LSM 710

The Power of Sensitivity

A New Dimension in
Confocal Laser Scanning Microscopy

ZEISS

We make it visible.

Providing Support for Progress and Innovation

The biomedical sciences are considered some of the most important and future-oriented areas of research. Taking advantage of increasingly powerful technologies, they lead to a deeper understanding of the complex mechanisms that are the foundation of living systems at the molecular, cellular and tissue levels.

For more than 160 years, Carl Zeiss has made the best technological instruments and related know-how available to the scientific community. By means of professional consulting – and especially by means of system solutions tailored to users' exact needs – we create the most ideal conditions for modern research.

The Confocal Revolution Continues

Confocal microscopy systems have laid the groundwork for numerous scientific breakthroughs and have made possible a number of new methods for conducting research. The new LSM 710 is the logical evolution of the successful LSM-Series from Carl Zeiss. The LSM 710 combines and surpasses the advantages and capabilities of all existing confocal systems. Working closely together with leading scientists worldwide, we have created an instrument that reflects the latest ideas and technological possibilities – an entire orchestra of innovations – that will accompany you in your research experiments.

Sensitivity Is the Key

Whether it is in live cell imaging, single molecule analysis or imaging of minute structures, such as yeast or DNA, the LSM 710 creates detailed, high-contrast images.

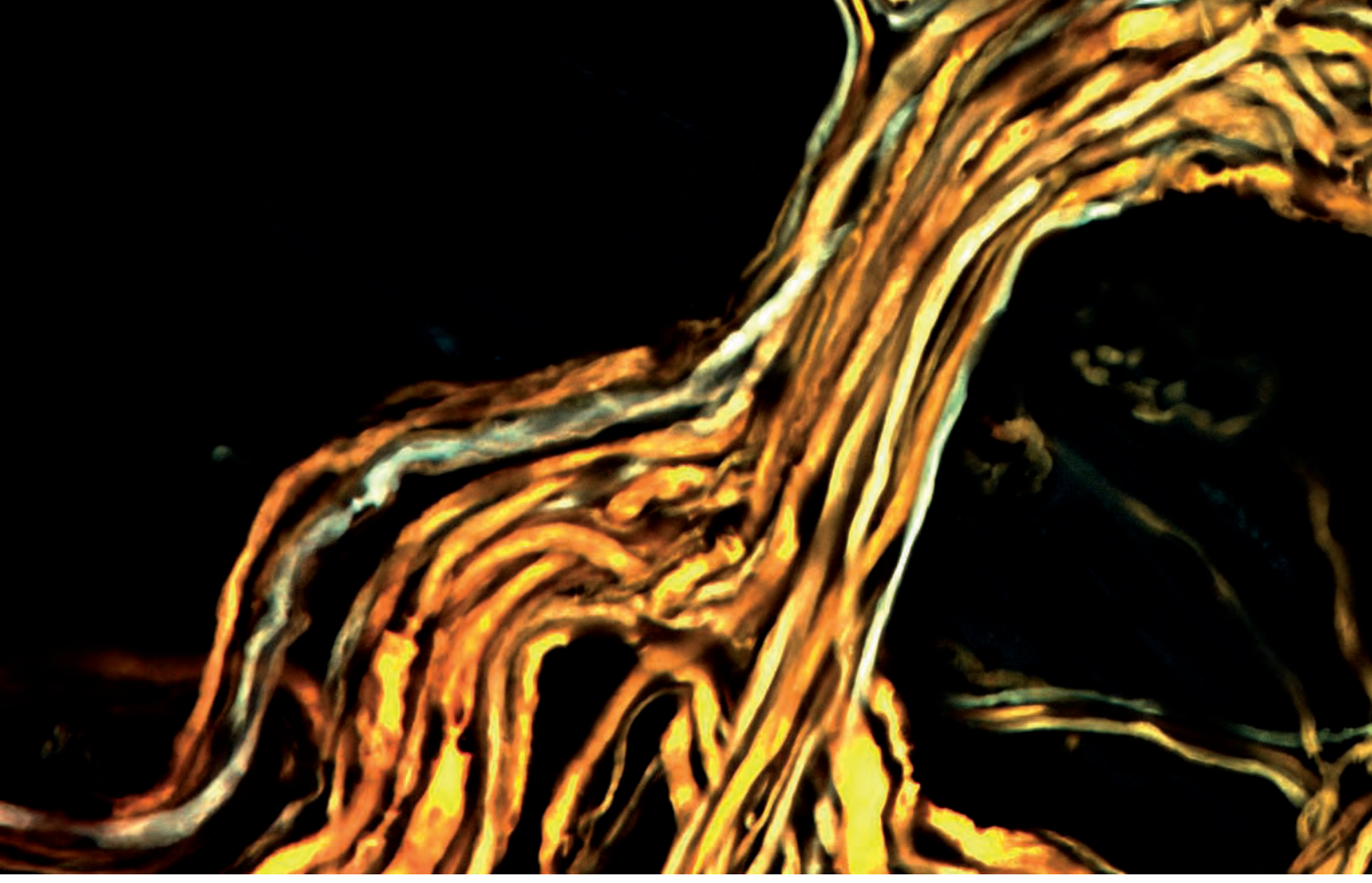
Enhanced sensitivity – and reduced background noise – is the prerequisite for every demanding application in laser-scanning microscopy. The excellent sensitivity of the LSM 710 is combined with outstanding suppression of noise and excitation laser light to deliver the best results, even with tricky preparations, such as those with dense 3D tissue or cells growing directly on metallic substrates (e.g., gold).

To achieve such performance, a whole range of improvements have been implemented:

- Low-noise electronics with up to 30 % longer sampling time per pixel via over-sampling
- excellent contrast due to improved laser suppression (even with mirror-like samples)
- an increase in sensitivity due to a new spectral grating and spectral-recycling loop design
- an array detector with three times lower dark noise
- parallel 34-channel imaging over the entire wavelength range
- APD-imaging and photon counting.

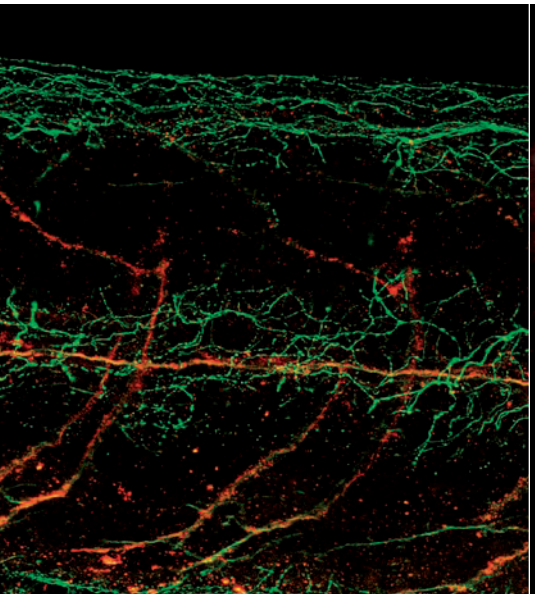
"Sensitivity is the key feature in a confocal microscope. The LSM 710 achieves a high sensitive image acquisition with low noise level, and provides reduced phototoxicity for experiments with living cells."
Dr. Hideaki Mizuno, Brain Science Institute, Riken, Wako, Japan

Digital gain function for increased sensitivity and the perfect balancing of up to 10 detection channels

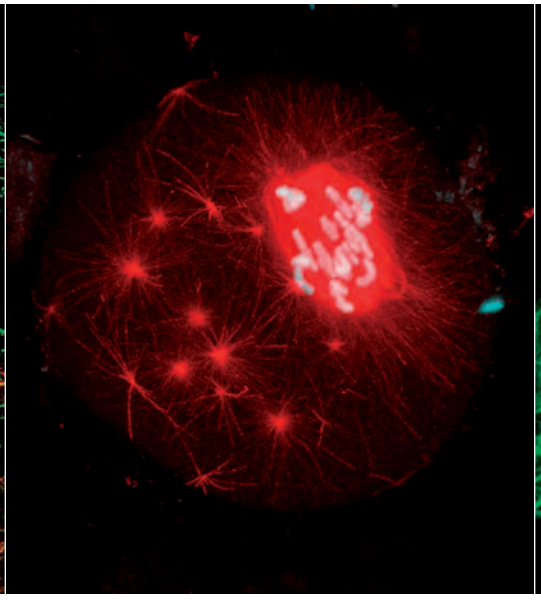


Nerve bundles innervating muscle in a transgenic mouse, labelled with kusabira-orange, CFP and YFP. Dr. J. Carlos, MCD, Harvard University, Boston, USA

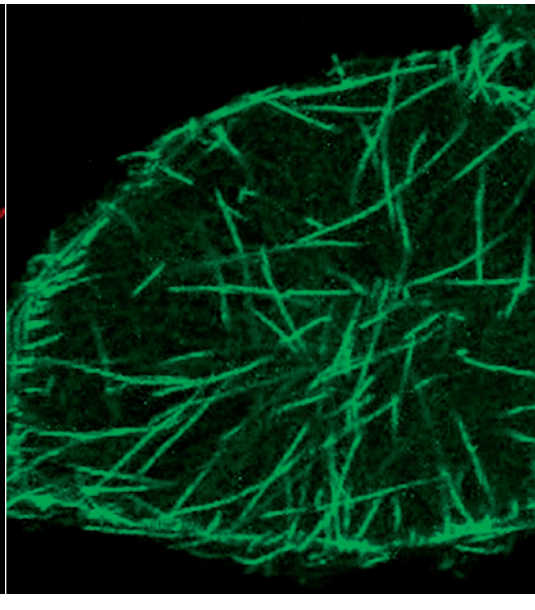
Nerve fibers in tail of a zebrafish embryo, labelled with Alexa 488, CY3, CY5



Spindle formation in mouse oocyte, labelled with Hoechst, Alexa 680. M. Schuh, EMBL, Heidelberg, Germany



Growing microtubules in Hela cells, labelled with GFP. Dr. L. Sironi, EMBL, Heidelberg, Germany

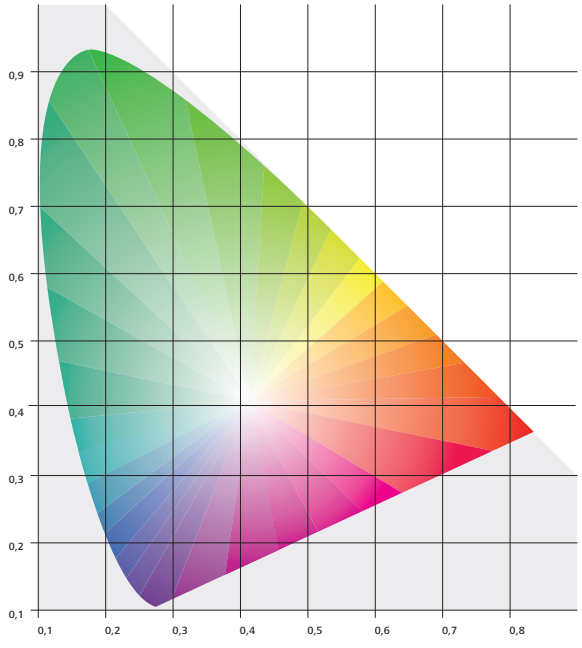


Use the latest dyes with extreme spectral properties

Flexibility in All Areas

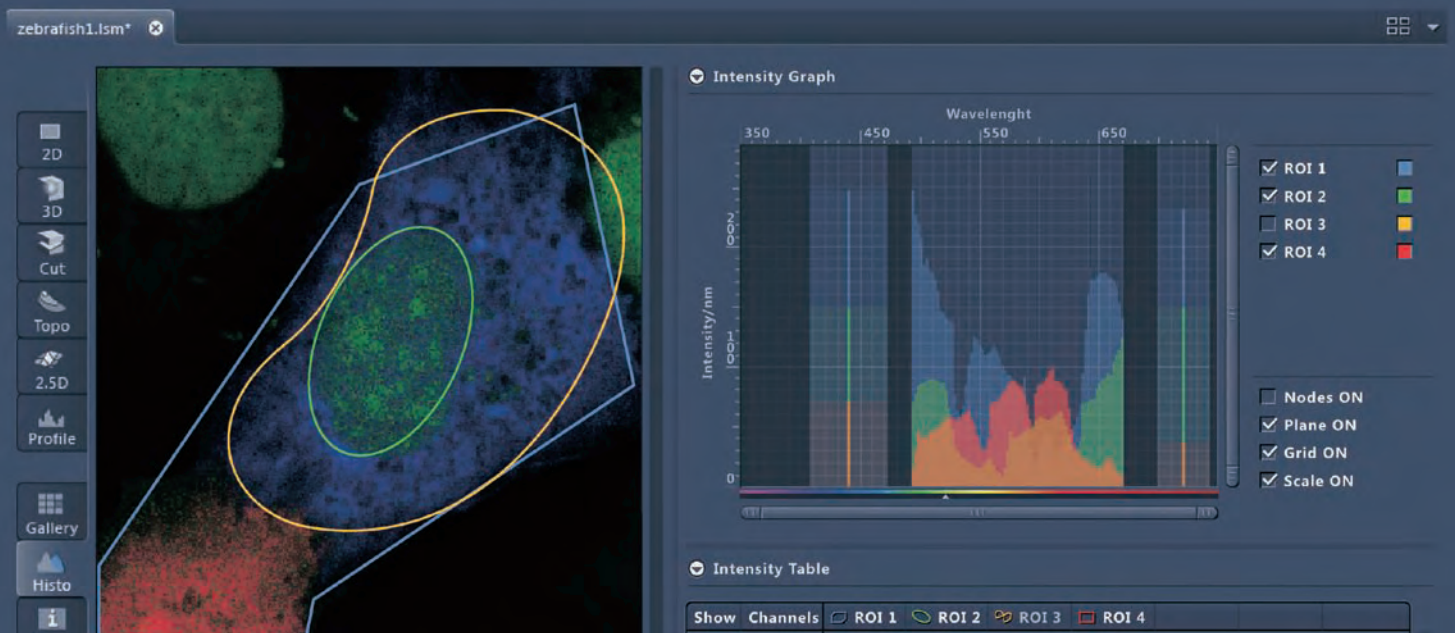
The LSM 710 allows you to use more dyes and to look deeper into cells and tissues. The new illumination and detection design gives you ultimate freedom for fluorescence microscopy.

Capable of continuous spectral detection over the whole wavelength range with up to 10 dyes used simultaneously, the LSM 710 is capable of performing virtually any application. In addition, users have the option to add additional laser lines if their experiments require new excitation possibilities. Multicolor imaging can be performed with perfection, enabling the use of the latest fluorescent proteins without spectral crosstalk. Molecules, such as proteins, and their interactions can be analyzed using all current methods of imaging.



Enjoy the freedom of fluorescence colors

The flexible beampath with the innovative FlexGate main beamsplitter provides up to 50 combinations of excitation laser lines and may be exchanged by the user. On the detection side, emission bands can be flexibly selected without emission filters or secondary dichroics owing to new band-pass sliders in front of 2, 3 or 34 spectral detectors. Additional external detectors can be attached to the coupling port. The optics are designed for a range of 350–1100 nm and, as a result, lasers – including pulsed lasers and powerful bleach lasers – can be freely combined from near UV (405 nm), VIS, and IR (Ti:Sa) ranges.



Spectral imaging in a new dimension with QUASAR detectors

Unique Precision and Reproducibility

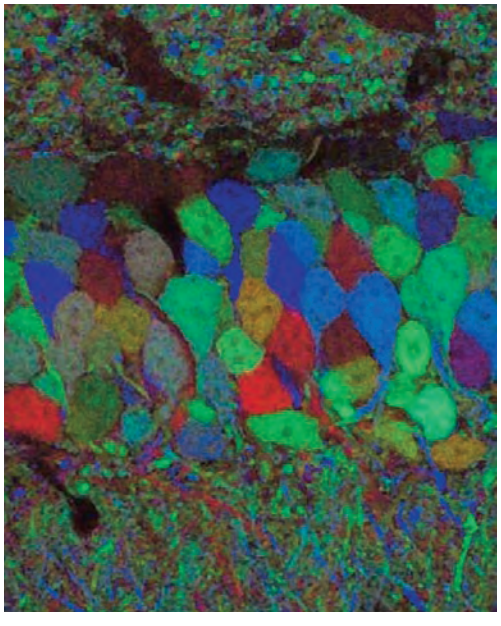
The LSM 710 provides faster, constantly verifiable results due to a more stable design with less mechanical movement, especially in spectral imaging.

The whole group of 2, 3, or 34 detectors is fixed. It reproduces your spectral measurements reliably and without deviations. The new parallel spectral detection offers simultaneous 34-channel read out in lambda mode. In addition, there is a sequential acquisition mode available that increases the spectral resolution to 3 nm.

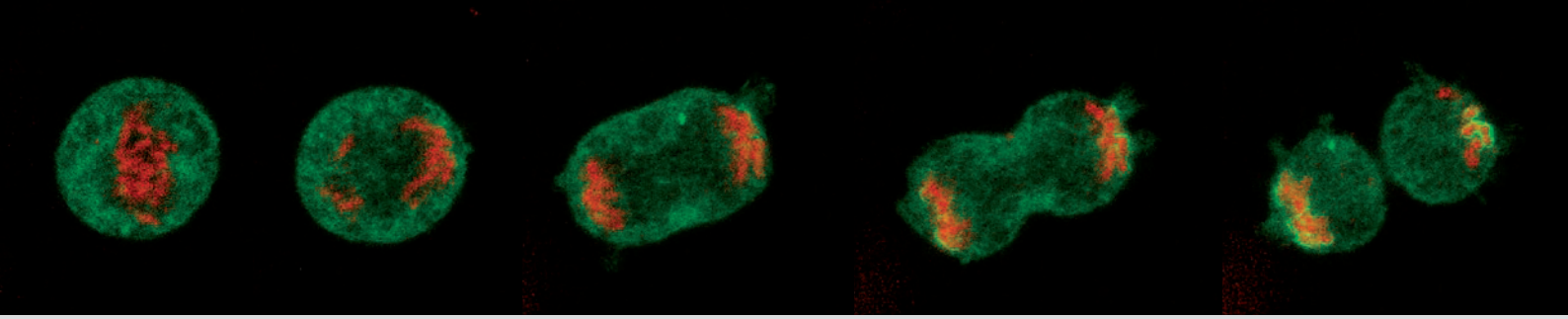
To get the best image data possible, we have conducted extensive research towards improving our unmixing software. By implementing the ideas published by leading scientists on how to optimize the spectral unmixing logic and to reduce the effect of noise on the unmixing result, we improved both the precision and signal strength of the resulting crosstalk-free images. Up to 10 dyes can be acquired and separated at the same time. Systems with 2 or 3 channels also offer the same outstanding linear unmixing technology.

Literature

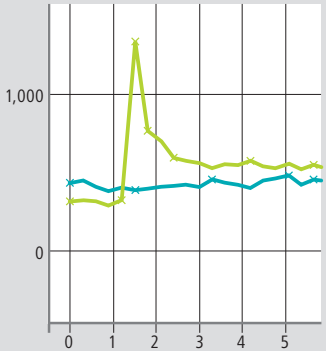
Neher R., Neher E.: *Optimizing imaging parameters for the separation of multiple labels in a fluorescence image,* J Microsc. 2004 Jan; 213(Pt 1): 46–62.



Hippocampus neurons in a Brainbow transgenic mouse, labelled with multiple hues of fluorescent proteins. Dr. J. Livet, MCB, Harvard University, Boston, USA



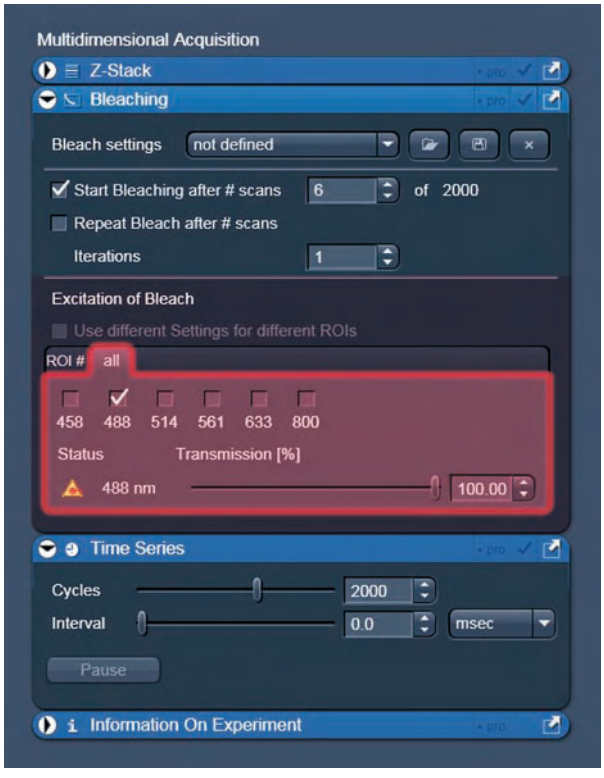
Time lapse imaging of dividing NRK cells, labelled with GFP and HcRed.
E. Dultz, EMBL, Heidelberg, Germany



Photoactivation series with PA-GFP.
Dr. S. Huet, EMBL, Heidelberg, Germany

More Possibilities With Living Cells

Get more valid results in live cell imaging with the LSM 710 – thanks to less disturbing, less damaging and more stable conditions for your living cells.

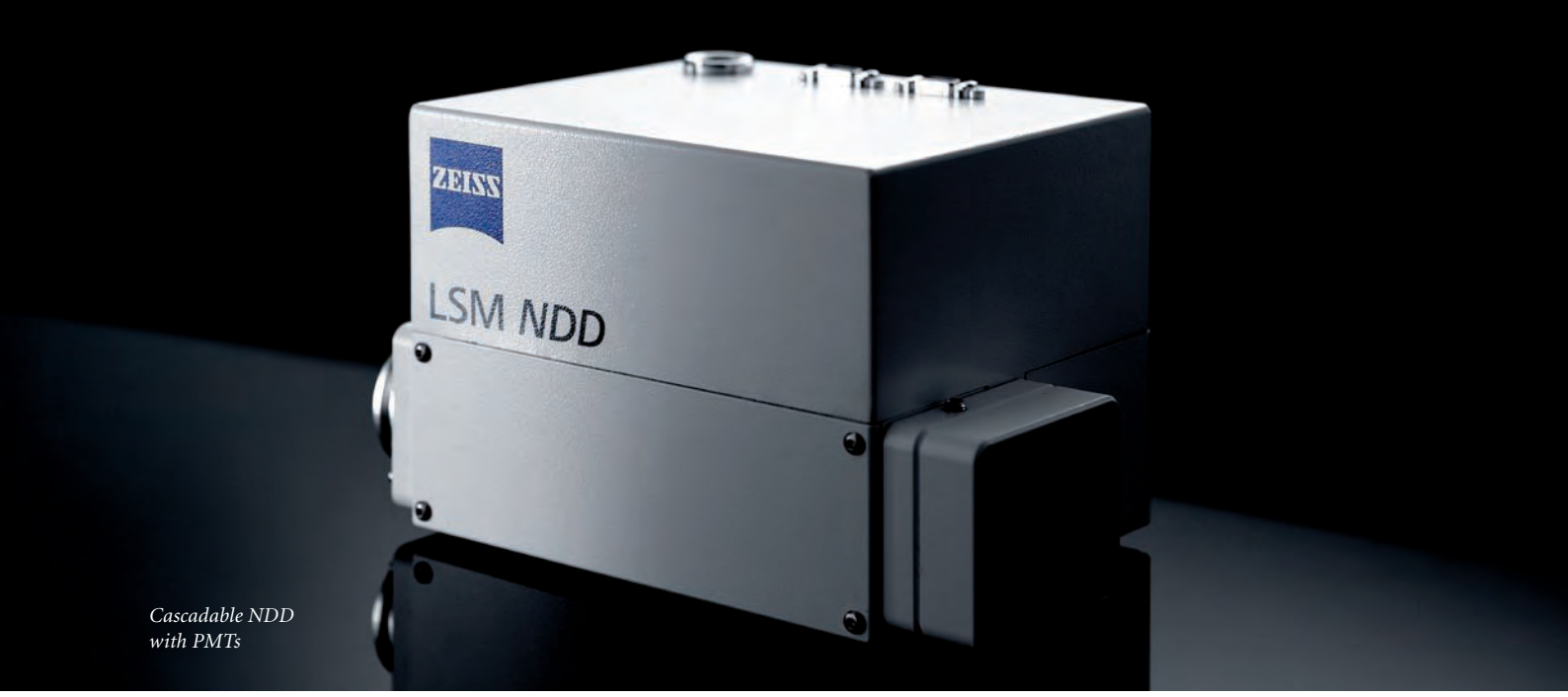


Flexible bleach- and photoactivation functions

The result of such improved capabilities is the ability to observe your cells longer and at higher spatial and temporal resolutions. The LSM 710 offers improvements in almost every aspect, whether it involves faster scan speeds at lower zoom factors (i.e., larger fields of view with a field number of up to 20 in the intermediate plane) or more constant imaging conditions with, for example, stable laser excitation or control of the focus plane using the Definite Focus attachment on the Axio Observer microscope stand.

The trend towards more representative experiments with living cells also means analyzing the interactions of structures. Whether it involves cancer research, cell death, the analysis of DNA repair proteins, protein synthesis or the detailed mechanisms of cell division, freely definable ROIs for bleach and photoactivation experiments are essential. The LSM 710 offers the ideal tools for single and multiple ROIs with individual settings and at the fastest speeds possible.

"Fast photoactivation experiments used to be very difficult with point scanning confocal microscopes. The faster scan rates and improved signal to noise of the LSM 710 now make it possible to analyze diffusion even of small soluble proteins with such a microscope."
Dr. Jan Ellenberg, EMBL, Heidelberg, Germany



Cascadable NDD with PMTs

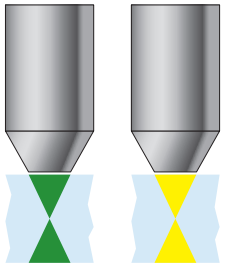
Multiphoton Imaging Without Compromise

As a physiologist or neurobiologist, you need to be able to get deeper images of three-dimensional samples, e.g., brain tissue. The LSM 710 NLO lets you penetrate deeper and detect more light.

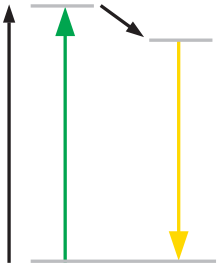
Improved femtosecond multiphoton technology lets you go from flat "caricatures" to a three-dimensional context so as to understand interrelations in complex biological systems. Improved NDD electronics and cascadable NDD modules allow spectral flexibility for multicolor NLO experiments.

The LSM 710 NLO was co-developed with a matching fixed-stage microscope, the Axio Examiner. This allowed us to optimize our NDD technology so as to detect even the faintest signals. The tube lens of the Axio Examiner is specially designed to optimize the beam conditions for our Plan-Apochromat 20×/1,0 W objective, which provides an ideal solution for NLO imaging. The LSM 710 NLO goes even further by offering a unique GaAsP NDD unit with excellent quantum efficiency and twice as good SNR integrated into the objective holder so as to provide the shortest beampath and better detection of scattered photons.

"Multiphoton imaging requires an efficient NDD light path. The LSM 710 NLO offers many improvements that result in brighter images and deeper penetration. Also, the configuration of NDD modules is very flexible, allowing simultaneous acquisition of many channels for multicolor imaging."
Dr. Stephen Turney, MCB, Harvard University, Boston, USA

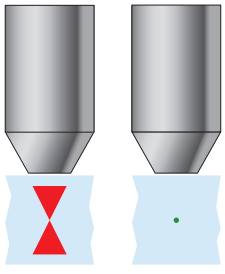


Single photon (visual light) lasers excite the dye in focus and out of focus.

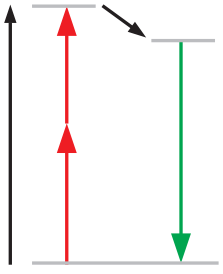


Energy diagram of fluorescence generation with single photon excitation.

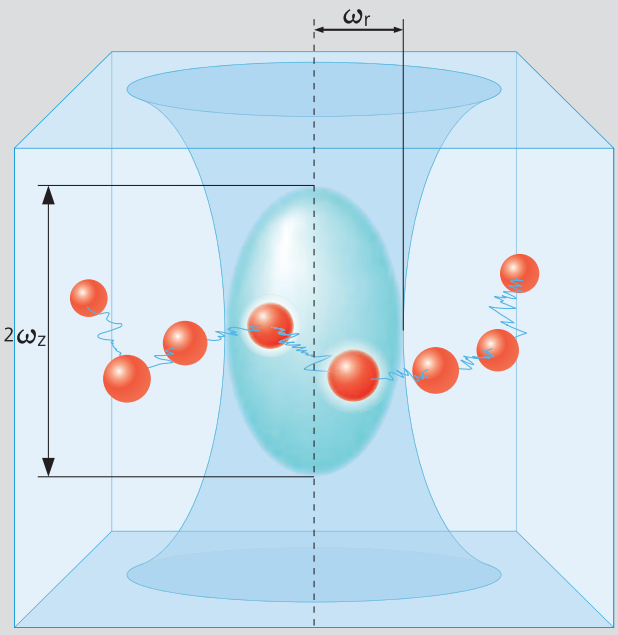
The principle of Two-Photon excitation



Femtosecond lasers excite the fluochrome only at the focus.

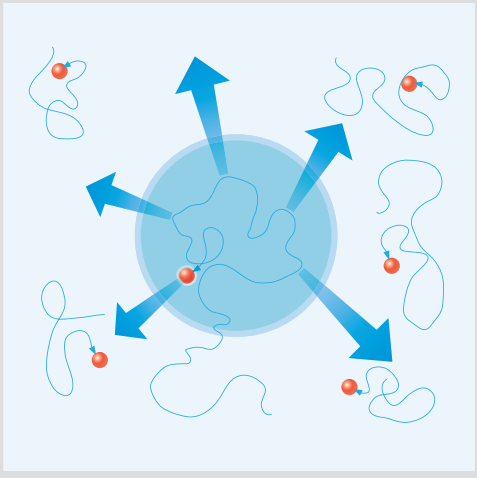


Energy diagram of fluorescence generation with multiphoton excitation.



FCS and ICS use the confocal volume to trace single molecules

Principle of single molecule analysis

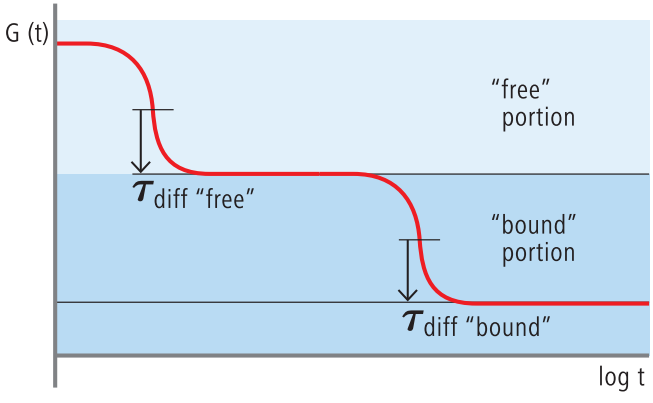


Integrated Special Imaging Modes

Thanks to its excellent SNR and image quality, the LSM 710 offers possibilities that go beyond conventional imaging, such as Fluoresence Correlation Spectroscopy (FCS) and Image Correlation Spectroscopy (ICS), which allow single molecules to be analyzed at a new level.

The new system is the first turnkey system to offer ICS, a method developed by E. Gratton and P. Wiseman. Unlike FCS, ICS requires no special hardware or APD detectors, and its analysis is done in the normal scanned image. Again unlike FCS, ICS produces a real image as a result. Nevertheless, both methods are complementary: FCS is more sensitive and gives higher count rates when molecule concentrations are low, while ICS provides more precise analysis of many fast-moving molecules.

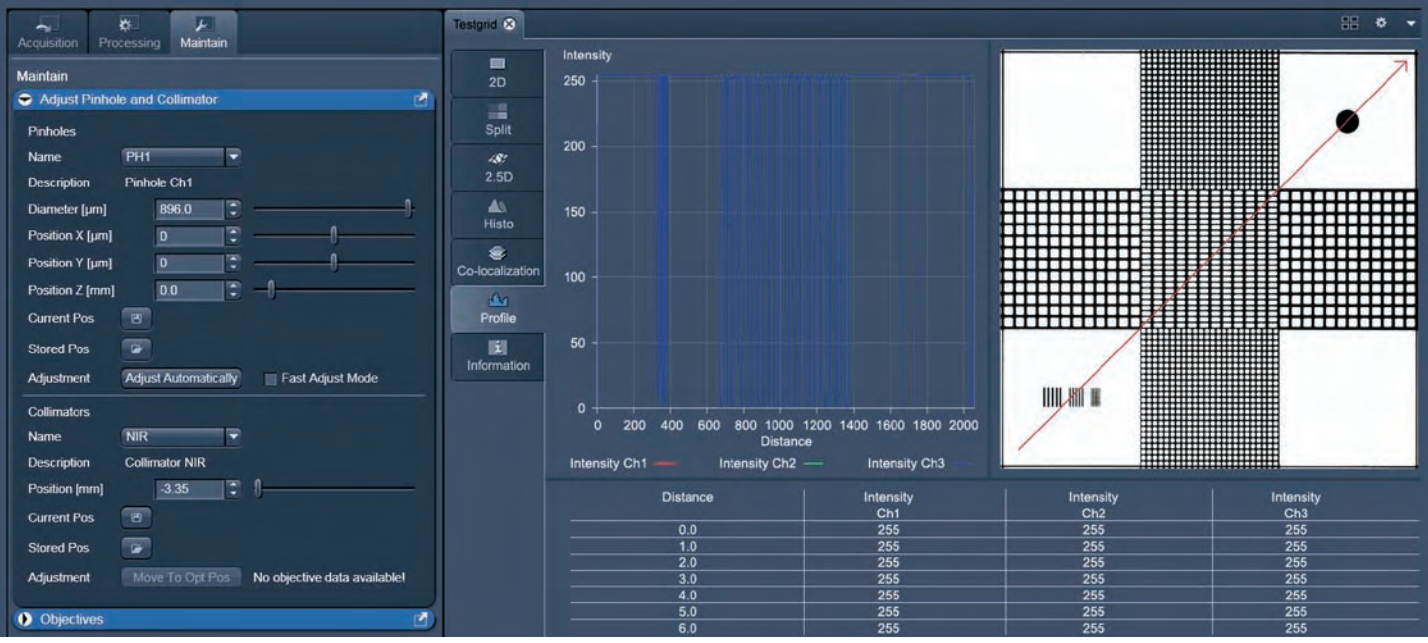
When using pulsed lasers on the LSM 710 (e.g., with NLO systems), another method is available that allows molecules and even their spatial interaction to be traced. FLIM allows for the analysis of the fluorescence lifetime, which makes it the ideal method for undertaking FRET experiments analyzing whether proteins are located closer than 10 nm apart and are thereby capable of interacting. The LSM 710 offers a direct coupling port, which allows matching Becker & Hickl FLIM detectors to be mounted to it.



Literature

Digman M.A.; Brown C.M.; Sengupta P.; Wiseman P.W.; Horwitz A.R.; Gratton E.: *Measuring fast dynamics in solutions and cells with a laser scanning microscope.* Biophys Journal, 2005 Aug; 89(2): 1317–27.

Raub C.B.; Unruh J.; Suresh V.; Krasieva T.; Lindmo T.; Gratton E.; Tromberg B.J.; George S.C.: *Image correlation spectroscopy of multiphoton images correlates with collagen mechanical properties.* Biophys Journal, 2007 Dec 7.



Distance	Intensity Ch1	Intensity Ch2	Intensity Ch3
0.0	255	255	255
1.0	255	255	255
2.0	255	255	255
3.0	255	255	255
4.0	255	255	255
5.0	255	255	255
6.0	255	255	255

A combination of pre-adjusted settings and self-test tools allows perfect system performance.

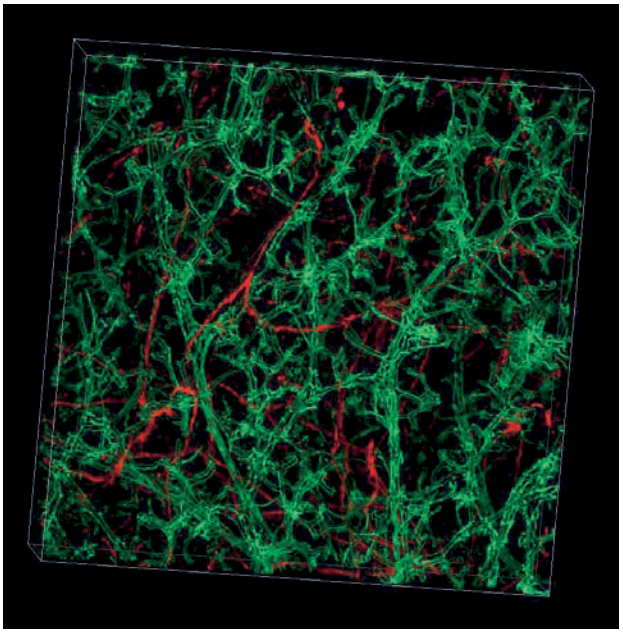
Maximum Ease of Use

The LSM 710 offers more efficient workflows and excellent ease of use. Serviceability is improved for faster maintenance and reduced downtime in case of upgrades or repairs – a decisive factor for multi-user research facilities.

Space and time requirements for setting up the system are less demanding due to its smaller size and reduced installation times. Improved diagnostics tools, new self-test software and an integrated calibration tool allows the system to be kept in optimal condition. Should you wish to make an increased investment at a later time, there are simple methods for upgrading both hardware components and the ZEN 2008 software with its fantastic ergonomic characteristics and ease of use.

"As a multiuser facility, stability and reliability have always been at the forefront of our needs. Downtime and time used to ensure that the systems are performing to specification can be costly and very frustrating to our users. Prealignment and self test tools are a huge step forward and will not only free up experimental time but will also give me greater confidence in the scientific excellence being produced by our regular users."
Dr. Peter O'Toole, Technology Facility, Biology,
University of York, United Kingdom

Perfect 3D results in superior samples resulting from perfect adjustments; Submandibular gland of a mouse, labelled with ZO-1 antibody and YFP, S. Sheu, MCB, Harvard University, Boston, USA



Discover the New Sensitivity:


Home
10x
20x
63x Oil
Lade-position
Pos. 5
Pos. 6
Automatik
XYZ
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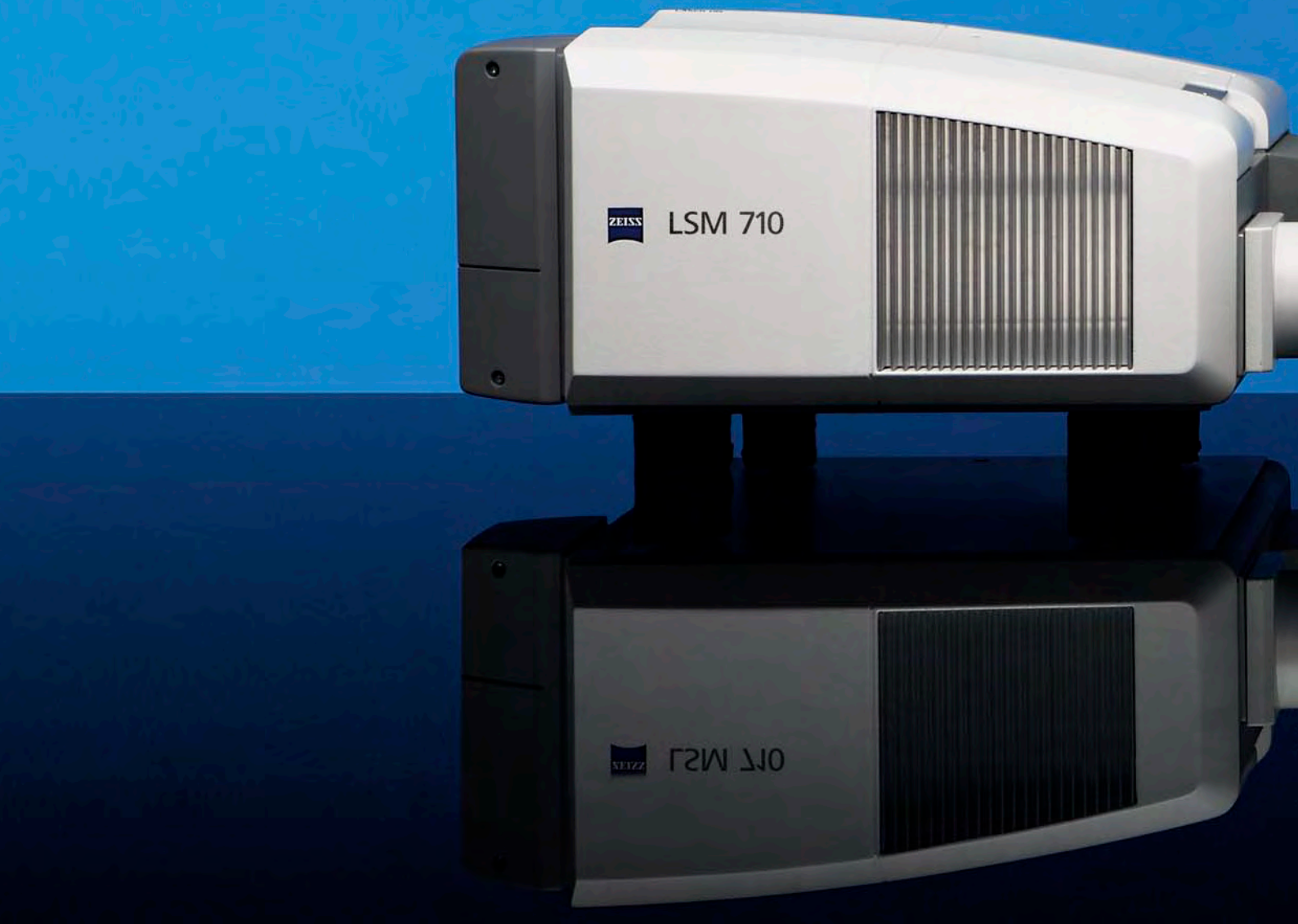
Auf
PH
DIC
ZEISS
SEIZZ

LSM 710 on Upright Stands

The LSM 710 on upright microscopes, such as the Axio Imager or the Axio Examiner, is ideal for research in neurobiology, physiology and developmental biology.

ZEN Software

The interface for your applications



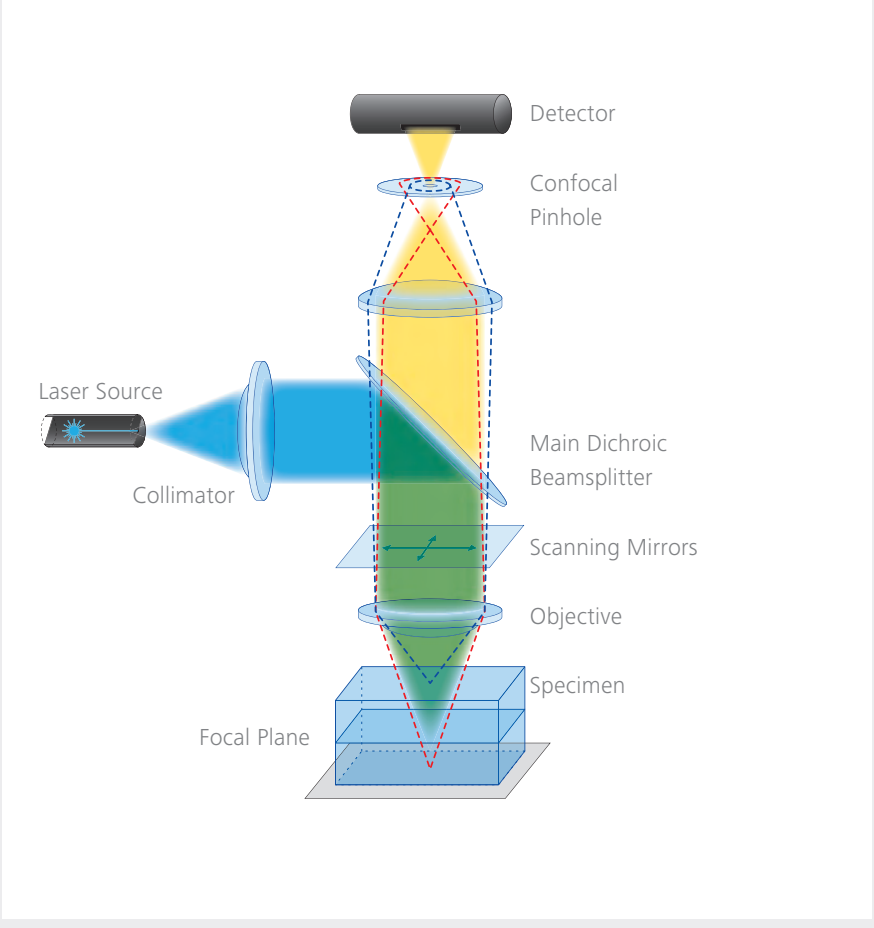
LSM 710 on Inverted Stands

The LSM 710 on the inverted Axio Observer microscope is ideal for research in cell and molecular biology.


Home
10x
20x
63x Öl
Lade-position
Automatik
XYZ
Display
PL
PH
DIC
ZEISS

Confocal Microscopy

The advantage of confocal light microscopy: capturing the light emitted by a single plane of a sample.

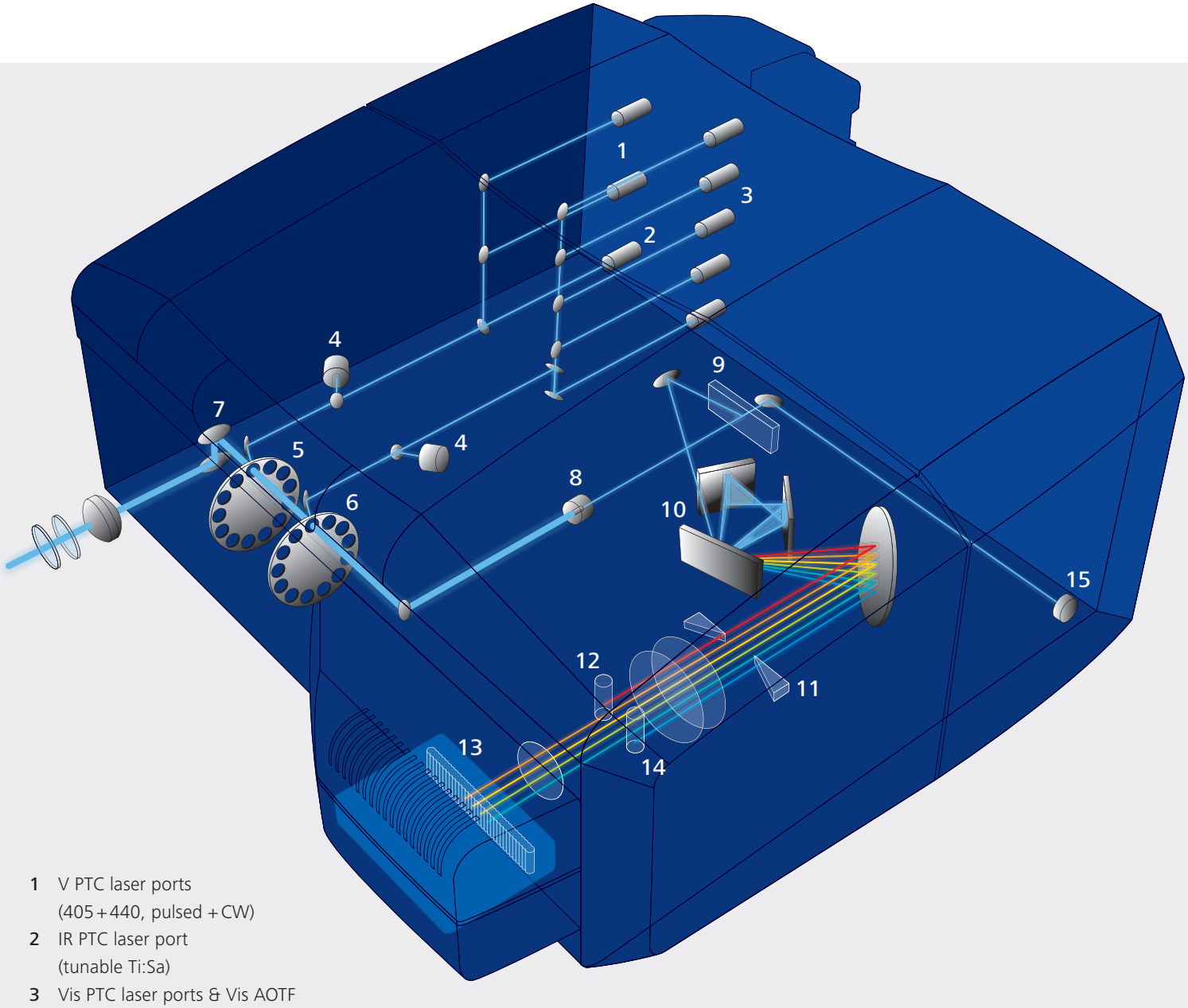


A laser beam scans the specimen pixel by pixel and line by line. A pinhole conjugated to the focal plane obstructs the light emerging from objects outside that plane, so that only light from objects that are in focus can reach the detector.

The pixel data gathered using this method are then assembled to form an image that represents an optical section of the specimen and is distinguished by high contrast and high resolution in the X, Y and Z planes. Several images generated by means of shifting the focal plane can be combined into a 3D image stack.

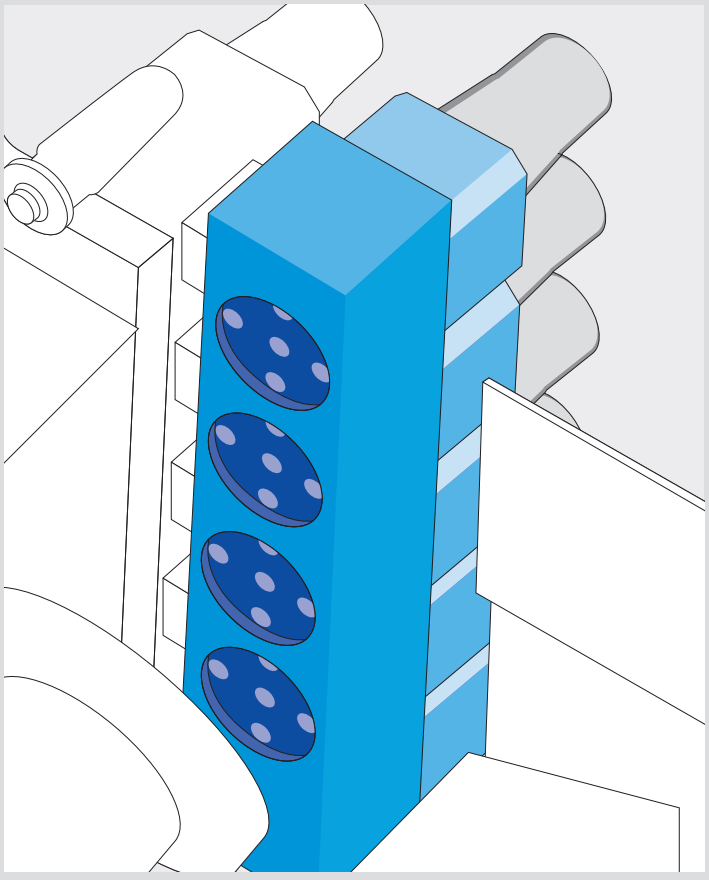
The Beampath

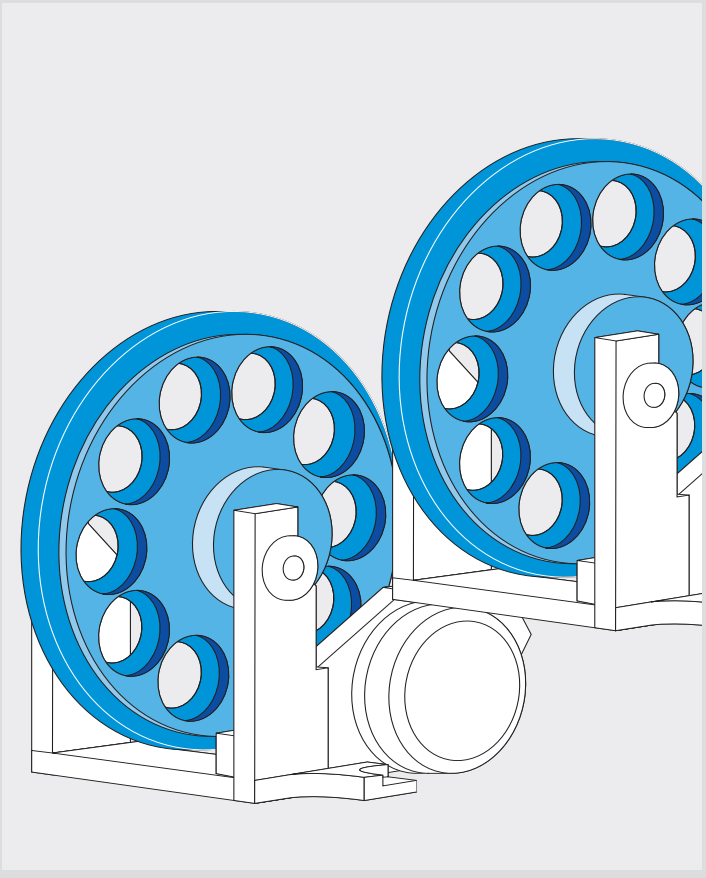
The unique design allows for the best possible combination of efficiency, flexibility, maintenance and upgrade opportunities in a compact construction.



1 V PTC laser ports (405 + 440, pulsed + CW)
2 IR PTC laser port (tunable Ti:Sa)
3 Vis PTC laser ports & Vis AOTF
4 Monitoring diodes
5 InVis TwinGate beamsplitter (upgradable)
6 Vis TwinGate beamsplitter (user exchangeable)
7 Scan mirrors (FOV 20, 6k × 6k)
8 Master pinhole
9 Splitter for external channels
10 Spectral separation and recycling loop
11 Spectral beam guides
12 QUASAR PMT spectral channel # 1
13 QUASAR PMT spectral channels # 2–33 (or # 2)
14 QUASAR PMT spectral channel # 34 (or # 3)
15 Ext. channels (# 4 + 5: APDs, FLIM, FCS etc.)

The Innovations in Detail



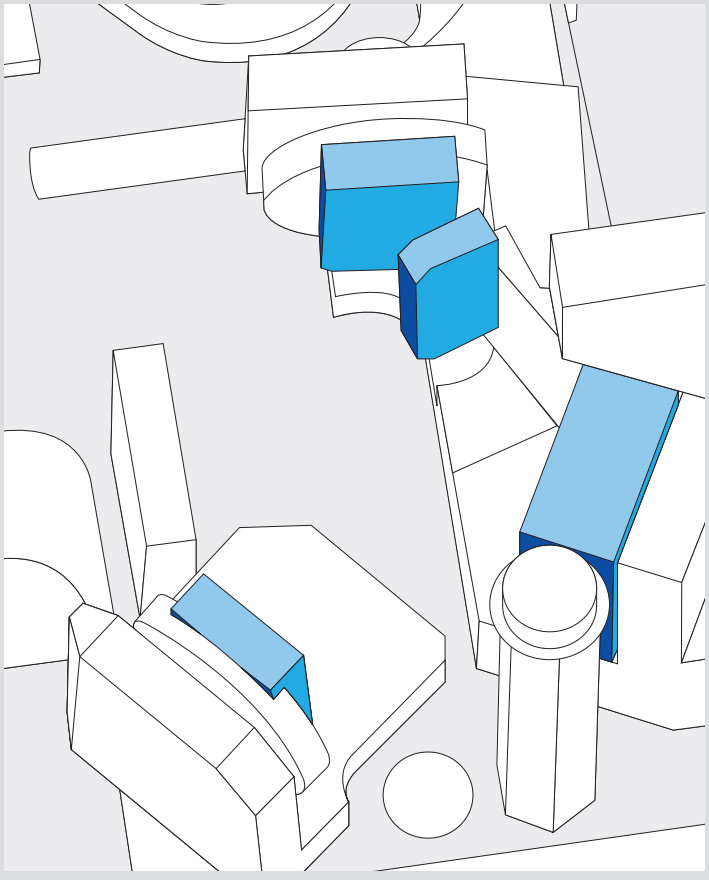


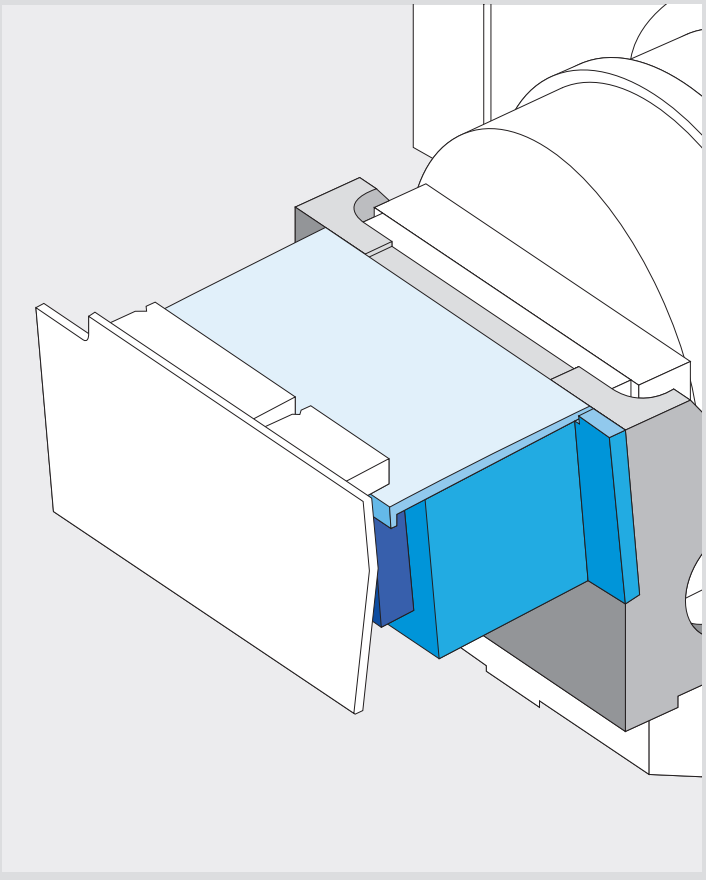
The PTC Laser Concept

The LSM 710 features a revolutionary PTC laser concept – there is no longer any laser module. Instead, all lasers are so-called "pigtailed" versions, which can be directly plugged into the scanning module. Up to eight ports in the LSM 710 scanning module allow direct coupling for near-UV, VIS and IR-lasers in free combinations. As a fortunate result, this saves space in your lab and reduces the heat generated by the lasers. Upgrades of future laser lines are easy and cost-effective.

TwinGate Main Beamsplitter

To allow almost infinite excitation combinations, the LSM 710 incorporates the new TwinGate main beamsplitter. This combination of two high-transmission dichroic filter wheels allows up to 50 combinations of laser lines for fluorescence excitation. Since four lines can be used simultaneously, complete flexibility for your experiments is guaranteed. In addition, Vis-range filters can be exchanged by the user for future laser upgrades. And that's not all ! The new shape results in an absolutely outstanding suppression of the excitation laser light for improved SNR.





Spectral Recycling Loop

Gratings are ideal for splitting light into its spectrum as a result of their even separation of colors. The LSM 710 features another revolution: the spectral recycling loop, which provides a boost in signal by feeding any non-separated portion of the signal through the grating a second time. The resulting spectral signal is ideal for high-resolution (up to 3 nm) spectral imaging or the simultaneous detection of up to 10 dyes. The LSM 710 also offers ultimate freedom, since any portion of the spectrum can be guided to any detector unit you designate for the color.

QUASAR Detector

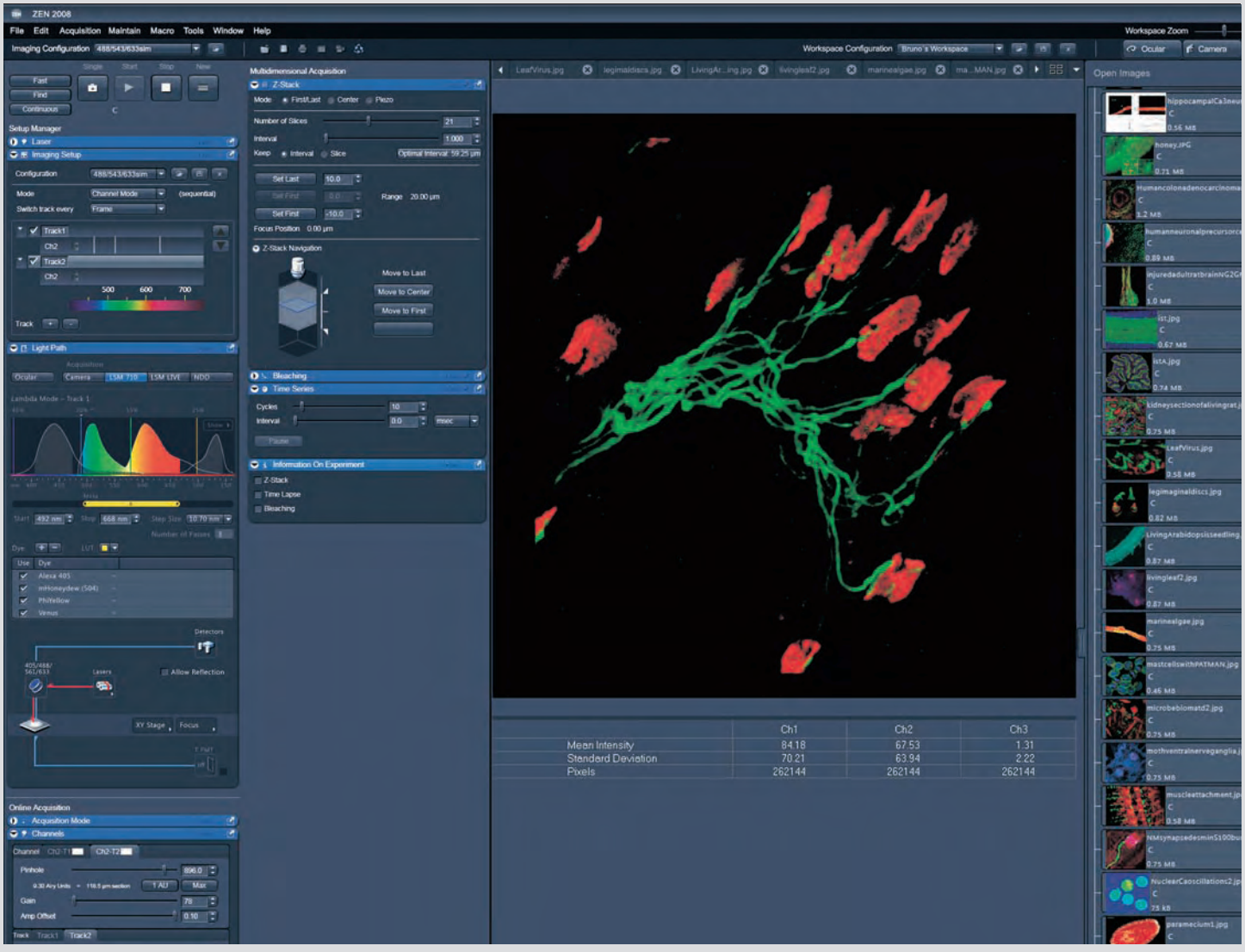
The LSM 710 employs a next generation QUASAR detector (Quiet Spectral Array) that offers two innovations. First, the sensitivity of our PMT array has been greatly enhanced by using a brand-new model with three times lower dark noise. Part of this achievement results from the improved match of the detection area with the beam dimensions. Second, there is not only one spectral detector but a choice between a two-channel, a three-channel or a full 34-channel configuration. All three offer excellent sensitivity, the lowest dark noise possible and 3–10 noise-free digital gains to adjust the balance of even the most extreme dye combinations.

The Universal System for All Applications

Scientists need specific performance features in order to take full advantage of and obtain real benefits from their system in the course of their research. The LSM 710 offers solutions tailored to your specific needs and applicative focus.

• Outstanding high sensitivity • Flexibility • Reproducibility of measurements, Spectral functionality • Long-term live cell imaging capabilities • No-compromise NLO implementation • Special imaging modes & contrasts • Improved serviceability	2–/3–Channel	34–Channel	DUO Extension	NLO Extension	APD Extension
3D examinations	+++	+++			
Multifluorescence	+++	+++			
Colocalization	+++	+++			
Spectral Imaging	++	+++			
Live Cell Imaging	+++	+++			
Ion Imaging	+++	+++			
ICS	+++	+++			
FLIM (by Becker & Hickl)	+++	+++			
FRET (various methods)	++	+++			
FRAP and FLIP	++	++	+++		
Photoactivation/-conversion	++	++	+++		
Uncaging	+	+	+++	++	
***In vivo* examinations**				+++	
3D in-depth imaging				+++	
FCS auto-correlation					+++
FCS cross-correlation					+++

ZEN Software: The Perfect User Interface for Your Applications



The LSM 710 operates using Zeiss's efficient navigation software, which offers not only a logical, easy-to-understand user interface but also an improved color scheme for work involving microscopy. In this way, the monitor won't be a "floodlight" in your laboratory.

Technical Data LSM 710

MICROSCOPES

Stands	Upright: Axio Imager.Z1, Axio Imager.M1, Axio Examiner*, with tube or rear port; Inverted: Axio Observer.Z1 with side port or rear port | (*available summer 2008)
Z drive	Smallest increments: Axio Imager.Z1, Axio Imager.M1: < 25 nm; Axio Observer.Z1: < 25 nm; Axio Examiner*: < 30 nm; fast Piezo objective or stage focus accessory; Definite Focus unit for stand | (*available summer 2008)
XY stage (option)	Motorized XY-scanning stage, with Mark & Find function (xyz) and Tile Scan (mosaic scan); smallest increments 1 µm (Axio Observer) or 0.2 µm (Axio Imager)
Accessories	Digital microscope camera AxioCam; integration of incubation chambers; micromanipulators; etc

SCANNNING MODULE

Models	Scanning module with 2, 3 or 34 spectral detection channels; high QE, 3 × lower dark noise; up to 10 individual, adjustable digital gains; prepared for lasers from V (405) to IR
Scanners	Two independent, galvanometric scan mirrors with ultra-short line and frame flyback
Scan resolution	4 × 1 to 6144 × 6144 pixels; also for multiple channels; continuously variable
Scanning speed	14 × 2 speed stages; up to 12.5 frames/sec with 256 × 256 pixels; 5 frames/sec with 512 × 512 pixels (max. 77 frames/sec 512 × 32); min 0.38 ms for a line of 512 pixels; up to 2619 lines per second
Scan zoom	0.6 × to 40 ×; digital variable in steps of 0.1 (on Axio Examiner 0.67 × to 40 ×)
Scan rotation	Free rotation (360 degrees), in steps of 1 degree variable; free xy offset
Scan field	20 mm field diagonal (max.) in the intermediate plan, with full pupil illumination
Pinholes	Master-pinhole pre-adjusted in size and postion, individually variable for multi-tracking and short wavelengths (e.g. 405 nm)
Beam path	Exchangeable TwinGate main beamsplitter with up to 50 combinations of excitation wavelengths and outstanding laser light suppression; optional laser notch filters for fluorescence imaging on mirror-like substrates (on request); outcoupling for external detection modules (e.g., FCS, B&H FLIM); low-loss spectral separation with Recycling Loop for the internal detection
Spectral detection	Standard: 2, 3 or 34 simultaneous confocal fluorescence channels with highly sensitive low dark noise PMTs; spectral detection range freely selectable (resolution down to 3 nm); additionally two incident light channels with APDs for imaging and single photon measurements; transmitted light channel with PMT; cascadable non-descanned detectors (NDD) with PMT or GaAsP NDD unit for Axio Examiner
Data depth	8-bit, 12-bit or 16-bit selectable; up to 37 channels simultaneously detectable

LASER INSERTS

Laser inserts (VIS, V)	Pigtail-coupled lasers with polarization preserving single-mode fibers; stabilized VIS-AOTF for simultaneous intensity control; switching time < 5 µs, or direct modulation; up to 6 V/VIS-laser directly mountable into the scanhead; diode laser (405 nm, CW/pulsed) 30 mW; diode laser (440 nm, CW+pulsed) 25 mW; Ar-laser (458, 488, 514 nm) 25 mW or 35 mW; HeNe-laser (543 nm) 1 mW; DPSS-laser (561 nm) 20 mW; HeNe-laser (594 nm) 2 mW; HeNe-laser (633 nm) 5 mW (pre-fiber manufacturer specification)
External lasers (NLO, VIS, V)	Prepared laser ports for system extensions; direct coupling of pulsed NIR lasers of various makes (incl. models with prechirp compensation); fast intensity control via AOM; NIR-optimized objectives and collimation; fiber coupling (single-mode polarization preserving) of external manipulation lasers of high power in the VIS range 488–561 nm (e.g., LSM 7 DUO-systems)

ELECTRONICS MODULE

Realtime electronics	Control of the microscope, the lasers, the scan module and other accessory components; control of the data acquisition and synchronization by real-time electronics; oversampling read out logic for best sensitivity and 2 × better SNR; data communication between real-time electronics and user PC via Gigabit-Ethernet interface with the possibility of online data analysis during image acquisition
User PC	Workstation PC with abundant main and hard disk memory space; ergonomic, high-resolving 16:10 TFT flat panel display; various accessories; operating system Windows XP or VISTA (depending on availability); multi-user capable

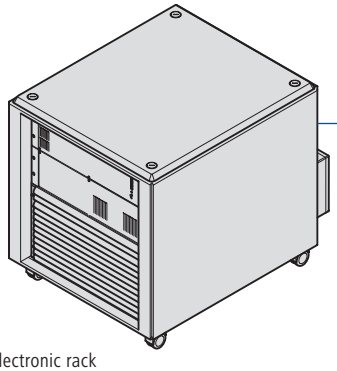
STANDARD SOFTWARE (ZEN)

System configuration	Workspace for comfortable configuration of all motorized functions of the scanning module, the lasers and the microscope; saving and restoring of application-specific configurations (ReUse)
System self-test	Calibration and testing tool for the automatic verification and optimal adjustment of the system
Acquisition modes, Smart setup	Spot, line / spline, frame, z-stack, lambda stack, time series and all combinations (xyz λ t); on-line calculation and display of ratio images; averaging and summation (line / framewise, configurable); step scan (for higher frame rates); smart acquisition setup by selection of dyes
Crop function	Convenient and simultaneous selection of scanning areas (zoom, offset, rotation)
RealROI scan, spline scan	Scanning of up to 99 arbitrarily shaped ROIs (Regions of Interest); pixel precise switching of the laser; ROI definition in z (volume); scan along a freely defined line
ROI bleach	Localized bleaching of up to 99 bleach ROIs for applications such as FRAP (Fluorescence Recovery After Photobleaching) or uncaging; use of different speeds for bleaching and image acquisition; use of different laser lines for different ROIs
Multitracking	Fast change of excitation lines at sequential acquisition of multicolor fluorescence for reduction of signal crosstalk
Lambda scan	Parallel or sequential acquisition of image stacks with spectral information for each pixel
Linear unmixing	Generation of crosstalk-free multifluorescence images with simultaneous excitation; spectral unmixing – online or offline, automatically or interactively; advanced logic with reliability figure
Visualization	XY, orthogonal (xy, xz, yz); cut (3D section); 2.5D for time series of line scans; projections (maximum intensity); animations; depth coding (false colors); brightness; contrast and gamma settings; color selection tables and modification (LUT); drawing functions
Image analysis and operations	Colocalization and histogram analysis with individual parameters; profile measurements on any line; measurement of lengths, angles, surfaces, intensities etc; operations: addition, subtraction, multiplication, division, ratio, shift, filtering (low pass, median, high-pass, etc; also customizable)
Image archiving, exporting & importing	Functions for managing of images and respective recording parameters; multi-print function; over 20 file formats (TIF, BMP, JPG, PSD, PCX, GIF, AVI, Quicktime, etc) for export

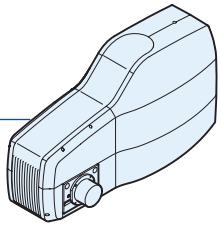
OPTIONAL SOFTWARE

LSM Image VisArt plus	Fast 3D and 4D reconstruction; animation (different modes: shadow projection, transparency projection, surface rendering); package 3D for LSM with measurement functions upon request
3D deconvolution	Image restoration on the basis of calculated point-spread function (modes: nearest neighbor, maximum likelihood, constraint iterative)
Physiology / Ion concentration	Extensive analysis software for time series images; graphical mean of ROI analysis; online and off-line calibration of ion concentrations
FRET plus	Recording of FRET (Fluorescence Resonance Energy Transfer) image data with subsequent evaluation; supports both the methods acceptor photobleaching and sensitized emission
FRAP	Wizard for recording of FRAP (Fluorescence Recovery After Photobleaching) experiments with subsequent analysis of the intensity kinetics
Visual macro editor	Creation and editing of macros based on representative symbols for programming of routine image acquisitions; package multiple time series with enhanced programming functions upon request
VBA macro editor	Recording and editing of routines for the automation of scanning and analysis functions
Topography package	Visualization of 3D surfaces (fast rendering modes) plus numerous measurement functions (roughness, surfaces, volumes)
StitchArt plus	Mosaic scan for large surfaces (multiple XZ profiles and XYZ stacks) in brightfield mode
ICS image correlation spectroscopy (PMT)	Single molecule imaging and analysis for all LSM 710 systems with PMT detectors (publ. by Gratton)
FCS / ConfoCor basic, diffusion, fitting	FCS and FCCS single molecule analysis for systems with ConfoCor 3 (APD) extension
FCS module PCH	Photon counting histogram extension for systems with ConfoCor 3 (APD) extension

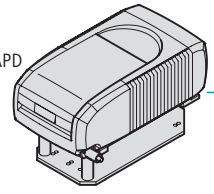
System Overview LSM 710



Laser and electronic rack
LSM 7 *DUO* (4 × Laser 405–635 nm)

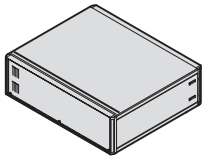


LSM 5 *LIVE*

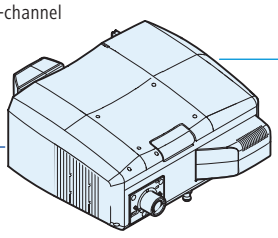


ConfoCor 3
2-channel APD

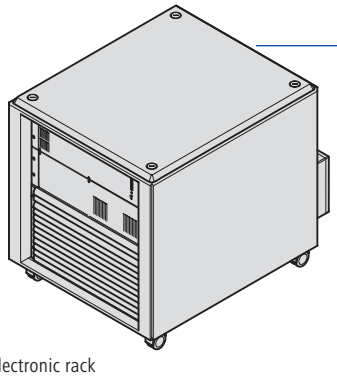
NLO kit for direct coupling



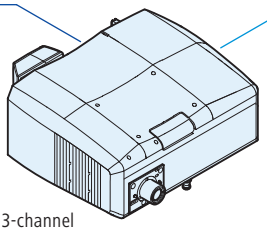
Extension electronics
for external laser (UV/NLO)



LSM 710 34-channel
spectral



Laser and electronic rack
LSM 710 (6 × pigtailed Laser 405–633 nm)

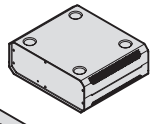


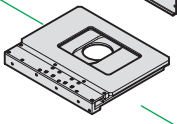
LSM 710 2-/3-channel
spectral

PIEZO objective focus

XY-stage controller PIEZO

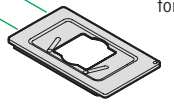
XY-joystick for stage
controller PIEZO





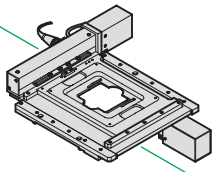
Scanning stage 130 × 85 PIEZO
for upright stand

Definite focus module
for stand



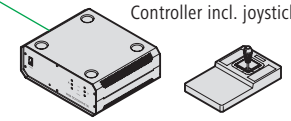
PIEZO stage focus

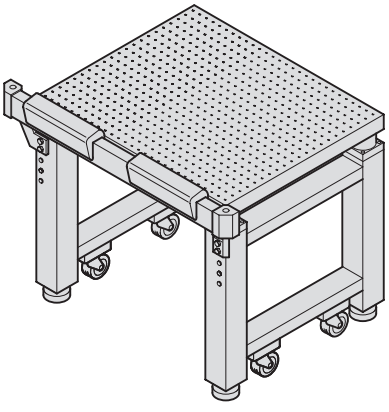
PIEZO objective focus

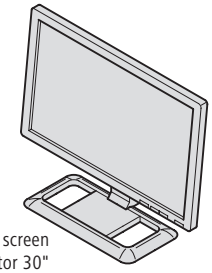


Scanning stage DC 120 × 100
for inverted stand

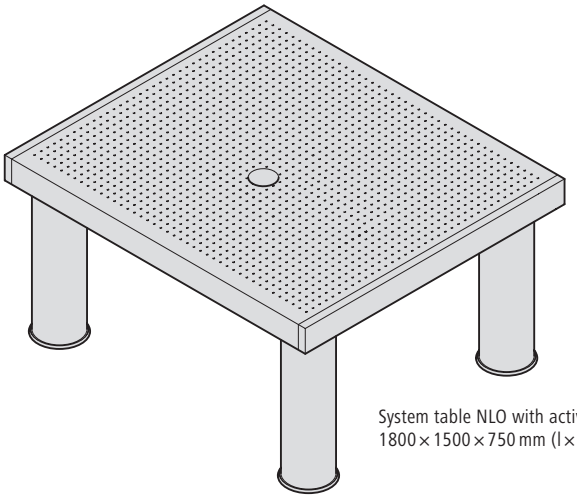
Controller incl. joystick







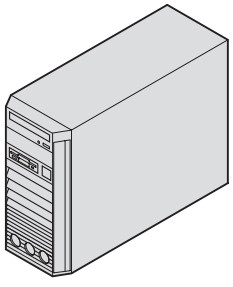
LCD TFT flat screen
monitor 30"



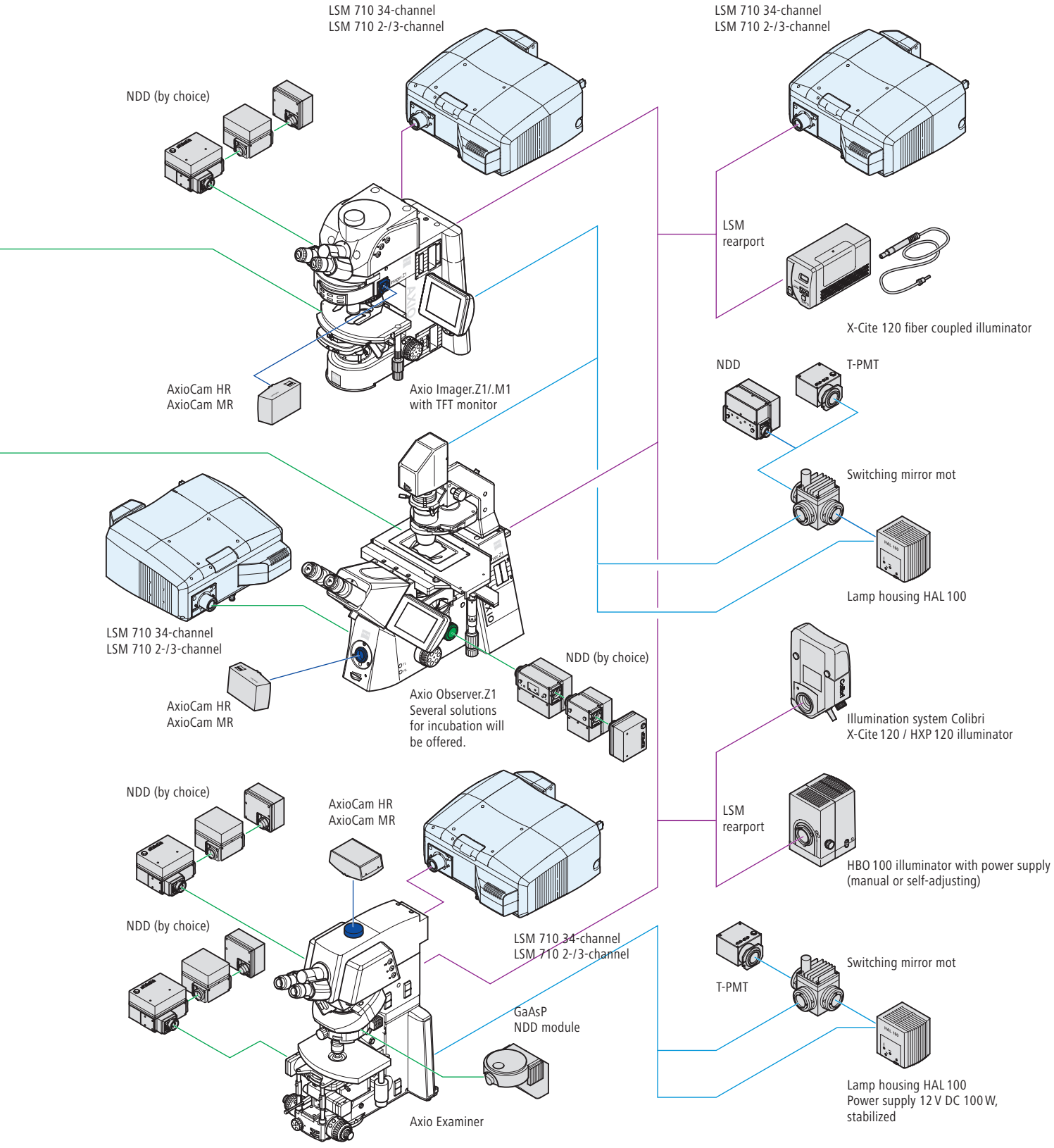
System table NLO with active absorption
1800 × 1500 × 750 mm (l × d × h)

System table LSM 710, passive or active absorption
900 (750) × 750 (900) × 770 mm (l × d × h)

System table DUO/ConfoCor, active absorption
1200 (900) × 900 (1200) × 770 mm (l × d × h)



Control computer


LSM 710 34-channel
LSM 710 2-/3-channel
NDD (by choice)
AxioCam HR
AxioCam MR
Axio Imager.Z1/.M1
with TFT monitor
LSM 710 34-channel
LSM 710 2-/3-channel
LSM
rearport
X-Cite 120 fiber coupled illuminator
NDD
T-PMT
Switching mirror mot
Lamp housing HAL 100
LSM 710 34-channel
LSM 710 2-/3-channel
AxioCam HR
AxioCam MR
Axio Observer.Z1
Several solutions
for incubation will
be offered.
NDD (by choice)
Illumination system Colibri
X-Cite 120 / HXP 120 illuminator
NDD (by choice)
AxioCam HR
AxioCam MR
LSM
rearport
HBO 100 illuminator with power supply
(manual or self-adjusting)
NDD (by choice)
LSM 710 34-channel
LSM 710 2-/3-channel
T-PMT
Switching mirror mot
GaAsP
NDD module
Axio Examiner
Lamp housing HAL 100
Power supply 12 V DC 100 W,
stabilized

An Orchestra of Innovations

Technology beyond the limits
of traditional confocals

- PTC lasers upgradeable ports for near-UV, VIS and IR for outstanding excitation flexibility
- Ideal geometry main beamsplitter for outstanding laser light suppression
- TwinGate exchangeable main beamsplitter with 50 combinations of excitation lines
- Definite Focus unit on microscope stand for focus stability
- Cascadable NDDs 2–8 on the microscope stand for multicolor NLO detection
- Master pinhole with optimized positioning for best 3D sectioning and light efficiency
- Coupling port for extension units, e.g., for FCS, FLIM and photon counting
- Spectral recycling loop for low-loss spectral separation and ultimate stability
- Beam guides for unlimited flexibility in the choice of detection bands
- Highly sensitive QUASAR detector with lowest noise possible and digital gain control
- ICS for single molecule analysis; excellent SNR allows quantitative image modes

Patents

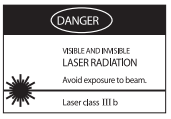
LSM 710
US Patents: 5127730, 6037583, 6167173, 6278555, 6377344, 6462345, 6486458, 6563632, 6631226, 6848825, 6941247
German Patents: 19702753C2, 19758744C2, 19758745C2, 19758748C2, 19702754C2, 19702752C2, 19827140C2, 69131176T2
EP Patent: 0977069B1

LSM 710 mit Array Detection
US Patents: 6403332, 6750036, 6858852, 6891613, 6958811, 7009699, 7271897
German Patents: 19915137C2, 10038526B4

LSM 710 NLO
US Patents: 5034613, 63446 53, 6403332, 6521899, 7119898
German Patents: 19919091C2, 69032621T3, 69034117T2

LSM 710 ConfoCor 3
US Patents: 6591223, 6693742
EP Patent: 1183525B1

LSM 7 *DUO*
US Patents: 7212337, 6037583, 6462345, 6486458, 6848825, 6888148, 6947127
EP Patent: 1617264B1



Perfection Is No Miracle

The precision and performance of our instruments derives from our aspiration for technological perfection. Our products have been the stepping-stone for many important discoveries and scientific breakthroughs.

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Information subject to change.
Printed on environmentally friendly paper
bleached without chlorine.
60-1-0001/e – printed 01.08