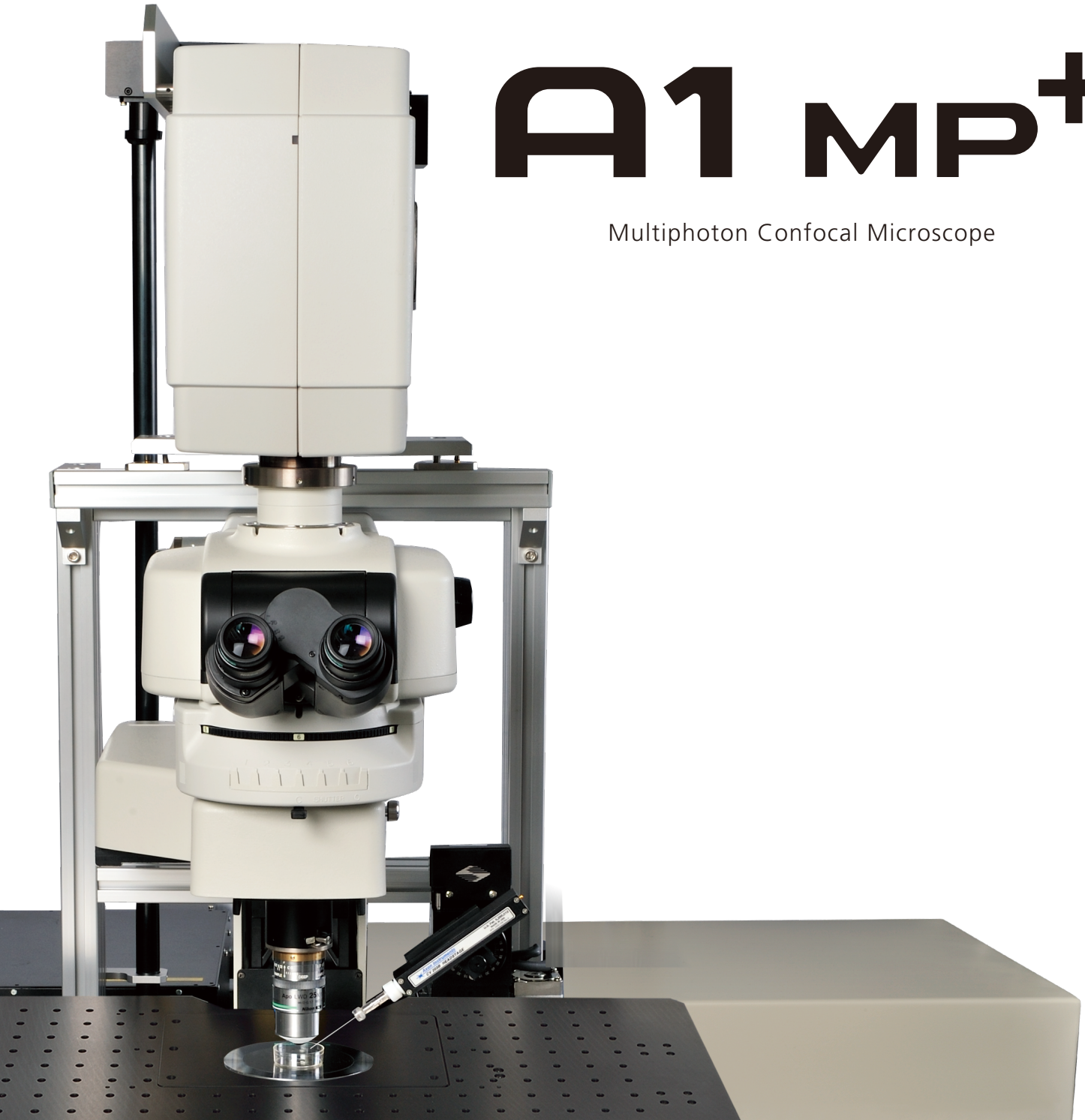
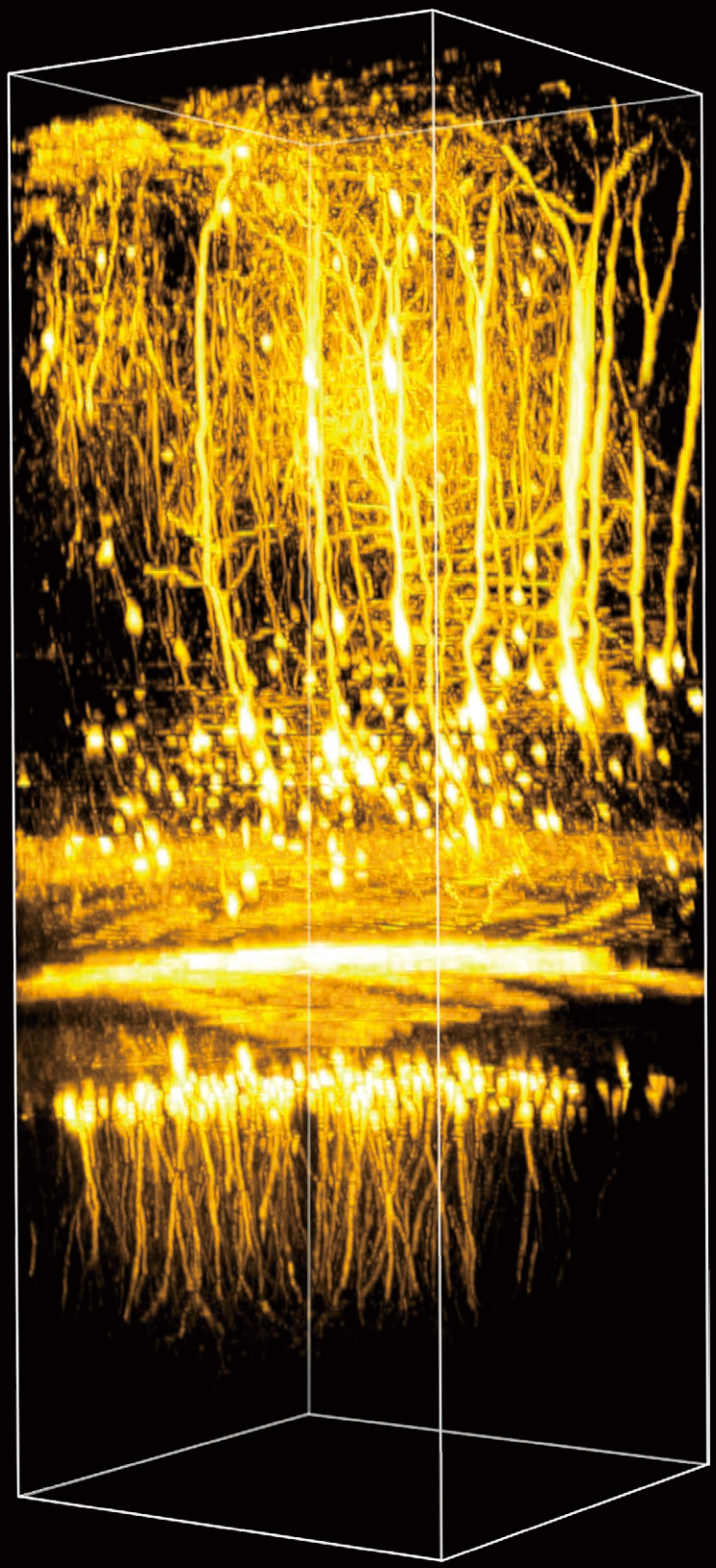
Nikon

A1 MP+

Multiphoton Confocal Microscope





Amazingly deep —

A1 MP+/A1R MP+ sharply visualizes ultra-deep dynamics within living organisms.

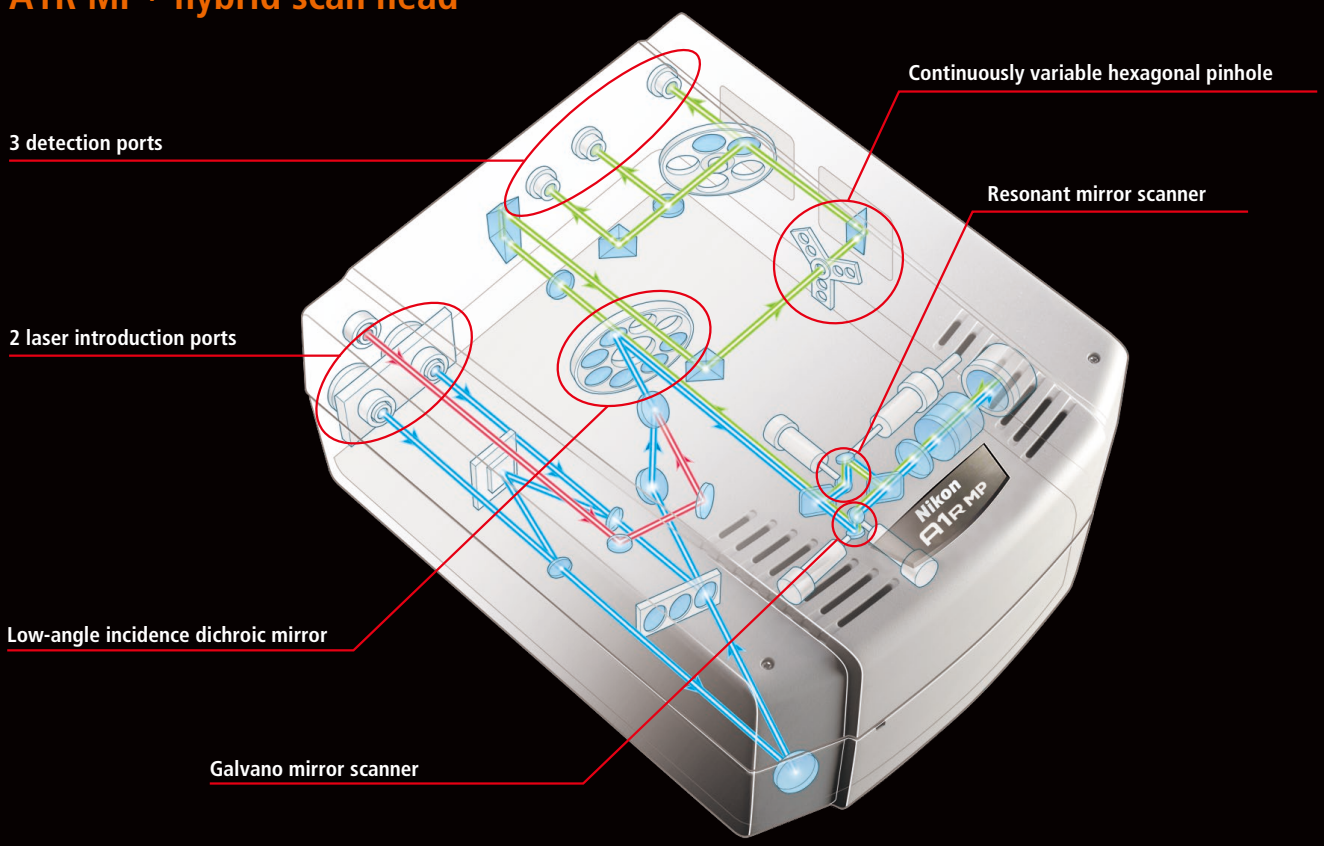
The A1 MP+ and A1R MP+ multiphoton confocal microscopes provide faster and sharper imaging from deeper within living organisms, extending the boundaries of traditional research techniques in biological sciences.

- Deep specimen imaging with ultrasensitive GaAsP NDDs located close to the back aperture of the objective lens.
- Simultaneous excitation imaging using dual beam 1300nm-compatible IR lasers
- Ultrahigh-speed imaging of up to 420 frames per second (fps) (512 x 32 pixels), with multiphoton imaging using the A1R MP+ high efficiency optical resonant scanner.
- An auto-alignment function that quickly corrects IR laser beam shifts caused by changes to the multiphoton excitation wavelength.
- A high-definition resonant scanner (1024 x 1024 pixels) with multiphoton imaging.

Selectable scan head enables high-speed, high-quality imaging

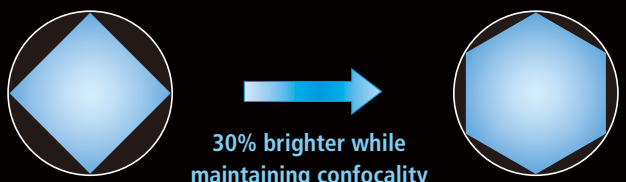
The A1R MP+ is a hybrid scan head that incorporates both a high-resolution galvano (non-resonant) scanner and an ultrahigh-speed resonant scanner. Hybrid scan heads allow imaging and photoactivation at the ultrafast speeds necessary for revealing cell dynamics and interaction. The A1 MP+ is equipped with a galvano scanner for high-resolution imaging.

A1R MP+ hybrid scan head



Continuously variable hexagonal pinhole

Square pinhole
64% of the area of a circle

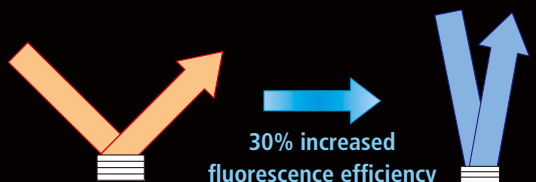


30% brighter while maintaining confocality

Hexagonal pinhole
83% of the area of a circle

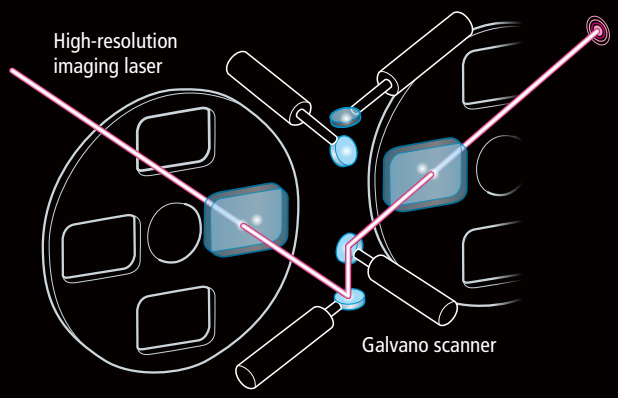
Low-angle incidence dichroic mirror

Conventional 45°
incidence angle method



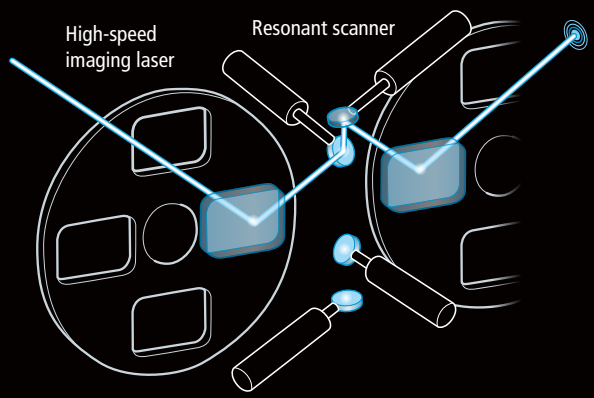
30% increased fluorescence efficiency

Low-angle
incidence method



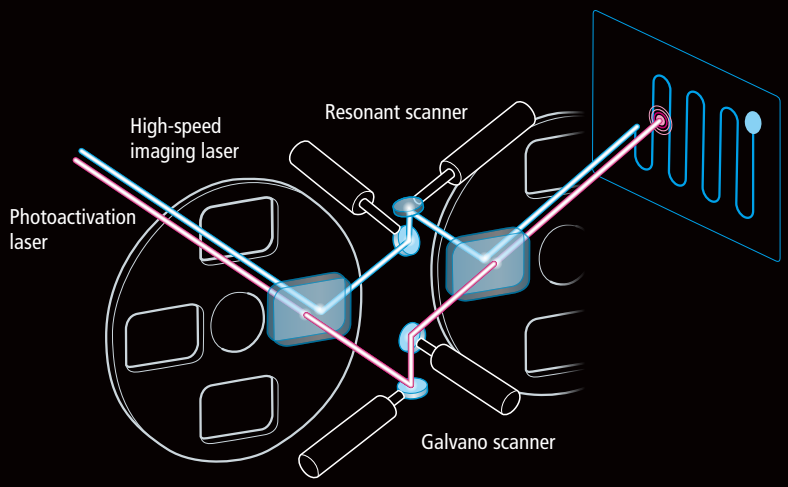
High resolution imaging with A1 MP+ and A1R MP+

Both A1 MP+ and A1R MP+ are equipped with a galvano scanner enabling high resolution imaging of up to 4096 x 4096 pixels. This scanner can capture images at up to 10 fps (512 x 512 pixels).



Ultrafast imaging with A1R MP+

The A1R MP+ scan head is equipped with a resonant scanner enabling frame rates of up to 420 fps (512 x 32 pixels), or resolutions of up to 1024 x1024 pixels (15 fps).



Hybrid scanning

Imaging and photostimulation can be carried out simultaneously by utilizing both resonant and galvano scanners in the A1R MP+.

Optional hyper selector / Dichroic mirror

- Visible stimulation/Visible imaging:
  stimulation by 405nm, imaging by 488-750 nm
- Visible stimulation/IR imaging:
  stimulation by 405 nm, 488 nm or 561 nm (selectable by NDD dichroic mirror), imaging by 800 nm-1080 nm (1080 nm configuration), 820 nm-1080 nm (1300 nm configuration)

	Galvano	Resonant
1D scanning	5,200 lps (lines per second)	15,600 lps
2D scanning	130 fps (512 x 32 pixels)	420 fps (512 x 32 pixels)
Full frame scanning	10 fps (512 x 512 pixels)	60 fps (256 x 256 pixels)、30 fps (512 x 512 pixels)、15 fps (1024 x 1024 pixels)

Ultimate high resolution 1K resonant scanner

Nikon's new resonant scanner mounted in the A1R MP+ scan head supports both high speed and high resolution imaging. The wide dynamic range and reduced noise level raises the bar for image quality in resonant scanners.

High resolution

A new resonant scanner achieves finely detailed images with a maximum resolution of 1024 x 1024 pixels (15 fps). A newly developed sampling method produces sharper images with any configuration: even at lower resolution settings. When combined with Nikon's high NA objective lenses, the A1R MP+ can achieve absolute optical precision.

Large field of view

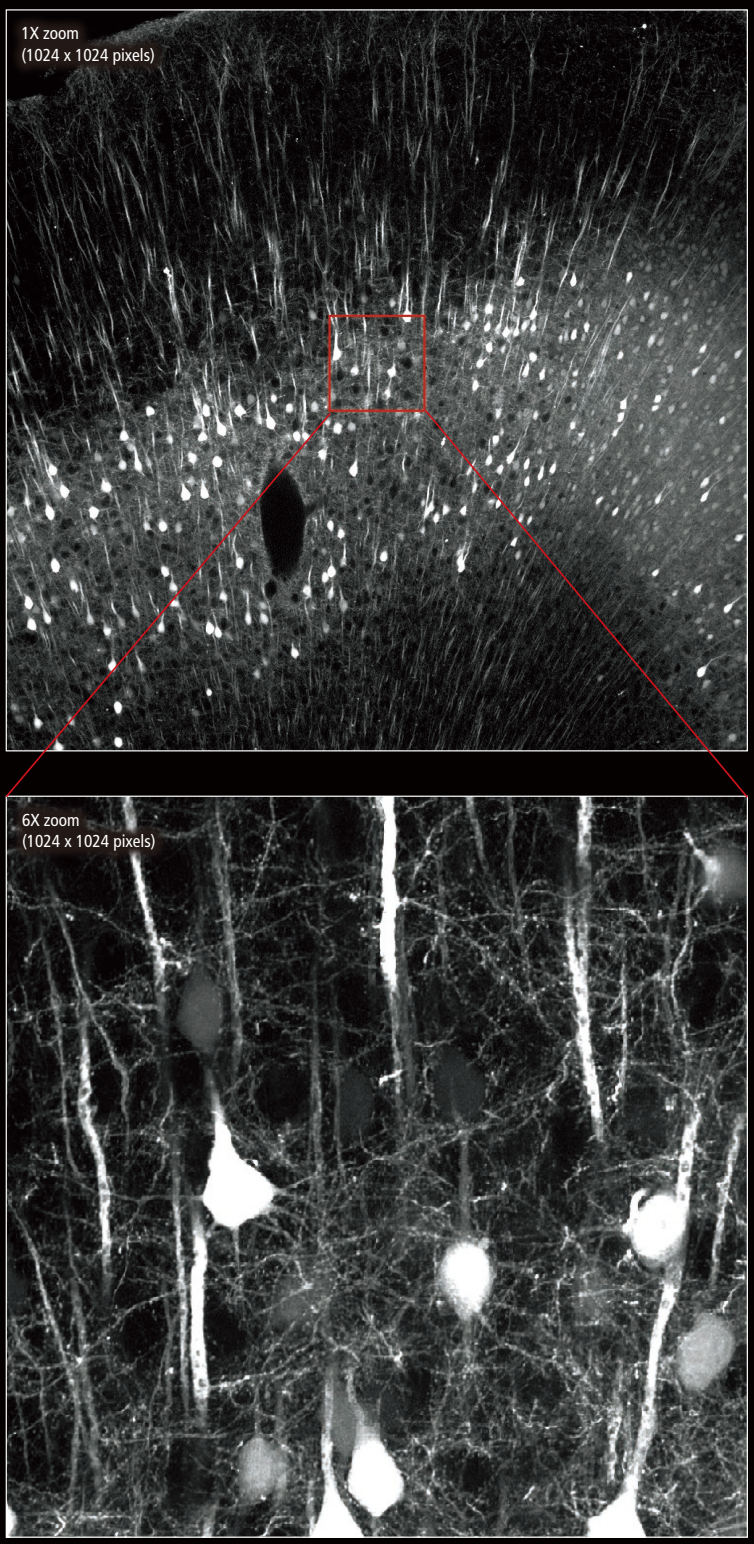
With both 1024 x 1024 pixel resolution and a large field of view (FOV18), the new resonant scanner delivers higher throughput in various imaging applications.

High speed

The fast acquisition speed of the resonant scanner is able to capture images with a very short dwell time, minimizing excitation time and light energy exposure of the samples.

Multicolor

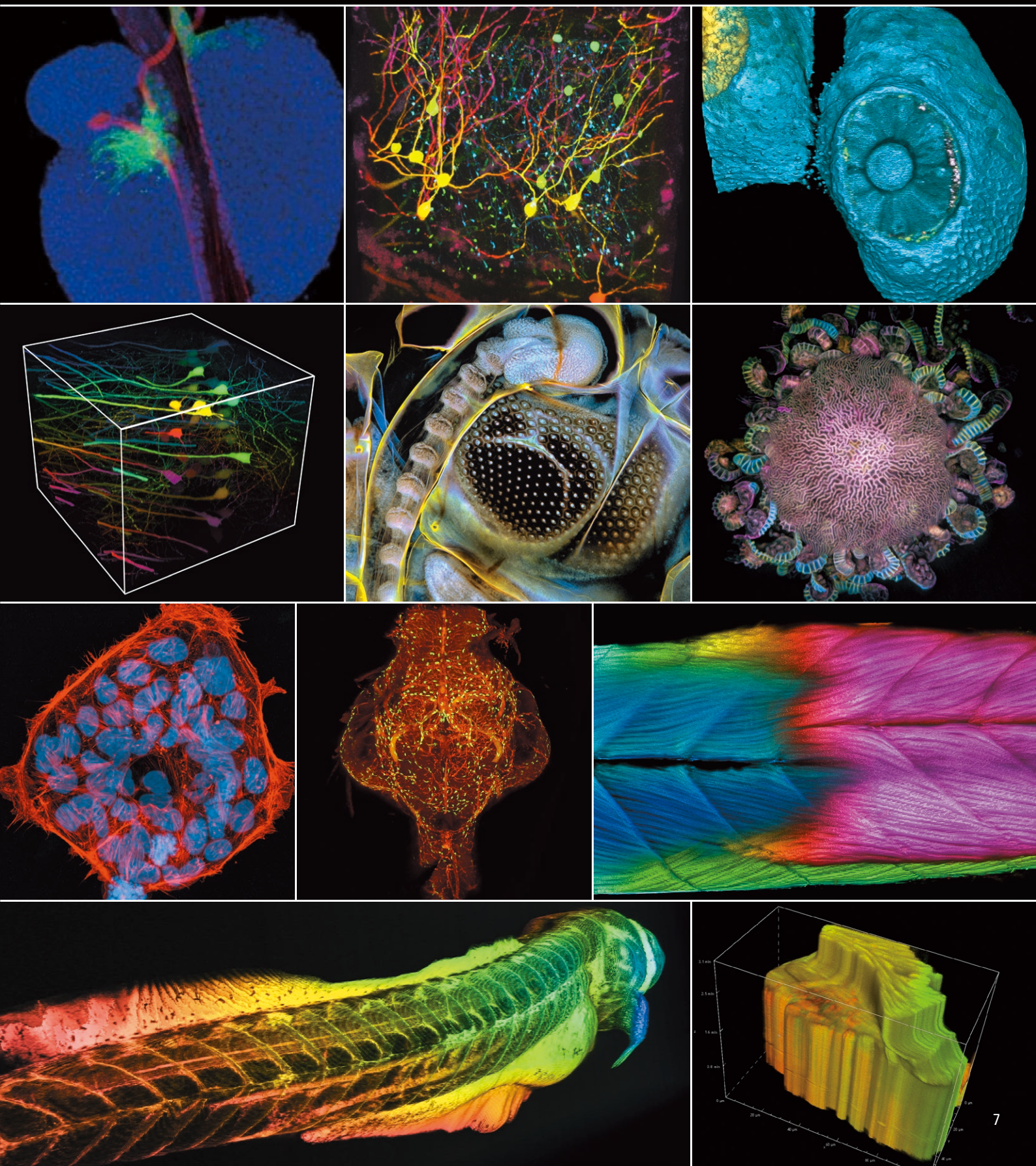
Up to 5 channel (four-channel episcopic NDD plus diascopic detector) simultaneous imaging is possible.



Comparison of a large FOV image and detailed image of fine structures in a cleared* 2 mm brain slice of H-line mouse.
Photographed with the cooperation of: Drs. Ryosuke Kawakami, Kohei Otomo, and Tomoni Nemoto, Research Institute for Electronic Science, Hokkaido University
*RapiClear1.52, SunJin Lab

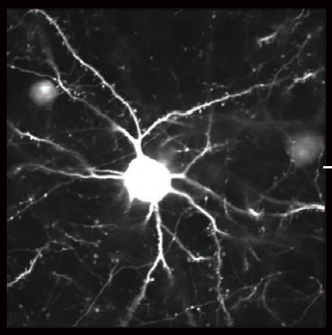
A continuum of imaging solutions

Nikon confocal microscopes are engineered with a range of new technologies, features and performance enhancements that are always kept up to date for superior results. Nikon's performance and versatility enables you to bring your imaging aspirations to life.

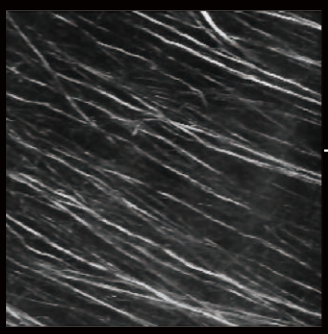


Ultra-deep imaging of living specimens

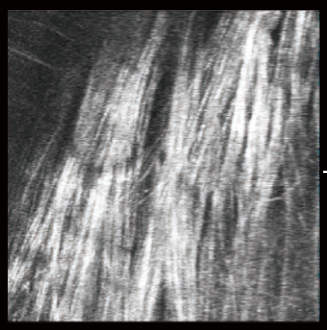
Ultrasensitive GaAsP NDDs allow clear *in vivo* imaging in deeper areas than ever before and are powerful enough to analyze fast dynamics in living specimens. With 1300nm IR laser compatibility, imaging well beyond 1mm depth is routinely possible.



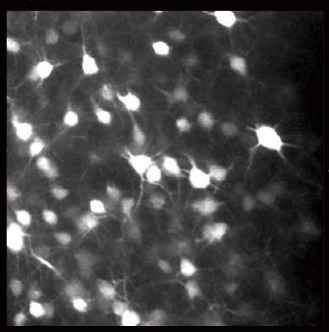
Pyramidal cells in layer V



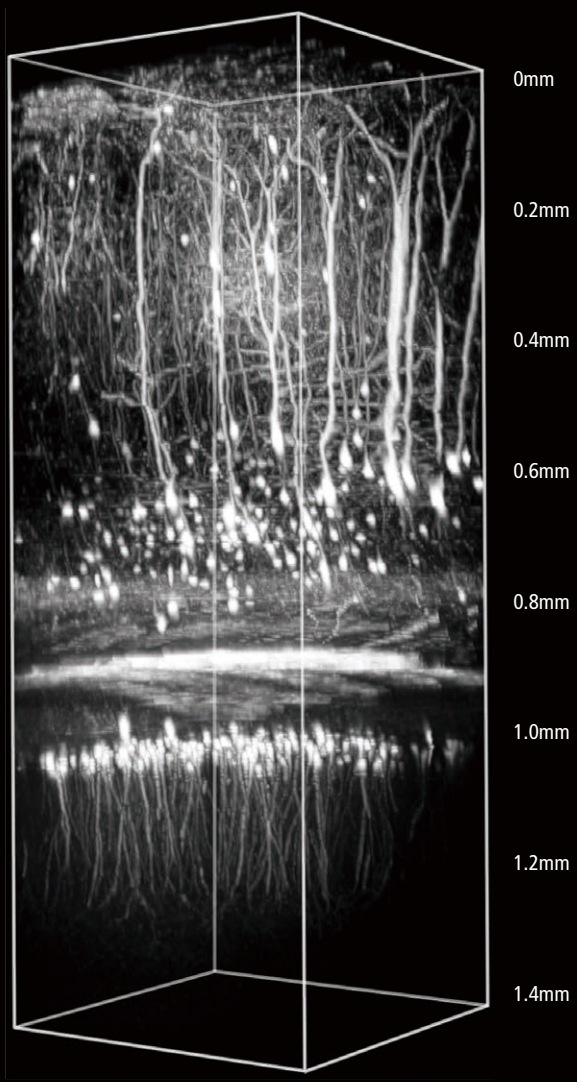
White matter

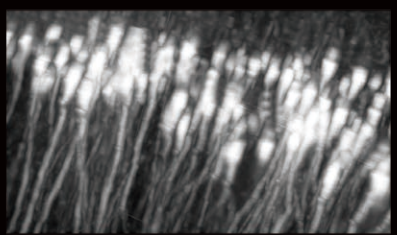


Alveus



Hippocampal pyramidal cells



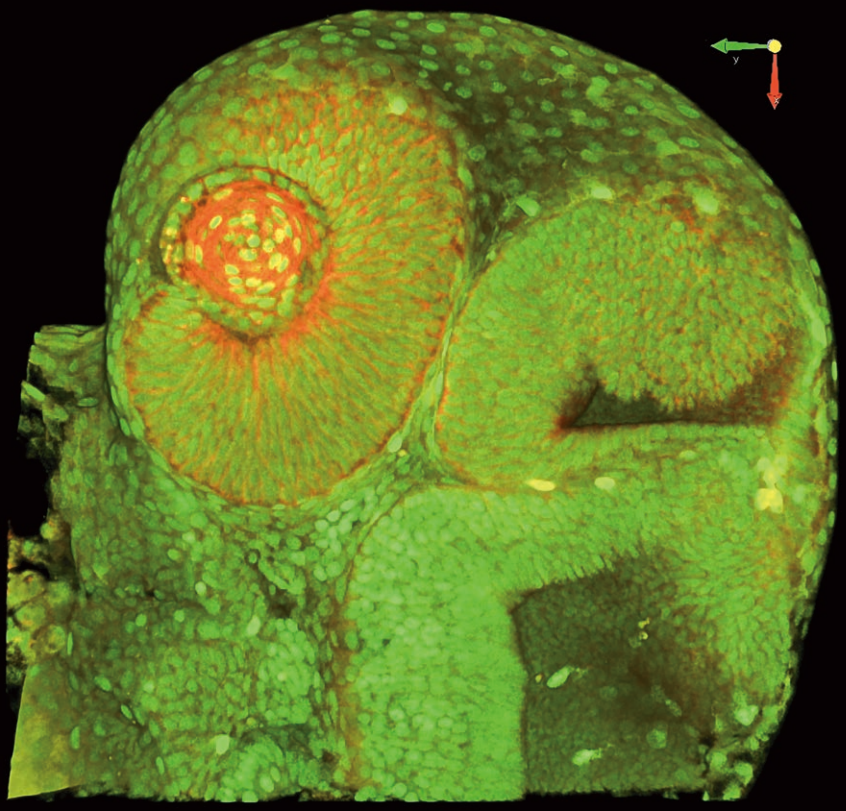


Hippocampus 3D zoom image

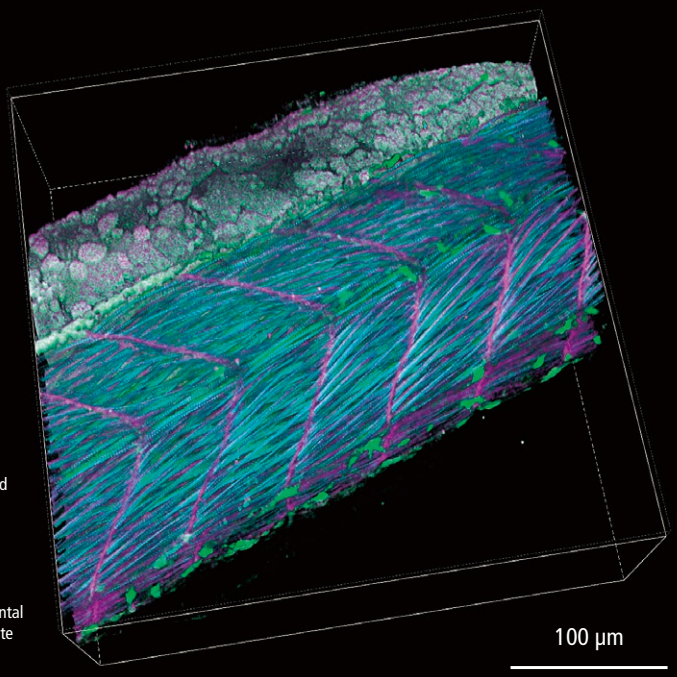
In vivo imaging of an anesthetized YFP-H mouse (4-week-old) via open skull method. Visualization of the entire layer V pyramidal neurons and the deeper hippocampal neurons. Deep imaging achieved for 3-dimensional imaging of hippocampal dendrites up to 1.4 mm into the brain.
Captured with episcopic GaAsP NDD for 1300 nm and CFI75 Apochromat 25XC W 1300 objective lens (NA 1.10, WD 2.0 mm), Excitation wavelength: 1040 nm
Photographed with the cooperation of: Drs. Ryosuke Kawakami, Terumasa Hibi and Tomomi Nemoto, Research Institute for Electronic Science, Hokkaido University

Simultaneous excitation imaging dual beam IR Lasers

The A1 MP+/A1R MP+ are available for two-wavelength simultaneous IR excitation. Combining a system with a femtosecond IR pulse laser with two wavelength simultaneous output (main tunable output of 700-1300 nm and auxiliary fixed output of 1040 nm) enables the simultaneous excitation and imaging of two different probes.



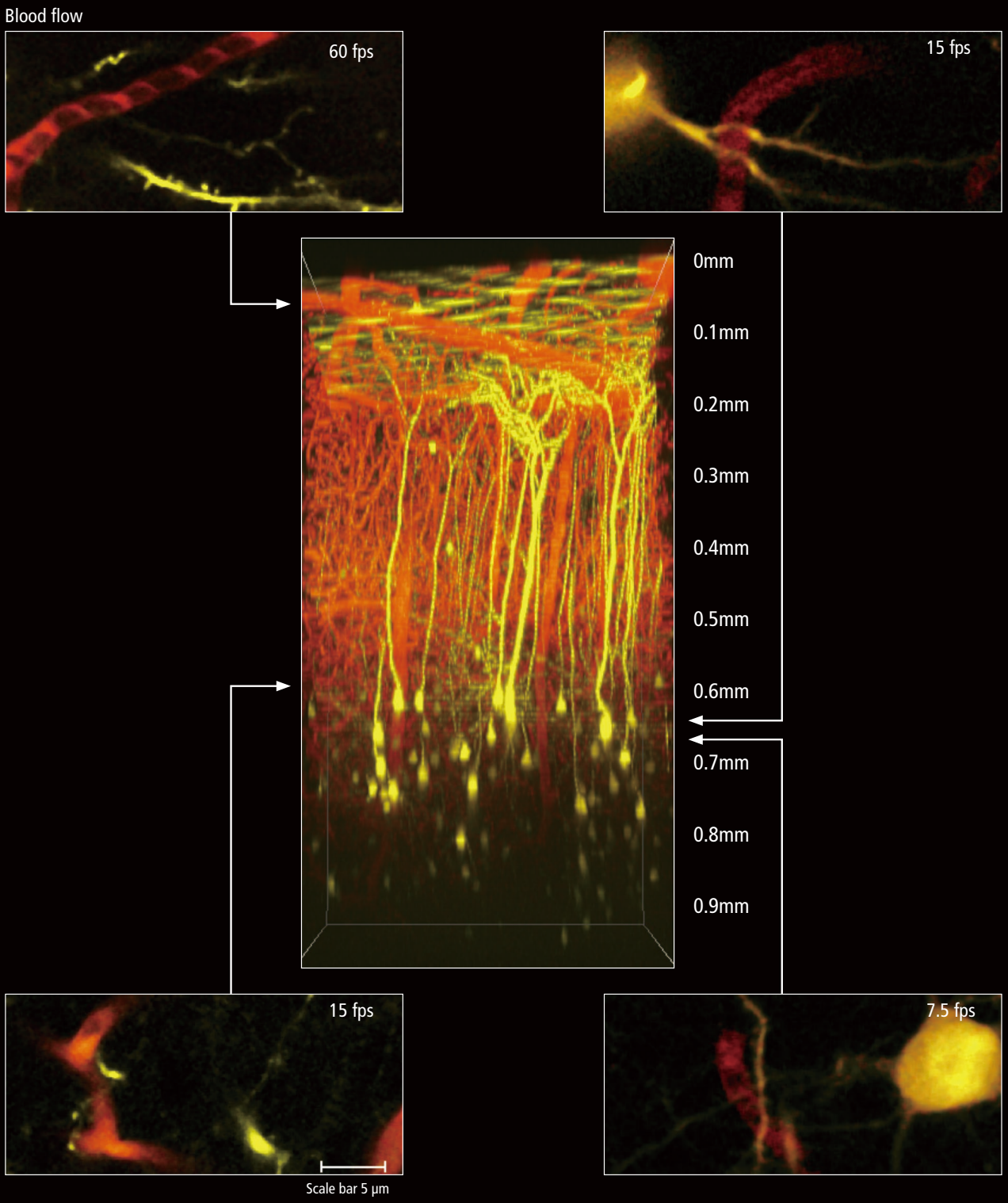
Three dimensional image of 34 hpf zebrafish transgenic line, Tg[h2afv:GFP; EF1α : mCherry-CAAX]. After breeding under Phenyltiourea (PTU) treatment, which inhibits melanin synthesis, the whole body was clarified with LUCID-A optical clearing solution. This transgenic line visualizes the cell membrane and chromatin with mCherry (red) and GFP (green), respectively.
Excitation wavelength: 900 nm and 1040 nm, Objective: CFI75 Apochromat 25XC W 1300 (NA 1.10, WD 2.0)
Photos courtesy of: Drs. Toshiaki Mochizuki and Ichiro Masai, Developmental Neurobiology Unit, Okinawa Institute of Science and Technology Graduate University



Lateral view of trunk of zebrafish transgenic line Tg[h2afv:GFP; EF1α : mCherry-CAAX] at 34 hpf. After breeding under Phenyltiourea (PTU) treatment, which inhibits melanin synthesis, the whole body was clarified with LUCID-A optical clearing solution. This transgenic line visualizes cell membrane and chromatin with mCherry (purple) and GFP (green), respectively. SHG (blue) indicates muscle fibers.
Excitation wavelength: 900 nm for SHG, GFP and 1040 nm for mCherry, Objective: CFI75 Apochromat 25XC W 1300 (NA 1.10, WD 2.0)
Photos courtesy of: Drs. Toshiaki Mochizuki and Ichiro Masai, Developmental Neurobiology Unit, Okinawa Institute of Science and Technology Graduate University

In vivo high speed imaging

Resonant scanning enables imaging of full fields of view at much higher speeds than galvano scanners. Nikon's optical pixel clock generation system, which monitors the position of the resonant mirror in real time, adjusts the pixel clock to ensure more stable, geometrically correct and evenly illuminated imaging, even at high speeds. This enables the successful visualization of rapid *in vivo* changes, such as reactions in living organisms, dynamics and cell interactions.

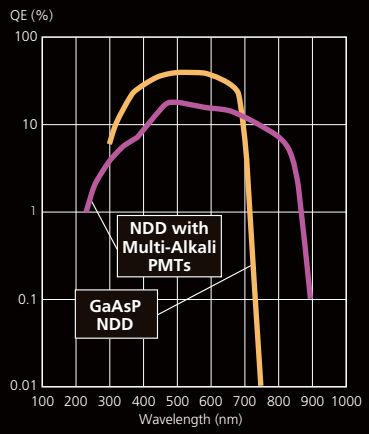


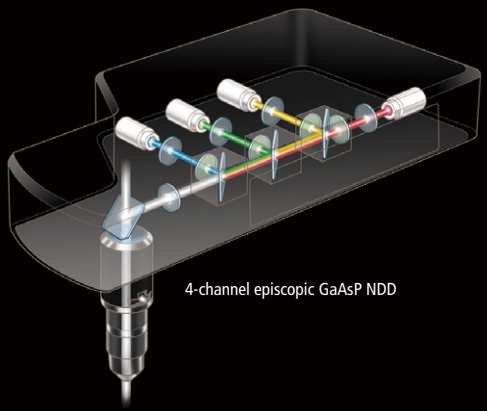
The cerebral cortex of an anesthetized YFP-H mouse (4-week-old) was studied with the open skull method. SRB (Sulforhodamine B) was injected into the tail vein. Using resonant scanning with episcopic GaAsP NDD, blood flow could be imaged at various deep Z positions.
Yellow: EYFP pyramidal cells in layer V of the cortex, Red: SRB-labeled blood vessels
Photographed with the cooperation of: Drs. Ryosuke Kawakami, Terumasa Hibi and Tomomi Nemoto, Research Institute for Electronic Science, Hokkaido University

Deep *in vivo* imaging with super high-sensitivity GaAsP NDDs

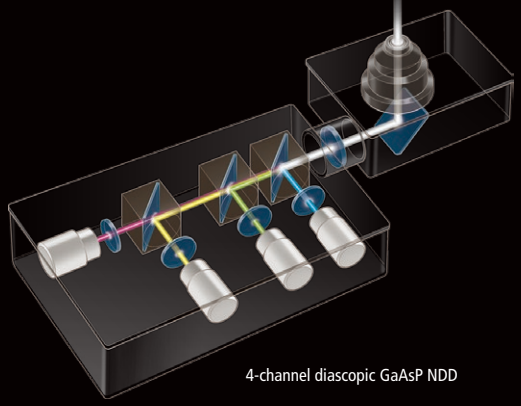
To counter the issue of light scattering in deep imaging of living specimens, and to achieve bright and clear images, the MP system:

- **The A1 MP+/A1R MP+ places the NDD (non-descanned detector) as close as possible to the specimen to obtain the maximum amount of scattered emission signals.**
- **The GaAsP NDD enables clear imaging of deeper areas of living specimens with less laser power, resulting in less photodamage to living specimens.**
- **A combination of episcopic and diascopic GaAsP NDDs together with the Ni-E/FN1 upright microscope allow acquisition of both reflected and transmitted emission signals, or second harmonic generated signals and fluorescence emission signals.**





4-channel episcopic GaAsP NDD

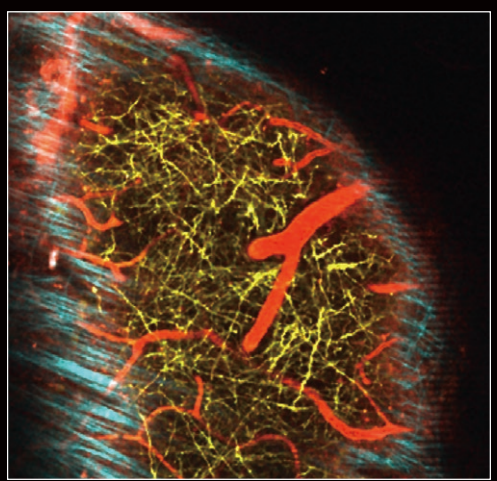


4-channel diascopic GaAsP NDD

Channel Unmixing

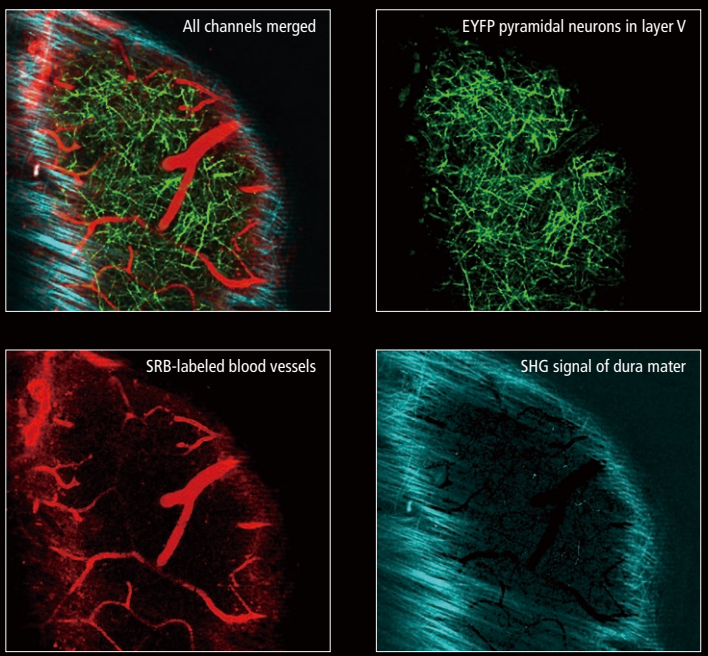
Utilizing 4-channel detectors, one IR excitation wavelength can be used to simultaneously excite multiple probes, and Nikon's spectral unmixing algorithms can separate overlapping signals.

Acquired image



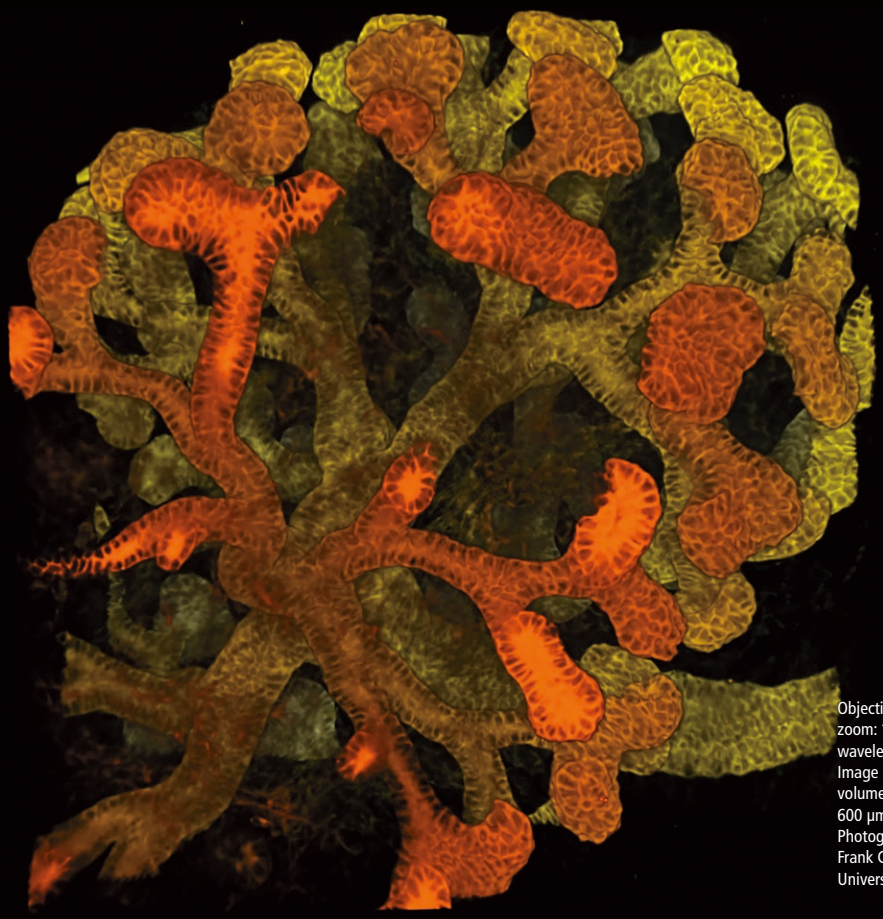
Simultaneous imaging of three colors in anesthetized YFP-H mouse with IR excitation of 950 nm.
Photographed with the cooperation of: Drs. Ryosuke Kawakami, Terumasa Hibi and Tomomi Nemoto, Research Institute for Electronic Science, Hokkaido University

Unmixed images

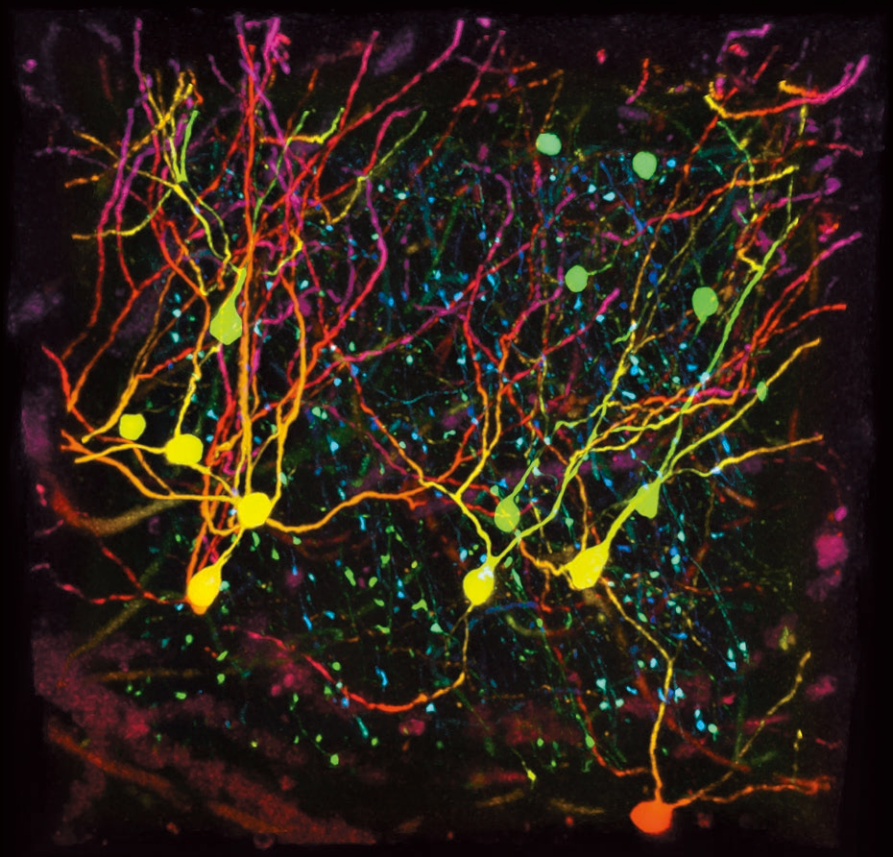


Highest Performance Optics for Multiphoton Confocal Imaging

A selection of high numerical aperture (NA) objectives are available, all of which provide chromatic aberration correction up to the near-infrared range, and allow enable multiphoton imaging with highly efficient excitation.



Objective: CFI Apochromat 25XC W; Scan zoom: 1x; Z step size: 1 µm; IR excitation wavelength: 930 nm
Image resolution: 1024x1024 pixels; Image volume: 460 µm (length) x 460 µm (width) x 600 µm (height)
Photographed with the cooperation of Drs. Frank Costantini and Liza Pon, Columbia University Medical Center, New York



CFI90 20XC Glyc

This objective includes a correction collar that accommodates refractive indices ranging from 1.44 to 1.50 and is compatible with a variety of immersion media and tissue-clearing agents. With its high NA, large field-of-view, and ultra-long working distance, this objective enables observation of large samples and whole organs with exceptional clarity and throughput. It also provides superior chromatic aberration correction and transmittance in the NIR wavelength range for multiphoton applications.

- Working distance: 8.2 mm
- Numerical aperture: 1.00
- Chromatic aberration correction: from 588nm to 1300nm
- Nano Crystal Coat applied.

CFI Plan Apochromat 10XC Glyc

Correction for refractive indices from 1.33 to 1.51 enables deep 3D-imaging of tissues cleared with a variety of optical clearing agents.

- Working distance: 5.50 mm
- Chromatic aberration correction: from UV through to near IR
- Nano Crystal Coat applied.

CFI75 Apochromat 25XC W 1300

This lens is perfect for deep multiphoton imaging, achieving both a high NA and long working distance, and correcting spherical aberrations caused by sample thickness. Its chromatic aberration correction in the IR range is effective in simultaneous two-wavelength excitation imaging.

- Working distance: 2.0 mm
- Numerical aperture: 1.10
- Chromatic aberration correction: from visible to 1300nm
- Nano Crystal Coat applied.

CFI Apochromat Lambda S 40XC WI

Its high NA for water immersion objectives provides brighter and higher-resolution images and makes this lens ideal for confocal live cell imaging.

- Numerical aperture: 1.25
- Chromatic aberration correction: from UV through to near IR
- Nano Crystal Coat applied.

CFI Plan Apochromat VC 60XC WI

This lens' chromatic aberration correction up to the UV range enables accurate multicolor confocal imaging

- Chromatic aberration correction: the full visible wavelength range over 405 nm
- Superior image flatness

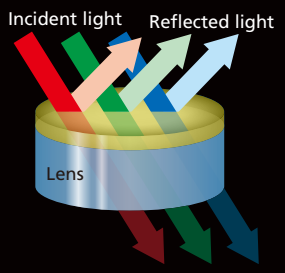
CFI Apochromat TIRF 60XC Oil

The highest NA in the industry provides unparalleled resolution and efficient acquisition of fluorescent signals in confocal imaging.

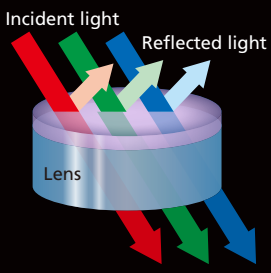
- Numerical aperture: 1.49
- Chromatic aberration correction: from UV through to near IR

Nano Crystal Coat for superior transmission

Nikon's exclusive Nano Crystal Coat is an anti-reflective coating consisting of ultra-fine crystalline particles. This forms a coarse structure that enables lower refractive indices, facilitating the passage of light through the lens rather than reflecting it, thus providing superior light transmission.



Conventional coating



Nano Crystal Coat

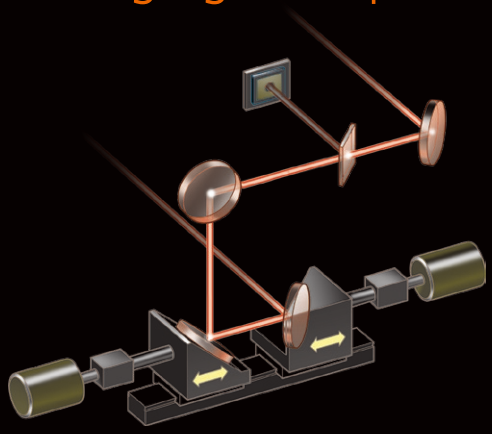
Objectives

CFI90 20XC Glyc*	NA 1.00	WD 8.20	N
CFI Plan Apochromat 10XC Glyc	NA 0.50	WD 5.50 (upright), 2.00 (inverted)	N
CFI75 Apochromat 25XC W 1300*	NA 1.10	WD 2.00	N
CFI75 Apochromat 25XC W*	NA 1.10	WD 2.00	N
CFI75 LWD 16X W*	NA 0.80	WD 3.00	
CFI Apochromat NIR 40X W	NA 0.80	WD 3.50	
CFI Apochromat LWD Lambda S 40XC WI	NA 1.15	WD 0.61-0.59	N
CFI Apochromat LWD Lambda S 20XC WI	NA 0.95	WD 0.99-0.90	N
CFI Apochromat Lambda S 40XC WI	NA 1.25	WD 0.20-0.16	N
CFI Plan Fluor 20XC MI	NA 0.75	WD 0.51-0.35 (Oil), 0.51-0.34 (Glycerin), 0.49-0.33 (Water)	
CFI Plan Apochromat IR 60XC WI	NA 1.27	WD 0.18-0.16	N
CFI Plan Apochromat VC 60XC WI	NA 1.20	WD 0.31-0.28	
CFI Apochromat TIRF 60XC Oil	NA 1.49	WD 0.16-0.10 (23˚C), WD 0.13-0.07 (37˚C)	

* Compatible with Ni-E/FN1 microscopes with a dedicated nosepiece

Automatic IR laser alignment when changing multiphoton excitation wavelengths

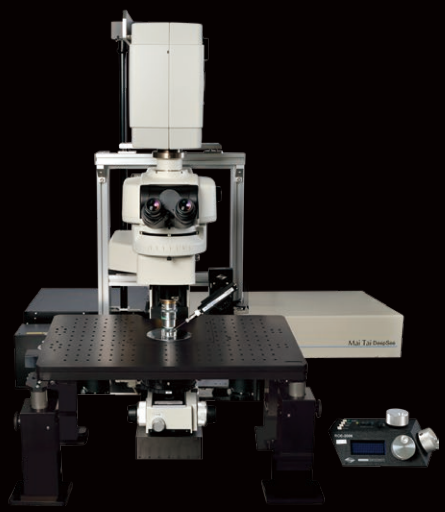
When the IR laser wavelength or pre-compensation is changed, the position of the multiphoton laser beam pointing at the objective back aperture may also change, resulting in uneven intensity across the image.
Nikon's auto laser alignment function automatically optimizes IR laser alignment with a single click in NIS-Elements C.



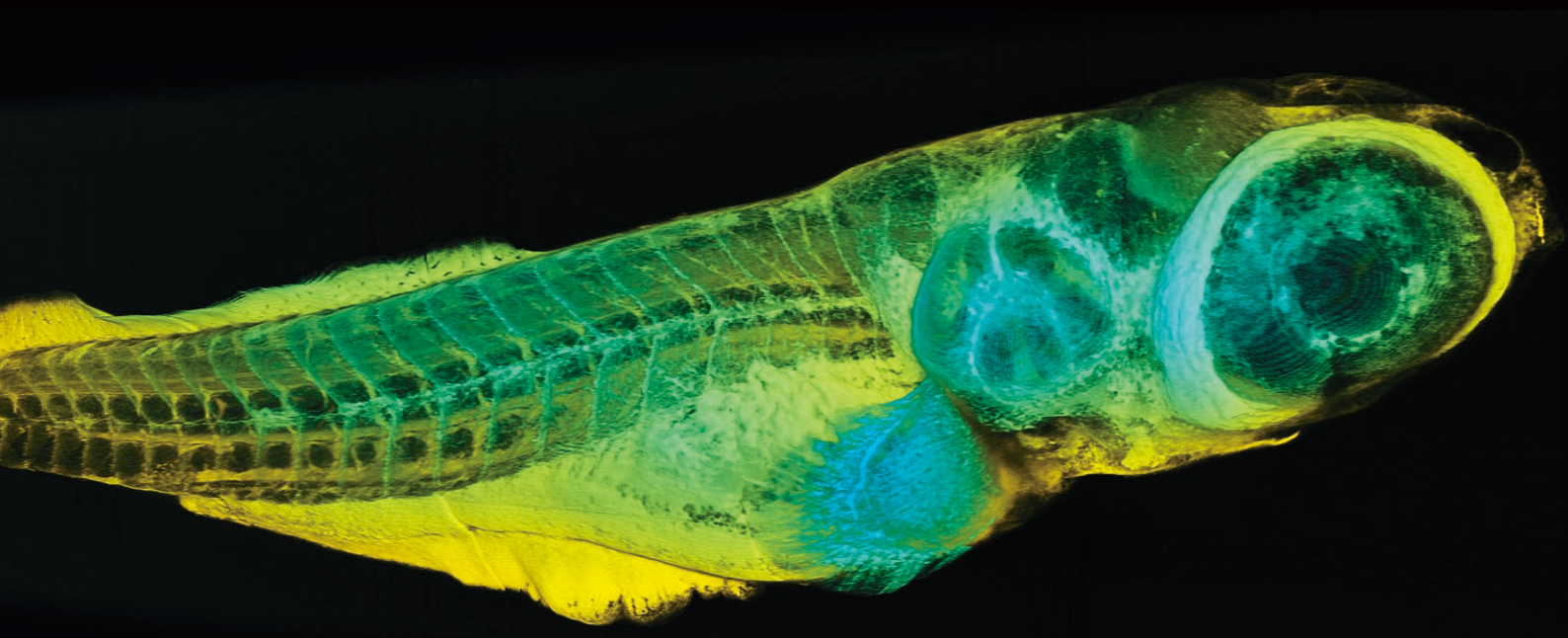
Combine with Inverted or Upright Microscopes

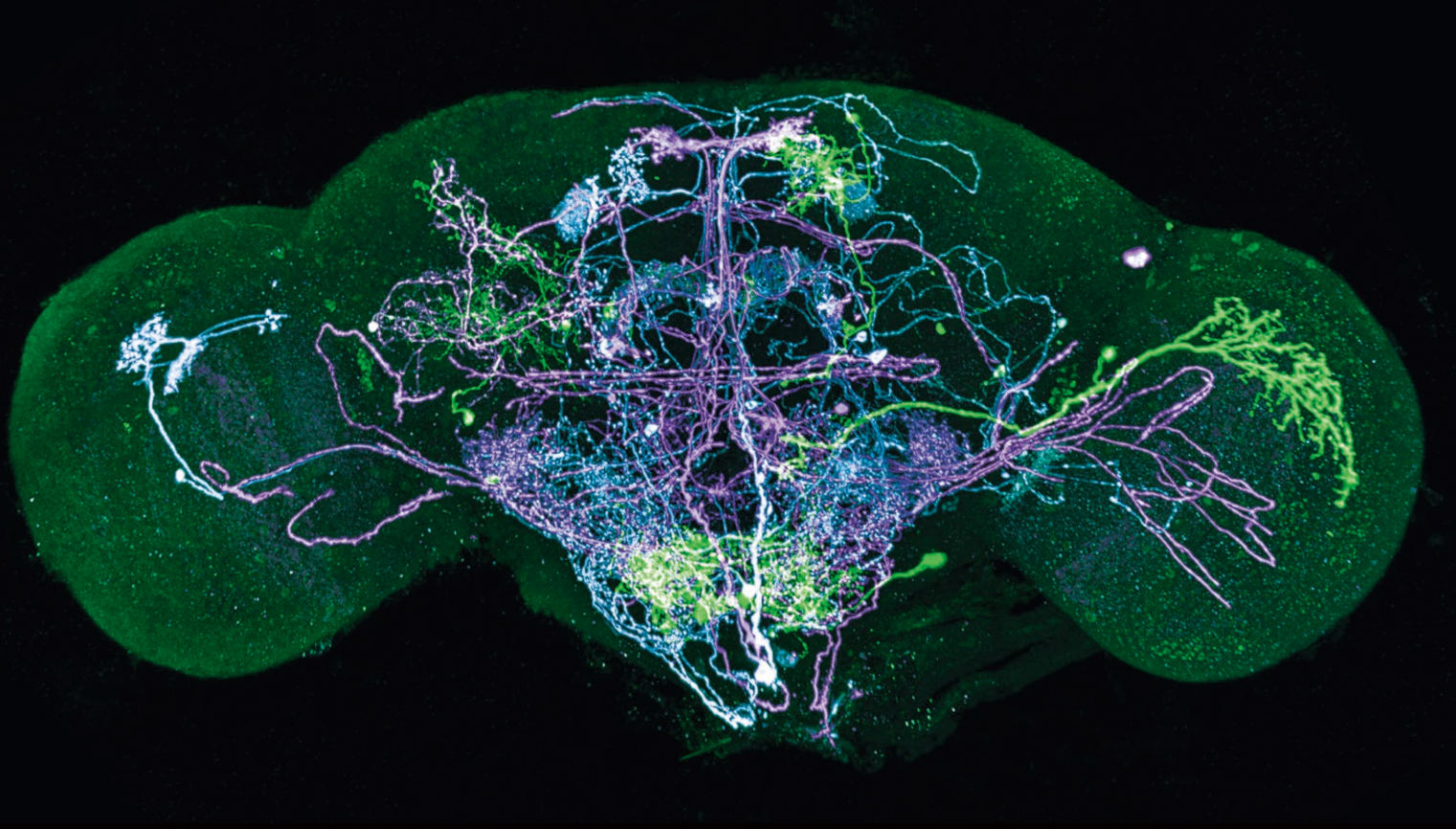
The A1 MP+/A1R MP+ is compatible with both Ti2-E inverted and Ni-E/FN1 upright microscope stands.

Configuration with Ti2-E



Configuration with FN1





Continuous Wave Visible Lasers

The A1 MP+/A1R MP+ system can also utilize visible lasers for conventional confocal imaging applications while still taking advantage of high speed resonant scanning, simultaneous stimulation and imaging capability, and multi-dimensional acquisition.

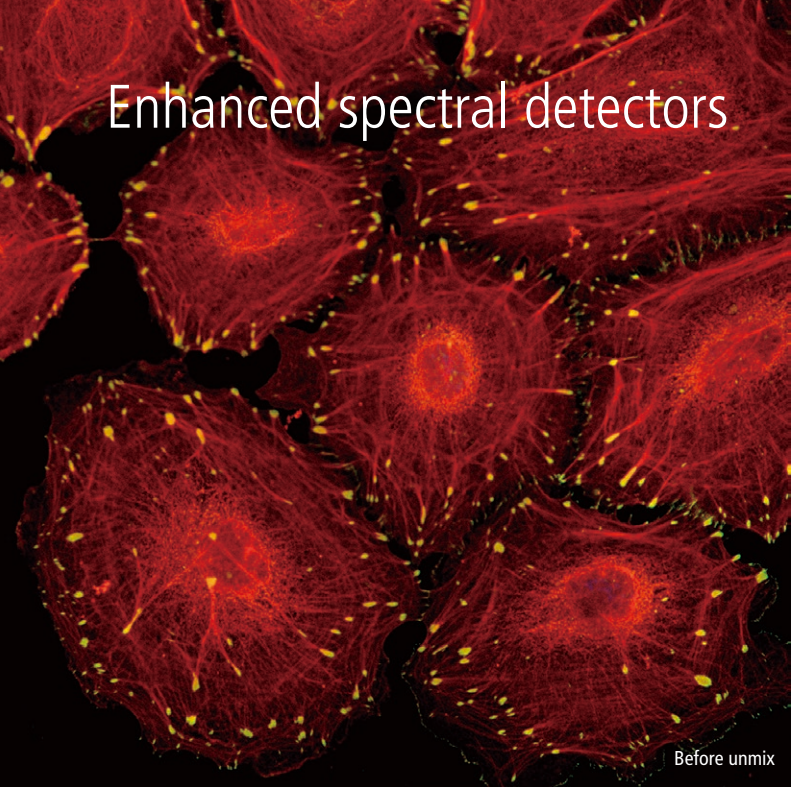
LU-NV series

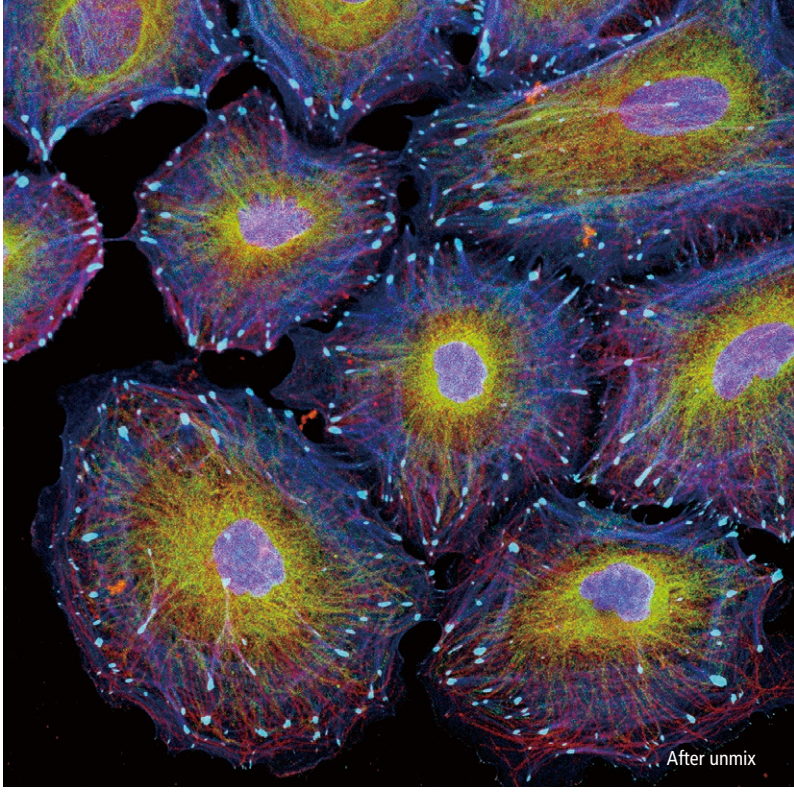
- Supports up to eight wavelengths and switching of seven fiber outputs.
- Lasers available for this series are: 405 nm, 445 nm, 458 nm, 488 nm, 514 nm, 532 nm, 561 nm, 594 nm, 640 nm and 647 nm.
- High-power lasers for the N-SIM/N-STORM super resolution microscope are available.

LU-N4/N4S 4-laser unit/LU-N3 3-laser unit

The LU-N4/LU-N4S is equipped with four lasers (405 nm, 488 nm, 561 nm, and 640 nm), while the LU-N3 has three lasers (405 nm, 488 nm, and 561 nm). The LU-N4S is compatible with spectral imaging.

Enhanced spectral detectors



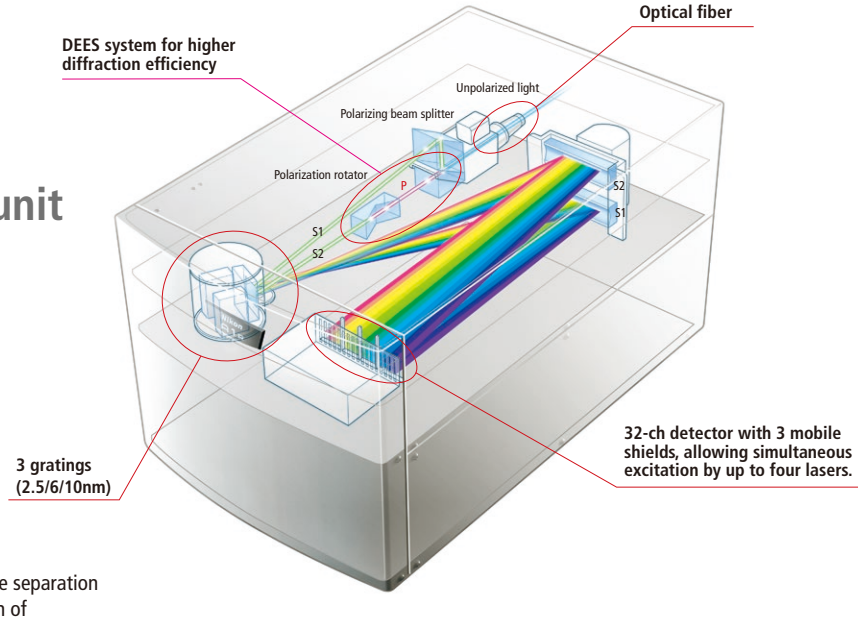


Spectral and unmixed images of five-color-fluorescence-labeled HeLa cells
Specimen courtesy of: Dr. Tadashi Karashima, Department of Dermatology, Kurume University School of Medicine

A1-DUS spectral detector unit

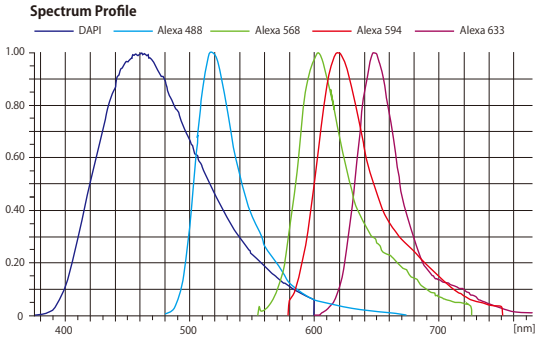
Fast 32-channel imaging at 24 fps

Spectral imaging over a 320 nm wavelength range is possible with a single scan. Acquisition of 512 x 512 pixels in 0.6 second and 512 x 32 pixels at 24 fps can be achieved.



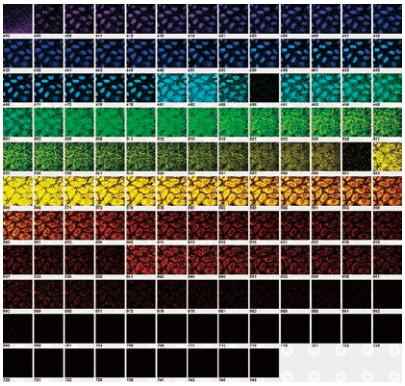
Accurate spectral unmixing

High wavelength resolution of at least 2.5 nm enables accurate separation of closely overlapping fluorescence spectra and the elimination of autofluorescence. In addition, probes with adjacent spectra such as GFP and YFP can be unmixed in real time during image acquisition. This is convenient for FRET analysis.



Wide band spectral imaging

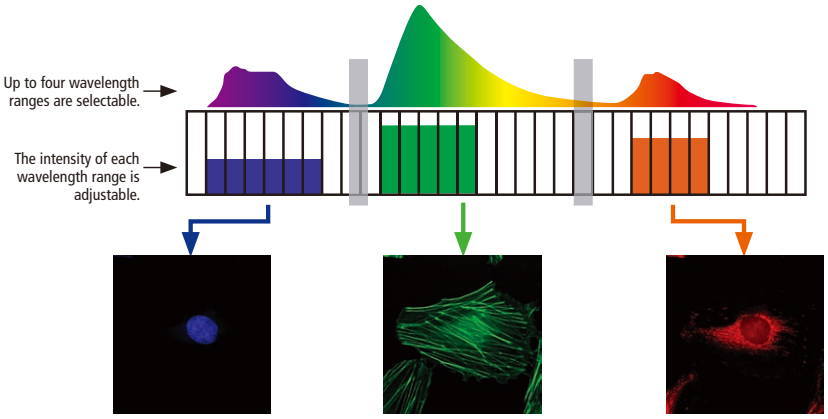
Simultaneous excitation with four lasers, selected from a maximum of eight lasers of different wavelengths, is possible.



The λ scanning function of ND acquisition software allows image capturing of a wide wavelength range of up to 350 nm (140 channels) with a high wavelength resolution of 2.5 nm.

Filter-less intensity adjustment is possible with V-filtering function

Up to four desired spectral ranges can be selected from 32 channels and combined to perform a filtering function that matches the spectrum of the fluorescence probe being used. By specifying the most appropriate wavelength range, image acquisition is possible at the optimal intensity of each probe in FRET and co-localization. The sensitivity of each range can be individually adjusted.



A1-DUVB-2 GaAsP detector unit

High-sensitivity spectral image acquisition

With a GaAsP PMT, the A1-DUVB-2 tunable emission detector delivers flexible detection of fluorescent signals with higher sensitivity.

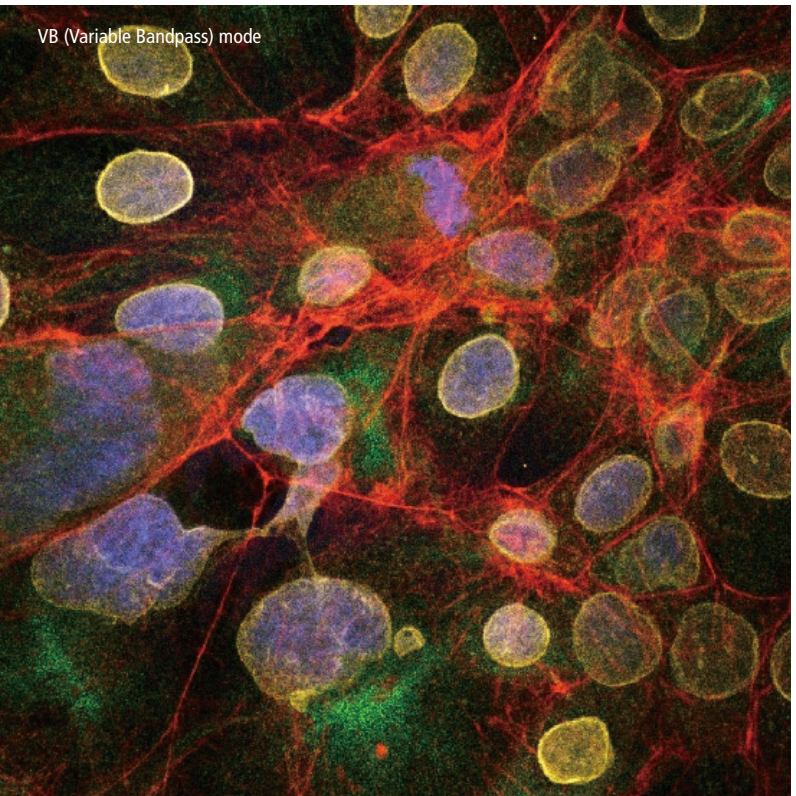
Variable acquisition wavelength range

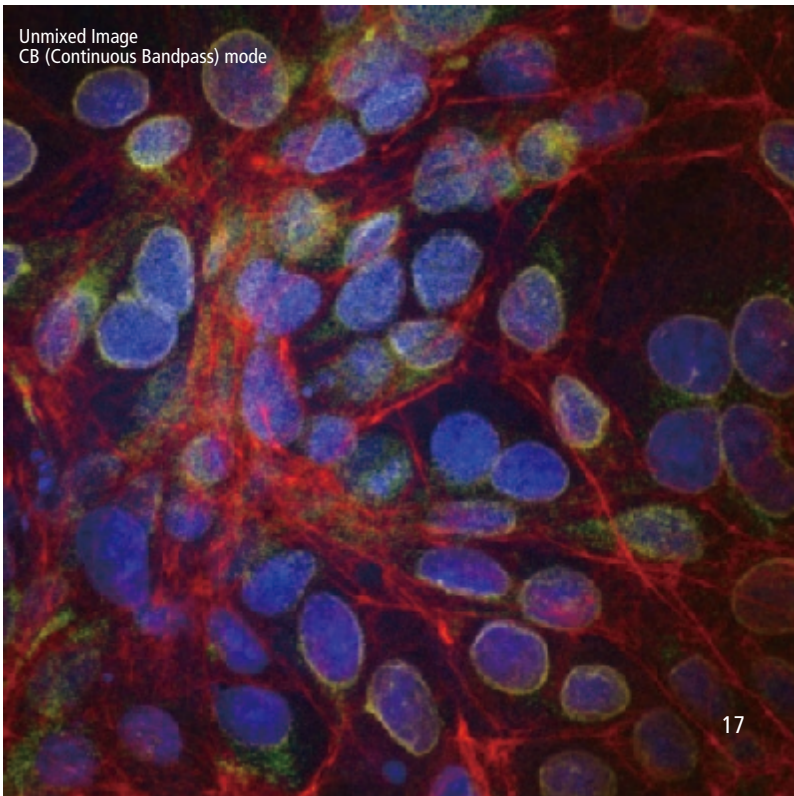
The A1-DUVB-2 is a compact fully tunable emission detector unit capable of spectral imaging with user-defined emission bandwidths of as little as 10nm, in both galvano and resonant imaging modalities, eliminating the need for fixed bandwidth emission filters. Spectral images of multi-labeled specimens can be acquired by capturing a series of spectral images while changing detection wavelengths.

Optional second channel detector

An optional second GaAsP PMT allows simultaneous two-channel imaging such as FRET and ratio imaging. Users can divert selected wavelengths to the second fixed bandwidth emission channel by inserting a dichroic mirror, while simultaneously utilizing the user-definable emission band on the first channel.

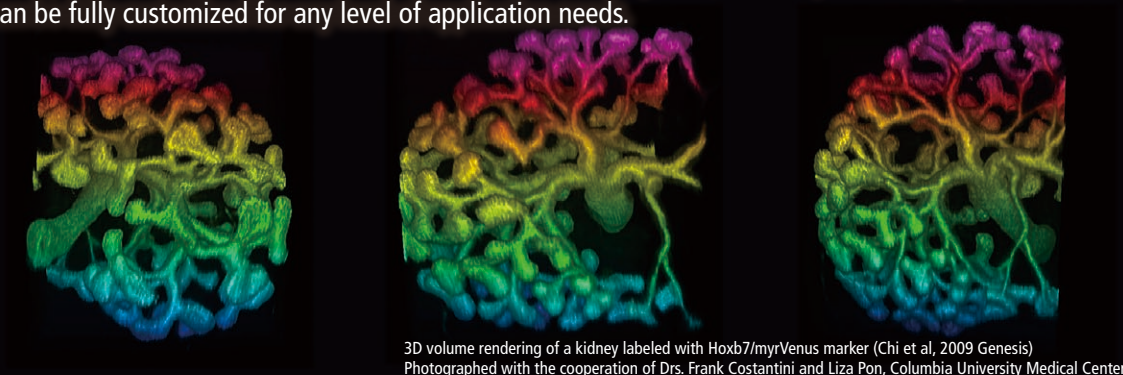
HeLa cells labeled with five-color fluorescence, Nucleus: DAPI, Vimentin: Alexa Fluor® 488, Lamin: Alexa Fluor® 568, Tubulin: Alexa Fluor® 594, Actin: Alexa Fluor® 633
Specimen courtesy of: Dr. Tadashi Karashima, Department of Dermatology, Kurume University School of Medicine





A unified acquisition and analysis software platform

NIS-Elements C, Nikon's unified software platform, provides intuitive workflow for confocal imaging. Combined with the graphical programming tools such as JOBS and illumination sequence, the comprehensive operational environment can be fully customized for any level of application needs.



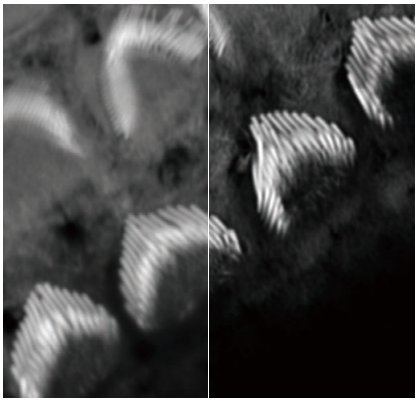
3D volume rendering of a kidney labeled with Hoxb7/myrVenus marker (Chi et al, 2009 Genesis)
Photographed with the cooperation of Drs. Frank Costantini and Liza Pon, Columbia University Medical Center, New York

NIS-Elements C

Detailed operability based on analysis of confocal microscope operation patterns provides an intuitive interface and operation. Complicated experiment sequences such as photoactivation can be carried out with easy-to-use settings.

NIS-Elements C-ER

Higher resolution images can be generated with a single click. The software assesses the captured image and automatically determines processing parameters to achieve increased resolution. The unique image processing technology increases image resolution beyond that of a conventional confocal image (resolution can be improved 1.5 times (XY), 1.7 times (Z)).



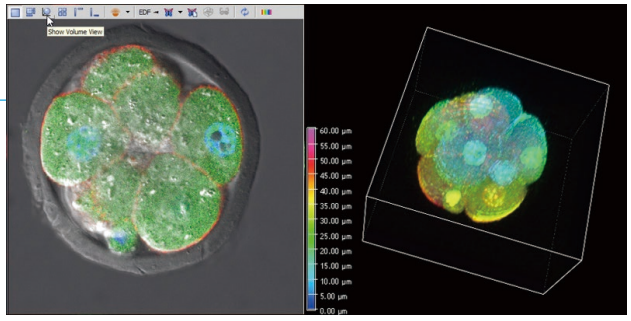
Left: without C-ER, right: with C-ER

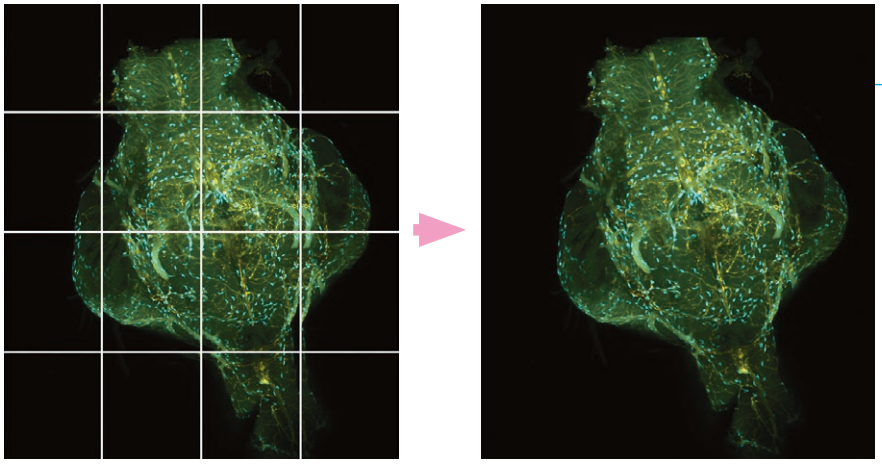
Apical surfaces of auditory epithelia of mouse cochleae were stained by Atto-565-phalloidin at postnatal day 2.
Photographed with the cooperation of: Dr. Hideru Togashi, Division of Molecular and Cellular Biology, Department of Biochemistry and Molecular Biology, Kobe University Graduate School of Medicine.

Device Control

Multidimensional Imaging

Optical configuration settings can be combined in the ND acquisition GUI to create experiments combining multichannel, multi-stage position, z-stacking, and timelapse imaging. Photostimulation and photobleaching can also be flexibly combined.





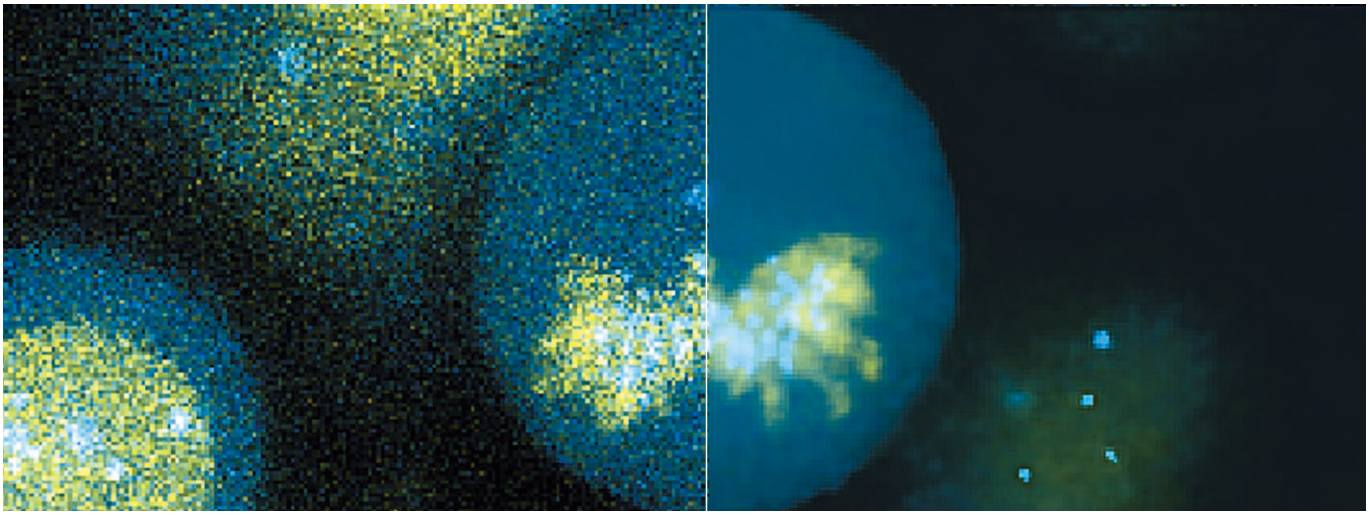
Large image (image stitching)

Images of adjacent fields that are continuously captured with the motorized stage are automatically stitched to produce a whole high-resolution image of the tissue.

Display & Processing

Denoising

Efficient tools for removing noise or graininess from images, improving image quality in low light imaging. This greatly improves the output quality of the image for analysis and presentation.

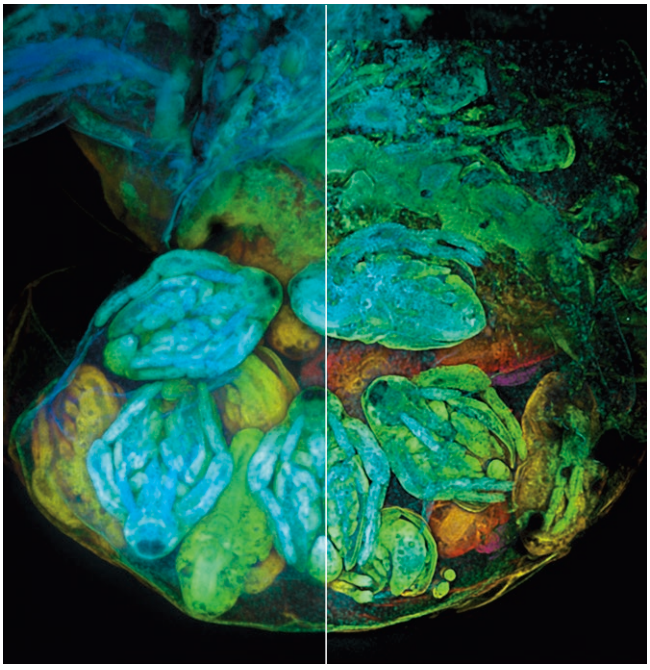


Before denoising

After denoising

Deconvolution

Automatic/manual, robust algorithms are provided to actualize theoretical resolutions. Both 3D and 2D deconvolution are available.



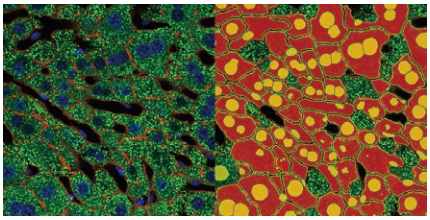
Before deconvolution

After deconvolution

Image analysis

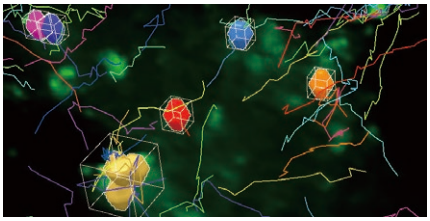
Automatic measurement

Segmentation tools, morphology functions, classifiers, and an extensive list of measurement tools for 2D, 3D and timelapse datasets.



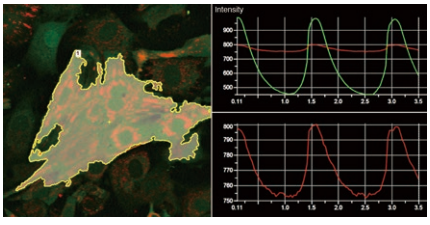
2D and 3D object tracking

Identifying and tracking 2D and 3D objects. Measurements include velocity, acceleration, distance, and direction.

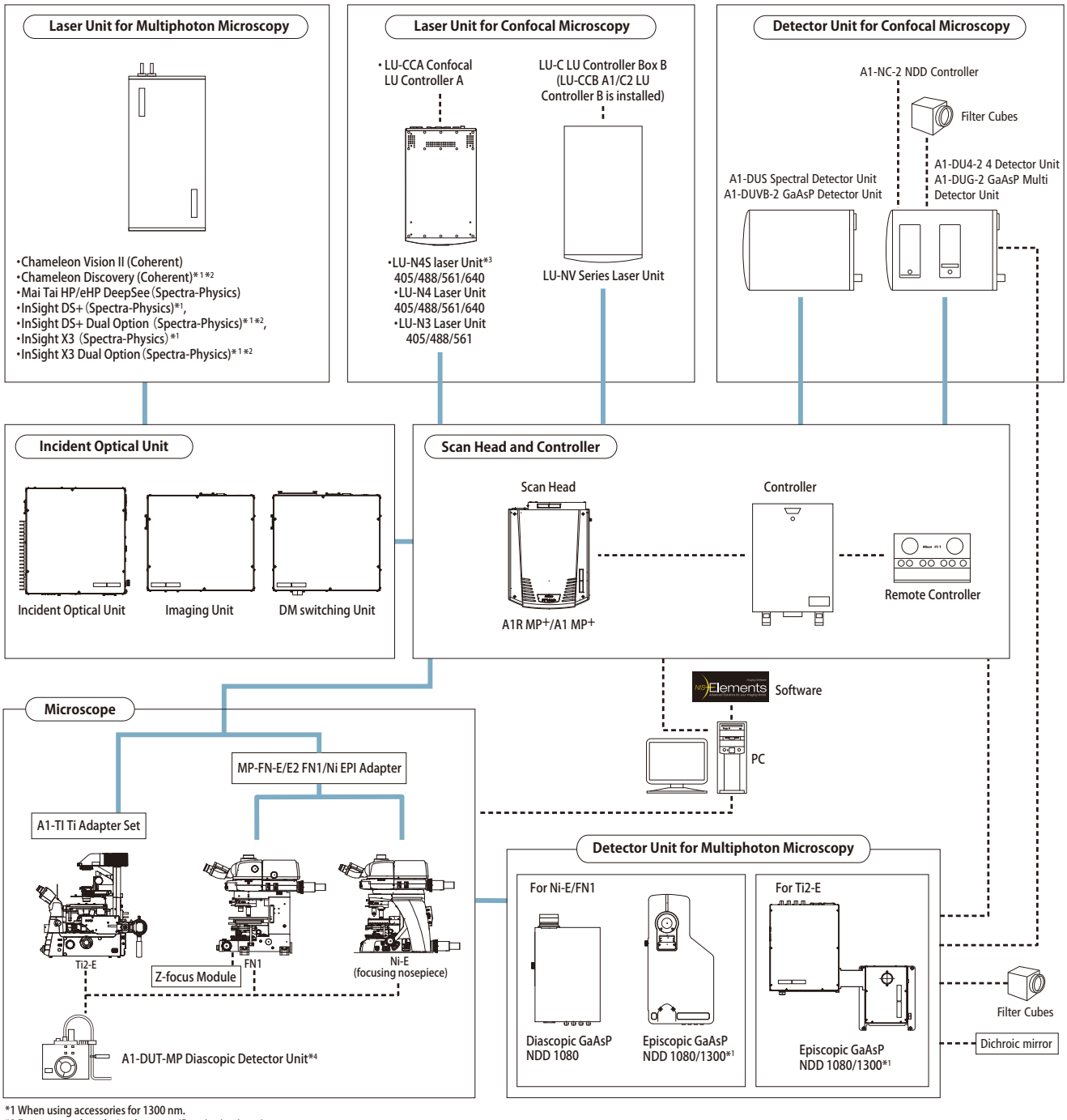


Real-time measurement

Time measurements can be carried out in real time and visualized during acquisition.



System diagram



*1 When using accessories for 1300 nm.
*2 For two-wavelength simultaneous IR excitation imaging system
*3 When using Spectral Detector Unit.
*4 Dedicated adapter is required depending on microscope model.

Laser units for multiphoton microscopy

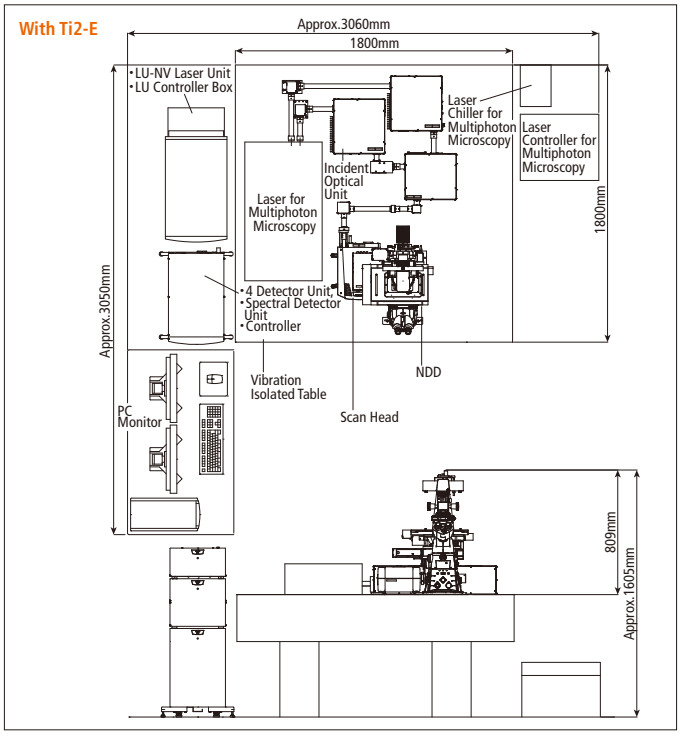
When a pulsed light of very short duration, typically about 100 femtoseconds, passes through microscope optics (e.g. objective), the pulse is spread out temporally on its way to the specimen because of group velocity dispersion, (the variation by wavelength in velocity of the speed of light through glass substrates), causing a reduction of peak power.
To prevent the reduction of peak pulse power, Nikon has equipped the femtosecond pulsed lasers for multiphoton microscopy with built-in group velocity dispersion precompensation, which restores the original pulse width at the specimen. The parameters of this precompensation have been optimized for Nikon's optical system.

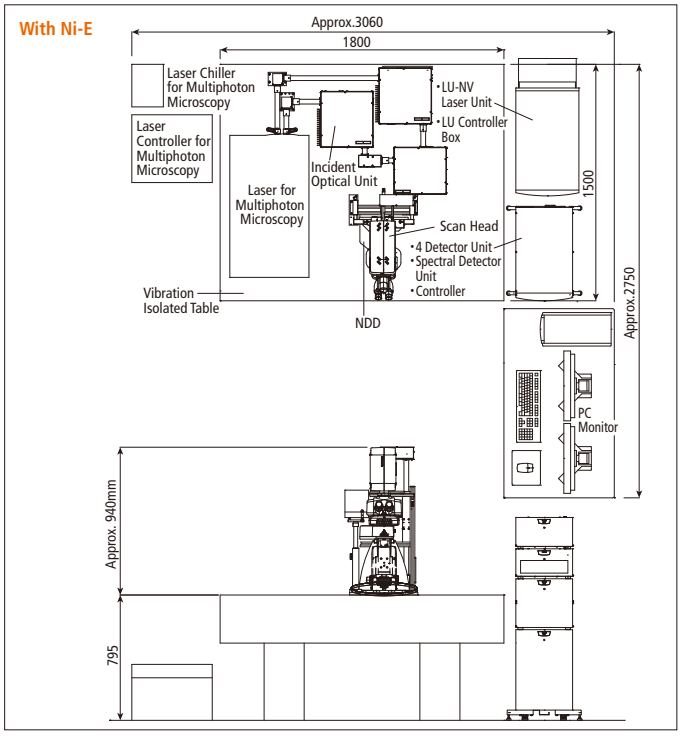
InSight X3, Newport Corp., Spectra-Physics Lasers Division (Nikon specifications)

Chameleon Discovery, Coherent Inc. (Nikon specifications)

Layout

Unit: mm





Operation conditions

- Temperature: 20 °C to 25 °C (± 1 °C), with 24-hour air conditioning
- Humidity: 75 % (RH) or less, with no condensation
- Completely dark room or light shield for microscope

Power source

Controller	Input100-240VAC±10%,50/60Hz, 5A-2A
IR pulsed Laser	(Reference value) Power Supply: 100-110VAC±10%,50/60Hz, < 10A 220VAC±10%, 50/60Hz, < 6A Chiller: 100-110VAC±10%,50/60Hz, < 10A 220VAC±10%, 50/60Hz, < 6A
Laser Unit	LU-N4/LU-N4S/LU-N3: Input100-240VAC±10%,50/60Hz, 2A max.
	LU-NV Series with LU Controller Box B Input100-240VAC±10%,50/60Hz, 5.8A max.
Microscope	Inverted Microscope Ti2-E and HG Fiber Illuminator Intensilight: 6.3A max

Dimensions and weight

Scan head	276 (W) x 163 (H) x 364 (D) mm	Approx. 10 kg
Controller	360 (W) x 580 (H) x 600 (D) mm	Approx. 40 kg
A1-IOUI Incident optical unit 1080 (Inv/Upr)	333 (W) x 186 (H) x 355 (D) mm	Approx. 10 kg
A1-IOUD Incident optical unit	333 (W) x 186 (H) x 355 (D) mm	Approx. 10 kg
A1-IOUS Incident optical unit	333 (W) x 186 (H) x 355 (D) mm	Approx. 10 kg
A1-GNEF-4 GaAsP NDD EPI N	216 (W) x 112 (H) x 425 (D) mm	Approx. 7 kg
A1-GNEN-4 GaAsP NDD DIA N	216 (W) x 85 (H) x 425 (D) mm	Approx. 7 kg
A1-GNEI-2 GaAsP NDD EPI Unit Ti2 1080	350 (W) x 64.5 (H) x 405 (D) mm	Approx. 6 kg
A1-GNEI-3 GaAsP NDD EPI Unit Ti2 1300	350 (W) x 64.5 (H) x 405 (D) mm	Approx. 6 kg
A1-DUG-2 GaAsP Multi Detector Unit	360 (W) x 199 (H) x 593.5 (D) mm	Approx. 16 kg
A1-DUS Spectral Detector Unit	360 (W) x 323 (H) x 593.5 (D) mm	Approx. 26 kg
LU-NV Series Laser Unit	400 (W) x 781 (H) x 685 (D) mm	Approx. 70 kg
LU-C LU Controller Box B	400 (W) x 781 (H) x 687 (D) mm	Approx. 7 kg

Dimensions exclude projections.

Specifications

		A1 MP+	A1R MP+
Scan head input/output port		3 laser input ports 3 signal output ports for standard, spectral and optional detector*1	
Laser for multiphoton microscopy	Compatible laser	Mai Tai HP/eHP DeepSee*4, InSight DS+*2, InSight DS+ Dual Option*3, InSight X3*2, InSight X3 Dual Option*3 (Spectra-Physics), Chameleon Vision II*4, Chameleon Discovery*3 (Coherent)	
	Modulation	Method: AOM (Acousto-Optic Modulator) device Control: power control, return mask, ROI exposure control	
	Incident optics	700 - 1080 nm*4,*5, 700 - 1300 nm*2,*3, auto alignment	
Laser for confocal microscopy (option)	LU-N3 3-laser unit	405 nm, 488 nm, 561nm lasers are installed; built-in AOTF (Cannot used with A1-DUS spectral detector)	
	LU-N4/LU-N4S 4-laser unit	405 nm, 488 nm, 561 nm, 640 nm lasers are installed; built-in AOTF (LU-N4 cannot be used with A1-DUS spectral detector)	
	LU-NV series laser unit	Compatible lasers: 405 nm, 445 nm, 458 nm, 488 nm, 514 nm, 532 nm, 561 nm, 594 nm, 640 nm, 647 nm; built-in AOTF	
NDD for multiphoton microscopy	Type	Compatible with 1080 nm: Episcopic GaAsP NDD (for Ti2-E/Ni-E/FN1), Diascopic GaAsP NDD (for Ni-E/FN1); Detectable wavelength range 380 - 650 nm*6 Compatible with 1300 nm: Episcopic GaAsP NDD (for Ti2-E/Ni-E/FN1); Detectable wavelength range 380 - 750 nm	
	Detector	4 PMTs (3 GaAsP PMTs and 1 Multi-Alkali PMT)	
	Filter cube	450/50, 492, 525/50, 575/25, 610/75, 629/53	
Standard fluorescence detector (option)	Detectable wavelength range	400 - 750 nm (400 - 650 nm when using IR laser)	
	Detector	A1-DU4-2 4 Detector Unit: 4 Multi-Alkali PMTs A1-DUG-2 GaAsP Multi Detector Unit: 2 GaAsP PMTs + 2 Multi-Alkali PMTs	
	Filter cube	6 filter cubes commonly used for a microscope mountable on each of three filter wheels Recommended wavelengths for multiphoton/confocal observation: 450/50, 482/35, 515/30, 525/50, 540/30, 550/49, 585/65, 594LP, 595/50, 700/75	
Diascopic detector (option)	Detectable wavelength range	440 - 645 nm	
	Detector	Multi-Alkali PMT	
FOV		Square inscribed in a ø18 mm circle	
Image bit depth		4096 gray intensity levels (12 bit)	
Scan head	Type	A1-SHSM-2	A1-SHRM-C
	Standard image acquisition	Scanner: galvano scanner x2 Pixel size: max. 4096 x 4096 pixels Scanning speed: Standard mode 2 fps (512 x 512 pixels, bi-direction), 24 fps (512 x 32 pixels, bi-direction), Fast mode 10fps (512 x 512 pixels, bi-direction), 130 fps (512 x 32 pixels bi-direction)*7 Zoom: 1-1000x continuously variable Scan mode: X-Y, X-T, X-Z, XY rotation, Free line, Line-Z	
	High-speed image acquisition	—	Scanner: resonant scanner (X-axis, resonance frequency 7.8 kHz), galvano scanner (Y-axis) Pixel size: max. 1024 x 1024 pixels Scanning speed: 15 fps (1024 x 1024 pixels), 30 fps (512 x 512 pixels), 60 fps (256 x 256 pixels) to 420 fps (512 x 32 pixels), 15,600 lines/sec (line speed) Zoom: 7 steps (1x, 1.5x, 2x, 3x, 4x, 6x, 8x) Scan mode: X-Y, X-T, X-Z Acquisition method: High-speed image acquisition, Simultaneous photoactivation and image acquisition
	IR laser wavelength range	700 - 1080 nm*4,*5, 700 - 1300 nm*2,*3	
	Dichroic mirror	Low-angle incidence method Position: 8 Standard filter: 405/488, 405/488/561, 405/488/561/638, 400-457/514/IR, 405/488/543/638, IR total reflection*2,*3, BS20/80, IR, 405/488/561/IR	
	Simultaneous stimulation option	—	Optional hyper selector Visible stimulation/Visible imaging: Stimulation by 405nm, Imaging by 488-750nm Visible stimulation/IR imaging: Stimulation by 405nm or 488nm, 561nm (selectable by NDD dichroic mirror), Imaging by 800nm-1080nm (1080nm configuration), 820nm-1080nm (1300nm configuration)
			Optional 1st dichroic mirror :High reflection mirror 405,488,561,800-1080
	Pinhole	12-256 µm variable (1st image plane)	

Specifications

		A1 MP+	A1R MP+
Spectral detector (option)	A1-DUS spectral detector unit	Number of channels: 32 Wavelength detection range: 400 - 750 nm Spectral image acquisition speed: 4 fps (256 x 256 pixels) Maximum pixel size: 2048 x 2048 (Spectral mode/Virtual filter mode) Wavelength resolution: 2.5/6.0/10.0 nm, wavelength range variable in 0.25 nm steps Compatible with galvano scanner only	
	A1-DUVB-2 GaAsP detector unit	Number of channels: 1 GaAsP PMT with variable emission plus 1 optional GaAsP PMT (A1-DUVB-OP) with a user-defined dichroic mirror and barrier filter Wavelength detection range: 400 - 720 nm, narrowest: 10 nm, broadest:320 nm Maximum pixel size: 4096 x 4096 (CB mode/VB mode) Wavelength resolution: 10 nm, wavelength range variable in 1 nm steps Compatible with galvano and resonant scanners	
Compatible microscopes		ECLIPSE Ti2-E inverted microscope, ECLIPSE FN1 fixed stage microscope, ECLIPSE Ni-E upright microscope (focusing nosepiece type)	
Z step		Ti2-E: 0.02 µm, FN1 stepping motor: 0.05 µm Ni-E: 0.025 µm	
Option		Motorized XY stage (for Ti2-E/Ni-E), High-speed Z stage (for Ti2-E), High-speed piezo objective-positioning system (for FN1/Ni-E)	
Software	Display/image generation	2D analysis, 3D volume rendering/orthogonal, 4D analysis, spectral unmixing	
	Image format	JP2, JPG, TIFF, BMP, GIF, PNG, ND2, JFF, JTF, AVI, ICS/IDS	
	Application	FRAP, FLIP, FRET (option), photoactivation, three-dimensional time-lapse imaging, multipoint time-lapse imaging, colocalization	
Control computer	OS	Windows 10 Pro 64bit, English version or Japanese version OS Version 1704 Windows 7 Professional, 64bit, SP1 English version or Japanese version, Windows Update KB3118401 or later	
	CPU	Intel Xeon E5-2643v4 (3.40GHz, 6 cores, 20MB, 2400MHz) or higher	
	RAM	16GB, 32GB or 64GB	
	HDD	1st HP Z Turbo G2 512GB PCIe M.2 SSD, 2nd SATA 2TB	
	Optical Drive	Super Multi drive, up to x 16 speed or higher	
	Graphics	NVIDIA Quadro K620/ K2200/ K4200/ M2000/ M4000/ M5000 (PCI Express / two-screen split display supported)	
	Extension slot	Two PCI Express 3.0 (x16) slots (one slot to be used for graphics), One PCI Express 3.0 (x8 mechanical, x4 electrical) slot, One PCI Express 2.0 (x8 mechanical, x4 electrical) slot, One PCI Express 2.0 (x1) slot	
	LAN port	10/100/1000 Network/Interfacex2 (for connection to controller, for connection to external LAN)	
	Monitor	1600 x 1200 or higher resolution, dual monitor configuration recommended	
Vibration isolated table		1500 (W) x 1500 (D) mm required (for FN1/Ni-E), or 1800 (W) x 1500 (D) mm required (for Ti2-E)	

*1 FCS/FCCS/FLIM is possible in combination with third-party systems.
*2 When using accessories with 1300 nm
*3 When using accessories with 1300 nm and Dual IR
*4 When using accessories with 1080 nm
*5 When using accessories with 1080 nm and visible light photoactivation/IR imaging
*6 400-650 nm when using diascopic NDD
*7 Fast mode is compatible with 8-1000x zoom and scanning modes X-Y and X-T. It is not compatible with Rotation, Free line, CROP, ROI, Spectral imaging, Stimulation and FLIM.

Specifications and equipment are subject to change without any notice or obligation on the part of the manufacturer. November 2017

⚠ WARNING	TO ENSURE CORRECT USAGE, READ THE CORRESPONDING MANUALS CAREFULLY BEFORE USING YOUR EQUIPMENT.

Monitor images are simulated.
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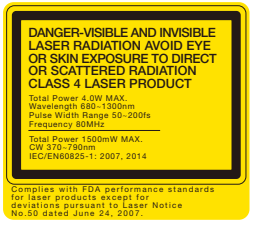

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