Revealing the vibrant sub-organelle network of life

ZEISS Lattice SIM 5

Your Live Imaging System for Uniform Super-Resolution in All Spatial Dimensions

zeiss.com/lattice-sim

Seeing beyond

Your Live Imaging System for Uniform Super-Resolution in All Spatial Dimensions

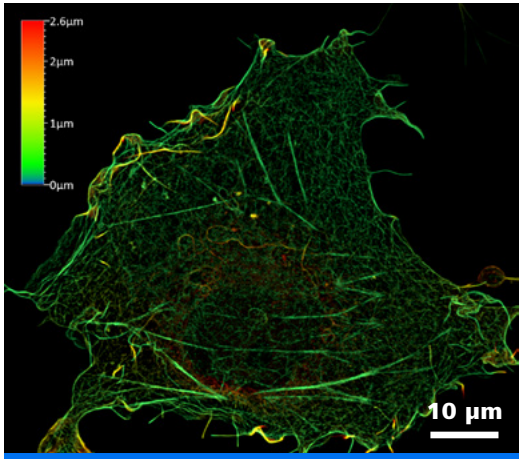
The ZEISS Lattice SIM family

Using microscopy to visualize biological structures provides insights into function. When imaging fixed structures, acquisition settings can be optimized for spatial resolution. However, when capturing dynamic events in living samples, higher acquisition speeds and low-light conditions must be balanced with resolution. The ZEISS Lattice SIM family balances sample size, imaging speed, and super-resolution capabilities based on your application – from outstanding optical sectioning of tissues and developing organisms to high-speed imaging of living cells to resolution excellence at the molecular level.

ZEISS Lattice SIM 5

ZEISS Lattice SIM 5 has been optimized for single cell imaging as well as capturing subcellular structures and their dynamics. Powered by the Lattice SIM technology and the SIM² image reconstruction algorithm, ZEISS Lattice SIM 5 provides you with outstanding super-resolution capabilities down to 60 nm in both living and fixed cells. Additionally, you can choose SIM Apotome imaging mode and a low-magnification objective to achieve fast overview images of your sample before zooming into super-resolution details.

With ZEISS Lattice SIM 5, not only do you gain unique SIM technology. You also maintain the use of standard dyes and fluorescent proteins, the ability to perform simultaneous two-color imaging with clean separation between channels, and the flexibility to choose from a variety of imaging modes to best suit the needs of your samples.



Actin dynamics in a U2OS cell expressing LifeAct-GFP were imaged with the Lattice SIM 3D Leap mode and reduced phases. The movie shows a color-coded depth projection of the volume stack. Objective: Plan-Apochromat 63×/1.4 Oil

Simpler. More Intelligent. More Integrated.

Capture highly dynamic processes

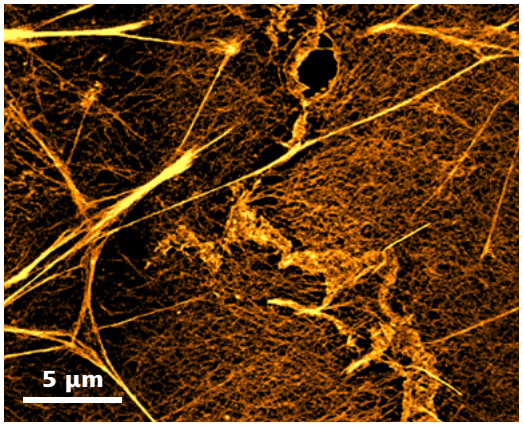
Equipped with the ZEISS Lattice SIM illumination pattern and the SIM² image reconstruction algorithm, ZEISS Lattice SIM 5 raises structured illumination microscopy (SIM) to a new level. You will always achieve the best possible results, even when using lower light exposures to protect living specimens. Double the conventional SIM resolution and discriminate the finest subcellular structures that are no more than 60 nm apart. The light-efficient Lattice SIM technology provides the gentlest imaging of living and fixed specimens, giving you not only double spatial resolution compared to classic SIM, but also high temporal resolution with up to 255 fps.

Optimize to the needs of living samples

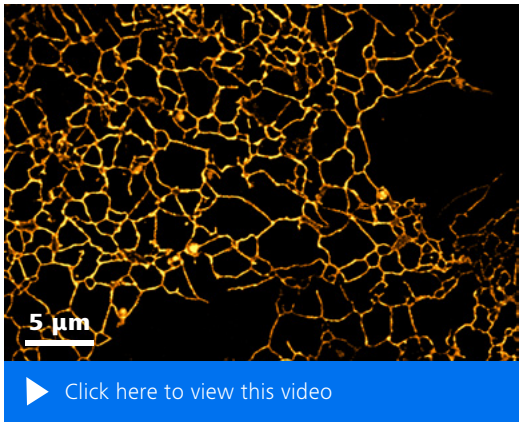
The flexibility of ZEISS Lattice SIM 5 allows you to balance the needs of your experiment by prioritizing resolution, speed, or by finding the right balance in between. Use the photon budget to enhance lateral resolution well below 100 nm or reduce the number of required raw images to boost acquisition speed and gentleness. ZEISS Lattice SIM 5 has a number of options for reducing raw images which allows you to select for the best acquisition settings that target your desired spatial and temporal resolution.

Get more reliable experiment results

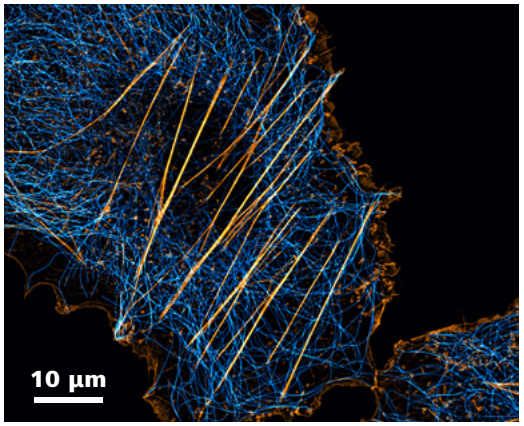
ZEISS Lattice SIM 5 with SIM² comes with outstanding out-of-focus light suppression, giving you the sharpest sectioning in widefield microscopy, even for highly scattering samples. The SIM² image reconstruction uses a special SIM point spread function to robustly reconstruct all structured-illumination-based acquisition data of your ZEISS Lattice SIM 5 with minimal image artifacts – for both living and fixed samples. Rest assured knowing that you are basing your experimental conclusions on reproducible data generated from a powerful and proven algorithm.



The Lattice SIM² image of Cos-7 cells labeled with phalloidin Alexa Fluor 488 shows the fine structure of the Actin network. Maximum intensity projection of Z stack is shown.



Lattice SIM²: Time lapse imaging of the endoplasmic reticulum (ER-StayGold) in a Cos-7 cell reveals highly dynamic structural changes. Sample courtesy of Miyawaki Lab, RIKEN Institute, Japan.



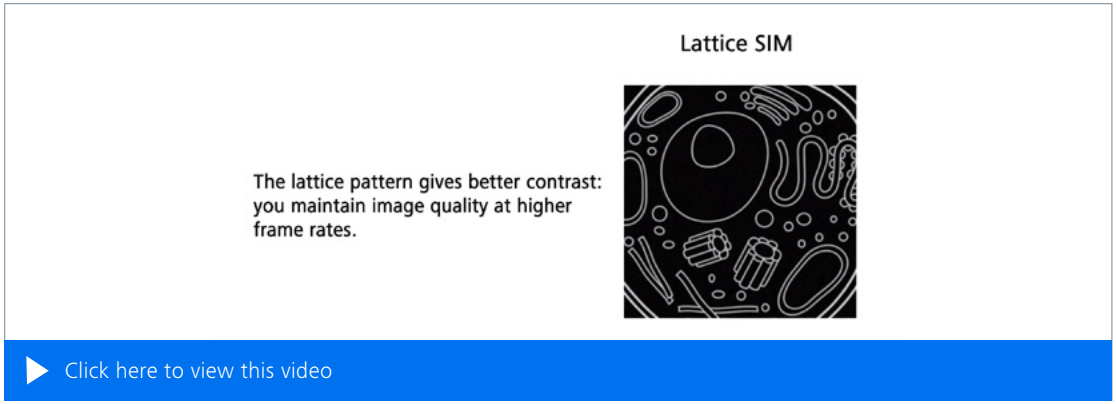
Cos-7 cells stained for microtubules (anti-tubulin Alexa Fluor 488, cyan) and actin (Phalloidin Alexa Fluor 561, orange)

Your Insight into the Technology Behind It

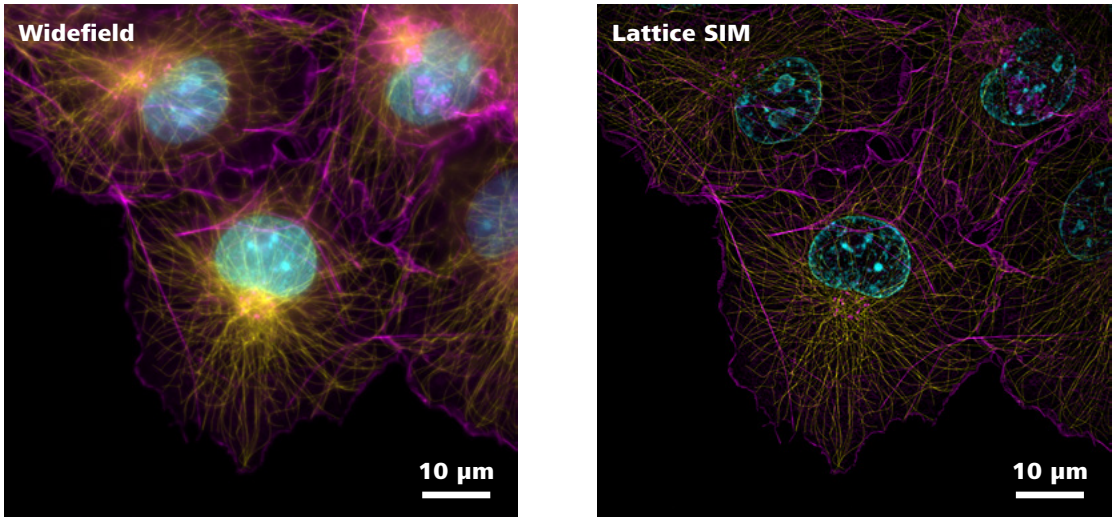
Lattice SIM:
Your 3D super-resolution technique

In classic SIM, the sample is illuminated with a grid structure that interferes with structures in the sample, creating Moiré fringes. These fringes contain high frequency information – that is, high resolution information – transformed down to low frequencies that can be resolved by the microscope. To achieve this effect in all directions, the sample is imaged at different rotational and translational positions (phases) of the grid pattern. The phase images are deconvolved into the resulting image, which will have twice the resolution in all three dimensions.

In Lattice SIM, the sample is illuminated with a lattice spot pattern instead of grid lines. Due to its intrinsic two-dimensionality, the lattice pattern requires only translational repositioning but no rotation. This leads to a dramatic increase in imaging speed. In addition, the lattice pattern provides higher contrast to allow a more robust image reconstruction. Since the sampling efficiency is doubled compared to classic SIM, half as much light exposure is needed making Lattice SIM a preferred live cell imaging technique.



Watch the movie for a quick comparison of classic SIM and Lattice SIM



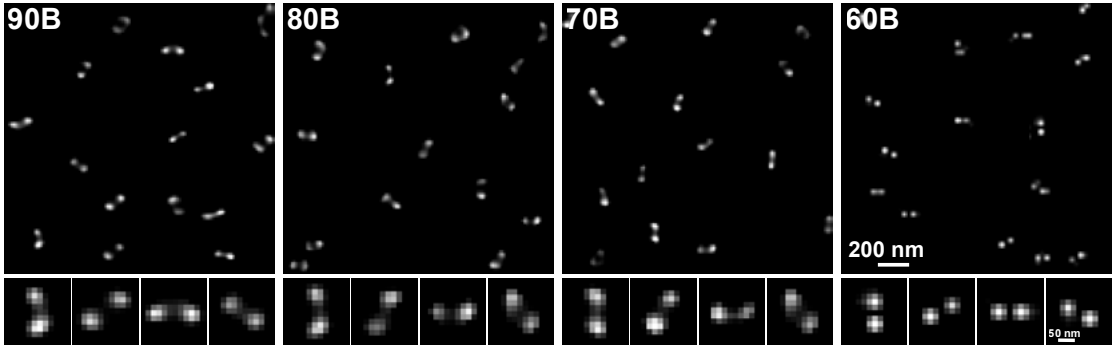
Lattice SIM: Comparison of widefield and Lattice SIM images of Cos-7 cells stained for actin (Phalloidin Alexa Fluor 568, magenta), microtubules (anti-tubulin Alexa Fluor 488, yellow) and nucleus (Hoechst, blue). Images are maximum intensity projections. Objective: Plan-Apochromat 63×/1.4 Oil

Your Insight into the Technology Behind It

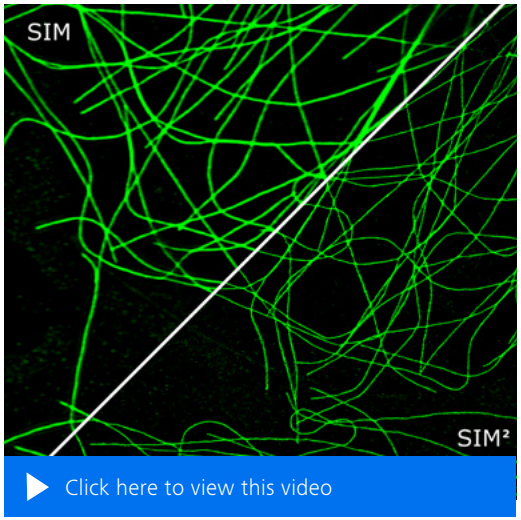
SIM² reconstruction:
Double your SIM resolution

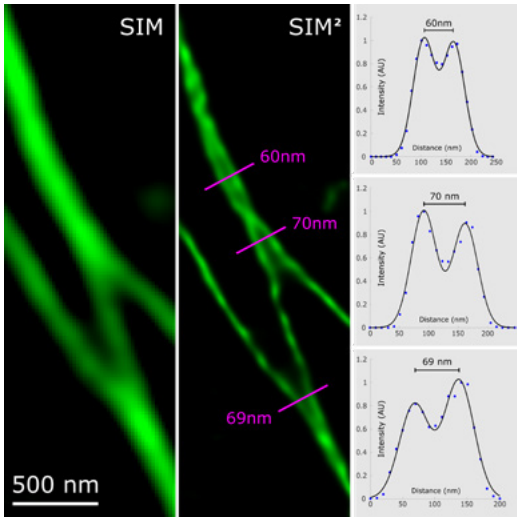
Dual-iterative SIM, or SIM², is a groundbreaking image reconstruction algorithm that increases the resolution and sectioning quality of structured illumination microscopy data. SIM² is compatible with all SIM imaging modes and fully integrated in ZEISS ZEN software.

Unlike conventional reconstruction algorithms, SIM² is a two-step image reconstruction algorithm. First, order combination, denoising, and frequency suppression filtering are performed. All the effects resulting from these digital image manipulations are translated into a digital SIM point spread function (PSF). The subsequent iterative deconvolution uses this PSF. Similar to the advantages of using experimental PSF for deconvolution of hardware-based microscopy data, the SIM² algorithm is superior to conventional one-step image reconstruction methods in terms of resolution, sectioning, and robustness.



GATTA-STED Nanoruler 90B, 80B, 70B and 60B (GATTAquant, Germany) were imaged and processed with Lattice SIM² mode with a 63×/1.4 oil objective. Distances of 90 nm, 80 nm, 70 nm and 60 nm are resolved.



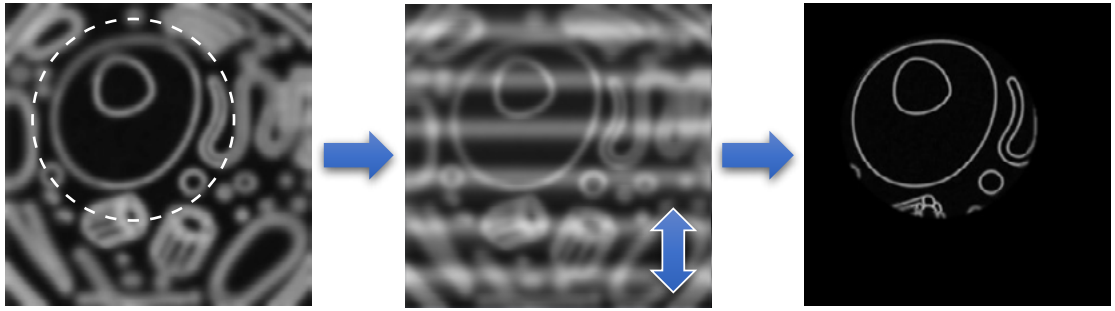


Images of Cos-7 cell stained with anti-alpha-Tubulin Alexa Fluor 488 were processed with the conventional SIM algorithms based on generalized Wiener filter and with the novel SIM² reconstruction. The images show an improvement of resolution for SIM² compared to SIM. The superior sectioning capability of SIM² is shown in the movie. Objective: alpha Plan-Apochromat 100×/1.57 Oil, imaged on Elyra 7 with Lattice SIM.

Your Insight into the Technology Behind It

SIM Apotome: Flexible optical sectioning
Live cell imaging with a widefield system often suffers from out-of-focus blur or background signal. These effects can decrease contrast and resolution. The SIM Apotome acquisition mode uses structured illumination to give you fast optical sectioning of larger volumes with crisp contrast and high resolution in all dimensions. A grid pattern is used to illuminate and rapidly modulate the fluorescence signals in the focal plane. After acquiring three or five images with different grid positions (phases), these frames are combined into a resulting image which contains only information from the focal plane – your optical section.

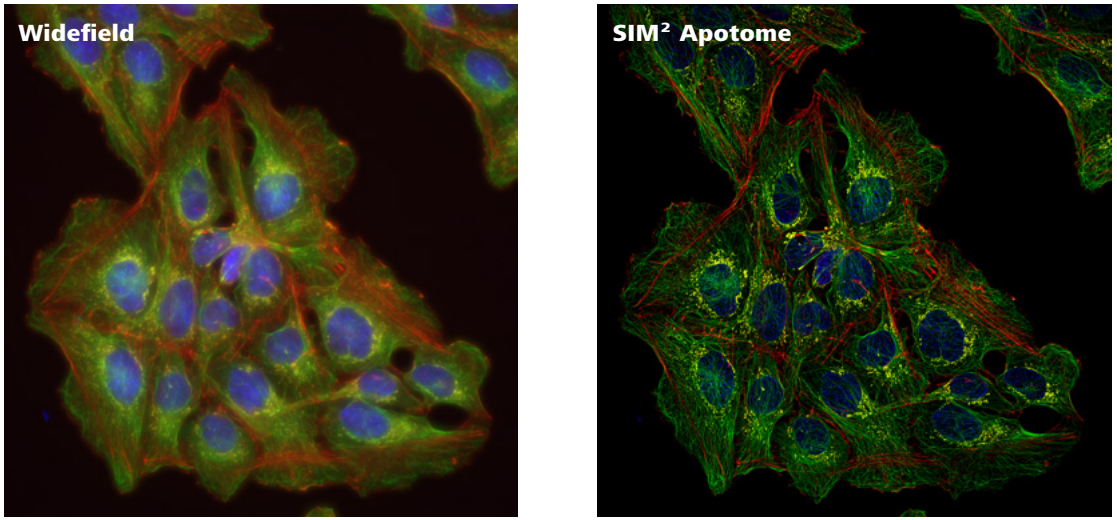
The SIM Apotome acquisition mode in combination with the SIM² reconstruction algorithm allows you to further tune the gentleness of fast live-cell imaging with high contrast and resolution. Or use your new optical sectioning speed to increase productivity when acquiring large sample areas or large volumes at different magnifications.



Widefield image with out-of-focus light. Signal from the focal plane is encircled by a white dashed line.

SIM Apotome acquisition at 3 or 5 different grid positions

Reconstructed optically sectioned image



SIM² Apotome: Comparison of widefield and SIM² Apotome single plane images of U2OS cells stained for actin (phalloidin Alexa Fluor 647, red), microtubules (anti-alpha-tubulin Alexa Fluor 488, green) and nuclei (Hoechst, blue).
Objective: LD LCI Plan-Apochromat 25×/0.8 Imm Corr

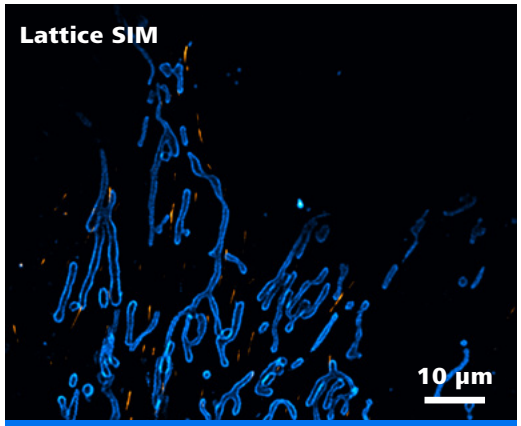
Your Insight into the Technology Behind It

Balance your need for speed and resolution

Higher imaging speeds and decreased light exposures are a constant demand in imaging experiments. At the same time, these acquisition settings affect the resolution of the resulting images, and these parameters must be balanced with the desired outcome. To increase speed and decrease light exposure with SIM techniques, the number of phase images acquired for the reconstruction of one final frame/volume are reduced.

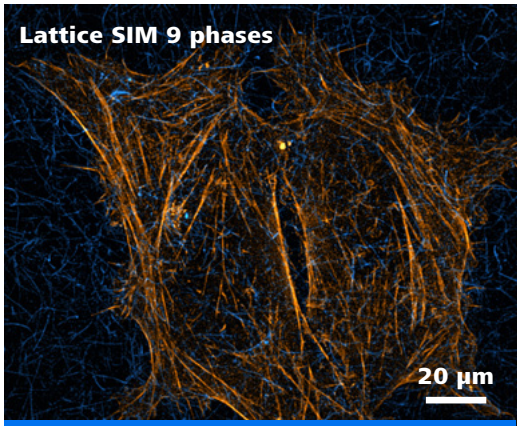
The robustness and flexibility of ZEISS Lattice SIM 5 structured illumination patterns plus the image reconstruction software allow a significant reduction to the number of phase images required for Lattice SIM acquisition mode, and, importantly, this only causes a slight decrease in the resolution of the final images. Lattice SIM 5 acquisition can be operated at 9 phase images per frame instead of 13, increasing the imaging speed by 44 %. The increased speed is particularly advantageous for gentle imaging of highly dynamic live cells where slower acquisition would result in motion blur and reduced resolution.

In combination with Leap mode, the reduced phase acquisition of Lattice SIM decreases the number of phase images per final frame. This means that for every reconstructed image, just one raw image is needed, enabling gentle super-resolution imaging that is unprecedented.



Click here to view this video

Cos-7 cell expressing TOMM20-mEmerald (cyan) and EB3-tdTomato (orange) shows dynamic movement of mitochondria and microtubules. Imaged with Lattice SIM. Objective: Plan-Apochromat 63×/1.4 Oil



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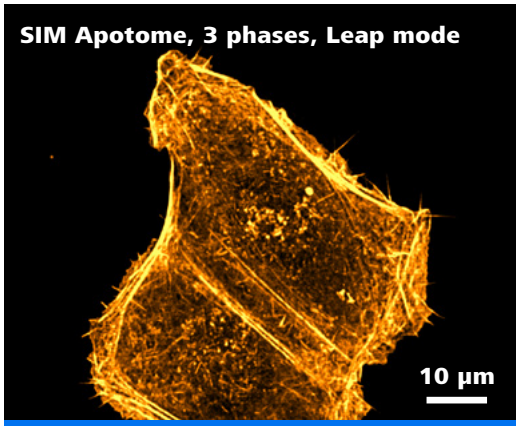
Actin dynamics of U2OS cells expressing LifeAct-tdTomato (orange) imaged with the Lattice SIM² mode with reduced phases. The cells were embedded in a collagen matrix stained with FastGreen dye (cyan). The image shows a maximum intensity projection of the volume stack. Objective: Plan-Apochromat 63×/1.4 Oil.



Click here to view this video

Actin dynamics in a U2OS cell expressing LifeAct-GFP were imaged with the SIM Apotome 3D Leap mode and reduced phases. The image shows a maximum intensity projection of the volume stack. Objective: Plan-Apochromat 40×/1.4 Oil

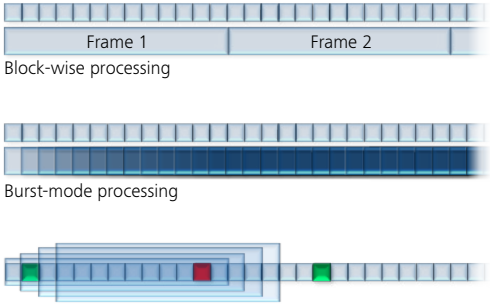
Your Insight into the Technology Behind It

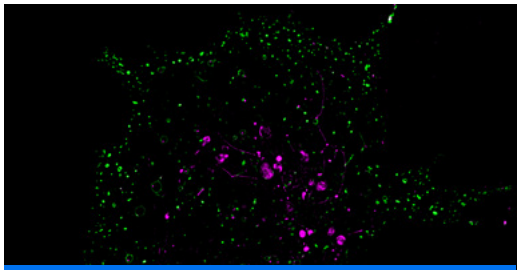
Boost the speed of SIM imaging even further

Lattice SIM 5 already provides you with fast imaging speeds. But you can further increase the temporal resolution and productivity for 2D and 3D imaging by using the speed enhancement modes. The Burst mode and the Leap mode are compatible with Lattice SIM as well as SIM Apotome acquisition. Combined with SIM² image reconstruction, they enable you to capture highly dynamic processes at exceptional resolution in all three dimensions.

2D Burst mode:
Get full temporal information

Burst mode processing uses the rolling window approach to let you observe processes in your living samples at up to 255 fps. Since Burst mode is a post-acquisition step, you have the flexibility to use it with previously acquired data sets. You decide how much temporal resolution is required for your data analysis.

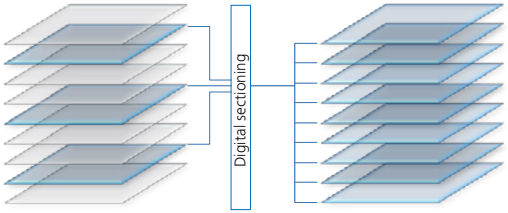


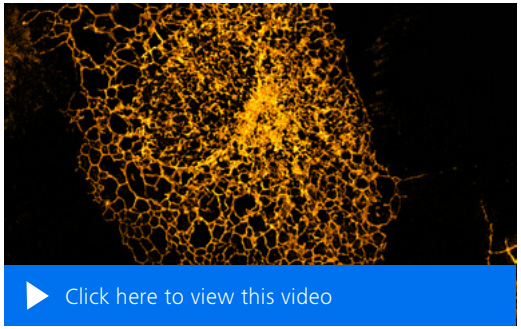


U2OS cell expressing Rab5-mEmerald (green) and tdTomato tagged Golgi associated transport marker (magenta). Simultaneous dual-color acquisition with an exposure time of 1.5 ms / phase for a FOV of 1024 × 1024 pixel (64 µm × 64 µm). Objective: Plan-Apochromat 63× / 1.4 Oil

3D Leap mode:
Digital sectioning at a new level

For demanding fast imaging in 3D, the Leap mode acquisition enables you to reduce your imaging time and lower the light exposure on your sample. This works by imaging only every third plane, for three-times higher volume imaging speed and three-times fewer light exposures. ZEN reconstructs the entire volume using a pixel reassignment approach.





U2OS cell expressing calreticulin-tdTomato to visualize the endoplasmic reticulum. The time series shows a maximum intensity projection of the volume data set. Objective: Plan-Apochromat 63× / 1.4 Oil

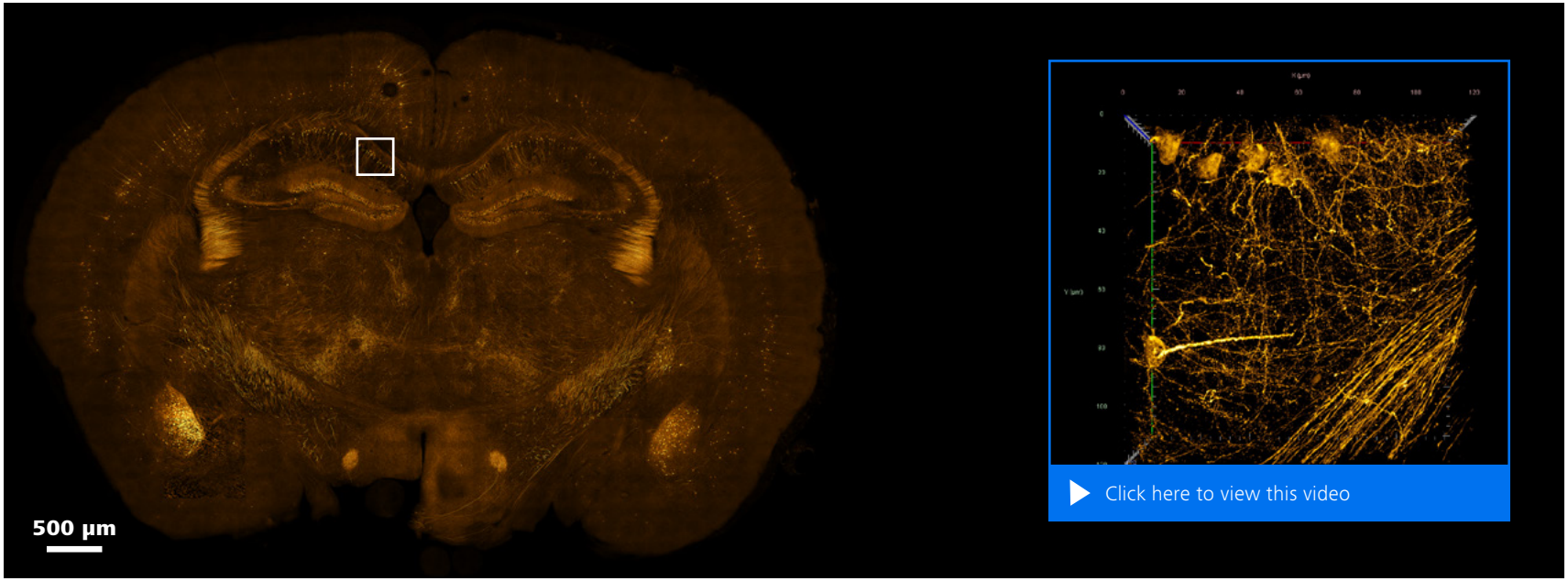
Expand Your Possibilities

ZEISS ZEN: A journey through different scales

Biological samples often contain different types of information at different length scales. Collecting low to high resolution data in the same sample not only makes you more productive, but also allows you to interconnect your findings and create more accurate biological models based on your experimental findings. With AI Sample Finder, you automatically detect your whole sample even before starting your experiment – ensuring that you won't miss any relevant areas. The ZEN Connect toolkit enables you to combine different experiments recorded with various acquisition modes or systems – placing your experiments into the spatial context of the whole sample.

ZEISS arivis Pro: Advanced image processing and 3D reconstruction

Use the efficient ZEISS arivis Pro software for visualization and quantification of large 3D and 4D data sets. ZEISS arivis Pro not only renders volume images of almost unlimited size, but also provides advanced image processing tools such as volume fusion, channel shift, conventional and machine learning based segmentation, 3D tracking, and neuron tracing. Visualize your quantitative results within ZEISS arivis Pro or export all data for further analysis.
The modular structure of ZEISS arivis Pro flexibly adjusts to your needs for advanced image processing and analysis.



Murine brain expressing the neuronal marker Thy1-eGFP was imaged in SIM Apotome and Lattice SIM modes over a Z stack range of 170 µm. Objective for overview image (left): Plan-Neofluar 10×. The ZEN Connect project combines data sets recorded with 10× SIM Apotome, 25× SIM Apotome, 40× SIM Apotome and 63× Lattice SIM. The volume rendering on the right-hand side shows a subset of the 63× Lattice SIM data set. Objective: Plan-Apochromat 63×/1.4 Oil. Sample courtesy of Herms Lab (MCN, University of Munich, Germany).

Expand Your Possibilities

Simultaneous two-color imaging

Investigation of living samples very often focuses on interactions of different proteins or organelles. Simultaneous imaging of the involved structures is key to proper understanding of these highly dynamic processes. ZEISS Lattice SIM 5 can be equipped with a Duolink adapter to operate two sCMOS cameras in parallel and perform true simultaneous two-color imaging within your entire field of view.

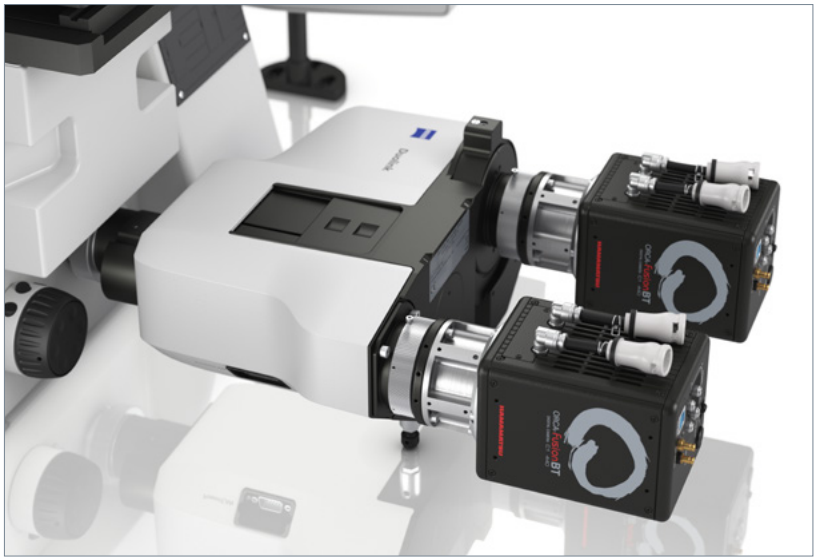
ZEISS Axiocam 820 mono

For excellent performance at a cost-efficient price point, select the ZEISS Axiocam 820 mono camera, which features back-illuminated CMOS sensor with a peak quantum efficiency of 86 %. In combination with its low readout noise, this camera is the perfect choice for imaging faint fluorescence signals in living or fixed samples. The USB 3.0 interface enables high acquisition speeds and exposure times down to 1 ms.

ZEISS Lattice SIM 5 equipped with two ZEISS Axiocam 820 mono cameras

Hamamatsu ORCA-Fusion BT

For outstanding performance, choose the Hamamatsu ORCA-Fusion BT camera. This camera features a scientific CMOS (sCMOS) with a back-thinned sensor enabling peak quantum efficiency of ~95 %. With its ultra-low, uniform readout noise and CoaXPress interface for high acquisition speeds and exposure times down to 1 ms, it yields unparalleled digital imaging results.



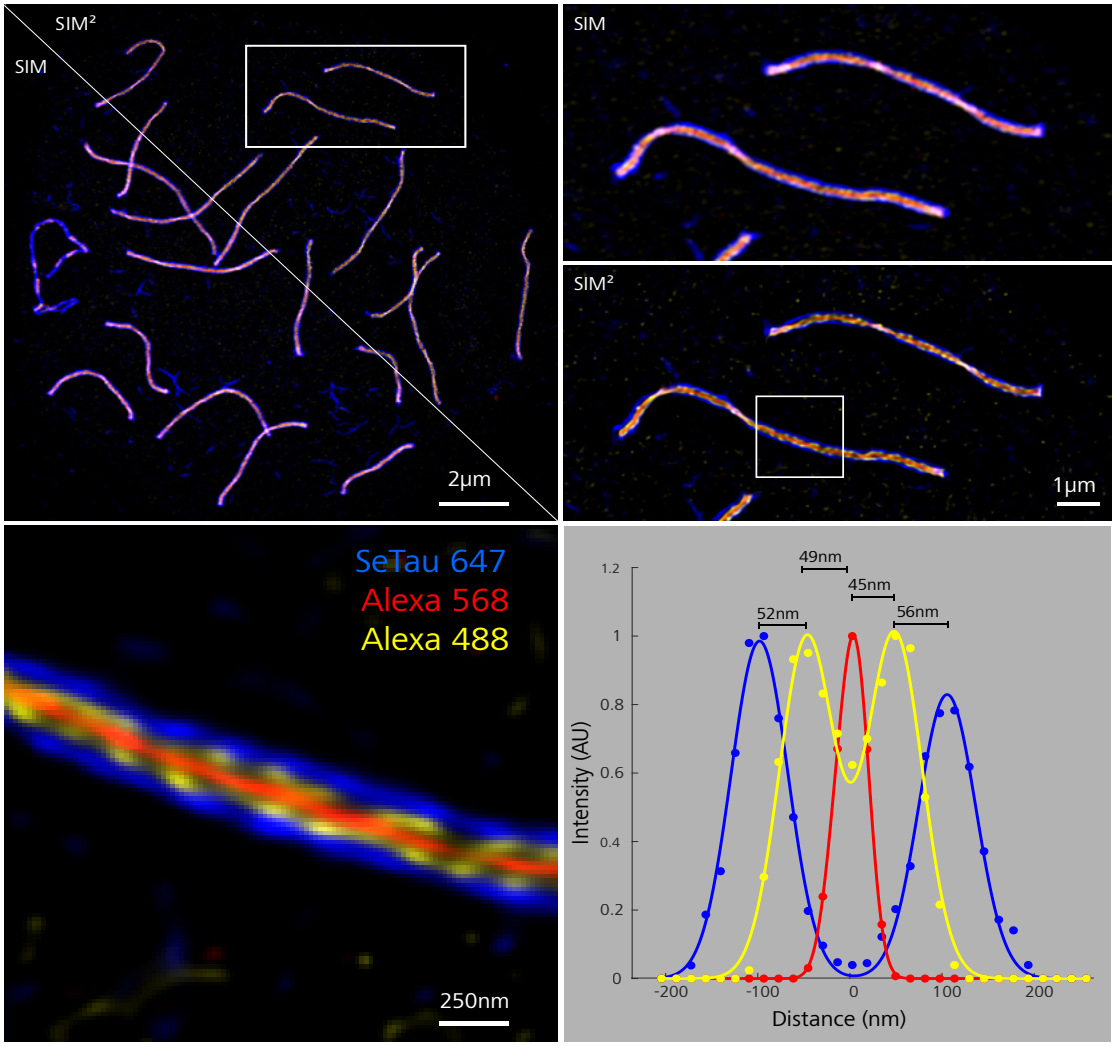
ZEISS Lattice SIM 5 equipped with two Hamamatsu ORCA-Fusion BT cameras

ZEISS Lattice SIM 5 at Work

Straightforward multi-color super-resolution imaging

Studying multiprotein complexes requires super-resolution imaging with multiple colors, which is not often attainable with conventional techniques. Lattice SIM² enables you to perform multi-color imaging at resolution down to 60 nm for conventionally stained samples.

The synaptonemal complex is a well-known structure in the nucleus of meiotic cells and consists of two lateral elements, which are connected to a central element by transverse filaments. Due to its small size, three-color imaging of the synaptonemal complex has previously been possible only using complex methods with elaborate sample preparation, such as super-resolution imaging of three-fold expanded samples using the expansion microscopy technique. Lattice SIM² resolves the two strands of SYCP3 (lateral elements) as well as SYCP1-C (C-terminus of transverse filaments) without special sample treatment or staining for distances well below 100 nm. More importantly, the three-color image provides structural information for the distances between the proteins SYCP3 and SYCP1. Even within the SYCP1 protein, the differently labeled N- and C-Terminus can be clearly separated with less than 50 nm resolution between the two labels.



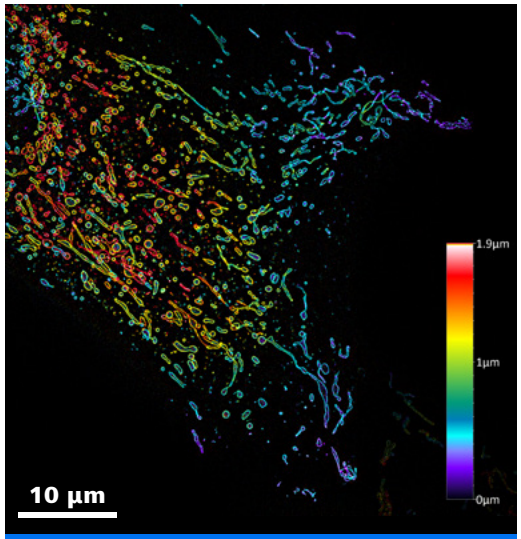
Architecture of threefold labeled synaptonemal complexes from mouse testis visualized via immunolabeling of SYCP3 with SeTau647, SYCP1-C with Alexa Fluor 488 and SYCP1-N with Alexa Fluor 568 and Lattice SIM² mode. Objective: Plan-Apochromat 63×/1.4 Oil. Sample courtesy: Marie-Christin Spindler, AG Prof Ricardo Benavente, Biocenter of the University of Würzburg.

ZEISS Lattice SIM 5 at Work

Observe life's finest details

Understanding biological processes requires observation of living cells or organisms at low light dosage and high spatiotemporal resolution. ZEISS Lattice SIM 5 is your super-resolution system designed for imaging live specimens. Due to its unique lattice structural illumination, it combines high speed imaging with incredible light efficiency, low photon dosage and sensitivity. You can observe cellular, subcellular, and even sub-organelle structures in living specimens in 2D and 3D over time. Whether you are interested in cytoskeletal dynamics, mitochondrial fusion and fission or budding of the endoplasmic reticulum, Lattice SIM 5 provides you with the necessary live cell compatibility at super-resolution.

Mitochondria are powerhouses of our cells, generating energy in the form of ATP to sustain the cell. They are highly dynamic organelles that constantly undergo fusion and fission events to ensure proper distribution of ATP across the cell. In order to do their job, they are known to interact with many other subcellular compartments including microtubules, which they ride on to get to their destinations, or the ER, which wraps around mitochondria to initially constrict their diameter before fission events.



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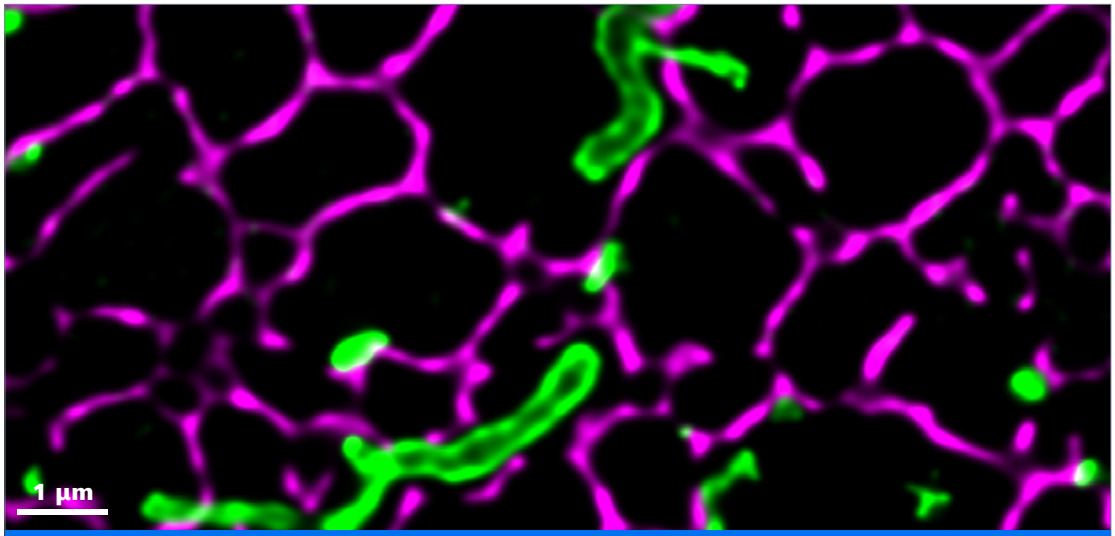
U2OS cell expressing Tomm20-mEmerald. Image shows a color-coded projection of the Lattice SIM² volume data set. Objective: Plan-Apochromat 63×/1.4 Oil



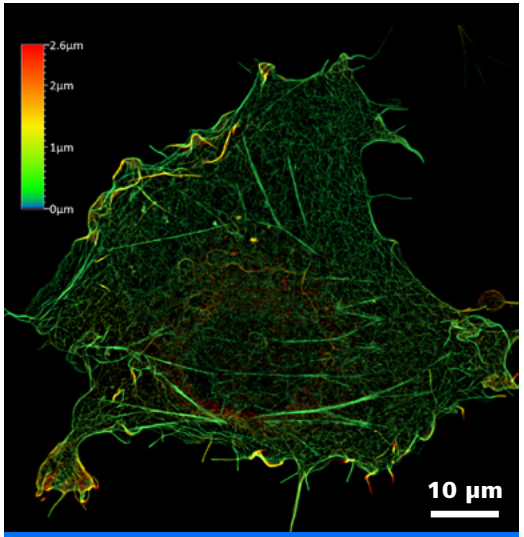
Click here to view this video

Cos-7 cell expressing the endoplasmic reticulum marker Calreticulin-tdTomato (magenta) and mitochondrial marker Tomm20-mEmerald (green) was simultaneously imaged for two colors. The movie shows high dynamic interactions of the ER and mitochondria. Objective: Plan-Apochromat 63×/1.4 Oil

ZEISS Lattice SIM 5 at Work

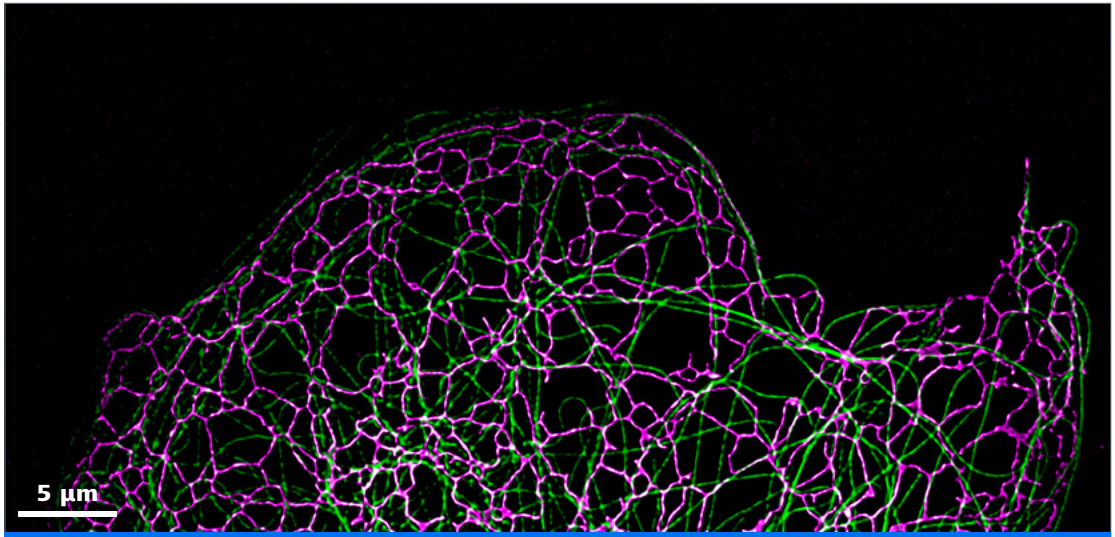
Observe life's finest details

Study of the components of the cytoskeleton is a prominent research field in biology. Due to the fine structures of these components, for example actin and ER networks or microtubular filaments, imaging far below 100 nm is often performed with super-resolution techniques. Lattice SIM² allows you to gain much more structural information from your samples compared to conventional SIM techniques. It not only operates with a resolution of down to 60 nm but also provides markedly improves the sectioning quality in your images. This robust image reconstruction method efficiently separates signal and background without the need for tailor-made staining protocols or expert knowledge of complex microscopy techniques. You can take advantage of the easy-to-use Lattice SIM² technology to unveil complex structural information and gain more insights from your experiments.



Click here to view this video

Actin dynamics in a U2OS cell expressing LifeAct-GFP were imaged with the Lattice SIM 3D Leap mode and reduced phases. The movie shows a color-coded depth projection of the volume stack. Objective: Plan-Apochromat 63×/1.4 Oil



Click here to view this video

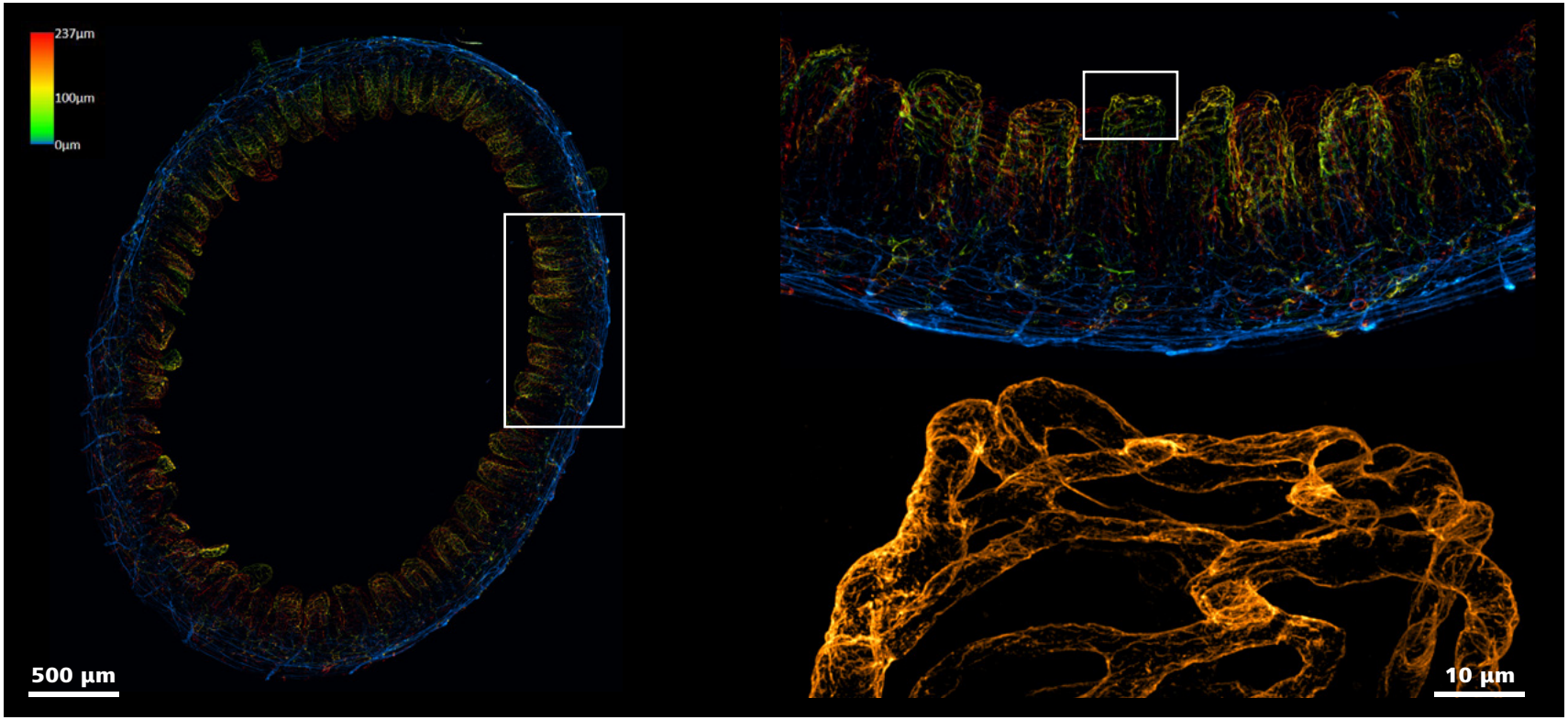
Simultaneous imaging of the endoplasmic reticulum (Calreticulin-tdTomato, magenta) and microtubules (EMTB-3xGFP, green) in a Cos-7 cell reveals highly dynamic interaction of these organelles. Objective: Plan-Apochromat 63×/1.4 Oil

ZEISS Lattice SIM 5 at Work

Resolve the details hiding in the depth

The Lattice SIM illumination pattern exhibits both higher contrast and deeper sample penetration as compared to classical SIM. Achieve super-resolution images along with high-quality sectioning even in thick or scattering samples.

A novel clearing and embedding technology developed by Prof. Tang and his team (Hsiao et al., Nature Communications 2023) combined with the robust Lattice SIM illumination pattern and excellent image reconstruction technology enabled imaging throughout an entire mouse intestine section of ~200 µm thickness. Networks of blood vessels and nerves can be visualized with finest details even at this depth.



Mouse small intestine in A-ha Polymer labeled for blood vessels (Alexa Fluor 488) and nerves (Alexa Fluor 647); anti-fade labeling. Left: Overview image of the whole section recorded with SIM Apotome, blood vessels: color-coded depth projection, nerves: cyan. Objective: Plan-Neofluar 10×/0.3 Air. Top right: Digital zoom into overview image. Objective: Plan-Neofluar 10×/0.3 Air. Bottom right: Selected region of interest imaged with Lattice SIM, blood vessels: orange. Objective: Plan Apochromat 63×/1.4 Oil. Sample courtesy of Prof. Shiue-Cheng (Tony) Tang, Institute of Biotechnology & Department of Medical Science, National Tsing Hua University, Taiwan

The Lattice SIM product family

Address all your super-resolution needs across scales

The ZEISS Lattice SIM product family gives you full access to super-resolution imaging for all research areas, from fast optical sectioning to the detection of highly dynamic processes and quantification at the molecular level.

ZEISS Lattice SIM 3

Reveal cellular behavior and inter-cellular dynamics

Lattice SIM 3 is specifically designed to meet the imaging requirements of multicellular organisms and tissue sections. This system exploits the full potential of the SIM Apotome technology: fast optical sectioning at superior quality, large fields of view with access to smaller regions of interest, near-isotropic resolution, and the gentlest super-resolution imaging possible.

ZEISS Lattice SIM 5

Reveal the vibrant sub-organelle network of life

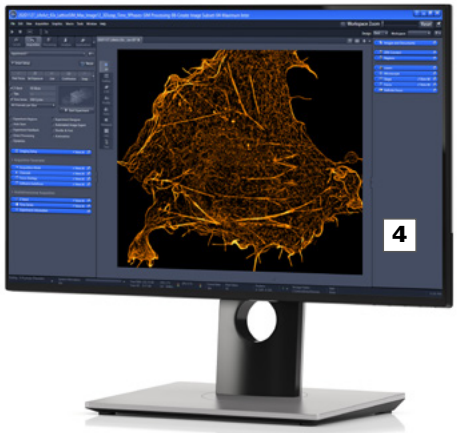
ZEISS Lattice SIM 5 has been optimized for single cell imaging as well as capturing subcellular structures and their dynamics. Powered by the Lattice SIM technology and the SIM² image reconstruction algorithm, ZEISS Lattice SIM 5 provides you with outstanding super-resolution capabilities down to 60 nm in both living and fixed cells.

ZEISS Elyra 7 with Lattice SIM

Reveal life across scales – down to molecular details

ZEISS Elyra 7 includes several microscopy techniques: Lattice SIM², SIM² Apotome, SMLM and TIRF. You can combine these techniques to multiply the insights from your specimen and to correlate the acquired data. With its focus on single molecule localization microscopy, ZEISS Elyra 7 gives you resolution excellence down to the molecular level.

Your Flexible Choice of Components



1 Microscope

- ZEISS Axio Observer 7 (inverse stand)
- Stage top incubation
- Motorized XY stepper scanning stage
- Z-Piezo stage insert
- 1 camera port for camera or Duolink

2 Objectives

- alpha Plan-Apochromat 63×/1.46 Oil
- Plan-Apochromat 63×/1.4 Oil (DIC*)
- C-Apochromat 63×/1.2 Water (DIC*)
- Plan-Apochromat 40×/1.4 Oil (DIC*)
- C-Apochromat 40×/1.2 W
- LD LCI Plan-Apochromat 25×/0.8 Imm Corr
- Plan-Apochromat 20×/0.8 Air
- EC Plan-Neofluar 10×/0.3 Air

3 Lattice SIM 5 Illumination and Detection

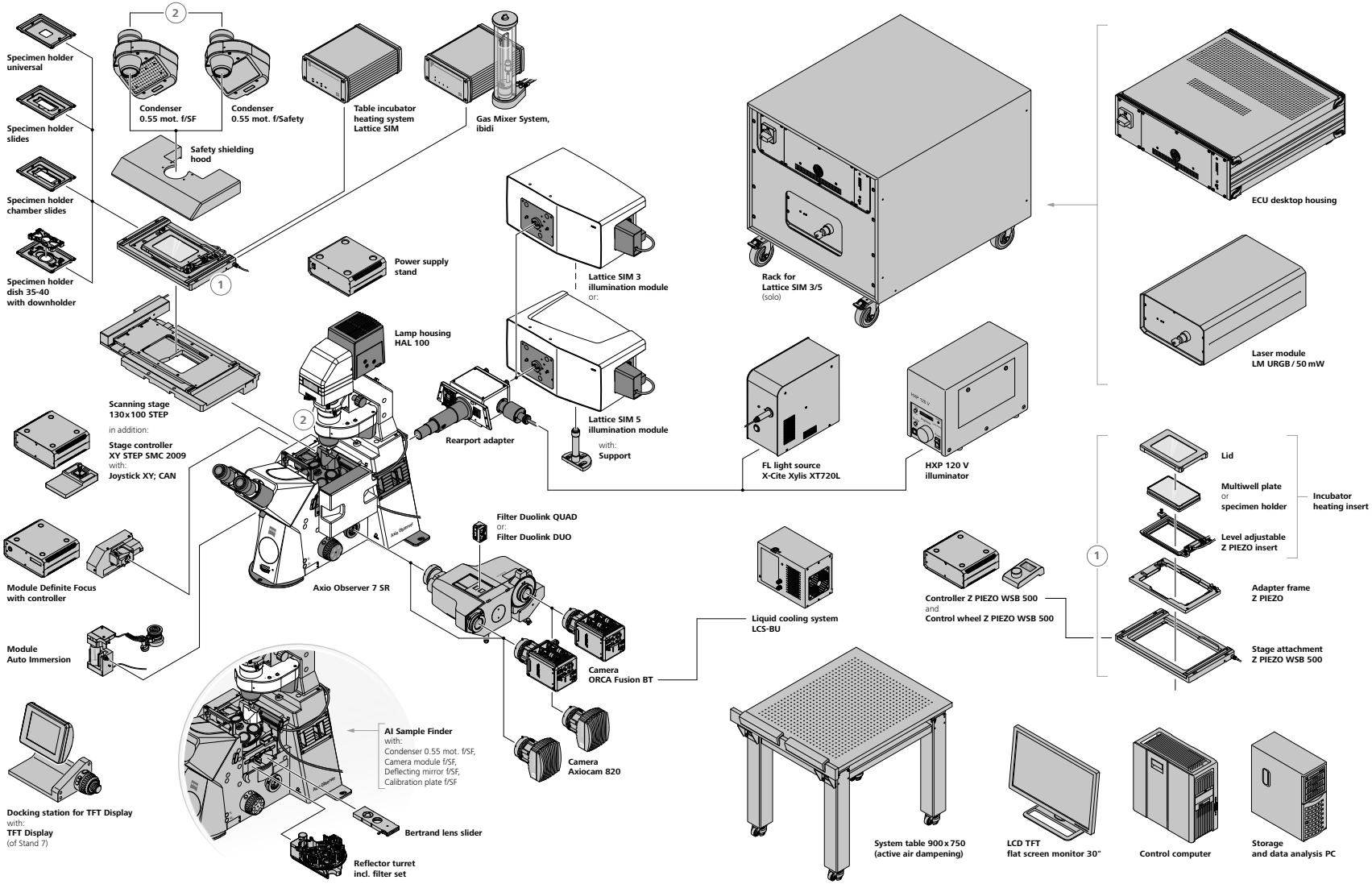
- Fiber-coupled diode pumped solid state lasers
- Available lines:
  405 nm diode (50 mW),
  488 nm diode (50 mW),
  561 nm diode (SHG) (50 mW),
  640 nm diode (50 mW)
- ZEISS Axiocam 820 mono CMOS camera
- Hamamatsu ORCA-Fusion BT sCMOS camera

4 Software

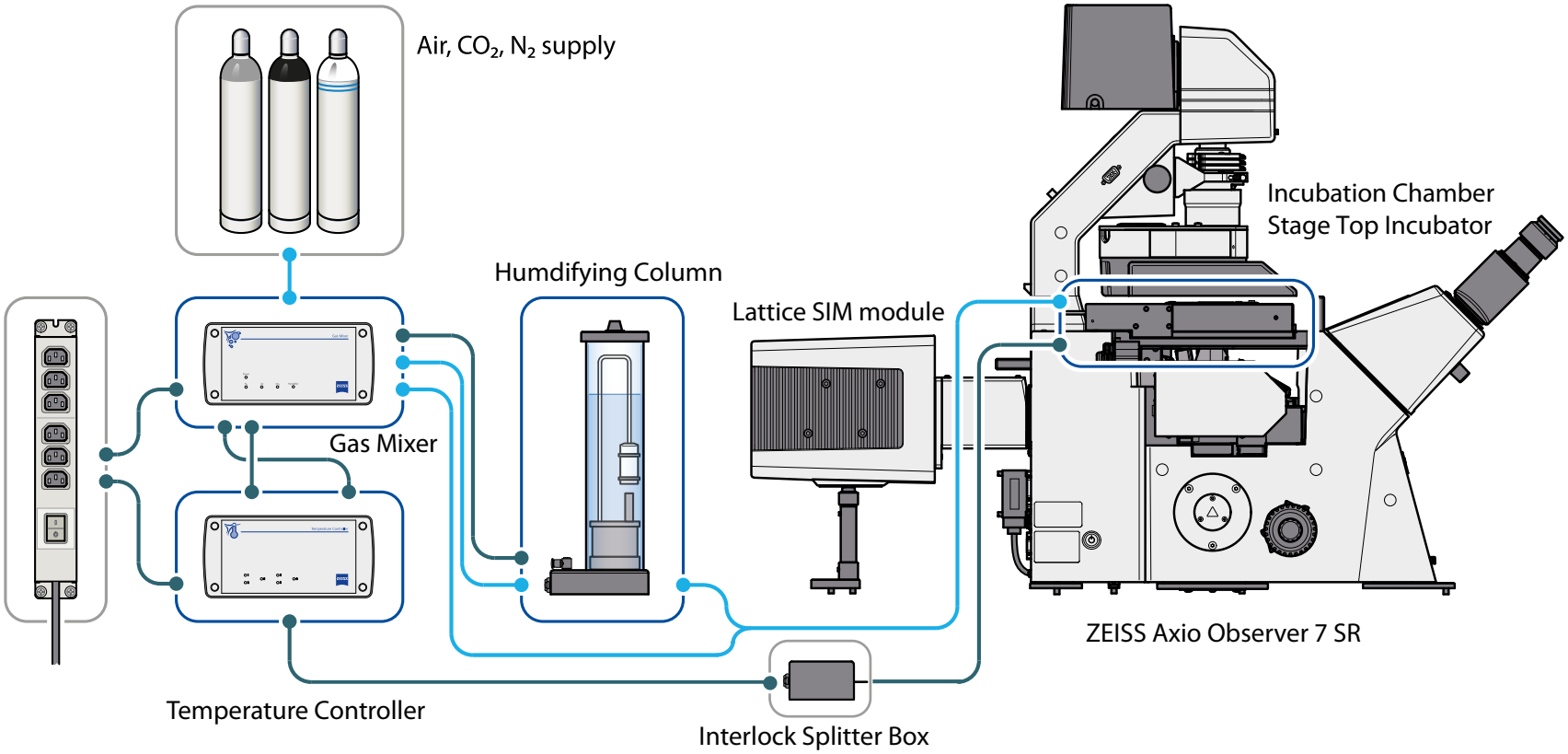
- ZEN (blue edition)
- SIM toolkit

* DIC indicates type of objective not imaging modality

System Overview



Incubation Setup



Technical Specifications

Microscope	
Stand	ZEISS Axio Observer 7, motorized inverted microscope for super-resolution microscopy
Z-drive	DC servo motor, opto-electronically coded; smallest Z step: 25 nm
XY stepper scanning stage	Motorized, stepper motor with 2 mm spindle pitch; travel range: 130 mm × 100 mm; max. speed: 50 mm/s; Resolution: 0.1 µm; reproducibility: ± 1 µm; absolute accuracy: ± 5 µm; Suitable for mounting frames K 160 × 110 mm and Z-Piezo stage insert; compatible with objectives' autocorr
Z-Piezo stage insert	For XY scanning stage, max travel range: 500 µm; smallest Z step size: 5 nm; Level-adjustable stage insert for frame inserts (sample holders) and multi-well plates; Sample holders available for 3" x 1" standard slides, LabTek chambers; 35–40 mm glass-bottom dishes; Universal stage insert for various carrier formats

Optical Filters	
Filter sets reflector turret	Flexible filter set available for simultaneous multi-channel acquisition Filter set with four precisely mounted ACR-coded filter modules for super-resolution microscopy on a motorized six-position turret; Two positions in the turret compatible with standard Push & Click filter modules, e.g., for visual sample observation
Dual filter set for Duolink	Filter sets are optimized for one color (SOLO), dual color (DUO) and four color (QUAD) applications
Filter slider	Manual filter slider with Bertrand lens; fits into the slit below the objective turret

Lasers	
Laser module for Lattice SIM 5	Laser coupling with polarization-maintaining single mode fiber (no adjustment of laser coupling by users required)
Laser lines	405 nm (50 mW), 488 nm (50 mW), 561 nm (50 MW), 640 nm (50 mW); 405, 488 & 640 nm: diode lasers (DL); 561 nm: frequency doubled diode laser (FDDL); Direct modulation @ 500:1

Cameras	
CMOS	ZEISS Axiocam 820 mono; sensor pixel count: 4512×4512 = 20 megapixel, effective: 3072×3072; pixel size: 2.74 µm×2.74 µm; QE: up to 86 % (@460 nm); binning: 1×1, 2×2 (default), 4×4; gain: 1× (min), 2×, 4× (opt), 8×, 16× (max); active cooling, regulated sensor temperature: 25 °C; bit depth: 14 Bit; frame rate: 28 fps, 75 fps (2×2 binning) @ full frame
sCMOS	Hamamatsu ORCA-Fusion BT; sensor pixel count: 2304 × 2304, effective: 1304 × 1304; pixel size 6.5 µm × 6.5 µm; QE: up to 95 % @ 540 nm); water cooling (regulated sensor temperature –8 °C); dynamic range: 16 bit; binning: 1×1, 2×2, 4×4; Frame rates: 89 fps (fast) @ full frame
	Liquid cooling system for sCMOS camera (Hamamatsu ORCA-Fusion BT)

Technical Specifications

Lattice SIM 5	
Illumination module	Illumination module attached to rear port of microscope stand; fully motorized SIM imaging; Five different grating frequencies for Lattice SIM for optimal matching of illumination pattern to laser wavelength and objective lens; Motorized exchange of gratings in multi-color Lattice SIM; one grating for SIM Apotome; fast piezo actuated phase stepping of gratings
Camera	Up to two CMOS (ZEISS Axiocam 820) or sCMOS (Hamamatsu ORCA-Fusion BT) cameras mounted on right side port
Imaging modes	Widefield mode for illumination with thermal light source or LED; laser widefield mode for illumination with laser; Lattice SIM mode using two-dimensional lattice grid; SIM Apotome mode using one-dimensional line grid
Objective lenses (Lattice SIM)	Plan-Apochromat 63×/1.40 Oil DIC*; C-Apochromat 63×/1.20 W Corr; alpha Plan-Apochromat 63×/1.46 Oil, ACR[(1)] coding
Objective lenses (SIM Apotome)	Plan-Apochromat 40×/1.4 Oil; C-Apochromat 40×/1.2 W; LD LCI Plan-Apochromat 25×/0.8 Imm Corr DIC*; Plan-Apochromat 20×/0.8 Air; EC Plan-Neofluar 10×/0.3 Air
Resolution (Lattice SIM/Lattice SIM²)	Lateral resolution (XY): down to 120/60 nm (typical experimental FWHM values with objective lens Plan-Apochromat 63×/1.40 Oil DIC*, sub-resolution beads of 100 nm diameter and excitation at 488 nm; resolution is sample and SNR dependent)
Resolution (SIM/SIM² Apotome)	Lateral resolution (XY): down to 320/265 nm for 25× (typical experimental FWHM values with sub-resolution beads of 100 nm diameter and excitation at 488 nm)
Multi-color (Lattice SIM and SIM Apotome)	Detection of up to four different fluorescent labels (sequential detection) and simultaneous dual-color detection with Duolink
Max. field of view (Lattice SIM) @ ORCA-Fusion BT	103.21 × 103.21 µm², full-frame recording (1288 × 1288 effective px) with Plan-Apochromat 63×/1.40 Oil DIC*
Max. field of view (SIM Apotome) @ ORCA-Fusion BT	127 × 127 µm², full frame recording (1288 × 1288 effective px) with Plan-Apochromat 40×/1.40 Oil; 203.20 × 203.20 µm², full frame recording with LD LCI Plan-Apochromat 25×/0.8 Imm Corr DIC*; 254 × 254 µm², full frame recording with Plan-Apochromat 20×/0.8 Air; 651 × 651 µm², full frame recording with EC Plan-Neofluar 10×/0.3 Air
Acquisition speed (Lattice SIM)	19 SIM image frames per second at 512 × 512 px resolution and 1 ms exposure time (13 phase images per one SIM image) 28 SIM image frames per second at 512 × 512 px resolution and 1 ms exposure time (9 phase images per one SIM image)
Acquisition speed (SIM Apotome)	51 sectioned frames per second at 512 × 512 px resolution and 1 ms exposure time (camera limited) (5 phase images per one sectioned image); 85 sectioned frames per second at 512 × 512 px resolution and 1 ms exposure time (camera limited) (3 phase images per one sectioned image)
Leap mode and Burst mode	Leap and Burst modes are combinable with both the Lattice SIM and SIM Apotome. Leap mode increases the frame rate by a factor of 3 for 3D image acquisition. Max. 255 image frames per second at 512 × 512 px resolution and 1 ms exposure time are available for 2D data after Burst processing.
Data recording and analysis (Lattice SIM and SIM Apotome)	Full software control of Lattice SIM imaging; Multi-tracking: sequential multi-channel data acquisition with freely configurable change of gratings (Lattice SIM), or one common grating (SIM Apotome mode), filters and excitation lasers between tracks; Simultaneous dual-color imaging with one grating; Lattice SIM and SIM Apotome mode imaging in user-defined sub-array regions (ROI imaging); Leap mode for 3 times faster imaging with excellent sectioning; Extension of imaged area possible with tile scanning and stitching; Burst mode processing for 2D time series data sets for Lattice SIM and Apotome mode to increase effective frame rates by a factor of 15 and 5, respectively.

* DIC indicates type of objective not imaging modality

[(1)] ACR (Automatic Component Recognition); Lattice SIM systems and ZEN imaging software automatically recognize ACR-coded components.

Technical Specifications

Software	
Standard	ZEN imaging software (64-bit); operating system: Microsoft Windows 10
	Full software control of image data recording in all imaging modes (including widefield, super-resolution); Software-controlled switching between imaging modes; Full software control of data recording (multi-channel imaging, time series, z-stack); Saving and restoring of user-specific configurations for data recording
SW packages	Required: ZEN package; ZEN module Lattice SIM; ZEN toolkit Advanced Acquisition; ZEN toolkit 3D, ZEN toolkit 2D Optional: ZEN toolkit Deconvolution; ZEN toolkit Connect; ZEN toolkit AI; ZEN toolkit Developer; Vision package

Accessories	
Definite Focus	Holding focus to compensate axial drift, typical z-position accuracy: 30 nm; Specified limits of Definite Focus 3: 0.2 × DOF (Depth of field: DOF ≈ λ/NA^2).
Incubation	Stage top incubation with safety lock
Duolink for attachment of two cameras of the same type	Allows attachment of two cameras of the same type to the microscope.
Storage PC with 81 TByte storage capacity	Direct streaming of data and parallel processing while streaming of data possible

Certified Quality System ISO 13485 mdc

Lattice SIM 5 meets the requirements according to IEC 60825-1:2014 and it a laser class 1 device.
Interlocks on customer interfaces prevent access to the laser radiation.

ZEISS Service – Your Partner at All Times

Your microscope system from ZEISS is one of your most important tools. For over 175 years, the ZEISS brand and our experience have stood for reliable equipment with a long life in the field of microscopy. You can count on superior service and support - before and after installation. Our skilled ZEISS service team makes sure that your microscope is always ready for use.

Procurement

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- Site Inspection & Environmental Analysis
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- Inspection & Preventive Maintenance
- Software Maintenance Agreements
- Operation & Application Training
- Expert Phone & Remote Support
- Protect Service Agreements
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- Instrument Relocation
- Consumables
- Repairs

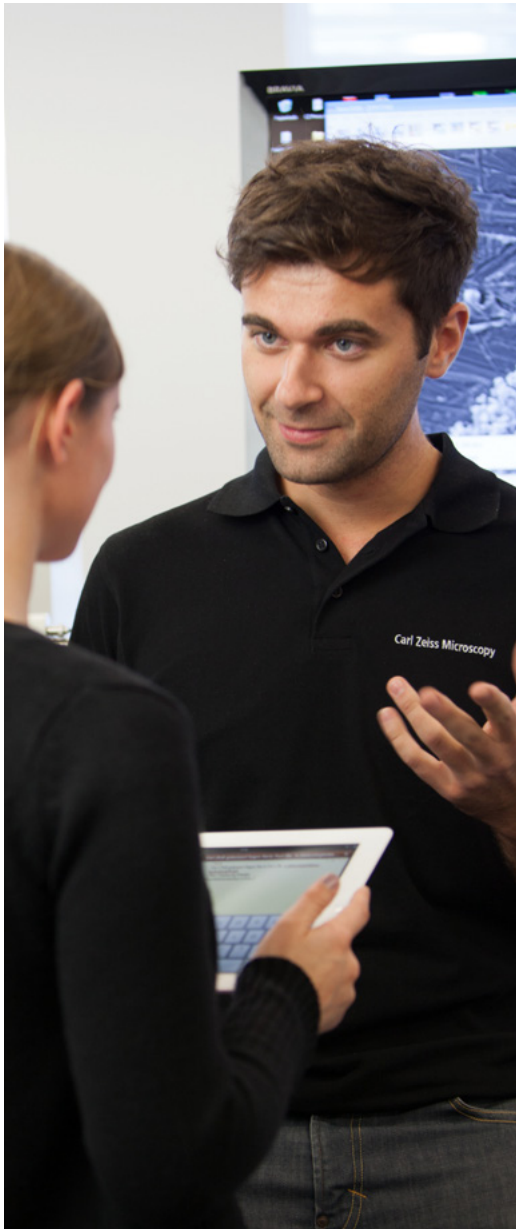
New Investment

- Decommissioning
- Trade In

Retrofit

- Customized Engineering
- Upgrades & Modernization
- Customized Workflows via ZEISS arivis Cloud

Please note: Availability of services depends on product line and location



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