin labeled with Alexa Fluor 488 and mounted in ProLong Diamond Antifade Mounting Medium. Total magnification: 1,000x. Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

3D SIM image

3D SIM Maximum projection

Mouse embryonic stem cells (mESC) mitochondria, labeled with MitoTracker Red and counterstained with Alexa Fluor 488 phalloidin.

Microscope: Nikon Ti-E with Perfect Focus System, Nikon Plan Apo λ 100x Oil objective (NA 1.45), Hamamatsu ORCA-Flash4.0 V3 sCMOS camera (6.5 µm pixel size), 2.5x Nikon intermediate magnification.

Acquisition software: Nikon NIS-Elements AR 4.30.02, 64-bit, Build 1053.

Image courtesy of Dr. Rainer Heintzmann, Leibniz Institute of Photonic Technology, Jena, Germany.

TIRF-SIM
Z-stack of 200 nm TIRF, 2 angle 3 pan

3D-SIM
Z-stack of 100 nm, 3 angle 3 pan

Sample: Alpha-tubulin labeled with Alexa Fluor 488 and mounted in ProLong Diamond Antifade Mounting Medium. Total magnification: 1,000x. Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

Z-projection of a Z-stack (Z-range: 2.4 µm) of a HeLa cell expressed Vim1-TRAcK, 100 nm Z-interval
Sample courtesy of Dr. Yuta Shimamoto
Nanobiology Institute, Yamaguchi University

Typical chromosome. Chromatin, spectrin in mouse hippocampal neuron expressing Lim
Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

Simultaneous two channel imaging

Simultaneous two color imaging is possible by utilizing an optional Two Camera Imaging Adapter* and two sCMOS cameras.

* Compatible: Prime 95 B

Simultaneous two color imaging of a cell with a 100x objective lens (NA 1.49) and two sCMOS cameras (Hamamatsu ORCA-Flash4.0 V3). Total magnification: 1,000x. Courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

Seamless switching between imaging modalities for multi-scale experiments

The N-SIM S can be simultaneously combined with a confocal microscope such as the A1+. A standard confocal image can be used to select a specific region of interest (ROI) for super-resolution imaging. Samples can be easily switched by simply switching the imaging method. Combining a confocal microscope with a super-resolution system can provide a method for gaining larger contextual views of super-resolution information.

Confocal image of a cell

TIRF-SIM image of the selected ROI

Sample courtesy of Dr. Shigeki Watanabe, The National Institute of Advanced Industrial Science and Technology (AIST), Tokyo, Japan.

Objectives for super-resolution microscopes

Silicone immersion objectives

Silicone immersion objectives provide high numerical aperture, refractive index close to that of live cells, as an immersion liquid. Because of this improved refractive index compatibility, these objectives can provide improved photon collection capability and resolution when performing super-resolution imaging deeper into the specimen. This added capacity minimizes aberration and spherical aberration and high transmittance over a broad range of wavelengths.

Silicone immersion objectives

Immersion objectives

Nikon's unique, high-quality and magnified using wavefront aberration measurement technology to deliver the ultimate spherical aberration and aberration and optimal spherical performance required for super-resolution imaging. All model objectives provide ultra high power lower vaccination doubling and improved optical chromatic aberration corrections, eliminating the need to switch objectives between the N-SIM S and A1/A1R systems. The NL Gigo objectives that support the Auto Correction Collar of the A1 microscope provide precise compensation of the coverslip thickness.

Immersion objectives

CFI SR HP Apochromat TIRF 100XC Oil

CFI SR Plan Apochromat IR 60XC WI

CFI SR HP Apochromat TIRF 100XAC Oil

Dry objectives

The N-SIM S is compatible with dry objectives, making both super-resolution imaging and confocal imaging available without switching lenses. Low-magnification, wide field-of-view dry lenses enable high resolution observation even at the periphery of sample tissues.

* Dry objectives support 2D-SIM and 3D-SIM (slice reconstruction)

Super-Resolution Microscopes

N-SIM S | N-SIM E | N-STORM | STEDYCON

Related Products

Eclipse Ti2 Series

NIS-Elements

Product Brochure

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