



Product Information
Version 1.1

ZEISS LSM 900 with Airyscan 2

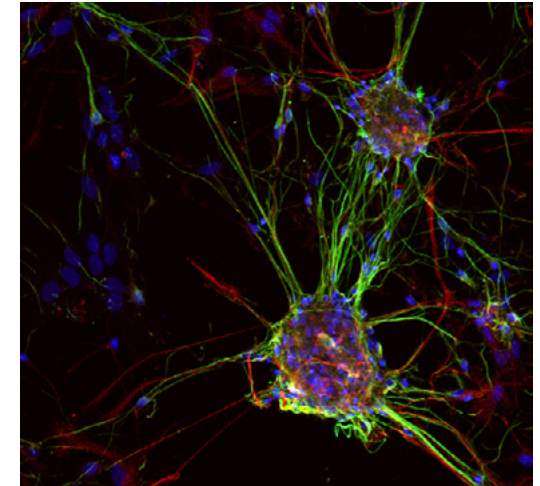
Your Compact Confocal for Fast and Gentle Multiplex Imaging



Your Compact Confocal for Fast and Gentle Multiplex Imaging

- › **In Brief**
- › The Advantages
- › The Applications
- › The System
- › Technology and Details
- › Service

What are you looking for in confocal imaging? Whatever your scientific question, you want to start with the best possible image quality and that means crisp contrast and the best resolution. You also want the highest sensitivity for gently imaging your living or fixed samples without bleaching. Your LSM 900 with Airyscan 2 has all this and more. You image with 4–8× more signal-to-noise ratio (SNR) and with a resolution down to 120 nm. You also get the highest frame rates: the new Multiplex mode for Airyscan 2 adds smart detection schemes for parallel pixel acquisition. You can now observe dynamic processes in living specimens gently – without sacrificing image quality. Plus, your LSM 900 has a genuinely small footprint, concentrating on the essence of a confocal and leaving off needless complexity. It fits easily into your lab or imaging facility – and it's easy to use, too.



Neurospheres , multi-color label with Dapi (blue), Tubulin-Cy2 (green), DCX-Cy5 (red). Acquired with GaAsP detectors on ZEISS LSM 900. Sample courtesy of H. Braun, LSM Bioanalytik GmbH, Magdeburg, Germany.

See for yourself how the new Multiplex mode for Airyscan 2 gives you better data faster than ever before. Book a hands-on demonstration in one of our ZEISS Microscopy Labs now.

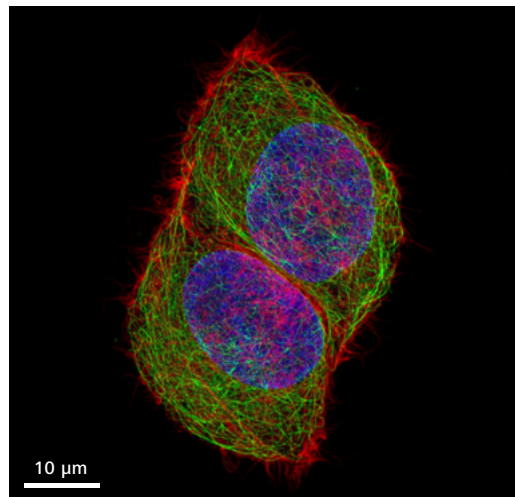
>> www.zeiss.com/lsm900

Simpler. More Intelligent. More Integrated.

- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

Get Better Data – Faster

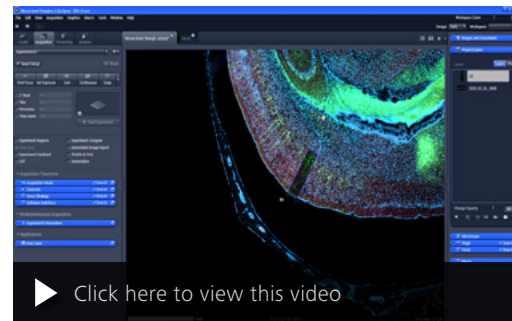
Combine the excellent image quality of your LSM 900 with the new Multiplex mode for Airyscan 2 to get more information in less time than ever before. You can now employ smart detection schemes to image your challenging three-dimensional samples with the highest framerates and superresolution. The speed and gentleness of the sensitive Airyscan area detector complement the compact point scanning confocal and allow you to image your most demanding samples with 4 – 8x more SNR.



HeLa cells stained for DNA (blue, Hoechst 44432), microtubules (green, anti-tubulin, alpaca anti-mouse-alexa 488) and F-actin (red, phalloidin-Abberior STAR Red). Acquired with Multiplex mode for ZEISS Airyscan. Sample: courtesy of A. Politi, J. Jakobi and P. Lenart, MPI for Biophysical chemistry, Göttingen, Germany.

Increase Your Productivity

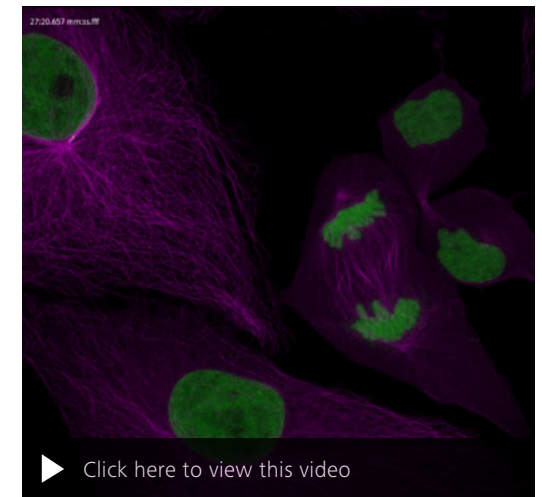
Your LSM 900 with Airyscan 2 is not just compact – it's also very easy to use. Setup is simple with ZEN imaging software, even for complex confocal live cell imaging experiments. A wealth of software helpers lighten the load and make sure you get reproducible results in the shortest possible time. Smart Setup and the new Sample Navigator let you find regions of interest and image them quickly, leaving you more time to acquire data. Direct Processing allows parallel acquisition and data processing. ZEN Connect keeps you on top of things at all times, both during imaging and later when sharing the whole story of your experiment. It's easy to overlay and organize images from any source.



See how ZEN Connect from ZEISS helps to always keep your context while imaging. From acquiring an overview image, to defining ROI's, and even when changing between different imaging systems. You save time and always stay on top of things.

A Small Footprint for Greater Image Quality

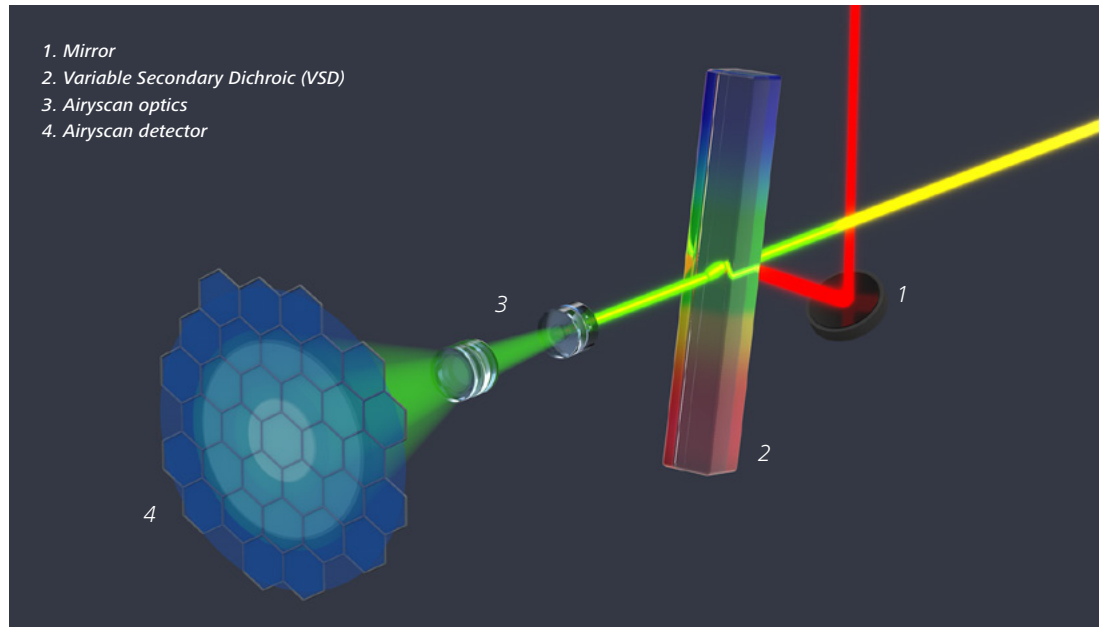
Your LSM 900 is packed with innovative and clever solutions for producing the best quality in confocal live cell imaging. The elegant beam path is designed for high spectral flexibility, with each single component optimized for the highest sensitivity and contrast. Given its small footprint and reduced complexity, you'll save valuable lab space, minimize the time needed for user-training and reduce the cost of ownership – this is especially good news for imaging facilities.



Cell division of LLC-PK1 cells, alpha-tubulin (mEmerald, magenta) and H2B (mCherry, green). With the new Multiplex mode for ZEISS Airyscan a Z-stack of 52 slices was captured every 40 seconds for a total of 40 minutes.

Your Insight into the Technology Behind It

- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service



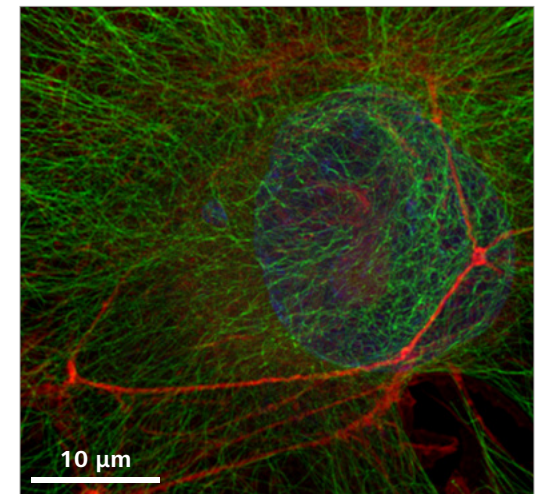
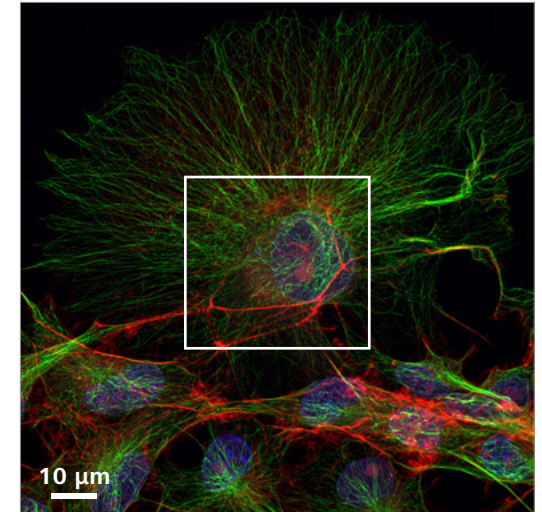
Schematic beam path of ZEISS Airyscan.

The Airyscan Principle

Classic confocal laser scanning microscopes use point illumination to scan the sample sequentially. The microscope optics transform each point to an extended Airy disk (Airy pattern). A pinhole then spatially limits this Airy disk to block out-of-focus light from reaching the detector. Closing the pinhole gives higher resolution, but at the price of detecting fewer photons – and these photons cannot be brought back by e.g. deconvolution. Airyscan 2 is an area detector with 32 concentrically arranged detection elements. This allows you to acquire most of the Airy disk all at once. The confocal pinhole itself remains open and does not block light, thus more photons are collected. This produces much greater light efficiency while imaging. Airyscan 2 gives you a unique combination of gentle superresolution imaging and high sensitivity.

For further information on the Airyscan principle please refer to:

<https://zeiss.ly/airyscan-principle>



Comparing the field of view you can image at superresolution in the same time using Airyscan SR (bottom) and Multiplex mode (top). COS 7 cells with labelled microtubules (alpha-tubulin 488, green) and actin (phalloidin 568, red).

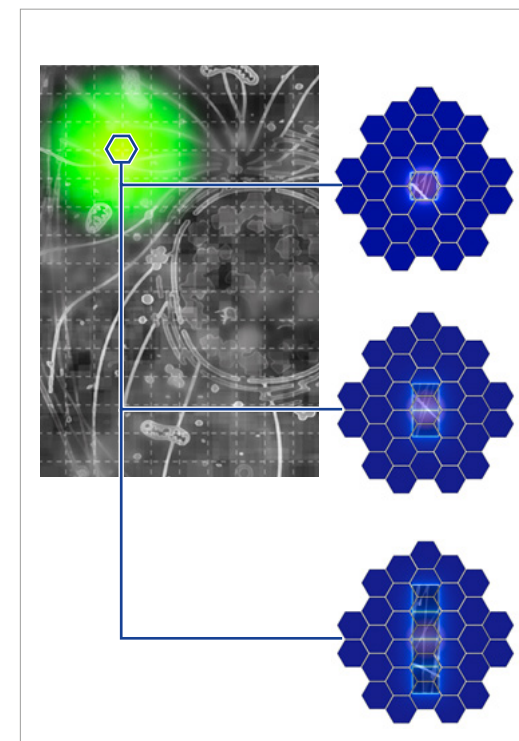
Your Insight into the Technology Behind It

- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

The New Multiplex mode for ZEISS Airyscan 2

Do you want to image large fields of view and whole sample volumes in shortest possible time? And do you want to image with superb image quality at the same time? The LSM 9 family with Airyscan 2 from ZEISS now gives you more options to fit imaging speeds and resolution to your experimental needs. You combine an area detector with smart illumination and readout schemes, which let you choose from different parallelization options.

The new Multiplex mode uses knowledge about the shape of the excitation laser spot and the location of single area detector elements to extract more spatial information, even during parallel pixel readout. This allows to take bigger steps when sweeping the excitation laser over the field of view, improving your achievable acquisition speeds. In fact, the high amount of spatial information captured in the pinhole plane allows to reconstruct a final image with better resolution than the acquisition sampling. Airyscan 2 in Multiplex mode can acquire up to four superresolution image lines with high SNR in a single sweep.



For each illumination position, Airyscan SR mode generates one superresolution image pixel. The spatial information provided by Airyscan 2 in the Multiplex modes SR-2Y/CO-2Y and SR-4Y allows to scan 2 or even 4 superresolution image lines in a single sweep.

ZEISS LSM 900 with Airyscan 2				
	Airyscan SR	Multiplex SR-2Y	Multiplex SR-4Y	Multiplex CO-2Y
Parallelization	1	2	4	2
Resolution	120/120	140/140	140/140	180/180
FPS at 512 × 512 pixels	4	8.4	18.9	8.3
FPS at max FOV	0.4 (Zoom 1.3)	0.8 (Zoom 1.3)	3.5 (Zoom 1.3)	3.5 (Zoom 1.3)
Antibody labeling, fine structures	+++++	++++	++++	++
Antibody labeling, tiling	++	+++	+++++	+++
Live cell imaging	++	+++	++++	+++++

Your Insight into the Technology Behind It

- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

A Streamlined Light Path with Surprising Flexibility

The compact light path with a minimum of optical elements is designed for highest efficiency. Fluorescence emission light travels through the main dichroic beam splitter with its outstanding laser suppression to deliver supreme contrast. Up to two patented variable beam splitter dichroics (VSDs) divert the spectral part of the light. You can define up to three detectors (multialkali, GaAsP or Airyscan 2).

▶ [Click here to view this video](#)

Schematic beam path of ZEISS LSM 900.

Your Insight into the Technology Behind It

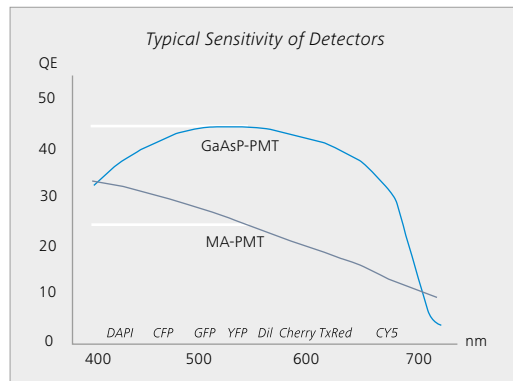
- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

GaAsP Detectors – Your Choice for Highest Sensitivity

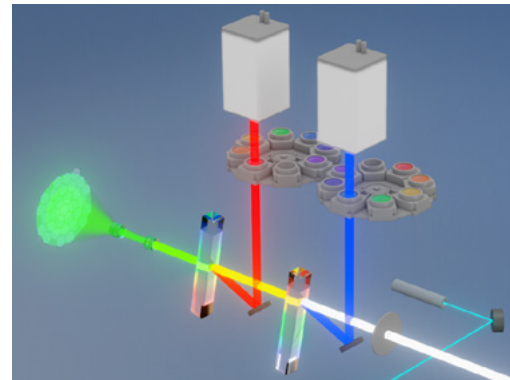
GaAsP PMTs – that is, gallium arsenide phosphide photomultiplier tubes – display high light collection efficiencies over a broad spectral range. Their low dark noise levels also render them the ideal tool for detecting faint signals. Enjoy outstanding image quality based on a superb signal-to-noise ratio (SNR). You might use this gain in SNR to increase productivity by achieving faster scan speeds while preserving excellent image quality. Or take advantage of the low laser powers needed in live cell imaging applications to avoid photobleaching and phototoxicity as much as possible. Or simply detect faint signals in low expressing cells. All that, and you can do it with up to three spectral channels simultaneously.

Benefit from up to Three Confocal Detectors

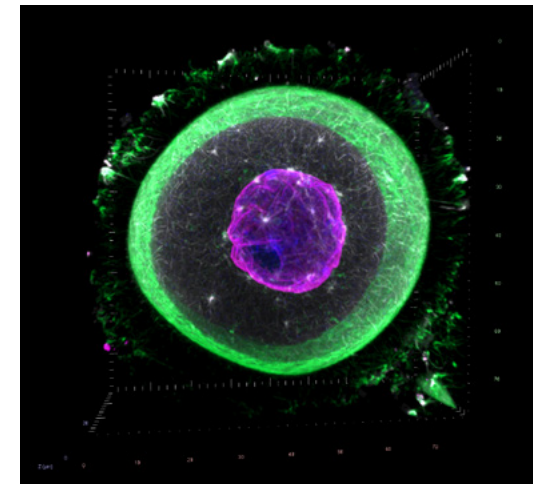
Investigations into localization and interaction of proteins often require multiple fluorescent labels with overlapping emission spectra. Now you can image up to four dyes, crosstalk free by multi-tracking. Or even more by performing a Lambda scan with spectral unmixing.



Typical spectral quantum efficiency (QE) of multi-alkali (MA-) PMT and GaAsP-PMT detectors.



Schematic beam path of ZEISS LSM 900.



Germinal vesicle state mouse oocyte, labelled for actin (green), Phalloidin-Alexa Fluor 488), mictorubules (white), Lamin A/C (magenta) and DNA (Hoechst). Sample: courtesy of K. Harasimov, MPI for Biophysical Chemistry, Goettingen, Germany.

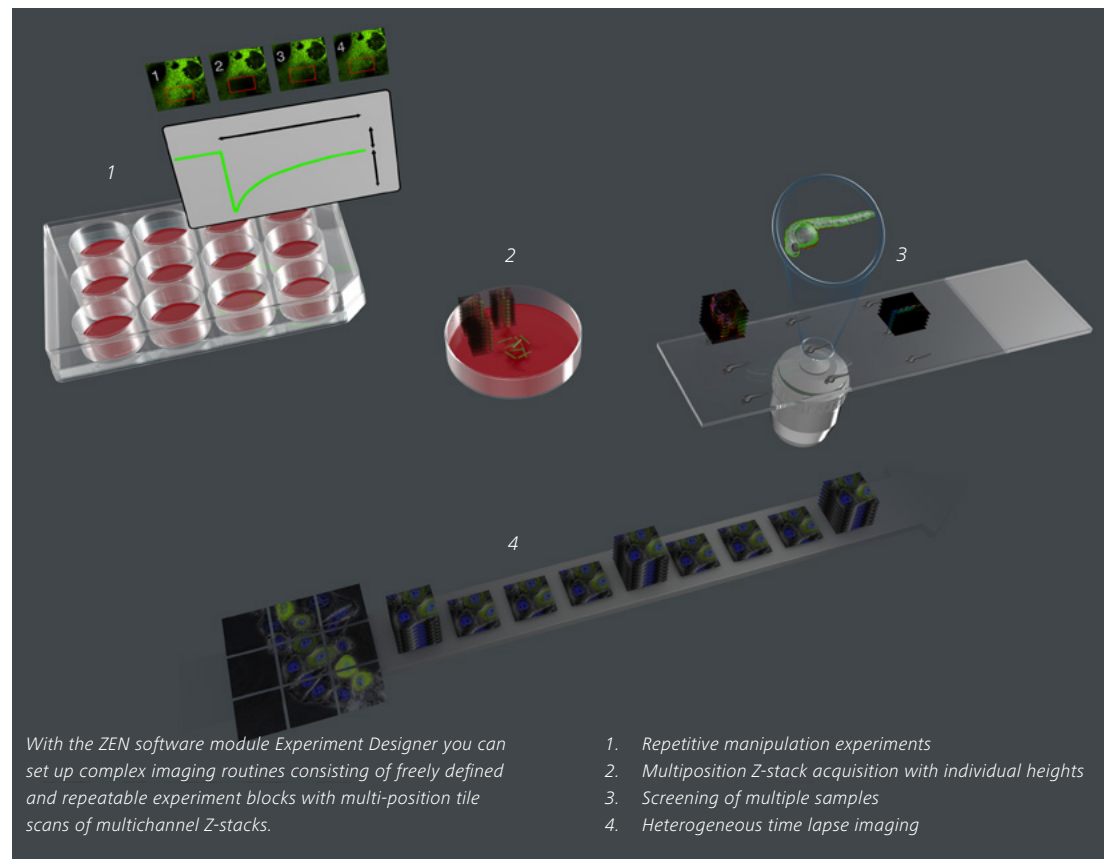
Expand Your Possibilities

- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

Acquire Reproducible Data with Ease

With all its various aspects and workflows, your research leaves you with no time to waste. That's why ZEN imaging software was created—to make your confocal imaging both efficient and enjoyable. ZEN – ZEISS Efficient Navigation - is the only user interface you will ever see on all imaging systems from ZEISS. This familiar and easy-to-learn interface will help you get reproducible results in the shortest possible time.

Use Smart Setup to select your dyes and ZEN will automatically apply all necessary settings for all LSM imaging modalities. The integrated database with spectral data for more than 500 dyes helps you make an informed decision about your imaging options. You can always save imaging configurations or even whole experiments to reproduce settings quickly. The Reuse function allows you to extract and load imaging settings from the existing images. The new Sample Navigator makes quick work of finding and imaging the regions of interest (ROI) on your specimen. The fast Autofocus lets you quickly acquire an overview image of your whole sample using your AxioCam or T-PMT. It takes less time to illuminate your sample and leaves you more of the precious time you've booked on the system for imaging. In addition, you can use the overview image to document all steps of your experiment and load it in ZEN Connect to combine with other multimodal data or aspects of your sample.



Sometimes your scientific questions will require complex acquisition strategies. Statistical analysis might call for repetitive imaging of a large number of samples with the same or even differing imaging conditions. Experiment Designer is a powerful yet easy-to-use module that images multiple regions with all imaging modalities of your LSM 900.

It gives you access to a number of hardware and software options which will always keep your sample in focus, even during the most demanding long-term time-lapse experiments. You can even view and save your valuable data during acquisition sessions to assess, analyze and react immediately.

Expand Your Possibilities

- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

See More Details

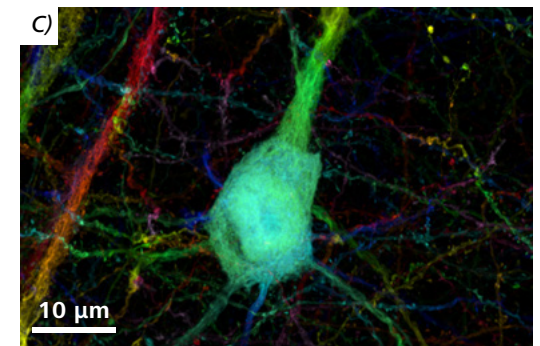
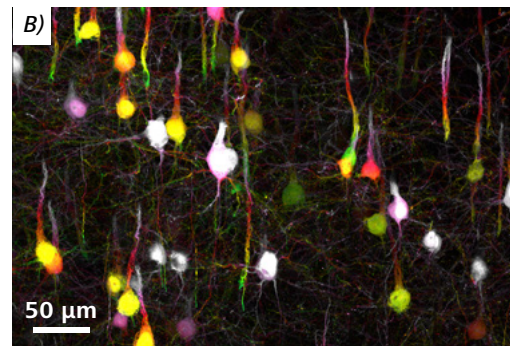
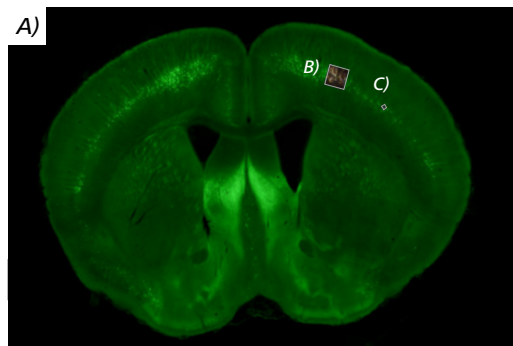
Sometimes you need to see and assess your multi-modal images during acquisition in order to plan your next steps. ZEN gives you multiple options. You can sit at your connected computer to start the new Direct Processing function for processing your Airyscan images during acquisition.

However, confocal imaging is only one part of the big picture, and you may need data from additional imaging modalities to complement the view on your sample. ZEN Connect can bring informa-

tion from all your experiments together. Keep the context of your data by collecting all images of one experiment session in a single project in which you can combine overview and detailed high-resolution images, all perfectly aligned. Once you have created a project, you can always add and align content from any other imaging source, be it ZEISS, non-ZEISS or even sketches and analysis graphs. You will stay on top of things at all times – both during your experiments and months or years later. Your ZEN Connect projects keep all

associated datasets together. It's never been easier to share results and co-work with others as a team.

The powerful integrated 3Dxl Viewer, powered by arivis®, is optimized to render the large 3D and 4D image data you have acquired with your fast new LSM 900. You can create impressive renderings and movies for meetings and conferences. After all, a good picture can say more than a thousand words.



Section of a Thy-1-YFP mouse brain. Thy-1 (green) is involved in the communication of cells in the nervous system. Overview image (A) acquired on ZEISS Axio Scan.Z1. Inset shows enlarged ROIs imaged on ZEISS LSM with Airyscan (B) The neuronal network is clearly visible. The depth of the Z-stack is color-coded. (C) shows a single neuron. Sample: courtesy of R. Hill, Yale University, New Haven, CT, USA.

Expand Your Possibilities

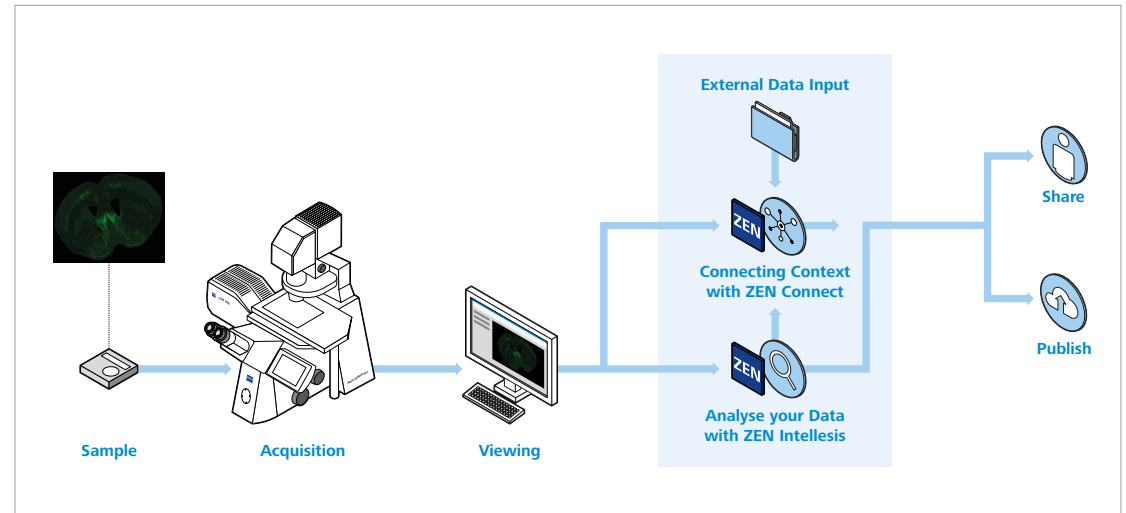
- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

Get More Data from Your Sample

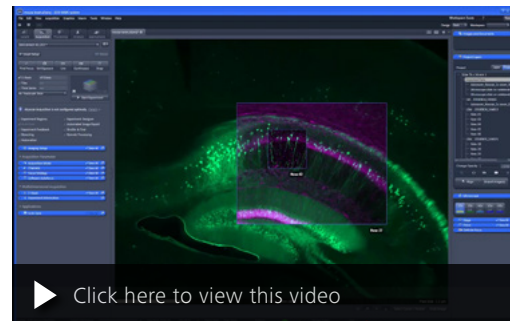
As enjoyable as microscopic images are, their real value is in the data they provide. The CZI file format of ZEN imaging software makes sure that all important metadata of your experiments are safely stored and can be accessed openly for cross-platform data exchange. ZEN provides numerous analysis tools to extract all kinds of information from your images.

You can perform FRET analysis based on sensitized emission or acceptor photobleaching. Or analyze dynamic processes with photomanipulation experiments such as FRAP or FLAP.

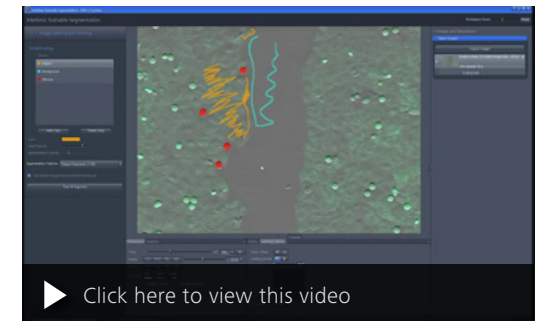
ZEN Intellesis lets you segment complex multimodal images. Just use your own expertise to train the software on a few images. Then powerful deep learning algorithms will take over and do all the time-consuming segmentation steps on the hundreds of similar images. Integrate the individual segmentation models seamlessly into your ZEN image analysis workflow.



ZEN imaging software integrates all steps from your sample to reproducible data for publication.



*Connect all your imagery
With ZEN Connect you bring images and data from any system or modality together. You always keep the context and the overview about all data from your sample.*



*From beautiful images to valuable data
Use the power of deep learning to easily segment your images. A smooth workflow helps to analyze multimodal images from many sources.*

Expand Your Possibilities

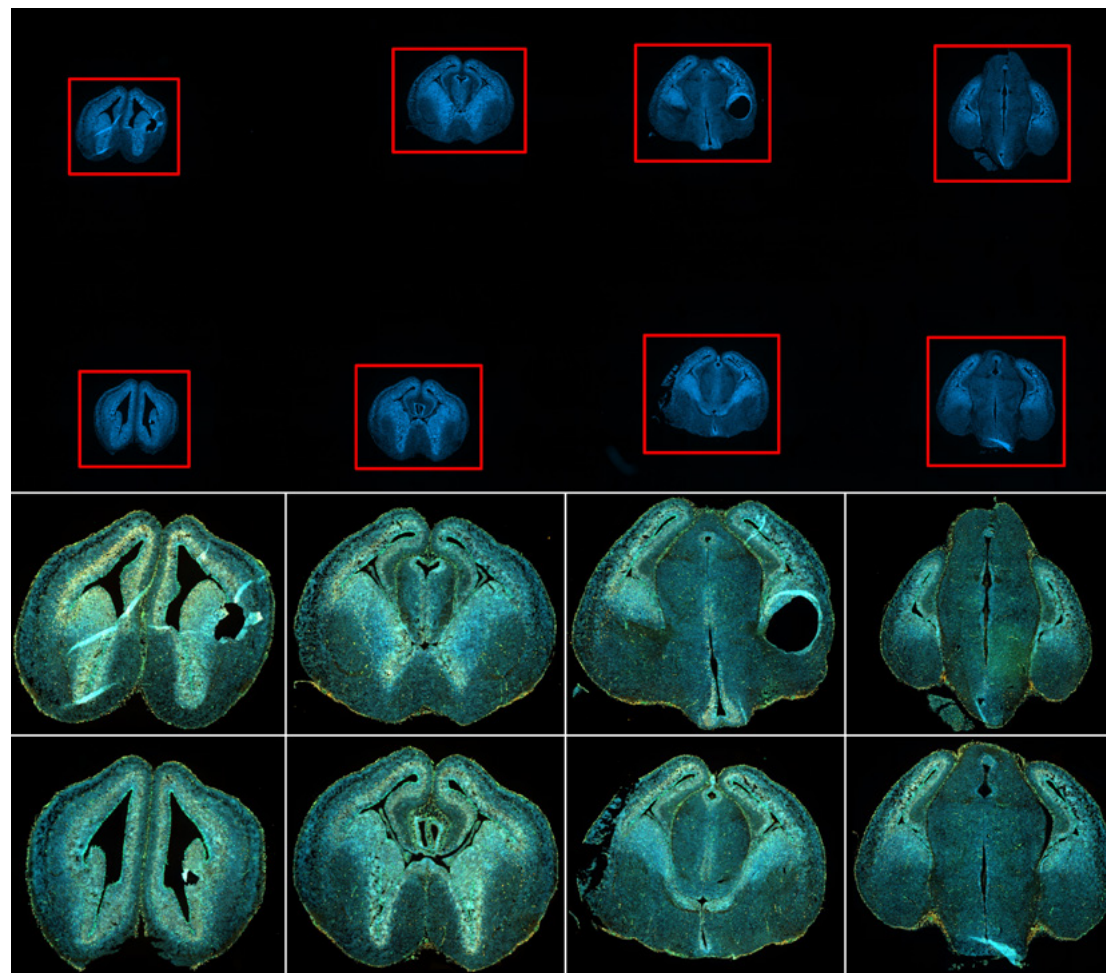
- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

OAD is Your Interface to ZEN Imaging Software

- Use Python scripts to customize and automate your workflows.
- Integrate external image analysis applications into your workflows.
- Exchange image data with external programs like ImageJ, Fiji, MATLAB, KNIME or Python.
- Use feedback for smart experiments.
- Get more reliable data in less time.
It's your choice.



OAD enables the analysis of data acquired with ZEN imaging software by other programs like ImageJ. Transfer your results back to ZEN for further analysis and display.



The result of overview scan using low magnification (top panel) was used to automatically detect the brain slices via image analysis. The results (XYZ position and the height/width of detected objects) were used in a automated subsequent scan using high NA objectives, where the system carried out an individual tile scan for every detected object in a complete automated fashion without any additional user interaction. Sample: courtesy of P. Grigaravicius, FLI – Leibniz Institute on Aging, Jena, Germany.

Expand Your Possibilities

- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

As your needs grow, LSM 900 grows with you, forming the basis for a number of enhancements. Like every system from ZEISS, LSM 900 comes with open interfaces and a modular architecture to guarantee the seamless interaction of all components, now and in the future.



Combine your ZEISS Axio Observer 7 with integrated incubation modules to create the perfect environment for long-term live cell imaging with stable temperature conditions.



Add a choice of sensitive ZEISS Axiocams to your ZEISS LSM 900. It's very easy to acquire overview images for your multiposition experiments or to perform light efficient widefield imaging.



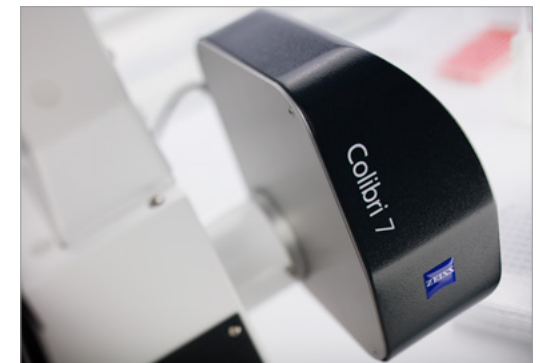
Shuttle & Find is your gateway to correlative light and electron imaging (CLEM). Combine the specificity of functional fluorescence imaging with ultrastructural information.



Z piezo stage and a leveling insert guarantee the precision needed for superresolution applications using ZEISS Airyscan 2.



Definite Focus.2 stabilizes the focal position of your sample compensating Z-drift. You can now perform long-term experiments that can last for multiple days.



Enhance your microscope with ZEISS Colibri 7. This flexible and efficient LED light source allows to screen and image your delicate fluorescent samples very gently. You profit from stable illumination and extremely long lamp life.

Expand Your Possibilities

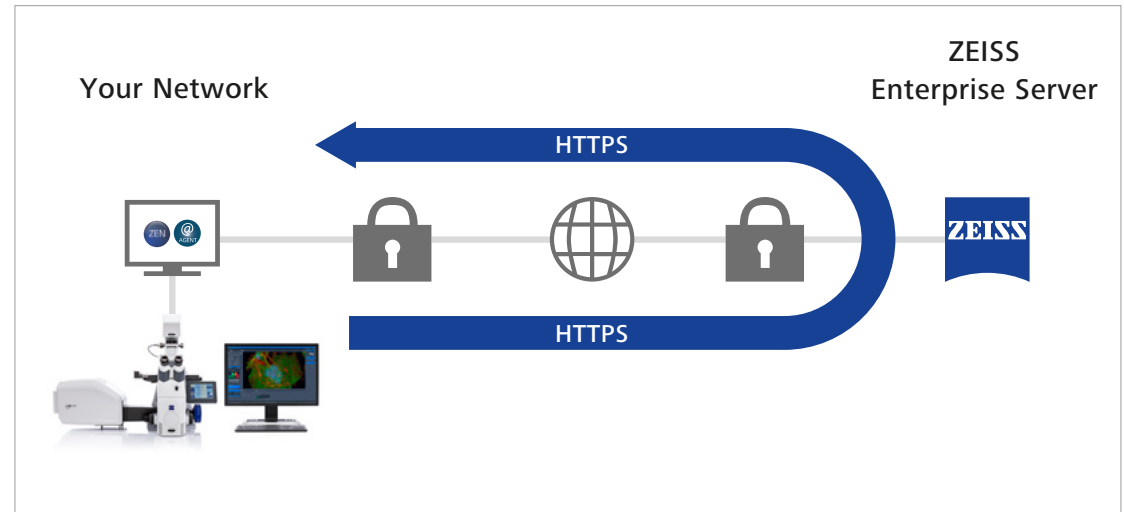
- › In Brief
- › **The Advantages**
- › The Applications
- › The System
- › Technology and Details
- › Service

ZEISS Predictive Service Maximizes System Uptime

Once connected to your network and activated, this advanced technology will automatically track the health status of your instrument and collect system log files in the background to improve remote diagnosis.

Relevant technical data such as operating hours, cycle counts or voltages are periodically monitored via a secure connection to our data center. The ZEISS Predictive Service application evaluates the performance of your microscope as system data can be received and analyzed.

Our support engineers will diagnose any issues by analyzing data on the Enterprise Server – remotely and without interruption to your operation.



- **Maintain highest system availability**
Increase your uptime through close monitoring of the system's condition as remote support can often provide immediate solutions
- **Fast and competent support**
Use secure remote desktop sharing to easily get an expert connected
- **Data security**
Ensure highest data security standards using well established technologies like PTC Thingworx and Microsoft Azure Cloud. No personal or image data is uploaded, only machine data
- **Optimum instrument performance**
As the status of your system is monitored, necessary actions can be planned before they become urgent

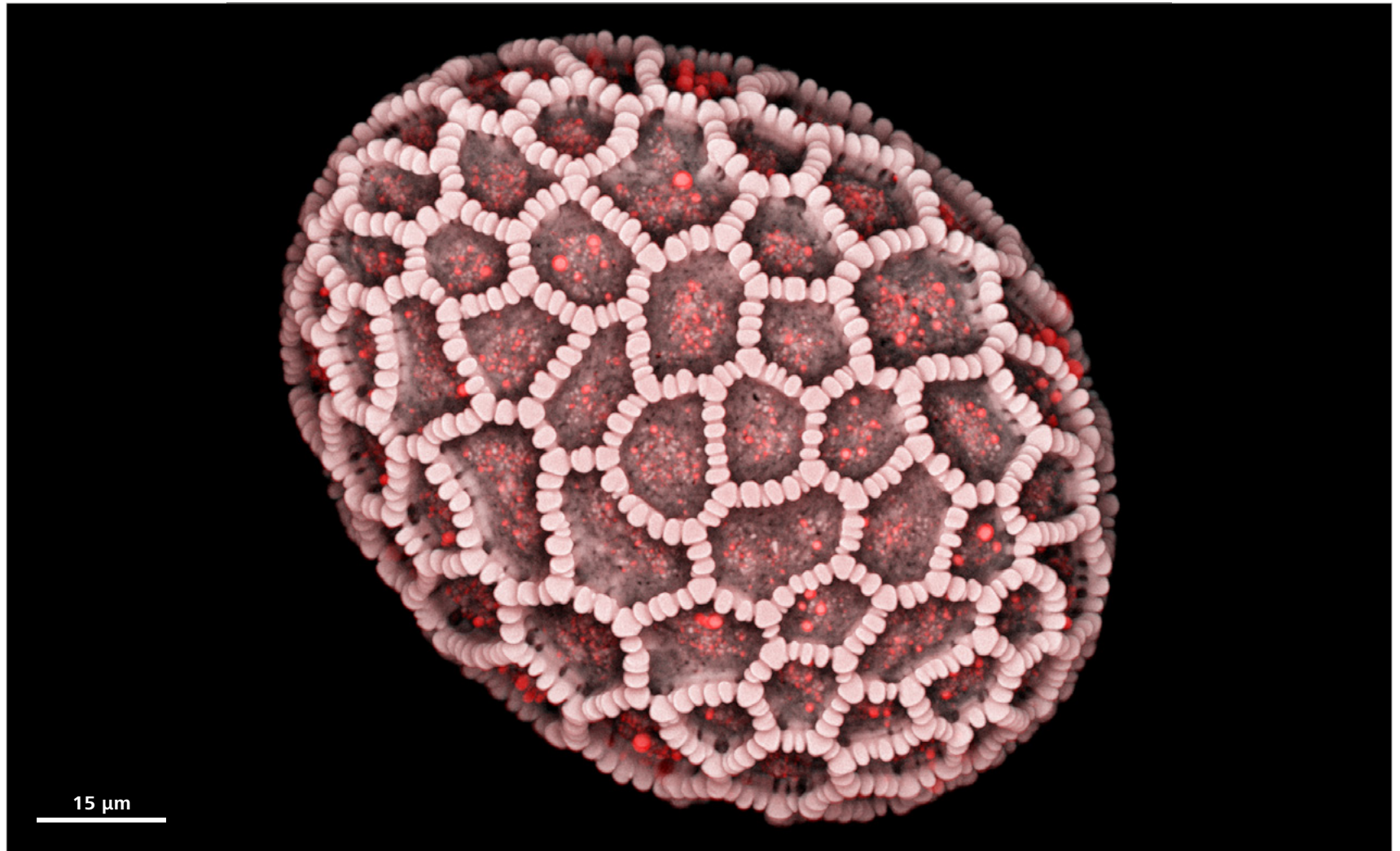
Tailored Precisely to Your Applications

- › In Brief
- › The Advantages
- › **The Applications**
- › The System
- › Technology and Details
- › Service

Typical Applications, Typical Samples	Task	ZEISS LSM 900 Offers
Antibody stained tissue slices	Document morphological relations of structures with a resolution of 120 nm (xy) / 350 nm (z) at 488 nm excitation Image large field of views and conduct tiling experiments for large specimen	Airyscan 2 with SR or Multiplex mode
Live cell culture	Study the motility of vesicles and organelles Screen and document cells expressing the desired fluorescent label in response to pharmacological treatment	Up to 8 frames per second confocal time lapse imaging Or use Airyscan 2 in Multiplex mode for up to 18 frames per second. Widefield imaging using AxioCam
Live cell culture with two labels	Study the motility of subcellular structures Explore the interaction of two proteins exploiting the Förster Resonance Energy Transfer (FRET) effect	Airyscan 2 with GaAsP detector and Multiplex mode for time lapse imaging in 2D or 3D at up to 9 frames per second FRET analysis tool
Live cells with multiple labels	Image over a long time in an automated way	Experiment Designer software to automatically record complex multi-color experiment. Combine different acquisition modes, e.g. spectral imaging, superresolution imaging. Combine the experiment in ZEN Connect
Live or fixed cells with multiple labels and overlapping emission signals	Examine the interplay of multiple proteins	Parallel acquisition of all signals with three spectral channels and linear unmixing
Cellular structures with weak labels	Image subcellular structures at physiological expression levels	LSM 900 with GaAsP detector or Airyscan 2
Study molecular dynamics	Photomanipulation	FRAP analysis tool, classical timed bleaching or flexible interactive bleaching strategies
Plant roots	Follow the changes of subcellular structures over time with high resolution	Airyscan 2 with GaAsP detector for 140 nm superresolution imaging beyond 40 µm deep into tissue with up to 18 frames per second in SR-4Y mode (512x512 pixel)
Model organisms, e.g. Zebrafish, <i>Drosophila</i> or <i>C. elegans</i> , <i>Arabidopsis</i>	See fine details of the organization and dynamics of endogenously expressed FP proteins	Airyscan 2 with GaAsP detector for superresolution imaging beyond 40 µm deep into tissue with a 40x/1.0 objective tissue, 20x/NA 1.0 water immersion objective available for confocal imaging with LSM 900 on Axio Examiner.Z1
Cleared samples	Image whole organs or entire organisms	Specialized objectives with long working distance and optimized for specific refractive indices are available for LSM 900 on Axio Examiner.Z1, (e.g. 20x NA 1.0 objectives for refractive index of 1.38 and 1.45)

ZEISS LSM 900 at Work

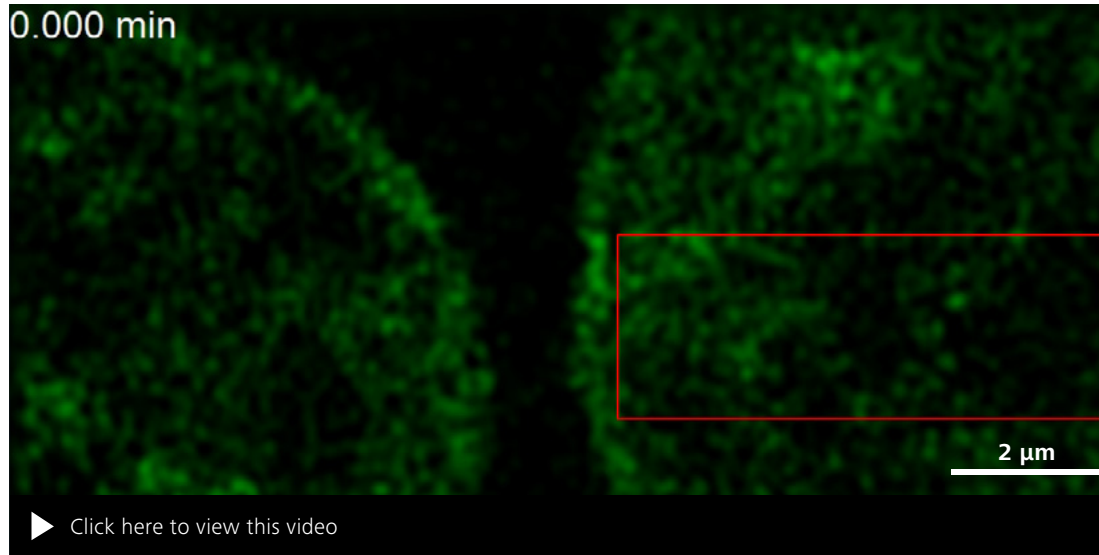
- › In Brief
- › The Advantages
- › **The Applications**
- › The System
- › Technology and Details
- › Service



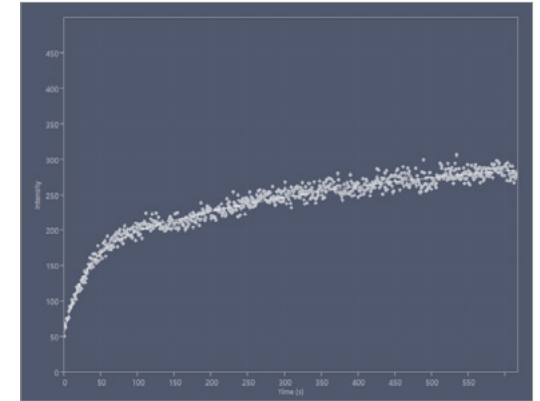
The micrograph shows a Lilium auratum pollen grain, acquired with Airyscan 2 in Multiplex mode. Image courtesy of Jan Michels, Zoological Institute, Kiel University

ZEISS LSM 900 at Work

- › In Brief
- › The Advantages
- › **The Applications**
- › The System
- › Technology and Details
- › Service

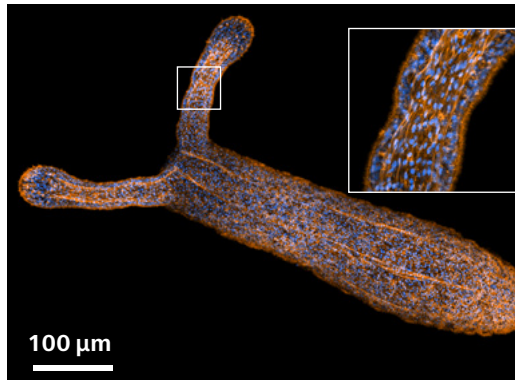
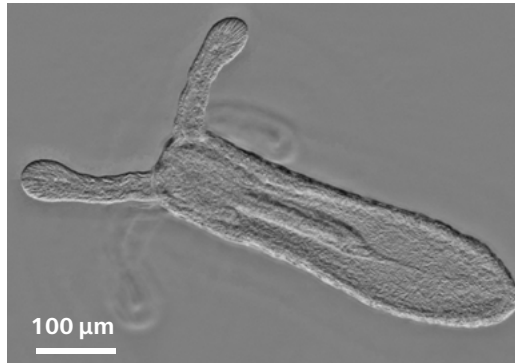


Nuclei of living HeLa Cells were labelled with 5'-610CP-Hoechst (Chem.Sci. 2019, 10, 1962–1970). The dye is added to the cell culture media in a defined concentration. The bleaching experiment (FRAP) confirms that the dye needs about 15 minutes to efficiently label DNA. The time series is recorded for 13.5 minutes with 1 frame per second; with the bleaching event in the labeled region after the first 10 frames. Sample courtesy of P. Lenart, MPI for Biophysical Chemistry, Göttingen, Germany

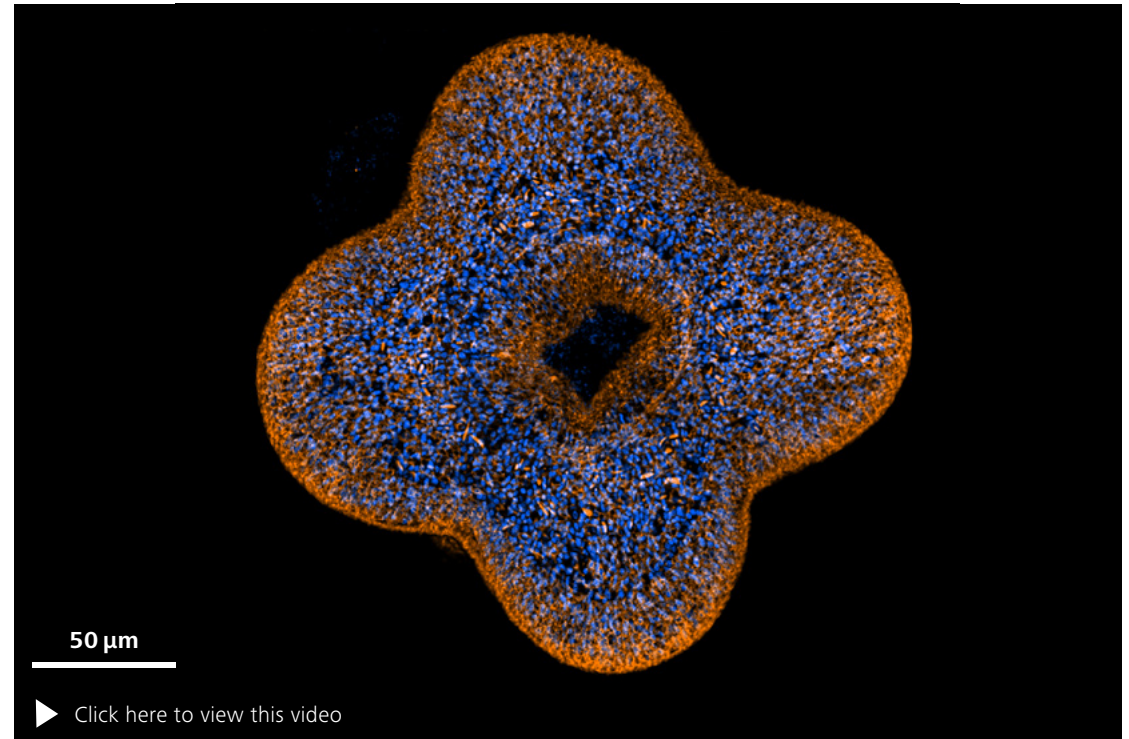


ZEISS LSM 900 at Work

- › In Brief
- › The Advantages
- › **The Applications**
- › The System
- › Technology and Details
- › Service



Fixed starlet sea anemone (*Nematostella vectensis*) stained with Hoechst (nuclei) and Phalloidin (actin). Side view imaged with LSM 900 on Celldiscoverer 7, seamlessly combining camera based phase gradient contrast mode (top) and high sensitivity mode with Airyscan 2 (bottom). Maximum intensity projection of 19 z-planes.



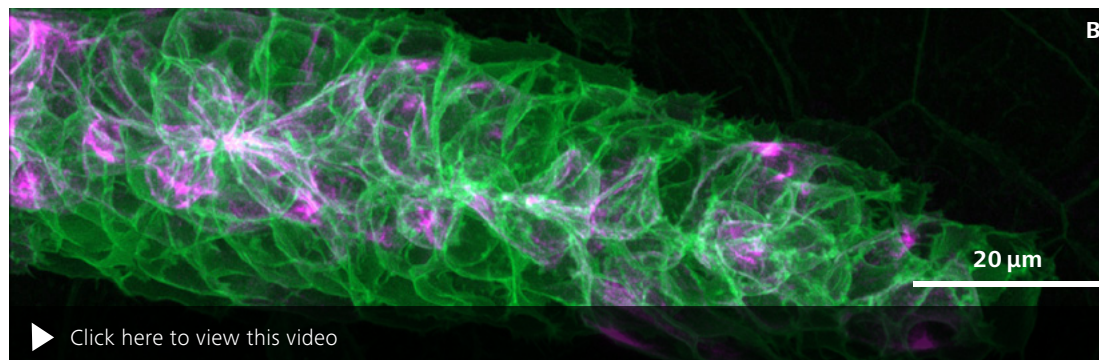
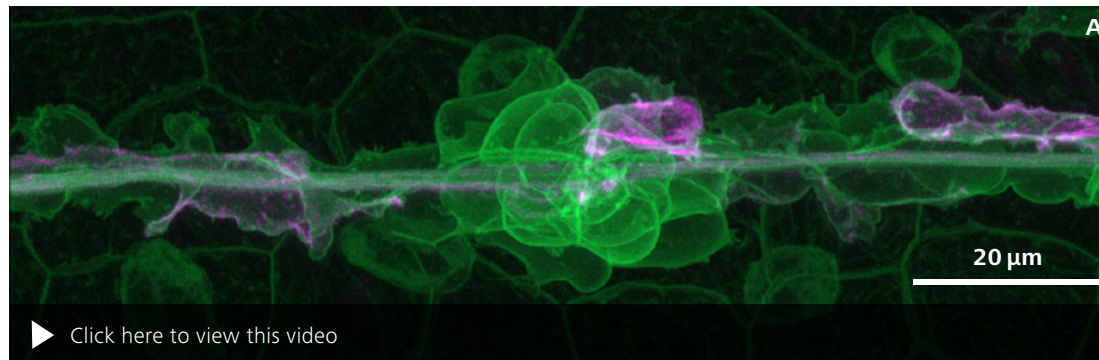
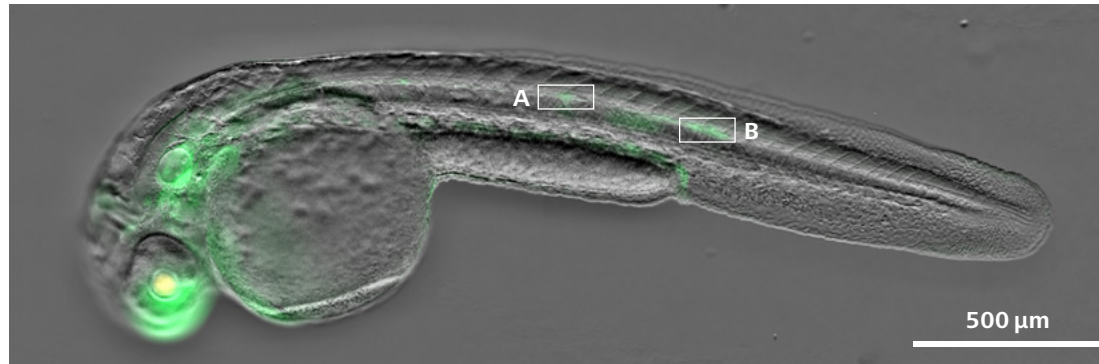
Sample courtesy of A. Stokkermans, Ikmi Group, EMBL, Heidelberg, Germany

Video: Top view of a young animal, showing mouth and four tentacle buds. Maximum intensity projection of 69 z-planes imaged with Airyscan 2 Multiplex. Images were acquired using the water immersion objective with a total magnification of 25x and a numerical aperture of 1.2.

Fine image details and high signal to noise ratio can clearly be seen on the insert in the top right image, showing an enlarged view of a tentacle area.

ZEISS LSM 900 at Work

- › In Brief
- › The Advantages
- › **The Applications**
- › The System
- › Technology and Details
- › Service



Lateral line primordium migration and deposition of immature neuromasts in a Zebrafish embryo (*Danio rerio*). Animals were anesthetized and embedded using low concentrated agarose in a glass bottom petridish.

Using Celdiscoverer 7 with integrated LSM 900 and Airyscan 2 allows to combine the best imaging modes seamlessly. Quick and easy sample navigation (top) is done by camera based imaging of Phase Gradient Contrast and fluorescence.

Subsequent high resolution imaging with Airyscan 2 in Multiplex mode was done on individual positions

identified in the widefield image (white boxes).

A) Maximum intensity projections of an immature neuromast (127 z-planes).

B) Maximum intensity projections of the lateral line primordium tip migrating through the animal (155 z-planes).

Green: LYN-eGFP (mebranes);

Red: tagRFP-T-UTRCH (actin).

The gentle and fast image acquisition that is inherent to the Airyscan 2 Multiplex mode is very beneficial for this kind of application. The animal is unperturbed by the imaging while images with a very high signal to noise ratio as well as level of detail can be acquired at the same time.

Sample courtesy of J. Hartmann and D. Gilmour, EMBL, Heidelberg, Germany

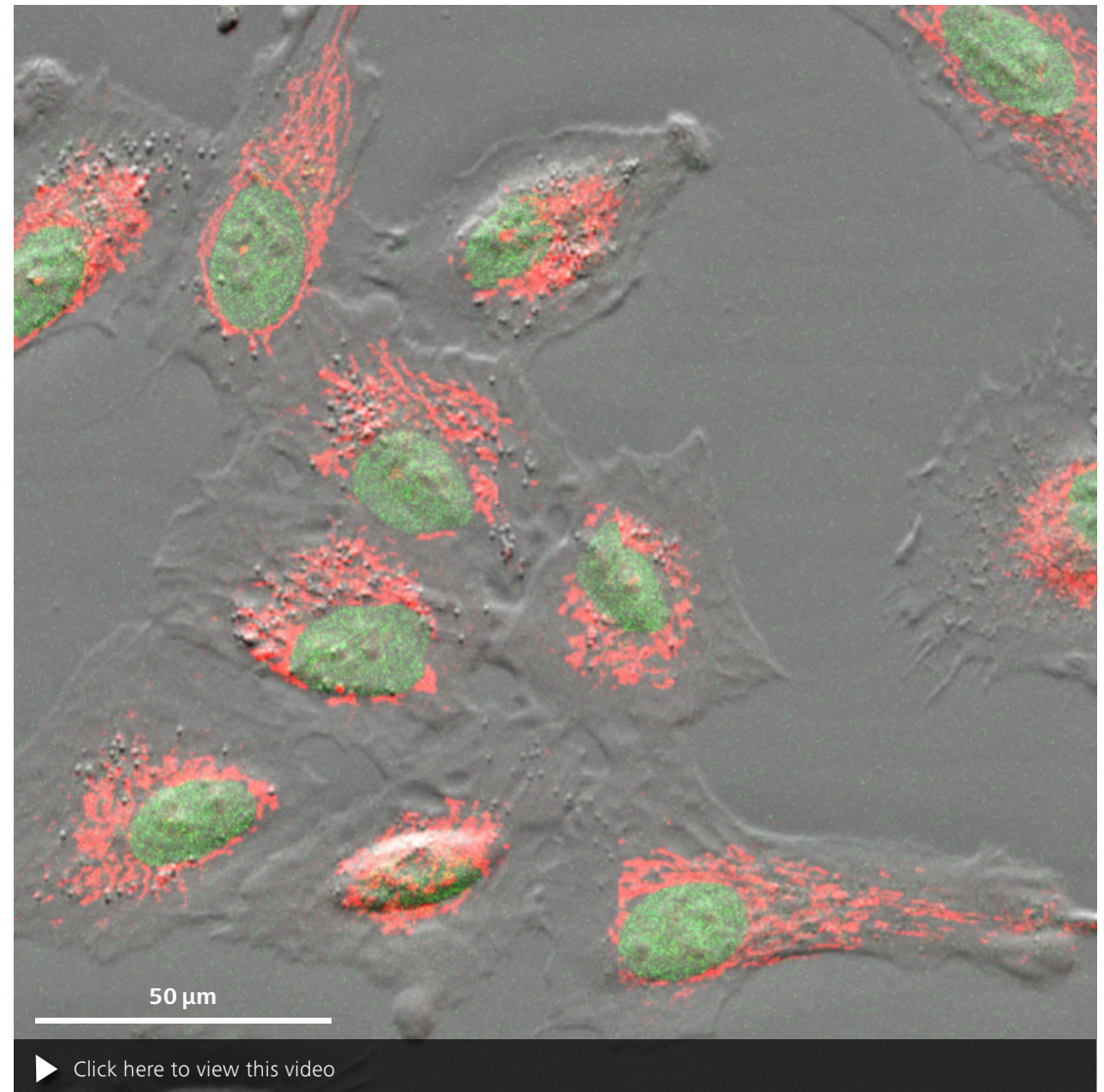
ZEISS LSM 900 at Work

- › In Brief
- › The Advantages
- › **The Applications**
- › The System
- › Technology and Details
- › Service

Human lung epithelial cell line A549 stained with MitotrackerOrange (mitochondria) and SIR-DNA (nuclei).

With Celldiscoverer 7 and LSM 900 you seamlessly combine two imaging modes. Fluorescent channels were acquired in confocal mode using highly sensitive GaAsP detectors while the Phase Gradient Contrast is acquired with a camera.

A timelapse of 2.5 h was acquired using a 40x magnification with a numerical aperture of 0.95.



Sample courtesy of A.C. Hocke, Charité, Berlin, Germany.

Your Flexible Choice of Components

- › In Brief
- › The Advantages
- › The Applications
- › **The System**
- › Technology and Details
- › Service



1 Microscope

- Inverted stands: Axio Observer 7, Celldiscoverer 7
- Upright stands: Axio Imager.M2, Axio Imager.Z2, Axio Examiner.Z1
- Camera port
- Manual or motorized stages
- Incubation solutions
- Fast Z piezo inserts (for inverted stands)
- Definite Focus.2

2 Objectives

- C-APOCHROMAT
- Plan-APOCHROMAT
- LD Plan-APOCHROMAT
- EC Plan-NEOFLUAR

3 Illumination

- Diode lasers: 405, 488, 561 and 640 nm

4 Detection

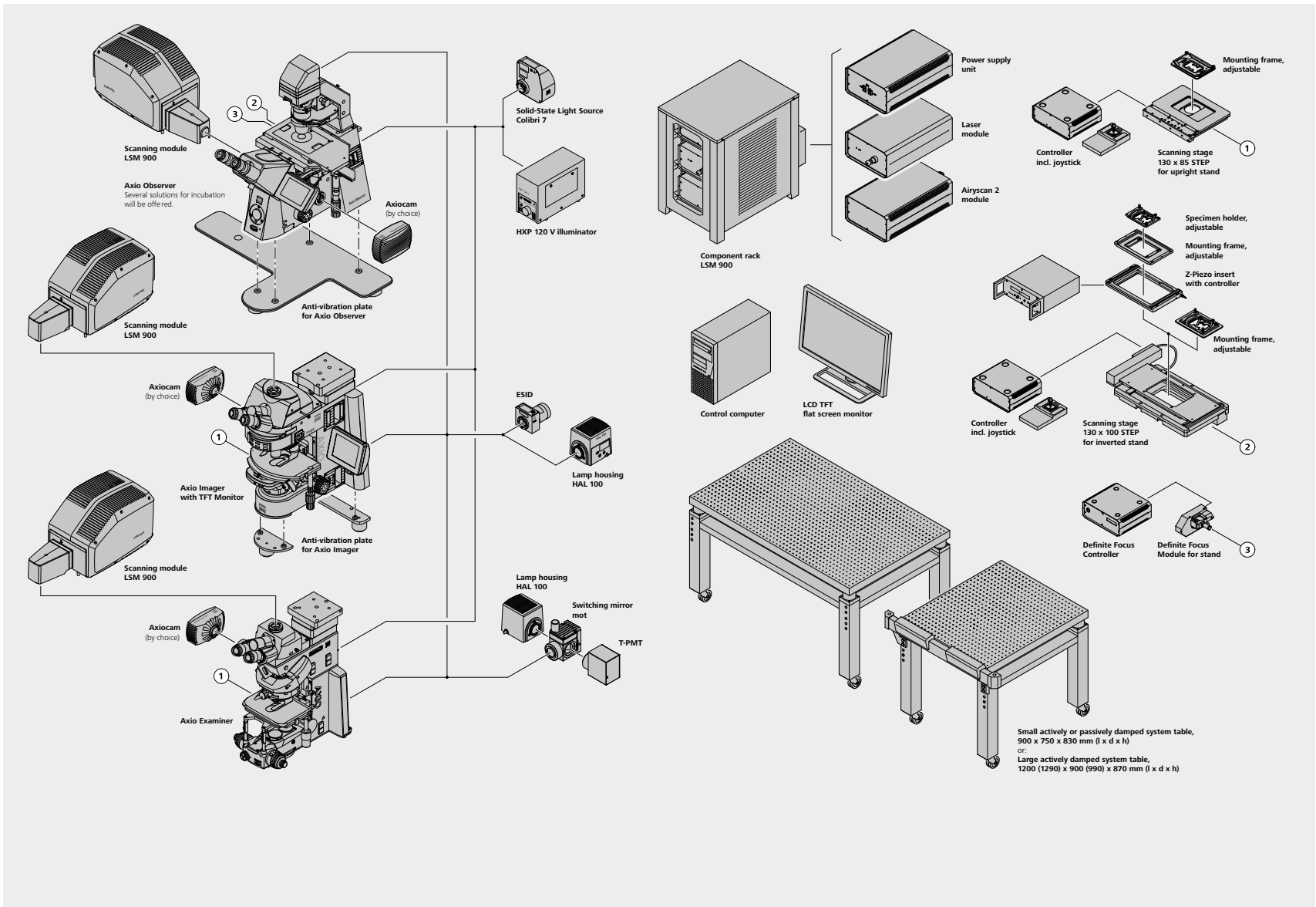
- 2 channel Gallium Arsenide Phosphid (GaAsP) PMT or 2 channel multialkali (MA) PMT
- 1 additional GaAsP PMT, MA PMT or 40x/63x Airyscan 2 detector with Multiplex mode
- Electronically switchable illumination and detection module (ESID) or transmitted light detector (T-PMT). T-PMT also usable for unique transmitted light fluorescence Sample Navigator.

5 Software

- ZEN imaging software, recommended modules: Tiles & Positions, Experiment Designer, 3D Viewer – powered by arivis®

ZEISS LSM 900: System Overview

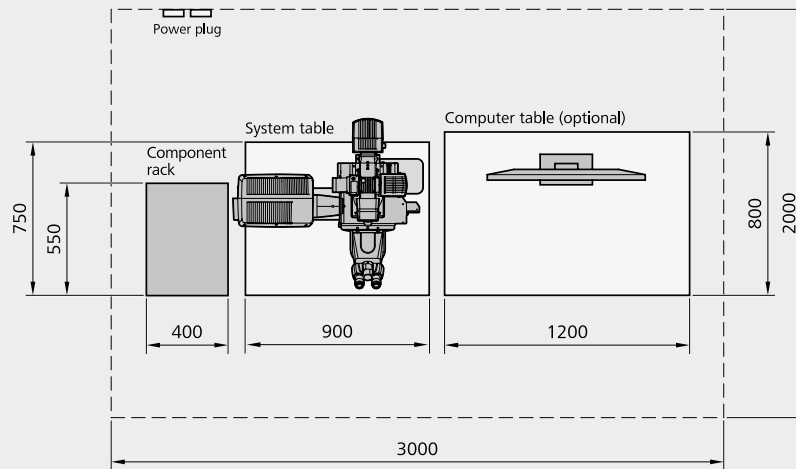
- › In Brief
- › The Advantages
- › The Applications
- › **The System**
- › Technology and Details
- › Service



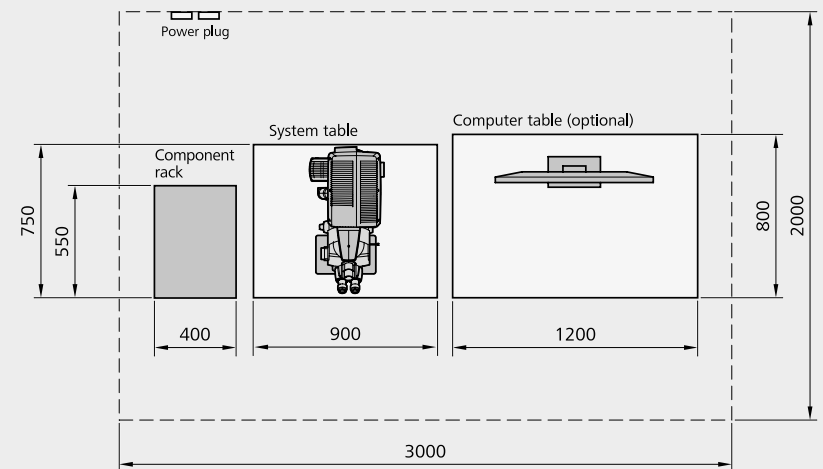
Technical Specifications

- › In Brief
- › The Advantages
- › The Applications
- › The System
- › **Technology and Details**
- › Service

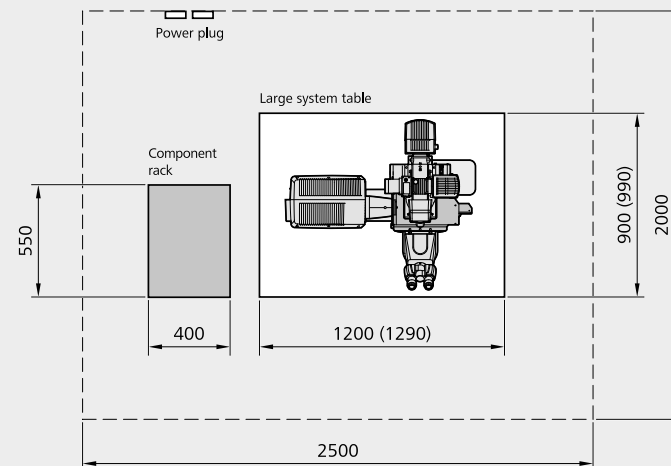
LSM 900 with Axio Observer on small system table



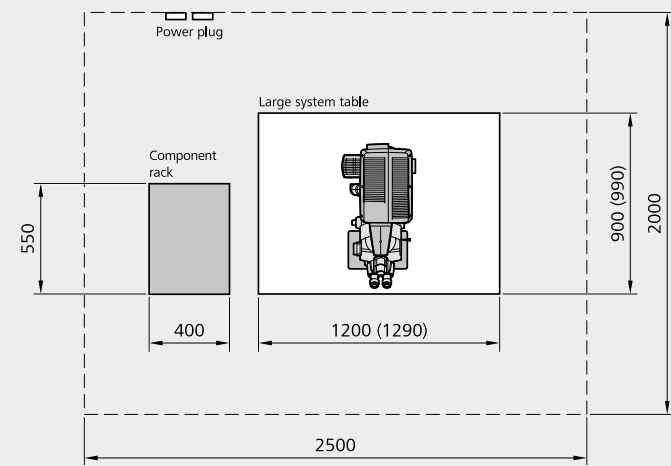
LSM 900 with Axio Imager or Axio Examiner on small system table



LSM 900 with Axio Observer on large system table



LSM 900 with Axio Imager or Axio Examiner on large system table



Technical Specifications

- › In Brief
- › The Advantages
- › The Applications
- › The System
- › **Technology and Details**
- › Service

Physical Dimensions	Length (cm)	Width (cm)	Height (cm)	Weight (kg)
Small actively and passively damped system table	90	75	83	130
Large actively damped system table (incl. corner pieces)	120 (129)	90 (99)	87	180
Vibraplate for Axio Imager (consists of three pedestals)	32	30	4.5	1.5
Vibraplate for Axio Observer	52.5	80	4.5	7
Scanning Module LSM 900	40	25.5	28	15
Axio Imager.Z2; Axio Imager.M2	56	39	70	20
Axio Examiner.Z1	70	39	82	24
Axio Observer 7	61	39	65	20
Component rack	55	40	60	35
Laser module (LM)	40	25	14.5	10
Airyscan 2 (40× and 63×)	40	25	14.5	5
Power supply unit (PSU)	40	25	14.5	6
Fiber optic cable, VIS	300			
Cables	300			
Microscopes				
Stands	Upright: Axio Imager.Z2, Axio Imager.M2, Axio Examiner.Z1 Inverted: Axio Observer 7 with side port; Celldiscoverer 7			
Z Drive	Smallest increment Axio Imager.Z2: Axio Observer 7: 10 nm; Axio Imager.M2, Axio Examiner: 25 nm; Z-Piezo stage available; Definite Focus.2 for Axio Observer 7			
XY Stage (optional)	Motorized XY scanning stage, for Mark & Find function (xy) as well as Tile Scan (Mosaic Scan); smallest increment of 0.25 μm (Axio Observer 7), 0.2 μm (Axio Imager.Z2), 0.25 μm (Axio Examiner.Z1)			

Technical Specifications

- › In Brief
- › The Advantages
- › The Applications
- › The System
- › **Technology and Details**
- › Service

Scanning Module	
Scanner	Two independent, galvanometric scanning mirrors with ultrashort line and frame flyback
Scanning resolution	32 × 1 to 6,144 × 6,144 pixels (Airyscan 2 max. 4,096 × 4,096 pixels), also for multiple channels, continuously adjustable (for each axis)
Scanning speed	At 512 × 512 pixels: confocal – up to 8 fps; Airyscan SR – up to 4 fps; Multiplex SR-2Y – 8.4 fps; Multiplex SR-4Y – 18.9 fps At 512 × 64 pixels: confocal – up to 64 fps
Scanning zoom	0.5 × to 40 ×; continuously adjustable
Scanning rotation	Can be rotated freely (360°), adjustable in increments of 0.1°, freely adjustable xy offset
Scanning field	18 mm diagonal in the intermediate image plane, with full pupil illumination
Pinhole	Master pinhole with preset size and position; can be adjusted as desired for multitasking and short wavelengths (such as 405 nm); automatic alignment
Beam path	One major beam splitter for four laser lines (405, 488, 561 and 640 nm) at 10 degree with excellent laser line suppression. Depending on the system, either one or two patented Variable Secondary Dichroics (VSDs) can be used to flexibly divert the respective spectral range of light to chosen channels. Emission filters can be used to clean up the signal when imaging autofluorescent or highly scattering samples.
Detection Options	
Detectors	2 spectral detection channels, GaAsP (typical QE 45%) or multialkali (MA) PMT (typical QE 25%) 1 additional GaAsP PMT, MA PMT or Airyscan 2 detector Airyscan 2 for spatial detection (GaAsP) with 40× or 63× objectives; for superresolution (up to 120 nm) or Multiplex acquisition (up to 140 nm) Transmitted light detector (ESID or T-PMT); unique transmitted fluorescence Sample Navigation with T-PMT
Spectral detection	>8 sequential confocal fluorescence channels, up to three parallel confocal fluorescence channels, based on low-noise GaAsP or MA PMTs; adjustable in increments of 1 nm
Data depth	8-bit and 16-bit available
Real-time electronics	Microscope, laser, scanning module and additional accessory control; data acquisition and synchronization management through real-time electronics; oversampling read-out logic for best sensitivity; data transfer between real-time electronics and user PC via LVDS with the ability to evaluate the data online during image acquisition

Technical Specifications

- › In Brief
- › The Advantages
- › The Applications
- › The System
- › **Technology and Details**
- › Service

ZEN Imaging Software	
GUI configuration	Workspace to conveniently configure all of the motorized functions of the scanning module, laser and microscope; save and restore application configurations (re-use)
Calibration tools	Calibration objective and software tools to calibrate the system
Recording modes, Smart Setup	Z-Stack, Lambda Stack, Time Series and all combinations (xyz, lambda, t), online calculation of signal intensities, average and summation (by line/image, adjustable), Step Scan (for higher image frame rates); quick set up of imaging conditions using Smart Setup by simply selecting the labelling dye
Crop function	Easily select scanning areas (simultaneously select zoom, offset, rotation)
Real ROI Scan	Scans of designated ROIs (regions of interest) as desired and pixel-by-pixel laser blanking
ROI bleaching	Localized bleaching in bleach ROIs for applications such as uncaging; use of different speeds for bleaching and imaging, use of different laser lines for different ROIs; flexibly define your bleaching experiments during the acquisition with Interactive Bleaching
Multitracking	Rapidly change excitation lines when recording multiple fluorescences for the purpose of minimizing signal crosstalk and increasing dynamic range
Lambda scan	Sequential acquisition of image stacks with spectral information for every pixel
Linear Unmixing	Acquisition of crosstalk-free, multiple fluorescence images using simultaneous excitation; offline unmixing; advanced unmixing logic with indication of reliability
Visualization	XY, orthogonal (XY, XZ, YZ), Cut (3D section); 2.5D for time series of line scans, projections (maximum intensity); animations; depth coding (inverse colors), brightness, gamma and contrast settings; color table selection and modification (LUT), character functions
Image analysis and operations	Co-localization and histogram analysis with individual parameters, profile measurement along user-defined lines, measurement of lengths, angles, areas, intensities and much more; operations: addition, subtraction, multiplication, division, ratio, shift, filters (low-pass, median, high-pass, etc., also user-definable)
Image Management	Features for managing images and the corresponding imaging parameters
3Dxl Viewer – powered by arivis®	Visualization of very large data sets, fully integrated in ZEN imaging software. Rapid 3D and 4D reconstructions and animations
Optional Software	
Direct processing	Processing of large datasets during acquisition by streaming technology, including analysis and storage on second computer
Deconvolution	3D image restoration based on calculated point-spread functions (modes: nearest neighbor, maximum likelihood, constrained iterative)
Physiology	Comprehensive evaluation software for online and offline ratio image calculation and calibration of ion concentrations
Open Application Development (OAD)	Python scripting interface for automation & customization; experiment feedback for Smart Experiments and open interface to third party software (e.g. ImageJ)
Experiment Designer	Definition of advanced automated imaging
ZEN Connect	Exchange and alignment of image data from multiple image acquisition systems
ZEN Intellesis	Image analysis and structure detection via computational self learning technology

Technical Specifications

- › In Brief
- › The Advantages
- › The Applications
- › The System
- › **Technology and Details**
- › Service

Lasers	
Laser module URGB (pigtailed; 405, 488, 561, 640 nm)	Single-mode polarization preserving fiber
	Typical total dynamic range of 10.000:1; direct modulation 500:1
	Diode laser (405 nm, 5 mW); laser class 3B
	Diode laser (488 nm, 10 mW); laser class 3B
	Diode (SHG) laser (561 nm, 10 mW); laser class 3B
Laser module GB (pigtailed; 488, 561 nm)	Diode laser (640 nm, 5 mW); laser class 3B
	Single-mode polarization preserving fiber
	Typical total dynamic range of 10.000:1; direct modulation 500:1
	Diode laser (488 nm, 10 mW); laser class 3B
	Diode (SHG) laser (561 nm, 10 mW); laser class 3B

Power Requirements

LSM 900 has country specific main power supply cords.

Line voltage	100 V AC ... 125 V AC ($\pm 10\%$)	220 V AC ... 240 V AC ($\pm 10\%$)
Line frequency	50 ... 60 Hz	50 ... 60 Hz
Max. current	1 phase at 9 A	1 phase at 4.5 A
Power plug	NEMA 5 / 15	Country specific connectors
Power consumption	900 VA (continuous operation; maximum)	900 VA (continuous operation; maximum)
	260 VA (standby operation)	280 VA (standby operation)
	0.011 VA (off mode)	0.025 VA (off mode)
Heat Emission	700 W	700 W

EMC Test

according to DIN EN 61326-1

1. Noise emission according to CISPR 11 / DIN EN 55011
2. Noise immunity according to table 2 (industrial sector)

Technical Specifications

- › In Brief
- › The Advantages
- › The Applications
- › The System
- › **Technology and Details**
- › Service

Environmental Requirements

For operation, the system has to be placed in a closed room.

1. Operation, specified performance	T = 22 °C ±3 °C without interruption (24 h a day independently whether system is operated or switched off) It has to be ensured that the airflow of the air-conditioning is not directed at the system.
2. Operation, reduced performance	T = 15 °C to 35 °C, any conditions different from item 1. and 4.
3. Storage, less than 16 h	T = -20 °C to 55 °C
4. Temperature gradient	±0.5 °C/h
5. Warm-up time	1 h for standard imaging; ≥2 h for high-precision and/or long-term measurements
6. Relative humidity	<65 % at 30 °C
7. Operation altitude	max. 2,000 m
8. Loss of heat	700 W



LSM 900 meets the requirements according to IEC 60825-1:2014

Count on Service in the True Sense of the Word

- › In Brief
- › The Advantages
- › The Applications
- › The System
- › Technology and Details
- › **Service**

Because the ZEISS microscope system is one of your most important tools, we make sure it is always ready to perform. What's more, we'll see to it that you are employing all the options that get the best from your microscope. You can choose from a range of service products, each delivered by highly qualified ZEISS specialists who will support you long beyond the purchase of your system. Our aim is to enable you to experience those special moments that inspire your work.

Repair. Maintain. Optimize.

Attain maximum uptime with your microscope. A ZEISS Protect Service Agreement lets you budget for operating costs, all the while reducing costly downtime and achieving the best results through the improved performance of your system. Choose from service agreements designed to give you a range of options and control levels. We'll work with you to select the service program that addresses your system needs and usage requirements, in line with your organization's standard practices.

Our service on-demand also brings you distinct advantages. ZEISS service staff will analyze issues at hand and resolve them – whether using remote maintenance software or working on site.

Enhance Your Microscope System.

Your ZEISS microscope system is designed for a variety of updates: open interfaces allow you to maintain a high technological level at all times. As a result you'll work more efficiently now, while extending the productive lifetime of your microscope as new update possibilities come on stream.



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