OLYMPUS®

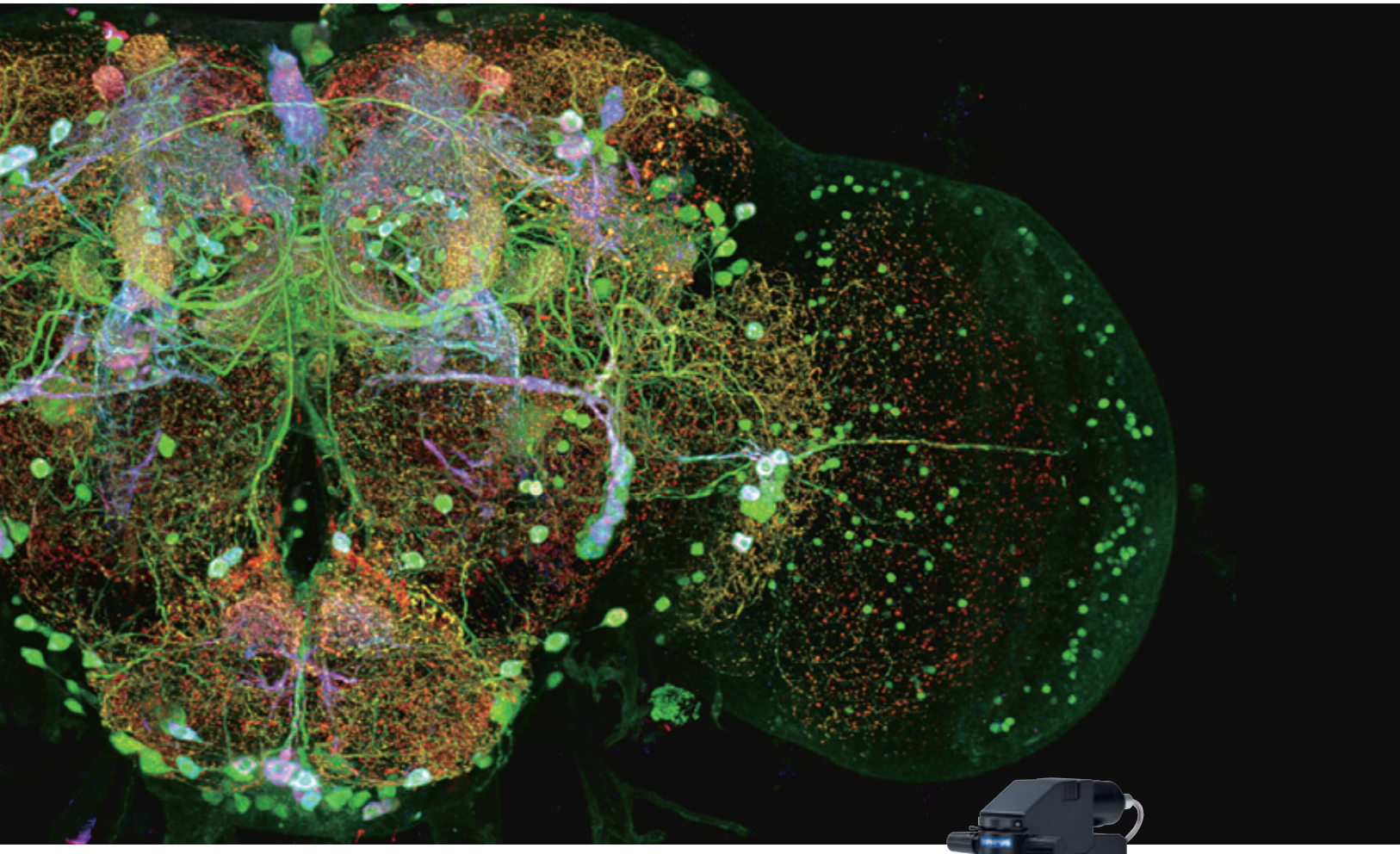
Your Vision, Our Future

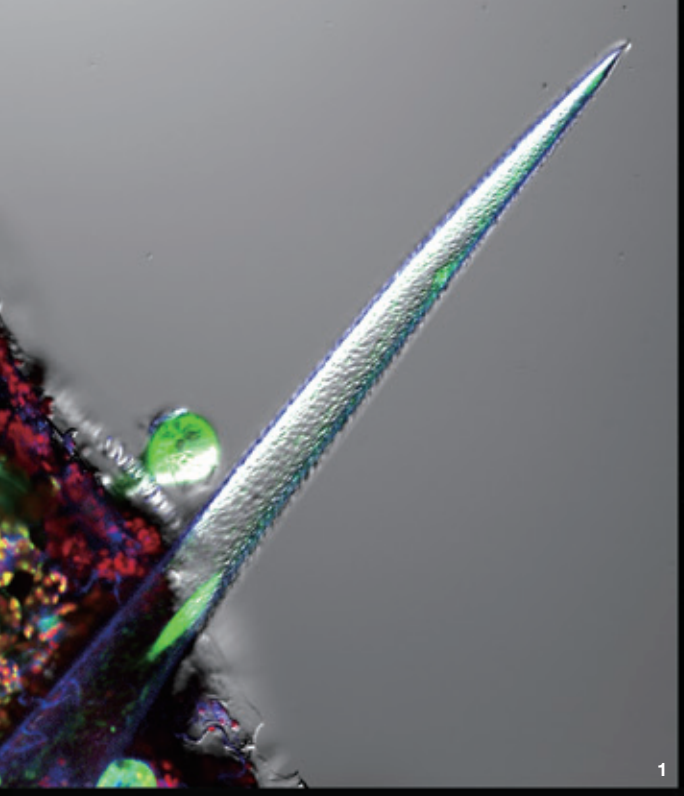
Biological Confocal Laser Scanning Microscope

FV1200

FLUOVIEW

High-Performance Laser Scanning Microscope for Live Cell Imaging Combining Accuracy, Sensitivity and Laser Stimulation





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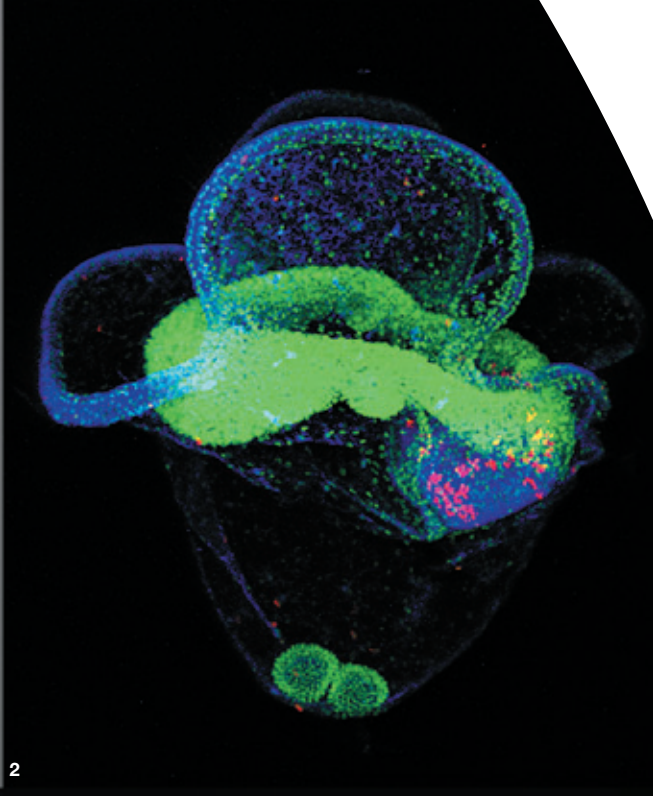

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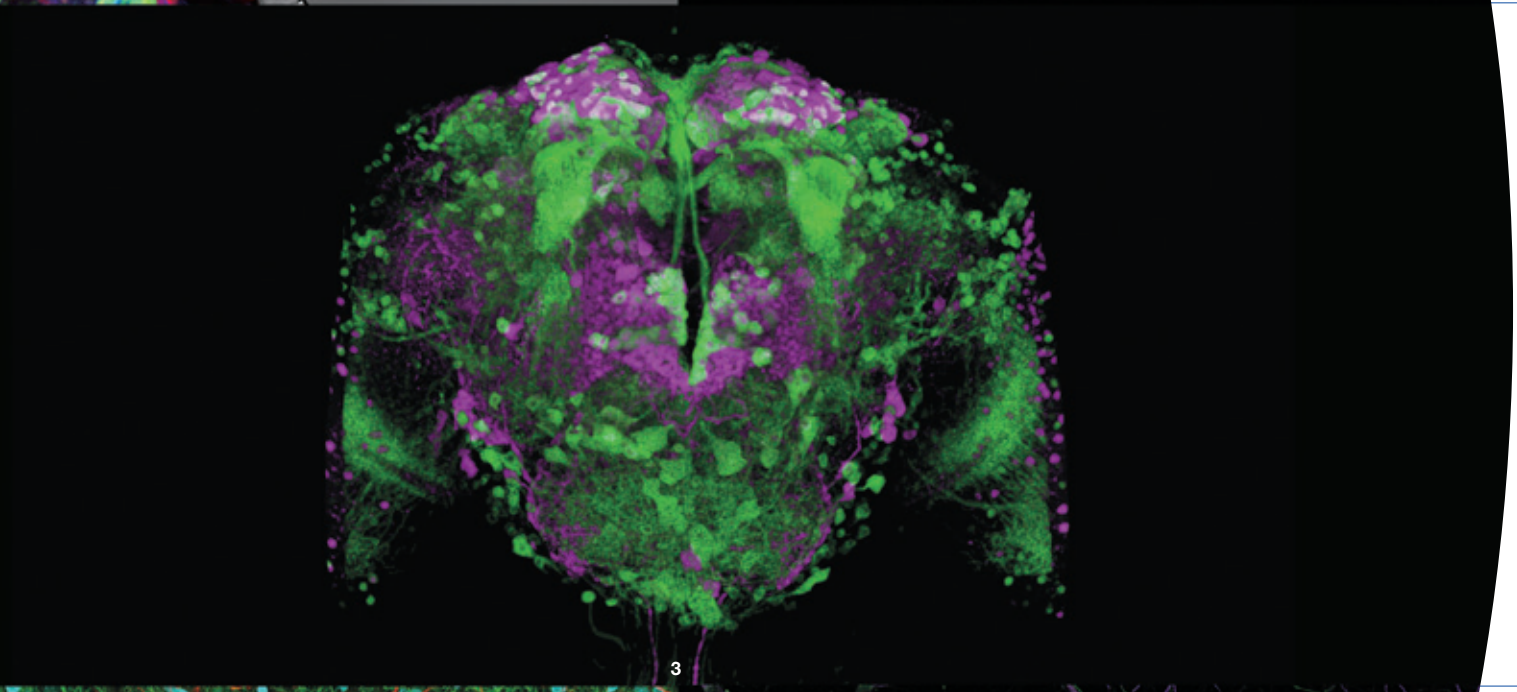

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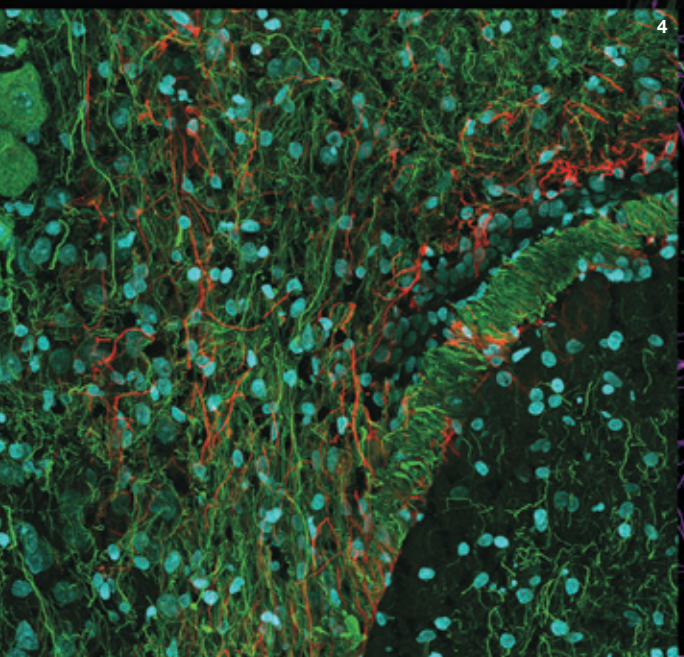

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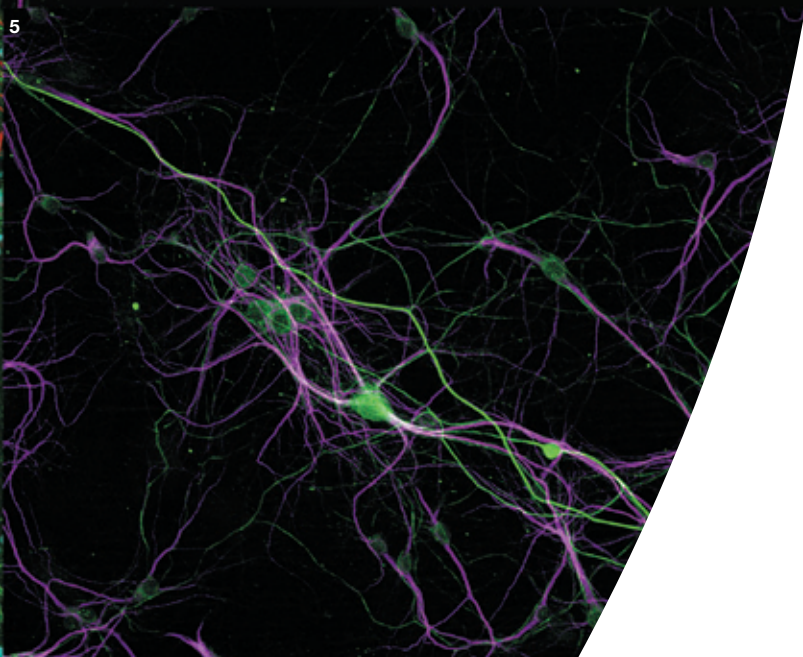


FV1200 (IX83 configuration)

The FLUOVIEW FV1200: High-quality Live Cell Imaging with High-level Reliability

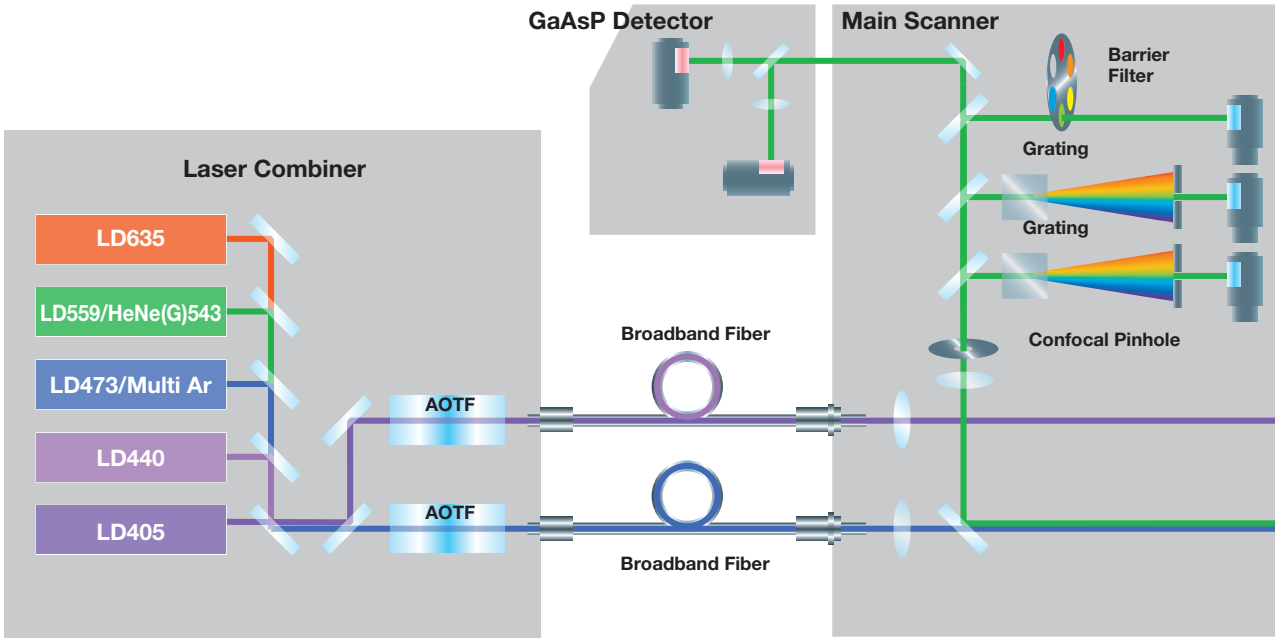
The FLUOVIEW FV1200 biological laser scanning microscope builds on renowned Olympus optics, enhancing sensitivity through new galvanometer coating and GaAsP detector technology. With the new IX83 microscope, the FV1200 is optimized for some of the most challenging live cell imaging experiments, implementing real time Z-drift compensation and touch panel control.

From high-resolution, confocal observation of fixed samples, with up to 5 simultaneous fluorescent detection channels, to high speed fluorescent measurements and simultaneous stimulation of living cells, the FV1200 offers advances in confocal system performance while providing the speed and sensitivity required for live cell imaging, with minimal risk of damage to living specimens.

What's more, the FLUOVIEW FV1200 supports an array of optional functions—such as capability for measuring cellular molecular diffusion coefficients—extending the exceptional performance from visualization to stimulation, to precision measurement.

FV1200 (BX61WI configuration)

EXCELLENT PRECISION, SENSITIVITY AND STABILITY
FLUOVIEW FV1200 ENABLES PRECISE, BRIGHT IMAGING WITH MINIMUM PHOTOTOXICITY



Laser Combiner/Fiber

Diode Laser
Greater stability, longer service life and lower operating cost are achieved using diode lasers.

Laser Feedback Control
Scanner unit is equipped with laser power monitor for feedback control enhancing stable laser output.

Laser Compatibility
Diode laser: 405nm, 440nm, 473nm, 559nm, 635nm
Gas laser; Multi Ar laser (458nm, 488nm, 515nm)
HeNe (G) laser (543 nm)

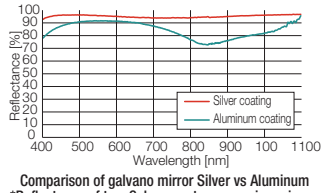
Broadband Fiber
Broadband fiber connection for 405–635nm lasers, to achieve an ideal point light source with minimal color shift and position shift between images.

Laser Combiner—Two Versions Available
- Dual fiber-type combiner for observation and simultaneous photostimulation
- Single fiber-type combiner for observation and sequential photostimulation

Scanners and Detection System

Choice of Main Scanner
Select the scanner to match the purpose at hand, with a choice of the spectral scan unit that achieves 2nm resolution for high-precision spectroscopy, and the filter scan unit incorporating high-quality filters.

High-performance Detection System
High performance and high S/N ratio optical performance are achieved through the smooth integration of a pupil projection lens, a high performance photomultiplier tube, silver-coated galvanometer scanning mirrors with high reflectance across a broad range of wavelengths, and an analog processing circuit that reduces extremely to lower noise than before. Furthermore, because the system enables image acquisition of this quality with only minimal laser power, phototoxicity is also significantly reduced.



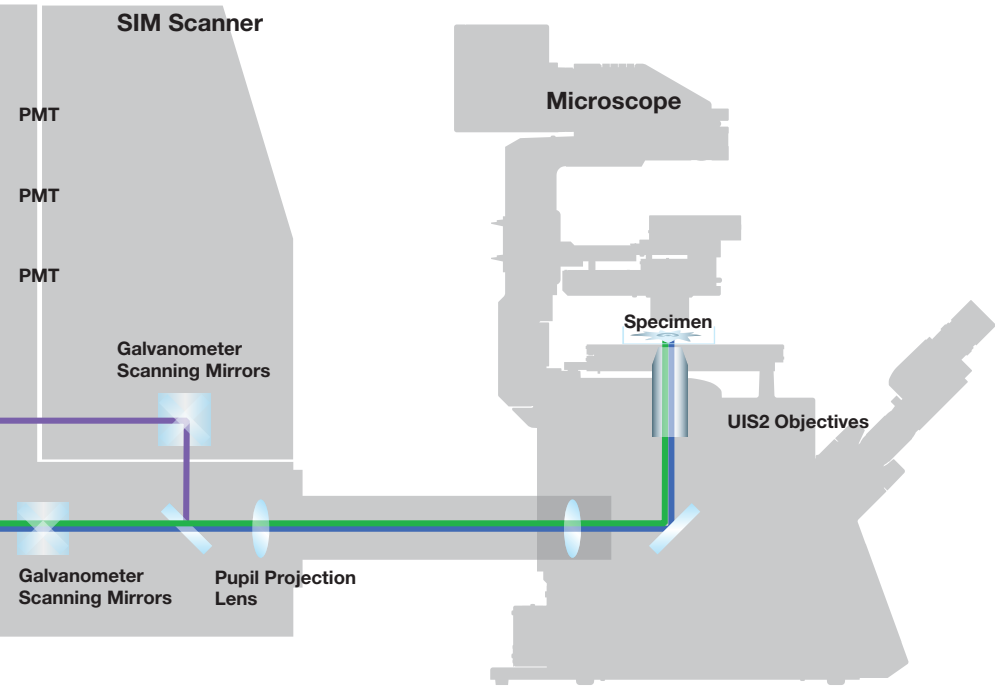
Comparison of galvano mirror Silver vs Aluminum
*Reflectance of two Galvanometer scannning mirrors

High-sensitivity Detector
A high-sensitivity detector employing gallium arsenide phosphide (GaAsP) is also available as an option.

Optical System

UIS2 Objectives
Olympus UIS2 objectives offer world-leading, infinity-corrected optics that deliver unsurpassed optical performance over a wide range of wavelengths.

High S/N Ratio Objectives with Suppressed Autofluorescence
Olympus offers a line of high numerical aperture objectives with improved fluorescence S/N ratio, including objectives with silicone immersion, exceptional correction for chromatic aberration, total internal reflection fluorescence (TIRF), and oil- and water immersion objectives.



Features of the NEW IX83

Discover Improved Expandability and Rigidity with the IX83

The Z-drive guide with high thermal rigidity is installed near the revolving nosepiece to further augment stability of the IX83 in the face of heat and vibration and improve the results of time-lapse imaging. Furthermore, when combined with the IX3-ZDC Z drift compensator and the motorized stage, high-precision multipoint time-lapse imaging is made possible without risk of focus drift or misalignment.

Switch Observation Methods with a Tap of the Touch Panel

A tap of the fingertip is all it takes to manage changes in magnification, switch between optical elements, and make adjustments to illumination. Not only does the controller make it a cinch to carry out complex microscope operations, but it can also save settings for observation modes.

The U-MCZ Controller Executes Procedures from a Preferred Position

The controller allows monitor observation to be executed in your preferred position and mode, while simple key arrangement allows confident control—even under darkroom conditions.

The U-HGLGPS Fluorescence Illumination Source Minimizes the Impact of Lamp Heat to Both Microscope and Specimen

Featuring a high-pressure mercury lamp with an average life of 2,000 hours, the user-friendly fluorescence illumination source incorporates a low chromatic aberration adapter that cleverly compensates when switching excitation wavelengths.

A STEP UP IN SENSITIVITY
THE FV1200 CAPTURES SUBTLE CHANGES IN LIVE CELLS, WITH HIGHLY SENSITIVE DETECTION IMMEDIATELY FOLLOWING PHOTOSTIMULATION

High Performance Across a Wide Range of Wavelengths

Galvanometer scanning mirrors on the main scanner feature an anti-oxidative silver coating that increases reflection efficiency for excitation and emission filters from 5% to 15% in the visible spectrum and by a maximum of 22% in the near-infrared spectrum. The standard, onboard multi-alkali photomultiplier tubes with a high dynamic range can also be combined with the optional, ultra high-sensitivity GaAsP photomultiplier tubes to further increase the freedom for experimental setups across a broad range of wavelengths.

Two Versions of Light Detection System that Set New Standards in Quality

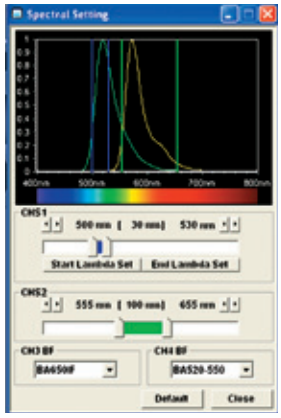
Spectral Based Detection

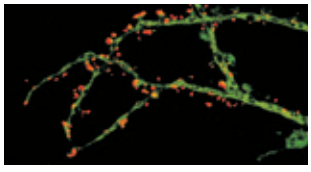
High Performance

Spectral detection using gratings for 2nm wavelength resolution and image acquisition matched to fluorescence wavelength peaks. User adjustable bandwidth of emission spectrum for acquiring bright images with much lower cross-talk than before.

Precise Spectral Imaging

The spectral detection unit uses a grating method that offers linear dispersion compared with prism nonlinear dispersion. The unit provides uniform 2nm wavelength resolution across the entire detection spectrum and high performance photomultiplier tube detectors. Fluorescence separation can be achieved through unmixing, even when cross-talk is generated by multiple fluorescent dyes with similar peaks. A standard third filter channel is provided without a grating allowing researchers greater flexibility and sensitivity.

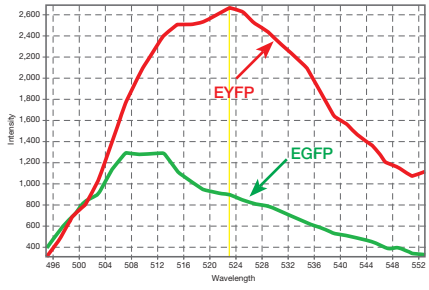




EGFP (dendrite)—EYFP (synapse) XYλ
Wavelength detection range: 495 nm–561nm in 2nm steps
Excitation wavelength: 488nm

Courtesy of Dr. Shigeo Okabe
Department of Anatomy and Cell Biology,
Tokyo Medical and Dental University

EGFP–EYFP Fluorescence Separation



Filter Based Detection

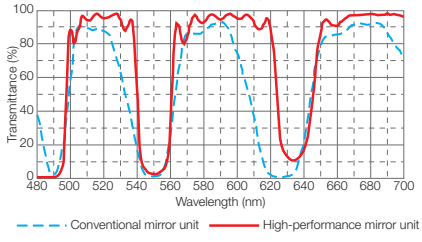
Enhanced Sensitivity

Three-channel scan unit with detection system featuring hard coated filter base. High-transmittance and high S/N ratio optical performance is achieved through integration of a pupil projection lens within the optics, the use of a high performance photomultiplier and an analog processing circuit with much lower noise than before.

High-Performance Filters Deliver Outstanding Separation

Special coatings deliver exceptionally sharp transitions to a degree never achieved before, for acquisition of brighter fluorescence images.

DM488/543/633 Comparison



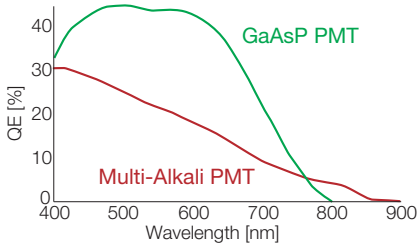
The High Sensitivity GaAsP Detector Module

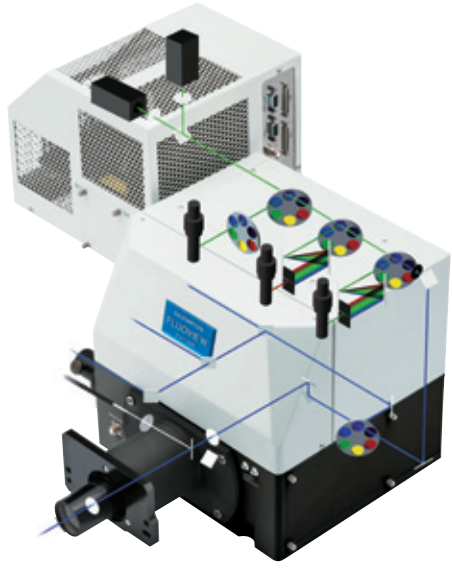
Cooled GaAsP Photodetector

Ultra-high Sensitivity Detector with GaAsP Photomultiplier Tubes Further Enhances Quantum Efficiency

The ultra-high sensitivity detector makes it possible to view samples that were simply too dim to view with conventional equipment. The GaAsP PMT incorporates 2 channels and combines the images with a further 3 built-in channels as well as the channel transmitted from the detector. Maximum quantum efficiency is 45%, Peltier cooling holds noise down by 20%, and high S/N ratio images can be obtained under exceptionally low excitation light.

Standard Quantum Efficiencies of Detector Technologies





SIM Scanner Allows Simultaneous Photostimulation during Time-lapse Imaging

SIM Scanner Unit

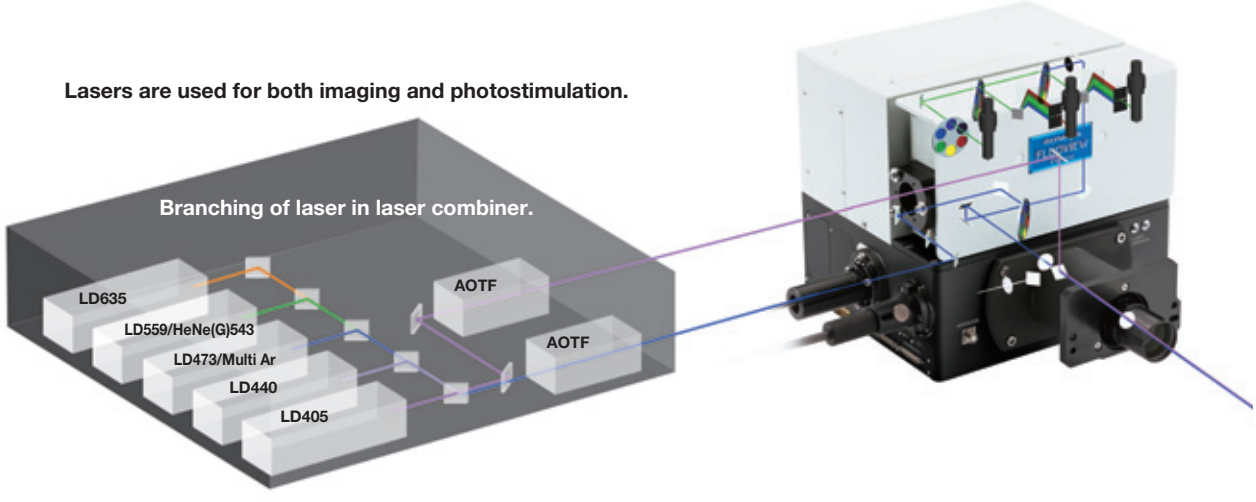
Dedicated Scanner for Photostimulation

Combination of the main scanner with a photostimulation scanner provide essential flexibility for tracking the diffusion or transport of fluorescence-labeled molecules or for marking specific live cells. The dual-fiber laser combiner makes it possible to use imaging lasers for photostimulation.

Simultaneous Photostimulation and Imaging

Performs simultaneous photostimulation and imaging to acquire images of immediate cell responses to stimulation in photobleaching experiments.

Lasers are used for both imaging and photostimulation.



ENHANCED RELIABILITY FOR LIVE CELL IMAGING MEETS DEMANDS FOR DEEPER 3D STRUCTURING, TIME-LAPSE IMAGING, AND PRECISION MEASUREMENT

Silicone Immersion Objectives for Live Cell Imaging Deliver High-resolution Observation At Depth

Silicone Immersion Objective

High-resolution Silicone Immersion Objective

Silicone immersion objectives can be designed with a larger numerical aperture (NA) than water immersion objectives, increasing image resolution and brightness.

Complete the range with the UPLSAPO40XS

This new objective with intermediate magnification and high NA performance supports continuous focus with the IX3-ZDC.Continuous high-resolution observation during extended time-lapse imaging.

Magnification: 40x, NA: 1.25 (silicone oil immersion), W.D.: 0.3mm,
Cover glass thickness: 0.13–0.19 mm, Operation temperature: 23ºC–37ºC

UPLSAPO30XS: For Broader View and Greater Depth

Magnification: 30x, NA: 1.05 (silicone oil immersion), W.D.: 0.8mm,
Cover glass thickness: 0.13–0.19mm, Operation temperature: 23ºC–37ºC

UPLSAPO60XS2: For 3D with Superior Resolution

Magnification: 60x, NA: 1.30 (silicone oil immersion), W.D.: 0.3mm,
Cover glass thickness: 0.15–0.19mm, Operation temperature: 23ºC–37ºC

UPLSAPO100XS: For Greater Depth in Closely Defined Regions

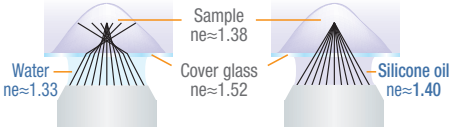
Magnification: 100x, NA: 1.35 (silicone oil immersion), W.D.: 0.2mm,
Cover glass thickness: 0.13–0.19mm, Operation temperature: 23ºC–37ºC

SIL300CS-30CC: For Extended Time-lapse Imaging

Refractive index: ne=1.406, 23ºC, Net 30ml, Low autofluorescence

Refractive Index is Important with Deep Tissue Observation

In deep tissue observation, image quality depends on keeping the refractive index of the sample and immersion medium as close to each other as possible.

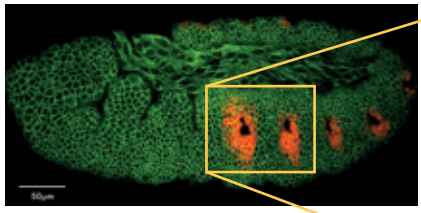


Water immersion objective

When working with a water immersion objective, the difference between the refractive index of the samples and water results in spherical aberration in deep tissue, causing resolution to deteriorate and fluorescence to become dim.

Silicone immersion objective

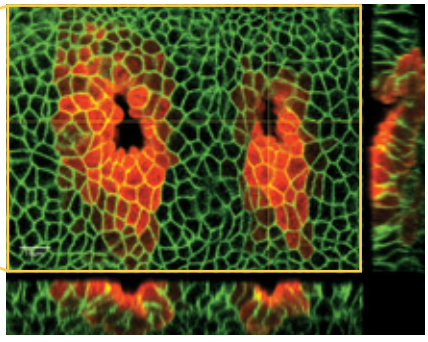
When working with a silicone immersion objective, the difference between the refractive index of the samples and silicone oil is minimal. So it achieves brighter fluorescence images with higher resolution for deep tissue.



XY: 466µm x 224µm (777x374pixel)

Confocal image of a Drosophila embryo at stage 11 expressing the tracheal maker trh-LacZ (Cy3, red) and the cell membrane maker Dlg (Alexa488, green). Enlarged view shows invaginating tracheal placode.

Courtesy of Dr. Takefumi Kondo, Dr. Shigeo Hayashi, Laboratory for Morphogenetic Signaling, RIKEN Center for Developmental Biology



XY: 120µm x 90µm (800 x 600pixel)
Z: 21µm (42 slices)

Enhance the Reliability of Colocalization Analysis, With the Low Chromatic Aberration Objective

Low Chromatic Aberration Objective

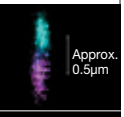
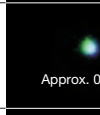
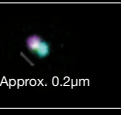
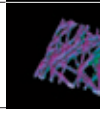
Acquire and Analyze Colocalization Imaging with the PLAPON60XOSC

This oil-immersion objective minimizes lateral and axial chromatic aberration in the 405-650nm spectrum, while supporting the reliable acquisition and measurement of colocalization images with superior positional accuracy. The objective also compensates for chromatic aberration through near infrared up to 850nm, making it an optimal choice for near infrared fluorescence observation.

Low Chromatic Aberration Objective

Magnification: 60x
NA: 1.4 (oil immersion)
W.D.: 0.12mm
Chromatic aberration compensation range: 405–650nm
Optical data provided for each objective.

Performance Comparison of PLAPON 60×OSC and UPLSAPO 60×O

	PLAPON 60×OSC	UPLSAPO 60×O
Axial chromatic aberration (Z direction) Compared for PSF fluorescent beads (405nm, 633nm)		
Lateral chromatic aberration (X-Y direction) Compared for PSF fluorescent beads (405nm, 488nm, 633nm)		
3D image Tubulin in Ptk2 cells labeled with two colors (405nm, 635nm) and compared		

Maintain High-precision Focus through Extended Time-lapse Imaging

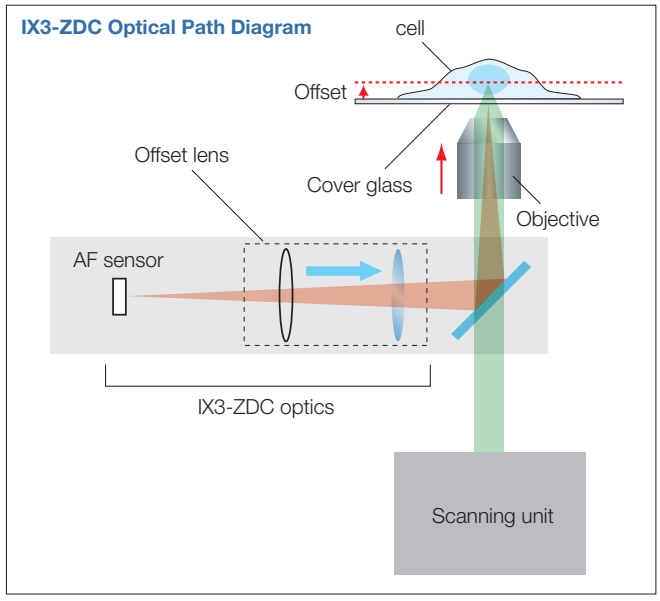
Z- drift Compensation System

The IX3-ZDC Z Drift Compensator Offers a Range of Functionality for Autofocus

The IX3-ZDC uses low phototoxicity IR light to detect the correct focus position as set by the user. One-shot AF mode allows several focus positions to be set as desired for deeper samples, enabling efficient Z-stack acquisition in multi-position experiments. Continuous AF mode keeps the desired plane of observation precisely in focus, avoiding focus drift caused by temperature changes due to perfusion or reagent addition and making it ideal for measurements such as TIRF that requires more stringent focusing.

ZDC One-shot Function Detects Focus Fast, Even in High Magnification Observation

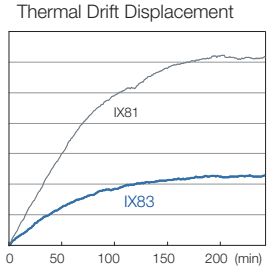
IX3-ZDC focus detection and tracking can be performed via the innovative touch panel independent of software. There's also a focus search function supported by a cell-safe, near-infrared laser enabling instant focusing on samples and start scanning.

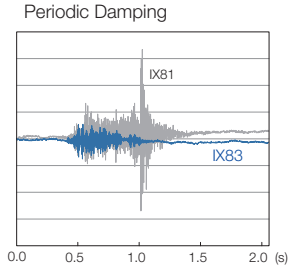


Rigidity

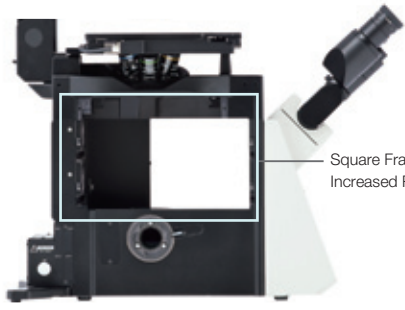
Tackle the Conflicting Requirements of Expandability and Rigidity with the IX3

A Z-drive guide installed near the revolving nosepiece combines high thermal rigidity with the further stability of a wraparound structure to significantly reduce the impact of heat and vibration and improve the quality of time-lapse imaging. Integration with the IX3-ZDC Z drift compensator permits the imaging without focus drift or misalignment, even through temperature changes due to the addition of reagents or a perfusion device. Furthermore, combination with a motorized stage that enables multipoint registration, allows the achievement of high-precision multipoint time-lapse imaging.





IX83 : Two-deck System + IX3-ZDC



USER-FRIENDLY SOFTWARE TO SUPPORT YOUR RESEARCH

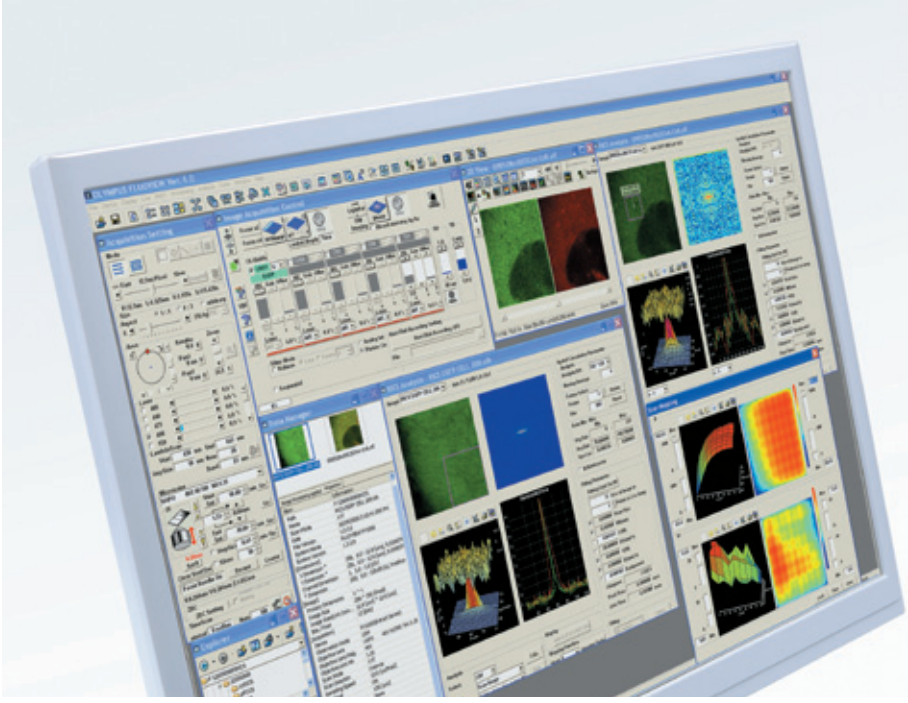
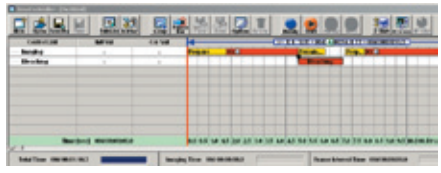


Image Acquisition by Application

User-friendly icons offer quick access to functions, for image acquisition according to the application (XYZ, XYT, XYZT, XYλ, XYλT).

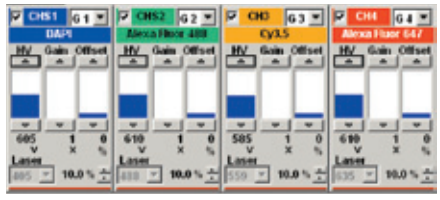
Time Controller

Precisely synchronizes different experimental protocols including FRAP, FLIP and FRET by acceptor photo-bleaching and time-lapse. Save and open settings for later use.



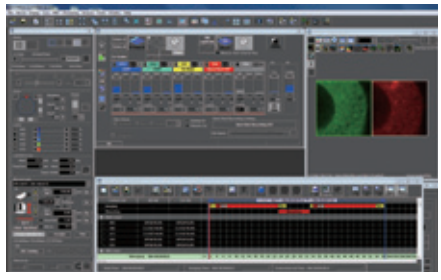
Re-Use Function

Open previously configured scanning conditions and apply them to new or subsequent experiments.



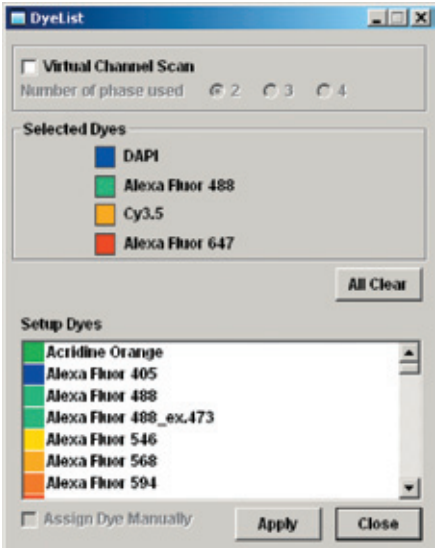
Dark Application Skin

Use of the dark application skin suppress the influence of the noise from the screen for the sample.



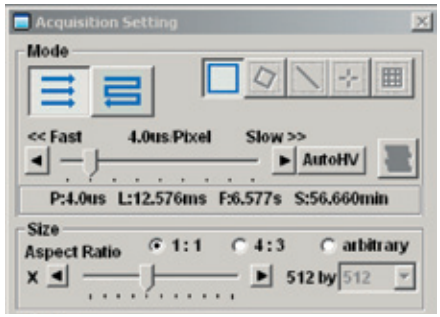
Configurable Emission Wavelength

Select the dye name to set the optimal filters and laser lines.



Wide Choice of Scanning Modes

Several available scanning modes including ROI, point and high-speed bidirectional scanning.



Configurable Excitation Laser Power

Easily adjust the optimum laser power for each specimen (live cells and fixed specimens).

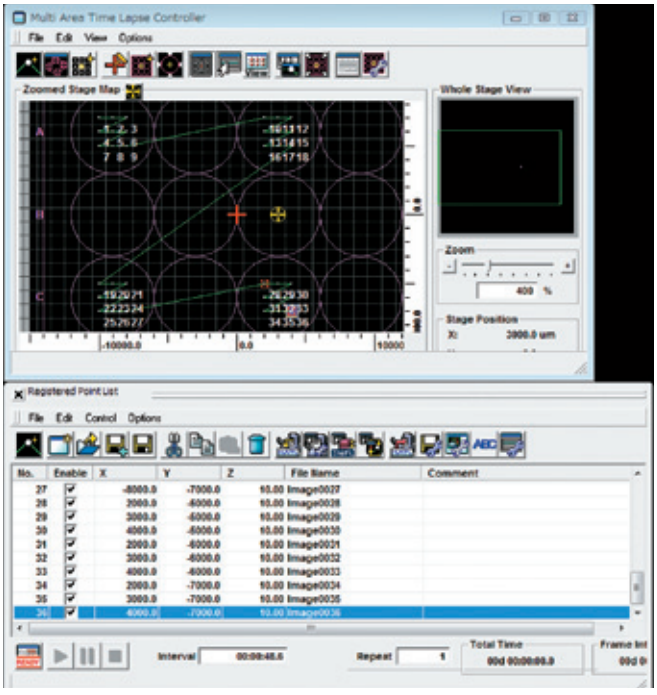
MULTI-DIMENSIONAL TIME-LAPSE

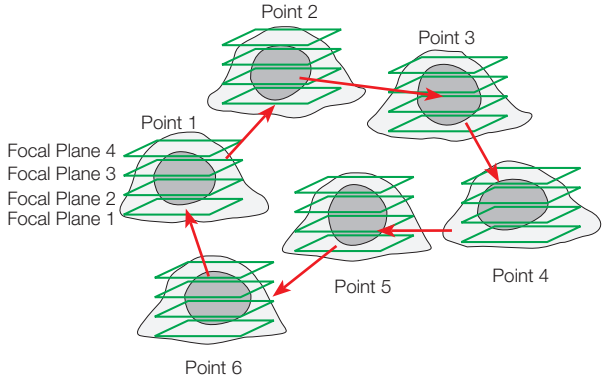
Multi-dimensional Time-lapse Imaging with Outstanding Positional Accuracy

The FLUOVIEW FV1200 can be used for ideal multi-dimensional time-lapse imaging during confocal observation, using multi-area time-lapse software to control the motorized XY stage and IX3-ZDC Z-drift compensator.

Significantly Improved Multi-Point Time-Lapse Throughput

Equipped with motorized XY stage for repeated image acquisition from multiple points scattered across a wide area. The system efficiently analyzes changes over time of cells in several different areas capturing, large amounts of data during a single experiment to increase the efficiency of experiments. Microplates can be used to run parallel experiments, which significantly improves throughput for experiments that require long-term observation.



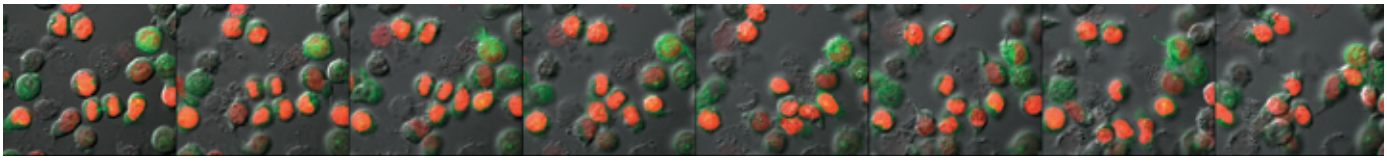


Supports repeated image acquisition from multiple areas in a single microplate well.

Multi-Point Time-Lapse Software

Maintain Cell Activity Over A Long Period

CO_2 incubator control keeps the environment inside the tissue culture dish completely stable. The environment is precisely maintained at 37°C with 90% humidity and 5% CO_2 concentration.



0s 1000s 2000s 3000s 4000s 5000s 6000s 7000s

Human lymphoblast cells TK6

Courtesy of Masamitsu Honma, Dir.
Biological Safety Research Center Div. of Genetics and Mutagenesis I, National Institute of Health Sciences

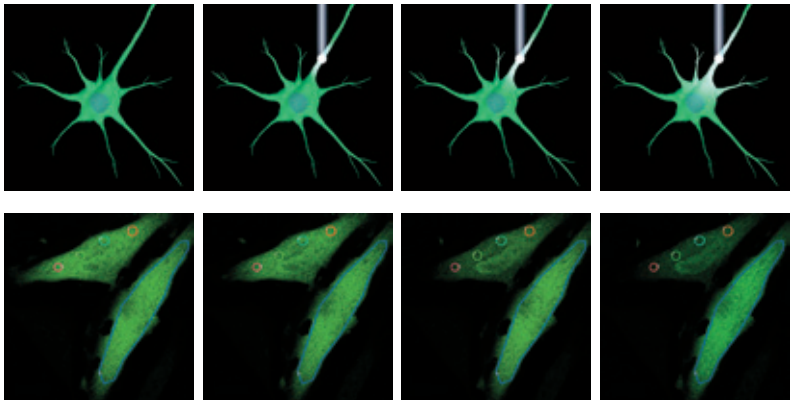
SIMULTANEOUS PHOTOSTIMULATION

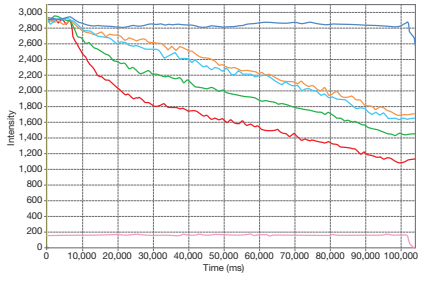
Combined Photostimulation and Imaging with Microsecond Precision Control

The SIM scanner system combines the main scanner with a photostimulation scanner. Control of the two independent beams enables simultaneous stimulation and imaging, to capture reactions during stimulation. Multi-stimulation software is used to continuously stimulate multiple points with laser light for simultaneous imaging of the effects of stimulation on the cell.

FLIP—Fluorescence Loss in Photobleaching

Fluorescence loss in photobleaching (FLIP) combines imaging with continuous bleaching of a specific region to observe the diffusion of a target protein within a cell. The changes in the image over time make it possible to observe the location of structural bodies that inhibit the diffusion of the molecule.

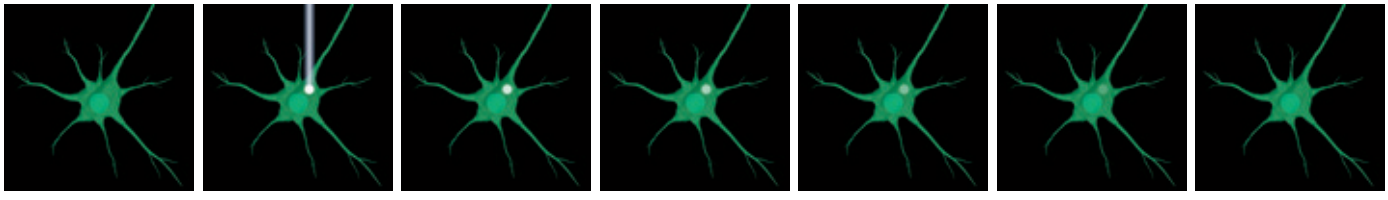


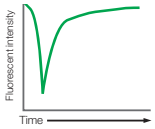


Specimen: HeLa cell, GFP (free), 488nm excitation (multi-argon laser)
Image acquisition time: 100ms/ bleach time: 100s continuously, 405nm bleaching

FRAP—Fluorescence Recovery after Photobleaching

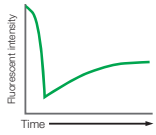
Exposure of fluorescent-labeled target proteins to strong laser light causes their fluorescence to fade locally. Fluorescence recovery after photobleaching (FRAP) is used to observe the gradual recovery of fluorescence intensity caused by protein diffusion from the area surrounding the bleached region. By examining the resulting images, it is possible to characterize the diffusion speed of the molecule, and the speed of binding and release between the molecule and cell structures.





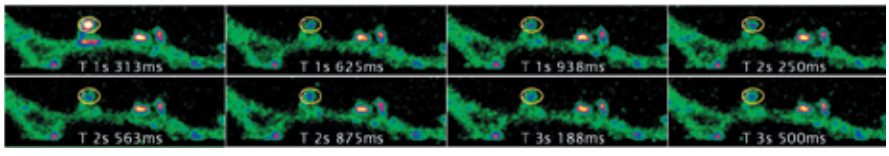
Example: Fluorescence Recovery Without Interactions

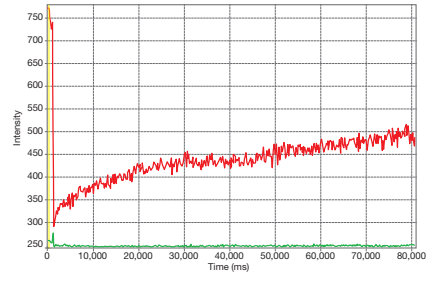
If the protein can freely diffuse, the bleached region recovers its fluorescence at a high speed due to Brownian motion.



Example: Fluorescence Recovery With Interactions

If the protein is strongly bound to a structure or forms part of a large protein complex, the bleached region recovers its fluorescence at a slower rate relative to the unbound state.

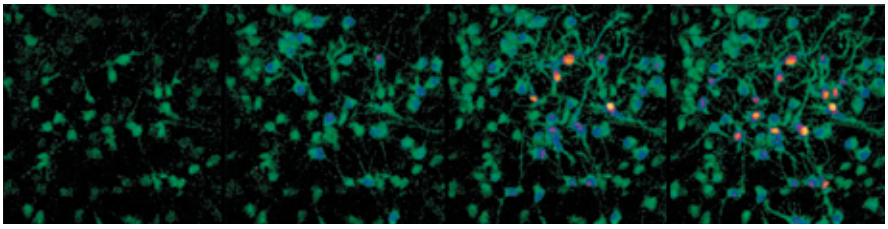


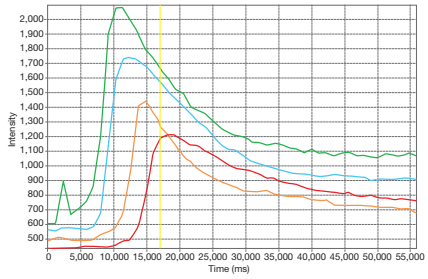


Specimen: Hippocampal neurons, Shank-GFP stain, 488nm excitation (multi-argon laser)
Image acquisition time: 100ms Bleach time: 80ms, 488nm excitation (Sapphire 488 laser)
Data courtesy of Dr. Shigeo Okabe,
Department of Anatomy and Cell Biology, Tokyo Medical and Dental University

Uncaging

A 405nm laser is optional for uncaging with the SIM scanner system. Caged compounds can be uncaged point-by-point or within a region of interest, while the main scanner of the FV1200 captures images of the response with no time delay.



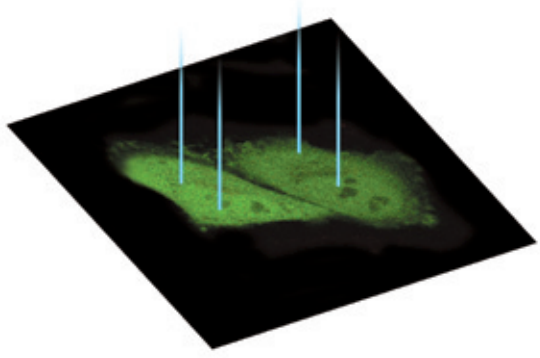


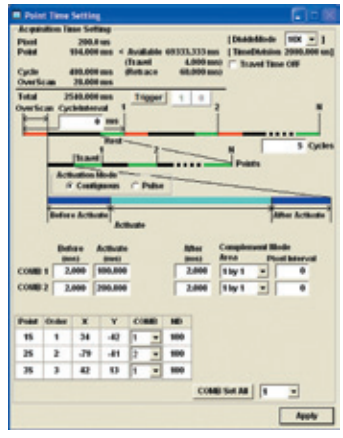
Caged-Glutamate
Fluorescent calcium indicator Fluo-3 in HeLa cells. Image acquisition at 1-second intervals
Using the caged compound Bhcmoc-Glutamate, an increase in calcium ion concentration inside the cell can be observed in response to glutamate stimulation, released via 405 nm laser illumination.
Data courtesy of Dr. Hiroshi Hama, Dr. Atsushi Miyawaki
RIKEN Brain Science Institute Laboratory for Cell Function Dynamics
Caged compound Bhcmoc-Glutamate presented by Dr. Toshiaki Furuta
Department of Science, Toho University

Multi-Stimulation Software

•High Speed Multipoint Scans

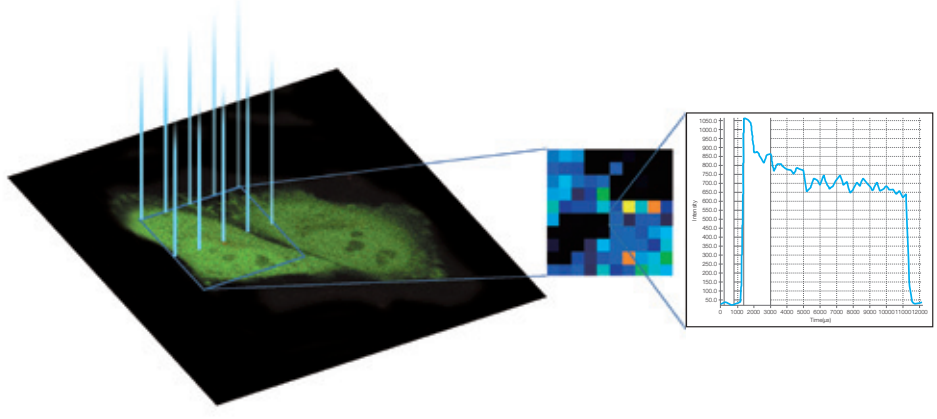
User can designate the number of points on an image for light stimulation. Stimulation timing, duration and interval can be defined in the magnitude of µs and the user can program the experiment with continuous or pulse stimulation. The same software also provides features that allows extended multiple points surrounding one single point to cover a small area.





•Mapping Scans

Light stimulation can be applied to a rectangular region of interest. Software control of stimulation of each point assures neighboring points will not be excited. This allows the user to observe reaction of sample more accurately. Changes in intensity from those points can be processed as a mapped image or graph.



DIFFUSION MEASUREMENT PACKAGE

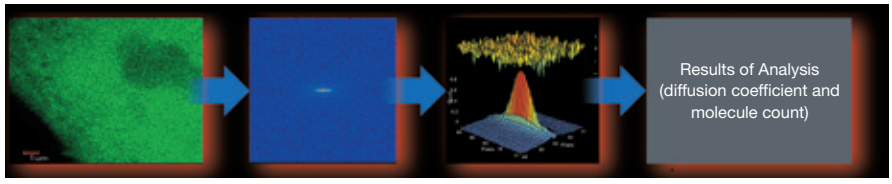
Diffusion Measurement Package Extends Analytical Capabilities

This optional software module enables data acquisition and analysis to investigate the molecular interaction and concentrations by calculating the diffusion coefficients of molecules within the cell. Diverse analysis methods (RICS/ccRICS, point FCS/point FCCS and FRAP) cover a wide range of molecular sizes and speeds.

RICS—Raster Image Correlation Spectroscopy

Raster image correlation spectroscopy (RICS) is a new method for analyzing the diffusion and binding dynamics of molecules in an entire, single image. RICS uses a spatial correlation algorithm to calculate diffusion coefficients and the number of molecules in specified regions. Cross correlation RICS (ccRICS) characterizes molecular interactions using fluorescent-labeled molecules in two colors.

RICS Analysis Method

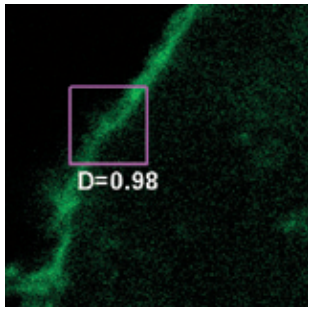


LSM Image | Spatial Correlation | Theoretical Formula Used for Fitting Calculation

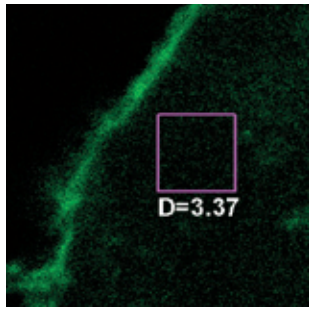
Comparison of Diffusion Coefficients for EGFP Fusion Proteins Near to Cell Membranes and In Cytoplasm

RICS can be used to designate and analyze regions of interest based on acquired images.
EGFP is fused at protein kinase C (PKC) for visualization, using live cells to analyze the translocation with RICS. The diffusion coefficient close to cell membranes was confirmed to be lower than in cytoplasm, after stimulation with phorbol myristate acetate (PMA). This is thought to be from the mutual interaction between PKC and cell membrane molecules in cell membranes.
In addition to localization of molecules, RICS analysis can simultaneously determine changes in diffusion coefficient, for detailed analysis of various intracellular signaling proteins.

At cytoplasmic membrane
Diffusion coefficient D=0.98μm²/s



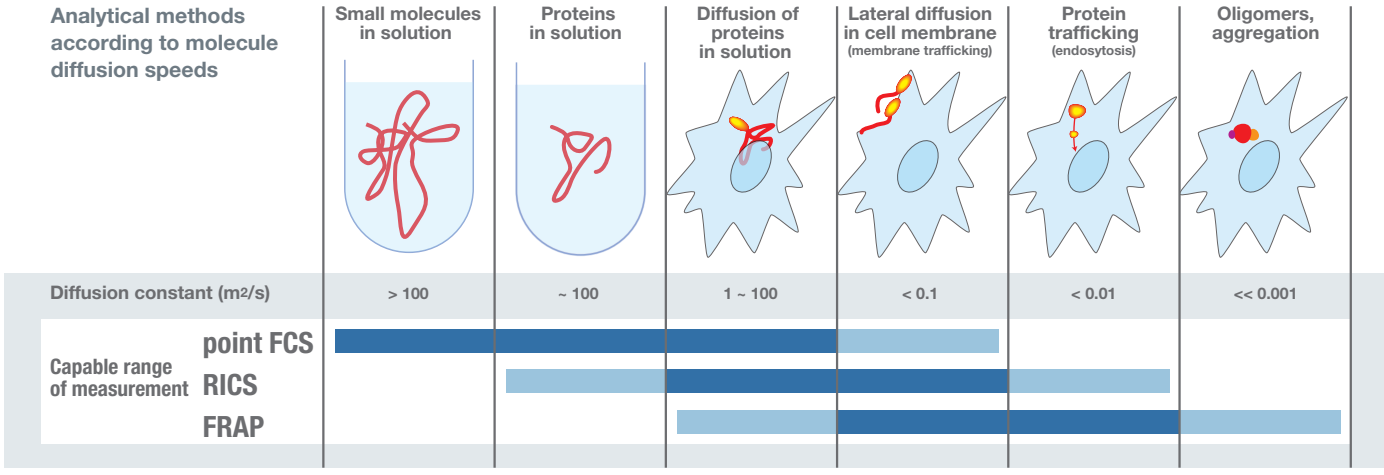
In cytoplasm
Diffusion coefficient D=3.37μm²/s



Sample image:
HeLa cells expressing EGFP fusion PKC (after PMA stimulation)

FRAP Analysis

The Axelrod analytical algorithm is installed as a FRAP analysis method. The algorithm is used to calculate diffusion coefficients and the proportions of diffusing molecules.

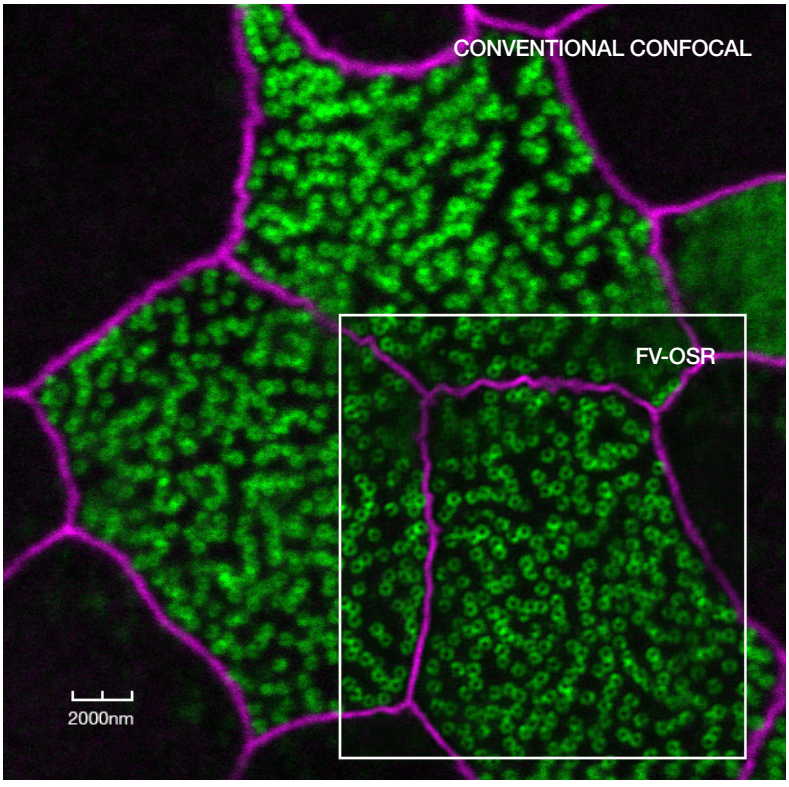


OLYMPUS' UNIQUE SUPER-RESOLUTION TECHNOLOGY

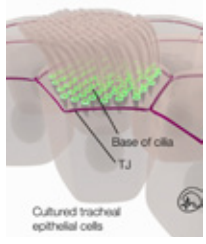
FV-OSR (Olympus Super Resolution) Technology

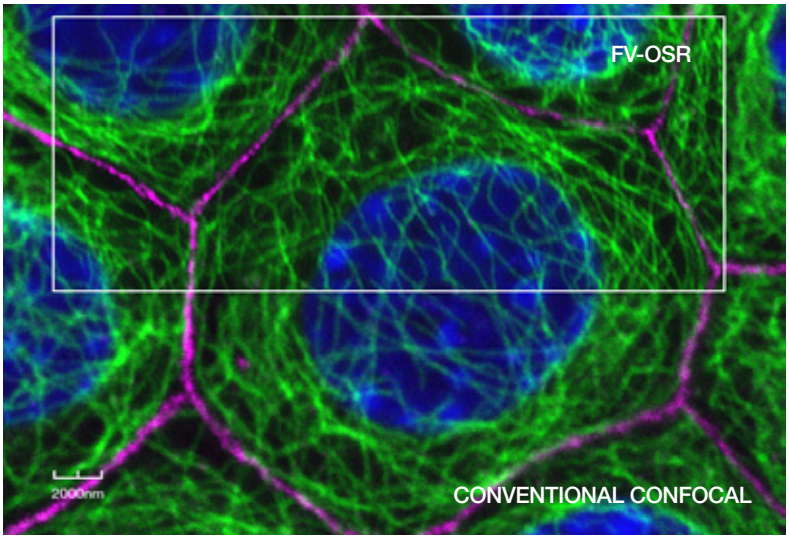
Olympus' widely applicable super-resolution method requires no special fluorophores, and can work for a wide range of samples in combination with a large selection of superior optics and high sensitivity detectors. Ideal for colocalization analysis, sequential or simultaneous acquisition of 2 fluorescent signals can lead to resolution of approximately 120 nm*, nearly doubling the resolution of typical confocal microscopy. Operation is simple, with minimal training requirements, and can be added to any FV1000 or FV1200 confocal system, making FV-OSR a truly accessible method for achieving super-resolution.

*Subject to objective magnification, numerical aperture, excitation and emission wavelength and experiential conditions.

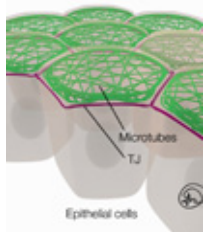


Trachea multi-ciliated epithelial cells (Culture)
Immunofluorescence microscopy:
Odf2 staining (Alexa Fluor 488, green)
ZO-1 staining (Alexa Fluor 568, magenta)
Staining for Odf2 encircled the base of cilia at the upper part of the basal body (green). Staining for ZO-1 revealed the tight junctions (magenta).
Objective: UPLSAPO60XS
Courtesy of Hatsuho Kanoh, Elisa Herawati, Sachiko Tsukita,Ph.D. Graduate School of Frontier Biosciences and Graduate School of Medicine, Osaka University





Cultured epithelial HeLa (EpH) cells.
Immunofluorescence microscopy:
α-tubulin staining (Alexa Fluor 488, green)
ZO-1 staining (Alexa Fluor 568, magenta)
Staining for ZO-1 revealed the tight junctions (TJs) (magenta).
Staining for α-tubulin showed an apical network of microtubules. This network associates with the TJ to form the "TJ-apical complex" (green).
Objective: UPLSAPO100XS
Courtesy of Hatsuho Kanoh, Tomoki Yano, Sachiko Tsukita,Ph.D. Graduate School of Frontier Biosciences and Graduate School of Medicine, Osaka University



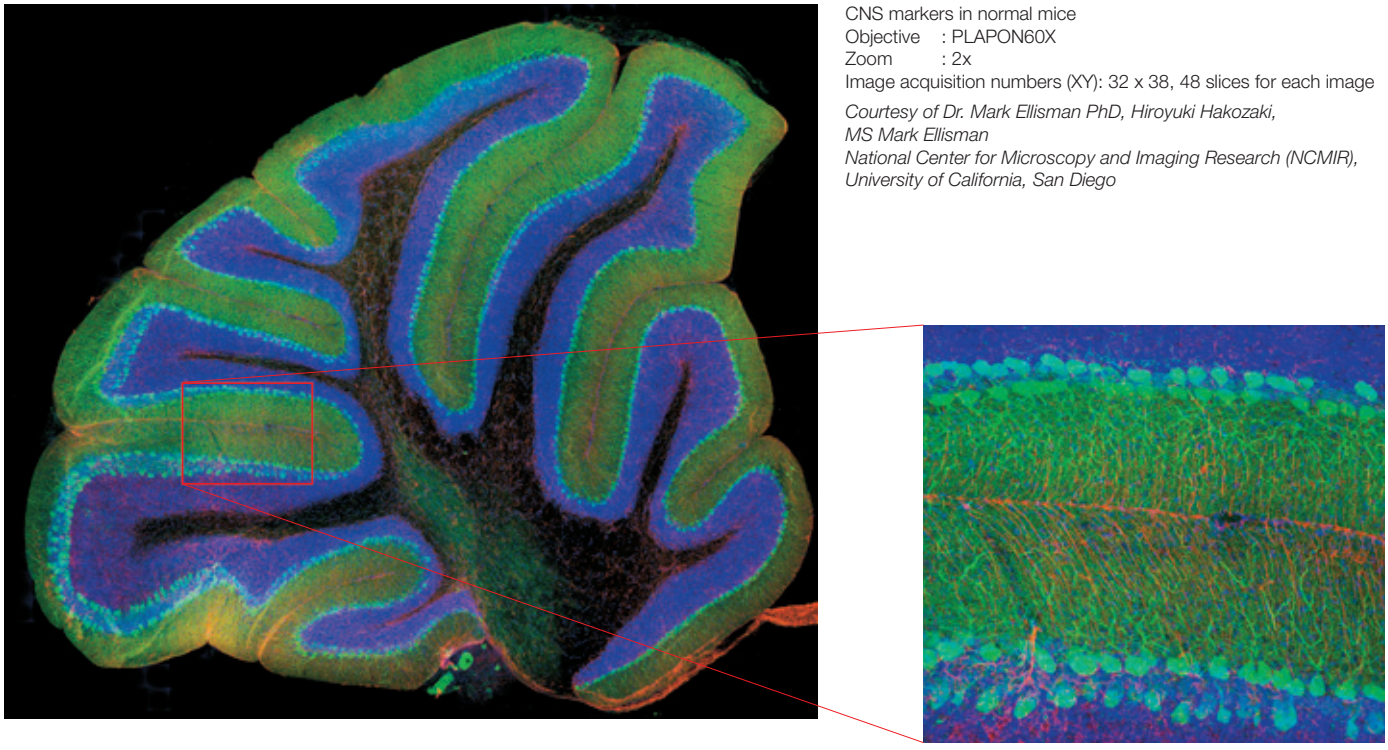
3D MOSAIC IMAGING

High-level Magnification With High Resolution for the Mosaic Imaging of Large-scale Specimens

Mosaic imaging is performed using a high-magnification objective to acquire continuous 3D (XYZ) images of adjacent fields of view using the motorized stage, utilizing proprietary software to assemble the images. The entire process from image acquisition to tiling can be fully automated.

Mosaic Imaging for 3D XYZ Construction

Composite images are quickly and easily prepared using the stitching function, to form an image over a wide area. 3D construction can also be performed by acquiring images in the X, Y and Z directions. Tiled images can be enlarged in sections without losing resolution. Particularly useful for “Connectome” or “Brain Mapping” type projects requiring large area scanning at high resolution. Tiling functions include true stitching and smoothing options for improved seamless images.

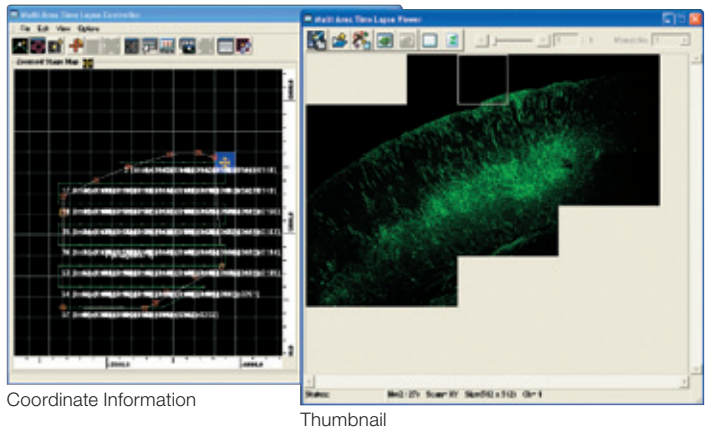


CNS markers in normal mice
Objective : PLAPON60X
Zoom : 2x
Image acquisition numbers (XY): 32 x 38, 48 slices for each image

Courtesy of Dr. Mark Ellisman PhD, Hiroyuki Hakozaki, MS Mark Ellisman
National Center for Microscopy and Imaging Research (NCMIR), University of California, San Diego

Automated from 3D Image Acquisition to Mosaic Imaging

Multi-area time-lapse software automates the process from 3D image acquisition (using the motorized XY stage) to stitching. The software can be used to easily register wide areas, and the thumbnail display provides a view of the entire image acquired during the mosaic imaging process.



Coordinate Information

Thumbnail

ACCESSORY UNITS THAT SUPPORT AN ARRAY OF APPLICATIONS

Laser Systems

The multi-combiner enables combinations with all of the following diode lasers: 405nm, 440nm, 473nm, 559nm and 635nm.
The system can also be equipped with conventional Multi-line Ar laser and HeNe(G) laser.

Dual Type
The multi-combiner outputs laser light with two fibers. Light can be used both for observation and photostimulation.

Single Type
Single channel laser output. AOTF is standard equipment.

Illumination Units

Conventional illumination modules are designed for long-duration time-lapse experiments. Since light is introduced through fiber delivery systems, no heat is transferred to the microscope.

Fluorescence Illumination Source/U-HGLGPS
The pre-centered fluorescence illumination source requires no adjustment and has an average lifespan of 2,000 hours.

Transmitted Light Detection Unit
External transmitted light photomultiplier detector and 100W Halogen conventional illumination, integrated for both laser scanning and conventional transmitted light Nomarski DIC observation. Motorized exchange between transmitted light illumination and laser detection. Simultaneous multi-channel confocal fluorescence image and transmitted DIC acquisition enabled.

Optional Upgrade Equipments for FV1200

Ultra-high Sensitivity Detector/GaAsP photomultiplier tubes
Achieve ultra-high sensitivity with low noise thanks to the gallium arsenide phoshide (GaAsP) detector and the onboard Peltier cooling system.

4th Channel Detector Unit
Attaches to the optional port of either the filter or spectral type scanning unit and is used as a 4th confocal fluorescence detection channel. This is a filter-based fluorescence detection unit.

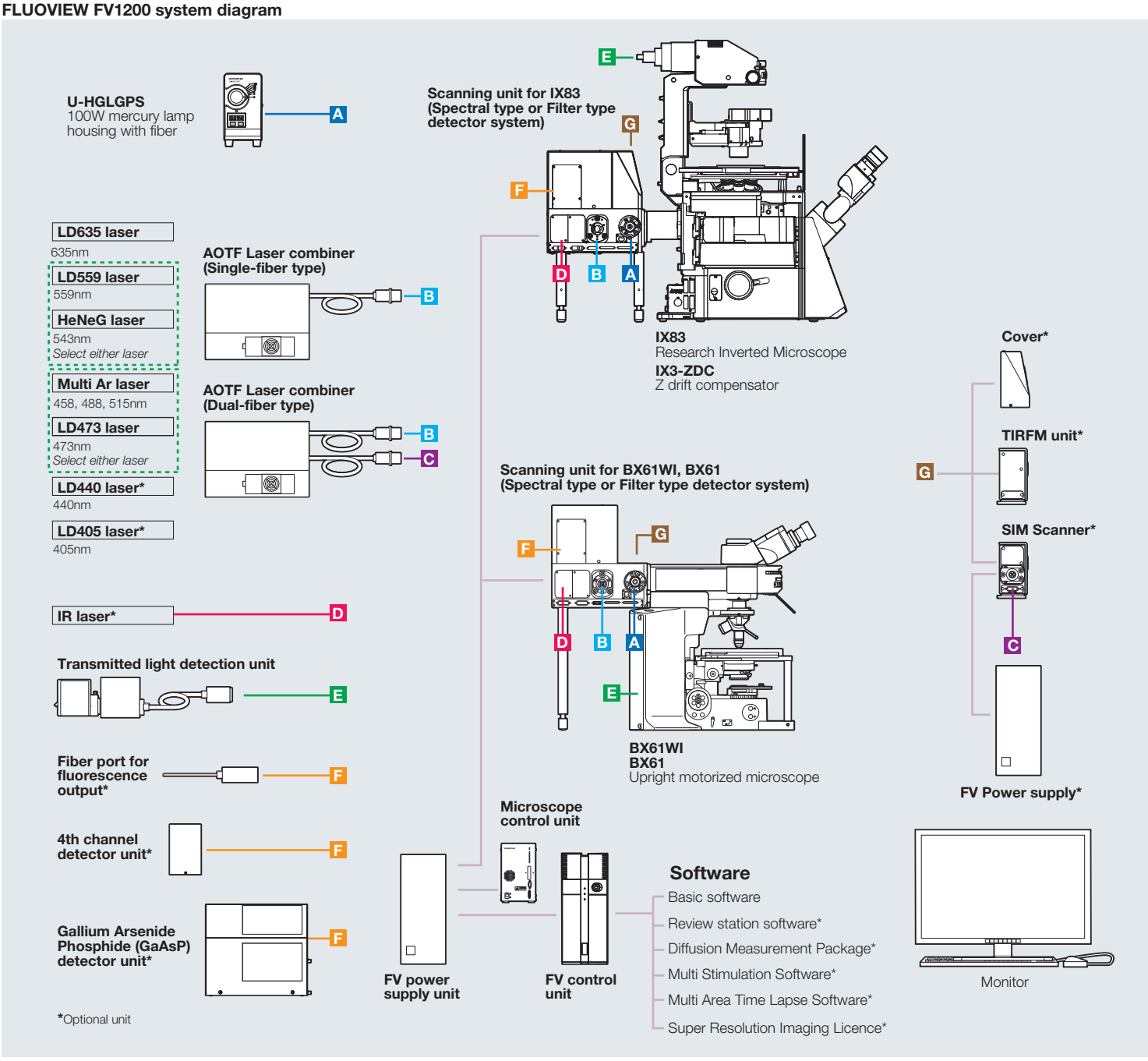
Fiber Port for Fluorescence Output
Confocal fluorescence emission can be introduced via fiber delivery system into external device. Fiber port equipped with FC connector (fiber delivery system not included).

SIM Scanner
Second scanner dedicated for photostimulation, synchronized to the FV1200 main scanner for simultaneous photostimulation and confocal image acquisition. Independent fiber optic laser introduction port. Dichromatic mirror within motorized optical port of the scan unit required for introduction of laser into main scanner.

TIRFM Unit
Enables control of the necessary volume of excitation light using FV1200 software. This unit enables TIRF imaging using the laser light source used with Confocal.

IX3-ZDC/Z-drift Compensator
Focal drift compensation for long time-lapse imaging.
* Requires IX83 microscope. For information about ZDC-compatible objectives, contact your Olympus dealer.

FLUOVIEW FV1200 system diagram



Objectives for BX2 and IX3
(using U-UCD8A-2, IX3-LWUCDA and U-DICTS)

Model	NA	W.D. (mm)	Cover glass thickness	Immersion liquid	Correction ring	Condenser for BX2 U-UCD8A-2 optical element	Condenser for IX3 IX3-LWUCDA optical element	U-DICTS position
UPLSAPO4X	0.16	13	—					
UPLSAPO10X2	0.40	3.1	0.17			U-DIC10	IX2-DIC10	normal
UPLSAPO20X	0.75	0.6	0.17			U-DIC20	IX2-DIC20	normal
UPLSAPO20XO	0.85	0.17	—	Oil		U-DIC20	IX2-DIC20	normal
UPLSAPO30XS	1.05	0.8	0.13–0.19	Silicone	✓	U-DIC60HC	IX2-DIC30	normal
UPLSAPO40X2	0.95	0.18	0.11–0.23		✓	U-DIC40	IX2-DIC40	normal
UPLSAPO40XS	1.25	0.3	0.13–0.19	Silicone	✓	U-DIC40	IX2-DIC40	BFP1
UPLSAPO60XO	1.35	0.15	0.17	Oil		U-DIC60	IX2-DIC60	BFP1
UPLSAPO60XW	1.20	0.28	0.13–0.21	Water	✓	U-DIC60	IX2-DIC60	normal
UPLSAPO60XS2	1.30	0.3	0.15–0.19	Silicone	✓	U-DIC60	IX2-DIC60	normal
UPLSAPO100XO	1.40	0.12	0.17	Oil		U-DIC100	IX2-DIC100	normal
UPLSAPO100XS	1.35	0.2	0.13–0.19	Silicone	✓	U-DIC100	IX2-DIC100	normal
PLAPON60XO	1.42	0.15	0.17	Oil		U-DIC60	IX2-DIC60	BFP1
PLAPON60XOSC	1.40	0.12	0.17	Oil		U-DIC60	IX2-DIC60	BFP1
UPLFLN40XO	1.30	0.2	0.17	Oil		U-DIC40	IX2-DIC40	BFP1
APON60XOTIRF	1.49	0.1	0.13–0.19	Oil	✓	U-DIC60	IX2-DIC60	BFP1
APON100XHOTIRF	1.65	0.1	0.15	Oil		U-DIC100	IX2-DIC100	normal
UAPON100XOTIRF	1.49	0.1	0.13–0.19	Oil	✓	U-DIC100	IX2-DIC100	normal
UAPON150XOTIRF	1.45	0.08	0.13–0.19	Oil	✓	U-DIC100	IX2-DIC100	normal

Objectives for Fixed Stage Upright Microscope
(using WI-UCD, WI-DICTHRA2)

Model	NA	W.D. (mm)	DIC prism	Revolving Nosepiece
MPLN5X	0.10	20.00	—	WI-SSNP, WI-SRE3
UMPLFLN10XW	0.30	3.50	WI-DIC10HR	WI-SSNP, WI-SRE3
UMPLFLN20XW	0.50	3.50	WI-DIC20HR	WI-SSNP, WI-SRE3
LUMPLFLN40XW	0.80	3.30	WI-DIC40HR	WI-SSNP, WI-SRE3
LUMPLFLN60XW	1.00	2.00	WI-DIC60HR	WI-SSNP, WI-SRE3
LUMFLN60XW	1.10	1.5	WI-DIC60HR	WI-SSNP, WI-SRE3
XLUMPLFLN20XW	1.00*	2.0	WI-DICXLU20HR	WI-SNPXLU2

* Note: These conditions are not met in confocal microscopy

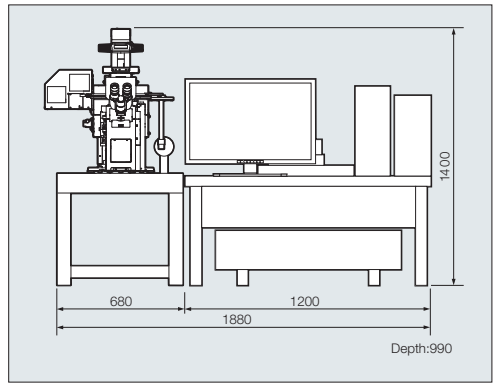
FLUOVIEW FV1200 major specifications

		Spectral Version	Filter Version
Laser Light	Violet/Visible Light Laser	LD lasers: 405nm: 50mW, 440nm: 25mW, 473nm: 15mW, 559nm: 15mW, 635nm, 20mW Multi-line Ar laser (458nm, 488nm, 515nm, Total 30mW), HeNe(G) laser (543nm, 1mW)	
	AOTF Laser Combiner	Visible light laser platform with implemented AOTF system, Ultra-fast intensity modulation with individual laser lines, additional shutter control Continuously variable (0.1%–100%, 0.1% increment), REX: Capable of laser intensity adjustment and laser wavelength selection for each region	
	Fiber	Broadband type (400nm–650nm)	
Scanning and Detection	Scanner Module	Standard 3 laser ports, Violet to IR Excitation dichromatic mirror turret, 6 position (High performance DMs and 20/80 half mirror), Dual galvanometer mirror scanner (X, Y) Motorized optical port for fluorescence illumination and optional module adaptation, Adaptation to microscope fluorescence condenser	
	Detector Module	Standard 3 confocal Channels (3 photomultiplier detectors) Additional optional output port light path available for optional units 6 position beamsplitter turrets with CH1 and CH2 CH1 and CH2 equipped with independent grating and slit for fast and flexible spectral detection Selectable wavelength bandwidth: 1–100nm Wavelength resolution: 2nm Wavelength switching speed: 100nm/ms CH3 with 6 position barrier filter turret	Standard 3 confocal Channels (3 photomultiplier detectors) Additional optional output port light path available for optional units 6 position beamsplitter turrets with CH1 and CH2 CH1 to CH3 each with 6 position barrier filter turret (High performance filters)
	Photo Detection Method	2 detection modes: Analog integration and hybrid photon counting	
	Scanning Method	2 silver-coated galvanometer scanning mirrors	
	Scanning Modes	Scanning speed: 512 x 512 (1.1 s, 1.6 s, 2.7 s, 3.3 s, 3.9 s, 5.9 s, 11.3 s, 27.4 s, 54.0 s) bidirectional scanning 256 x 256 (0.064 s, 0.129 s), 512 x 512 (0.254 s)	
		X,Y,T,Z,λ Line scanning: Straight line with free orientation, free line, Point scanning	X,Y,T,Z Line scanning: Straight line with free orientation, free line, Point scanning
	Pinhole	Single motorized pinhole pinhole diameter ø50–300µm (1µm step)	Single motorized pinhole pinhole diameter ø50–800µm (1µm step)
	Field Number (NA)	18	
	Optical Zoom	1x–50x in 0.1x increment	
	Z-drive	Integrated motorized focus module of the microscope, minimum increment 0.01µm or 10nm	
	Transmitted Light Detector Unit	Module with integrated external transmitted light photomultiplier detector and 100W Halogen lamp, motorized switching, fiber adaptation to microscope frame	
Microscope	Motorized Microscope	Inverted IX83 (IX83P2ZF), Upright BX61, Upright focusing nosepiece & fixed stage BX61WI	
	Fluorescence Illumination Unit	External fluorescence light source with motorized shutter, fiber adaptation to optical port of scan unit Motorized switching between LSM light path and fluorescence illumination	
System Control	Control Unit	OS: Windows 7 Professional (English version), Dedicated I/F board: built-in control unit	
	Power Supply Unit	Galvo control boards, scanning mirrors and gratings, Real time controller	Galvo control boards, scanning mirrors
	Display	SXGA 1280 x 1024, dual 19 inch (or larger) monitors or WQUXGA 2560 x 1600, 29.7 inch monitor	
Optional Unit	SIM Scanner	2 galvanometer scanning mirrors, pupil projection lens, built-in laser shutter, 1 laser port, Fiber introduction of near UV diode laser or visible light laser Optional: 2nd AOTF laser combiner	
	TIRFM Unit	Available laser: 405–635 nm. Motorized penetration ratio adjustment. Automatic optical setting for TIRFM objectives	
	Ultra-high Sensitivity Detector	Cooled GaAsP-PMT 2 channels	
	Fourth Confocal Detector	Module with photomultiplier detector, barrier filter turret, beamsplitter turret mounted with 3rd CH light path	
	Fiber Port for Fluorescence	Output port equipped with FC fiber connector (compatible fiber core 100–125µm)	
Software			
Image Acquisition		Normal scan: 64 x 64, 128 x 128, 256 x 256, 320 x 320, 512 x 512, 640 x 640, 800 x 800, 1024 x 1024, 1600 x 1600, 2048 x 2048, 4096 x 4096 Clip rectangle scan ,Clip ellipse scan ,Polygon clip scan,line scan ,free line scan,Point scan, Real-time image	
		2-dimension: XY, XZ, XT and Xλ 3-dimension: XYZ, XYT, XYλ, XZT, XTλ and XZλ 4-dimension: XYZT, XZTλ and XYTλ 5-dimension: XYZTλ	
Programmable Scan Controller		Time Controller function	
2D Image Display		Each image display: Single-channel side-by-side, merge, cropping, live tiling, live tile, series (Z/T/λ), LUT: individual color setting, pseudo-color, comment: graphic and text input	
3D Visualization and Observation		Interactive volume rendering: volume rendering display, projection display, animation displayed (save as OIF, AVI or MOV format) Free orientation of cross section display 3D animation (maximum intensity projection method, SUM method) 3D and 2D sequential operation function	
Image Format		OIB/ OIF image format 8/16 bit gray scale/index color, 24/ 32/ 48 bit color, JPEG/ BMP/ TIFF/ AVI/ MOV image functions Olympus multi-tif format	
Spectral Unmixing		2 Fluorescence spectral unmixing modes (normal and blind mode)	
Image Processing		Filter type: Sharpen, Average, DIC Sobel, Median, Shading, Laplacian Calculations: inter-image, mathematical and logical, DIC background leveling	
Image Analysis		Fluorescence intensity, area and perimeter measurement, time-lapse measurement	
Statistical Processing		2D data histogram display, colocalization	
Optional Software		Review station software, Off-line FLUOVIEW software for date analysis. Motorized stage control software, Diffusion measurement package, Multi stimulation software, Multi area time-lapse software, Super Resolution Imaging Licence	

Dimensions, weight and power consumption

		Dimensions (mm)	Weight (kg)	Power Consumption
Microscope with Scan Unit	BX61/BX61WI	320 (W) x 580 (D) x 565 (H)	41	—
	IX83	385 (W) x 835 (D) x 755 (H)	59	
Fluorescence Illumination unit	Lamp	180 (W) x 320 (D) x 235 (H)	6.7	
	Power Supply	90 (W) x 270 (D) x 180 (H)	3.0	AC 100-240 V 50/60 Hz 1.6 A
Transmitted Light Detection Unit		170 (W) x 330 (D) x 130 (H)	5.9	—
Microscope Control Unit		125 (W) x 332 (D) x 216 (H)	5.2	AC 100-120/220-240 V 50/60 Hz 3.5 A/1.5 A
FV Power Supply Unit		180 (W) x 328 (D) x 424 (H)	7.5	AC 100-120/220-240V 50/60 Hz 4.0 A/2.0 A
Display	19 inch, dual (value per monitor)	363 (W) x 216 (D) x 389.5–489.5 (H)	5.9	AC 100-120/200-240 V 50/60 Hz 0.65 A/0.4 A
	29.7 inch	694 (W) x 276 (D) x 489–589 (H)	13.0	AC 100-240 V 50/60Hz 2.0 A
Power Supply Unit for Laser Combiner		210 (W) x 300(D) x 100 (H)	4.0	AC 100-120/220-240 V 50/60 Hz 2.0 A/1.0 A
Laser combiner (with Ar laser heads)		514 (W) x 504 (D) x 236 (H)	45	—
Laser Combiner (without Ar laser heads)		514 (W) x 364 (D) x 236 (H)	40	—
LD559 Laser Power Supply		200 (W) x 330 (D) x 55 (H)	1.2	AC 100-240 V 50/60 Hz 30 W
Multi Ar Laser Power Supply		162 (W) x 287 (D) x 91 (H)	4.4	AC 100-240 V 50/60 Hz 20 A
HeNe(G) Laser Power Supply		130 (W) x 224 (D) x 65 (H)	1.8	AC 200-240 V 50/60 Hz 0.23 A

Recommended FV1200 system setup (IX83, BX61, BX61WI)



(Unit:mm)

Images are courtesy of the following institutions:

Dopaminergic neural circuits of the fruit fly Drosophila brain (adult female). Three-channel antibody labeling of the brain in which an expression driver strain that mimics the expression pattern of the Dopamine-producing enzyme was used for activating simultaneous expression of three reporter molecules, each fused with a membrane protein for visualizing cell bodies and neurites (shown in green), with a transmitter receptor protein for visualizing postsynaptic cites (in blue), and with a synaptic vesicle-docking protein for visualizing postsynaptic cites.
Courtesy of Jun Tanimura, Ph. D., Kei Ito, Ph. D., Institute of Molecular and Cellular Biosciences, University of Tokyo (cover page)

Glandular and non-glandular leaf hairs (trichomes) of Pelargonium
Courtesy of Dr. Ferhan Ayaydin, Cellular Imaging Laboratory, Biological Research Center, Szeged, Hungary (1, on the page 1)

Pilidium larva of Micrura alaskensis
Courtesy of Dr. Svetlana Maslakova of the University of Washington and Dr. Mikhail V Matz of the Whitney Laboratory for Marine Bioscience, University of Florida (2, on the page 1)

CFP and YFP labelling of glycerol cleared fruit fly brain taken with 30x silicone objective
Courtesy of Dr.Hidehiko Inagaki, Anderson lab, California Institute of Technology (3, on the page 1)

Cultured nerve cells derived from the mouse hippocampus
Courtesy of Dr. Koji Ikegami, Dr. Mitsutoshi Setou, Molecular Geriatric Medicine, Mitsubishi Kagaku Institute of Life Sciences (5, on the page 1, lower, on the page 2)

Drosophila, Stage 14
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