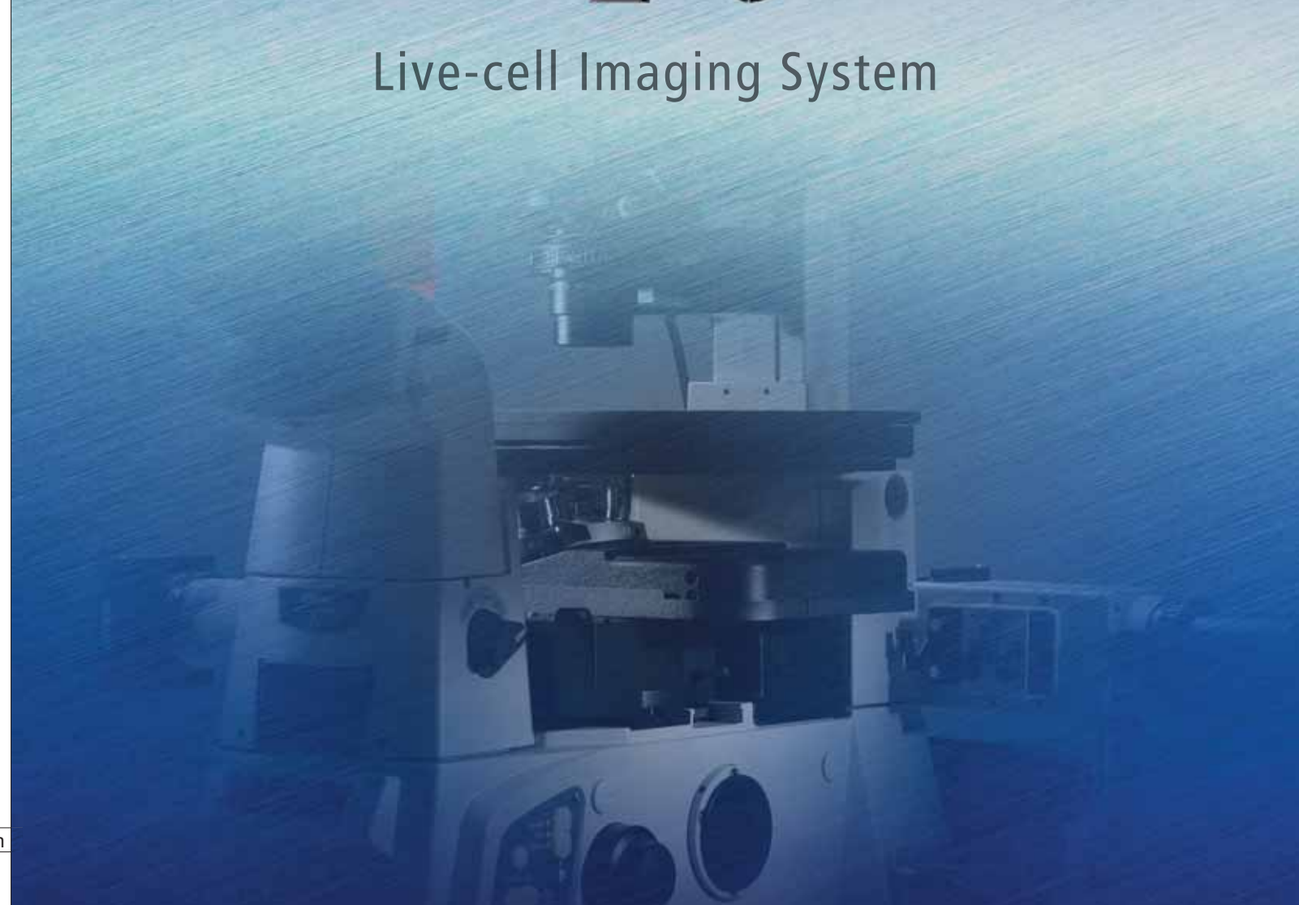
Inverted Research Microscope

ECLIPSE Ti

Live-cell Imaging System



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ECLIPSE Ti

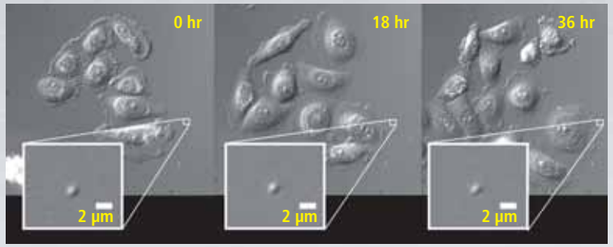
Total imaging system control with NIS-Elements software for accurate and reliable live-cell data acquisition

Developed around the Ti series inverted research microscope platform, these live-cell imaging systems incorporate Nikon's comprehensive NIS-Elements software for fully integrated system control, including a wide range of accessories and 3rd party products, such as stages, focus drives, cameras, illuminators, and other peripheral devices. The Ti live-cell imaging systems support stable and reliable long-term multi-color, multi-point live-cell observation through intuitive, simple control of all high-performance accessories.

Multi-dimensional Time-lapse Imaging

Nikon's exclusive Perfect Focus System (PFS) corrects focus drift in real time during long-term multipoint observation and when reagents are added. Focus can be maintained over hours and days. Integrated control of the microscope and motorized accessories with NIS-Elements imaging software facilitates long-term multi-dimensional time-lapse imaging.

Focus maintained during long-term time-lapse observation

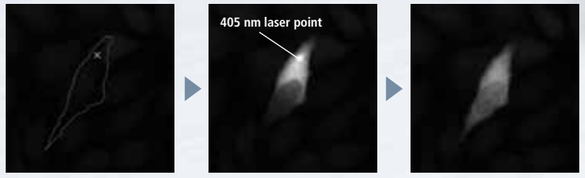


Specimen: HeLa cell proliferation over 0-36 hours
Objective: CFI Plan Fluor 40x (NA 0.75)

Photoactivation

The photoactivation illuminator allows excitation of a desired point or circular region with a specified wavelength. Spot excitation with UV or near UV wavelengths allows photoconversion and photoactivation at specific cellular regions to activate molecules labeled by fluorescence proteins such as Kaede or PA-GFP. This facilitates visualization of dynamic events on a molecular level, enabling analysis of intracellular processes.

Photoactivation of PA-GFP in a living mammalian cell

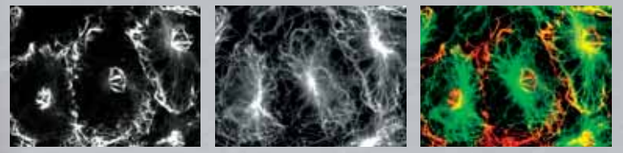


Photos courtesy of Dr. Tomoki Matsuda and Prof. Takeharu Nagai, Research Institute for Electronic Science, Hokkaido University

Laser TIRF

Nikon's TIRF objectives make it possible to introduce laser illumination at incident angles greater than the critical angle because of their high numerical apertures (NA). This enables Total Internal Reflection Fluorescence (TIRF) that creates an evanescent wave immediately adjacent to the coverslip-specimen interface, allowing excitation and visualization of an ultra-thin optical section approximately 100 nm from the coverslip surface, resulting in the highest Signal-to-noise ratio possible. The TIRF illuminator, which is highly corrected for chromatic aberrations, is the ideal choice for multi-color TIRF imaging. The motorized laser TIRF illumination unit allows storage and recall of laser incident angles and laser powers using NIS-Elements software, allowing calibration for multiple wavelengths to be saved and recalled during multi-dimensional experiments.

TIRF image of coverslip-specimen interface, epi-fluorescence image of entire cell



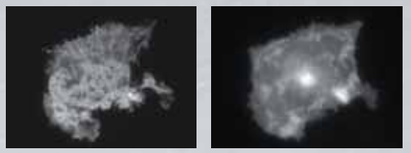
Laser TIRF image | Epi-fluorescence image | TIRF/epi-fluorescence image overlay (pseudo color)

Photos courtesy of Dr. Gregg G. Gundersen, Columbia University

White-light TIRF

Nikon's unique white-light TIRF system enables multiple methods of fluorescence observation including TIRF, oblique light fluorescence and epi-fluorescence with white light. By exciting a limited depth, white-light TIRF enables images with a much higher S/N (signal-to-noise) ratio than is possible using standard epi-fluorescence methods. With oblique light fluorescence, increasing the angle of incident light beyond that of TIRF allows a deeper range of observation in the area near the coverslip.

White-light TIRF and epi-fluorescence images using the same light source



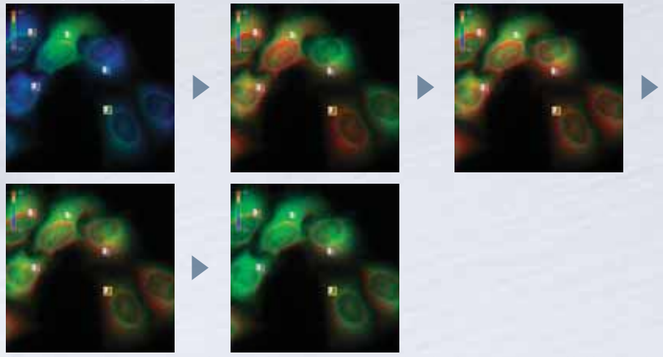
White-light TIRF image | Epi-fluorescence image

Photos courtesy of Dr. Yasushi Okada, Laboratory for Cell Polarity Regulation, Quantitative Biology Center, RIKEN

FRET

FRET has been utilized to develop many molecular bio-sensors, and the Ti's multi-level stratum structure allows the use of two fluorescence cube turrets in tiers, allowing various configurations for FRET acquisition. Using dual cameras attached to the back port and side port to capture different wavelength images simultaneously, highly accurate measuring of intensity ratios can be achieved. This facilitates research applying the Förster Resonance Energy Transfer (FRET) technique that supports analysis of intermolecular interactions.

Time-lapse imaging of $[Ca^{2+}]i$ release



Photos courtesy of Dr. Kenta Saito and Prof. Takeharu Nagai, Research Institute for Electronic Science, Hokkaido University

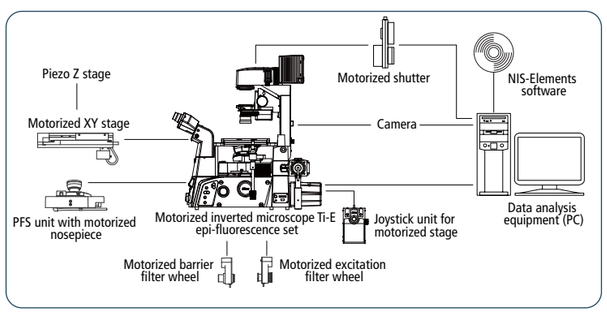
Comprehensive software integrates control of entire live-cell imaging system

Designed to meet the needs of advanced bioresearch, NIS-Elements is comprehensive software that provides a totally integrated solution for Nikon equipment and other manufacturer's accessories. It delivers automated intelligence to microscopes, cameras and peripheral components through a logical and simple control interface. The software optimizes imaging routines and provides the ability to closely monitor and adjust illumination and camera exposure, minimizing unnecessary illumination to critical live cell specimens.

* Available functions differ depending on NIS-Elements package

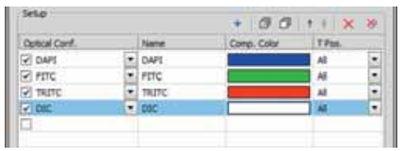
6D time-lapse imaging system

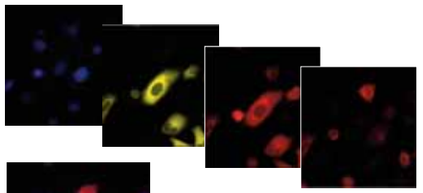
The intuitive interface and workflow of NIS-Elements facilitates complex experiments with ease, while a diverse suite of analysis tools supports measurement, automated counting, documentation and a database, allowing the programming of automated sequences for multi-dimensional experiments (X, Y, Z, t (time), Lambda (wavelength), and multipoint).

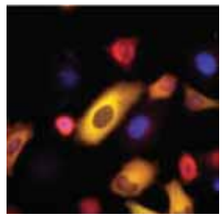


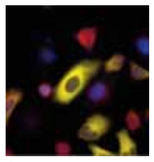
Multi-channel (multi-color) image acquisition

NIS-Elements can acquire full intensity bit depth multi-color images, combining multiple fluorescence wavelengths and different illumination methods (DIC, phase contrast etc.). Each channel's raw data is maintained, while at the same time the channels can be combined and independently scaled, overlaid, or tiled for various viewpoints of the data.



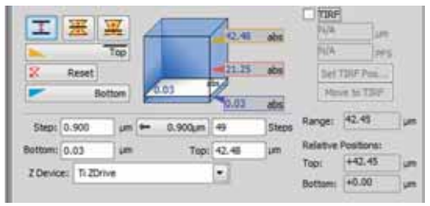

Single-color images

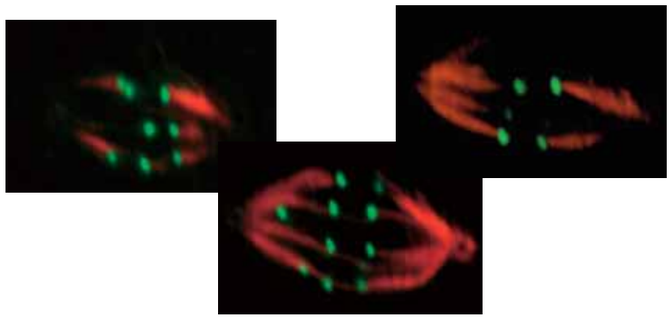

All-color merged image


Specified-color merged image

Z-series image acquisition

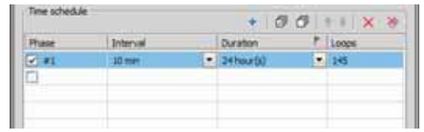
Through motorized focus control, NIS-Elements reconstructs and renders 3D volume images from multiple Z-axis planes, or renders 3D over time views of time-lapse Z series data.

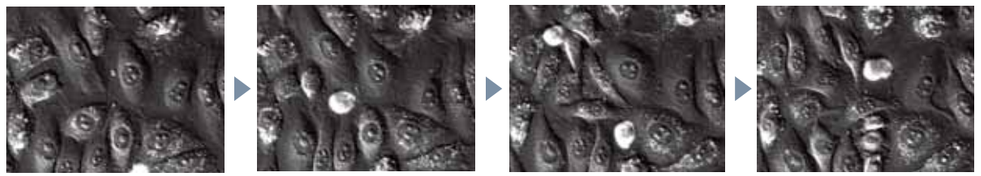




Time-lapse image acquisition

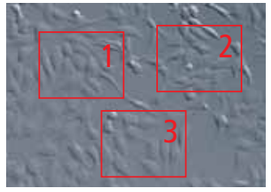
Time series acquisition in NIS-Elements automatically controls mechanical shutters and illumination devices according to configurable interval and duration settings, and can be used in conjunction with Ti Perfect Focus System to enable focus drift correction over the course of a time-lapse.

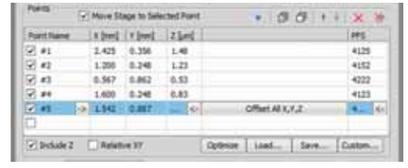




Multi-point image acquisition

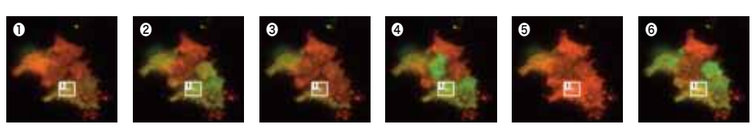
NIS-Elements' motorized stage control offers automated travel to multiple stage points of the sample, including regular patterns such as multi-well plates and chamber slides, or dishes. The software can optimize the order of stage positions for shortest distance and fastest time in time-lapse experiments. Users can also move the motorized stage by navigating with a mouse with live images onscreen for precise positioning of their samples.

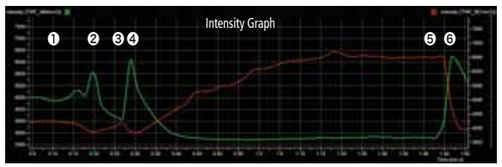


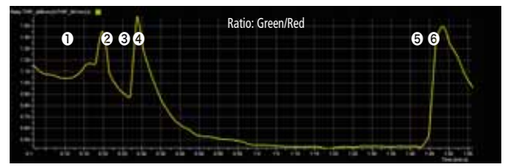


Time (Intensity) Measurement

Time measurement creates a graph of sequential intensity changes while time-lapse imaging or from captured time-lapse images. Ratio view function allows the measurement of the ratio of two wavelengths across multiple ROIs and shows the ratio value by pixel. Numeric data and graph images are exportable and the measurements on the graph are available as well.







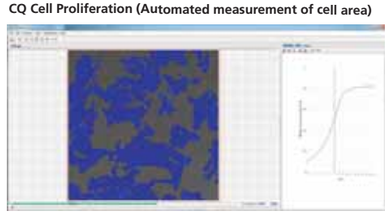
Green: Fluo-4, red: DsRed

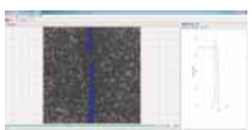
Cell Image Analysis Option

NEW

The CQ series optional module for NIS-Elements Ar/C enables quantitative live-cell analysis utilizing non-invasive label-free phase contrast images. Selecting the desired magnification and pre-programmed "recipe," which is optimized for various cell types, automatically launches cell detection and analysis.

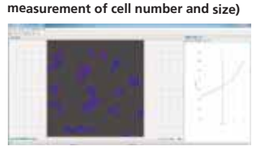
CQ Cell Proliferation (Automated measurement of cell area)





CQ Wound Healing (Automated measurement of wound area in the repair process)

CQ Cell Count (Automated measurement of cell number and size)



CQ Cell Motility (Automated tracking of cell movement)

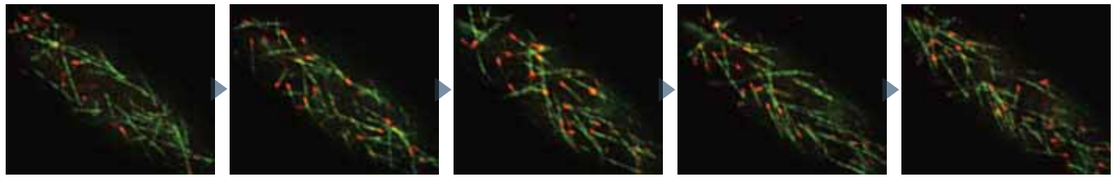
PFS, the automatic focus correction system for long-term time-lapse imaging

NEW

Ti-E PFS

Nikon's Perfect Focus System (PFS) provides real-time focus correction that overcomes microscope focus drift caused by thermal and mechanical effects. The use of PFS dramatically improves the quality of long-term time-lapse image data.

Nikon's Perfect Focus System (PFS) automatically corrects focus drift caused by thermal and mechanical changes that occur during long-term observations and when reagents are added. Images remain in focus even when using higher magnification and higher resolution techniques such as TIRF imaging. The latest generation of PFS offers significant enhancements, setting a new standard for live cell imaging. Its streamlined design enables easier access to objective lenses and correction collars. Two models are available: one for UV-visible imaging and another for Visible-IR imaging for multiphoton microscopy.

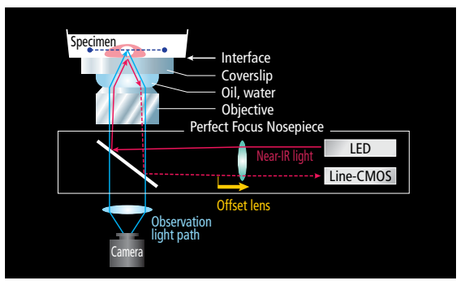


EB1 and tubulin in the cortex of Physcomitrella patens moss
Images were acquired on a spinning disk confocal with a CFI Plan Apochromat VC 100x 1.4 NA lens at the Marine Biological Laboratory.
Photos courtesy of: Drs. Jeroen de Keijzer and Marcel Janson, Wageningen University, and Dr. Gohta Goshima, Nagoya University.

Optical offset technology

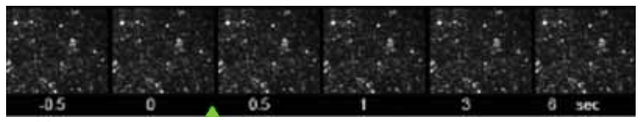
Nikon's proprietary technology allows focusing at a desired height above the coverslip while simultaneously detecting the coverslip interface. PFS immediately corrects focus drift resulting from stage movement during multi-point imaging or temperature drops when reagents are added. PFS eliminates the need to capture extra images of different planes in anticipation of focus drift, resulting in minimized light exposure and photobleaching.

Perfect Focus System concept

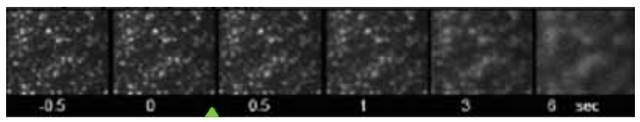


The diagram shows the case when an immersion type objective is used. A dry type objective is also available.

Correction to focus drift when reagents are added



• **With PFS** Adding reagent

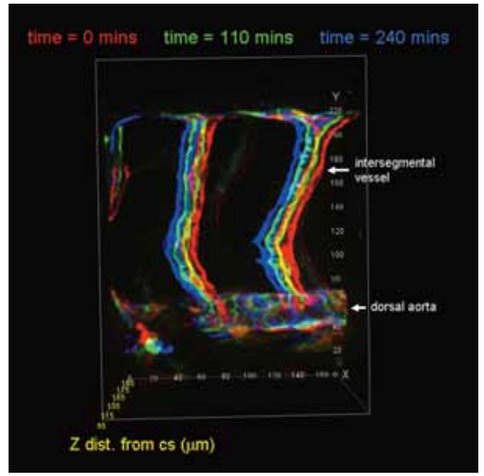


• **Without PFS** Adding reagent

The change in temperature caused by adding media (indicated by the arrow) causes the focus to drift if PFS is not used. Engaging PFS eliminates this problem entirely.

Maintaining focus at greater depths

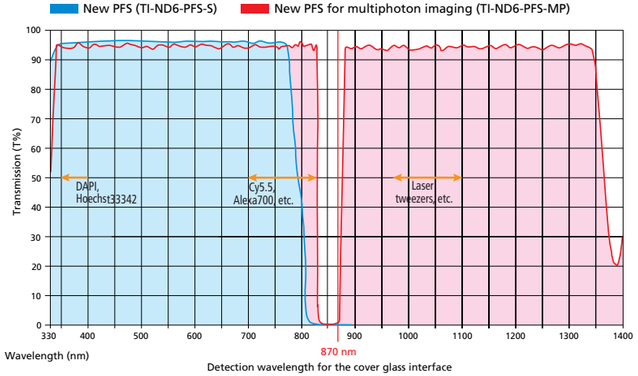
Due to its improved optics and sensitivity, PFS allows for correction of focus drift at significantly greater distances from the objective lens and at greater depths within the specimen than before. This capability is ideal for developmental biology and applications that require studying the dynamics of cells in thick samples such as tissues or organs. This broadened focus drift correction range results in more reliable data.

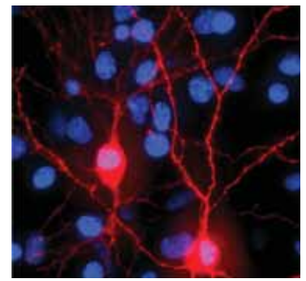


3D time-lapse image of the developing vasculature of a zebrafish embryo (Z-series is imaged at 95-186 µm away from the coverslip). Because PFS can maintain focus at greater depths within the specimen, whole images of intersegmental vessels sprouting upward from the dorsal aorta are clearly captured. Shown in the three channels are three different timepoint volumes.
Objective: CFI Apochromat LWD 40x WI λS, NA 1.15
Photo courtesy of: Dr. Robert Fischer, Marine Biological Laboratory

Compatible with diverse fluorescence dyes with improved performance in broader wavelength range

PFS utilizes an 870nm wavelength LED for detection of the coverglass interface, enabling imaging of near-infrared fluorescence dyes such as Cy5.5 without interference. The overall wavelength range has increased, allowing researchers to acquire focused-data sets in applications that require a broad spectrum of imaging wavelengths, including Ca^{2+} imaging in the UV range and laser tweezer applications in the IR range.
The multiphoton model can correct for focus drift even when imaging with wavelengths ranging from 880-1300 nm.





Live imaging of primary rat cortical neurons stained with Hoechst33342 and DiR

Photo courtesy of: Drs. Ippei Kotera and Shinya Hosaka, and Prof. Takeharu Nagai, Research Institute for Electronic Science, Hokkaido University

Compatible with plastic dishes and well plates

In addition to glass bottom dishes, plastic dishes, which are less expensive but suitable for cell culture, can be used with PFS. This plastic-compatibility feature enables a cost-effective means for focused imaging in high-throughput screening applications that involve multi-well plates.

Nikon's unique multi-color laser TIRF system with motorized intelligence

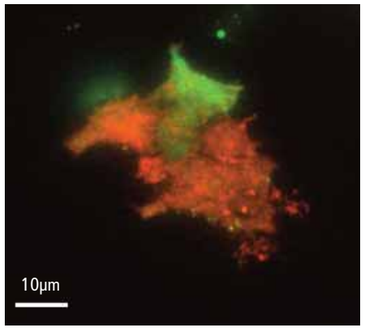
Ti-E Ti-U

The laser TIRF (Total Internal Reflection Fluorescence) system enables ultra-high signal-to-noise (S/N) ratio imaging of single fluorescent molecules localized near cell membranes in living cells. Both motorized type and manual type TIRF illuminators are available.

Configuration with the Ti-E and motorized laser TIRF illuminator unit

Multi-color TIRF imaging

With Nikon's laser TIRF system, chromatic aberrations are corrected both with the apochromatic illumination unit and the apochromatic objectives. Sharp and reliable multi-color TIRF images are acquired with minimum intensity deviation, as the focus is maintained even when wavelengths are switched.



Green: Fluo-4, red: DsRed
Objective: CFI Apochromat TIRF 60x Oil

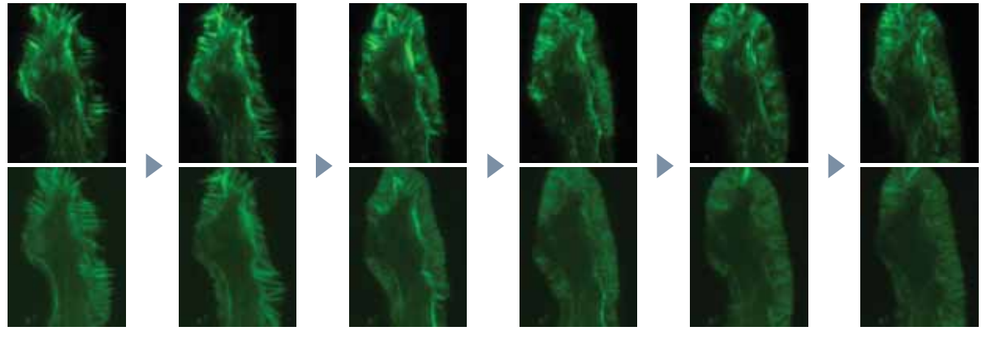
Motorized control of laser incident angles

The motorized laser TIRF illumination unit allows laser incident angle adjustment, shutter control and switching to epi-fluorescence illumination from a control pad or with NIS-Elements software. The laser incident angle can be saved with a single touch of the control pad button and easily recalled. This enables alternate time-lapse recording between epi-fluorescence and TIRF images, and supports temporal and spatial dynamic analysis of intracellular protein molecules.

Remote controller

Motorized TIRF illuminator unit

Time-lapse imaging by switching TIRF and epi-fluorescence observation



NG108 cell: Growth cone stained with EGFP-fascin
Photos courtesy of: Drs. Satoe Ebihara and Kaoru Katoh, The National Institute of Advanced Industrial Science and Technology (AIST)

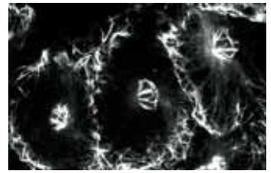
TIRF Objectives with unprecedented NA 1.49

Nikon has developed TIRF objectives with a NA of 1.49. With correction of all optical aberrations throughout the visible spectrum, the objectives are the optimum design for multi-color TIRF imaging. These lenses can be used with standard coverslips and immersion oils. Moreover, these objectives incorporate a correction ring for adjustment for temperature changes and coverslip thickness. Negative influences on image quality resulting from temperature-induced changes in the refractive index of the immersion oil within the temperature range of 23°C (room temperature) and 37°C (physiological temperature) are eliminated. Additionally, the elimination of influences from variations in coverslip thickness allows high-resolution images to be captured at diffraction limited resolutions.

CFI Apochromat TIRF 60x Oil (left)
CFI Apochromat TIRF 100x Oil (right)

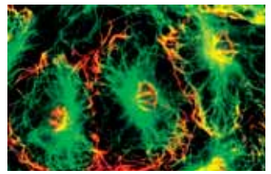
Overview of TIRF

TIRF allows high-sensitivity, high-contrast dynamic imaging of molecules utilizing a unique optical property for imaging near the coverslip, usually corresponding with surfaces of cells or substrates. When a coverslip is illuminated with a laser at an incident angle greater than the critical angle for an objective lens, total internal reflection occurs due to refractive index differences between the glass and the solution. Under these conditions, an evanescent wave is generated within approximately 100nm of the coverslip-specimen interface. By using this light to excite the coverslip-specimen interface, fluorescence images of a very thin area in contact with the coverslip can be acquired with extremely high signal-to-noise (S/N) ratio, because only this thin area is illuminated.

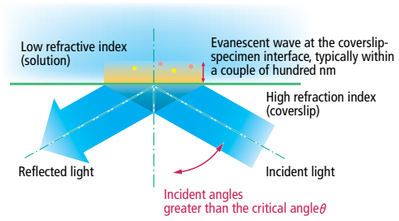


Laser TIRF image

Epi-fluorescence image

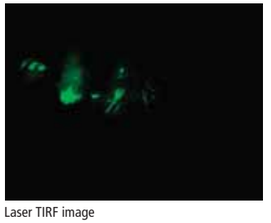


TIRF/epi-fluorescence image overlay (pseudo color)

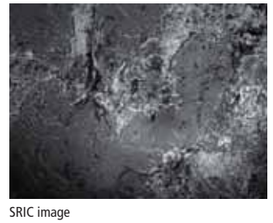


SRIC (Surface Reflection Interference Contrast) method can reveal focal contacts prior to switching to TIRF

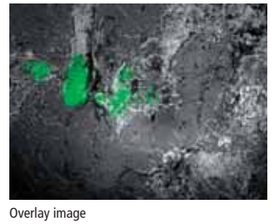
SRIC technique makes all parts of the specimen in contact with a glass coverslip appear black, allowing the user to confirm whether a specimen has adhered to the glass before proceeding with TIRF observation. As no excitation light is used in this process, specimen damage is minimized and more time can be spent on acquiring data. Switching from laser TIRF and white-light TIRF to SRIC is as simple as switching to the special filter cube.



Laser TIRF image



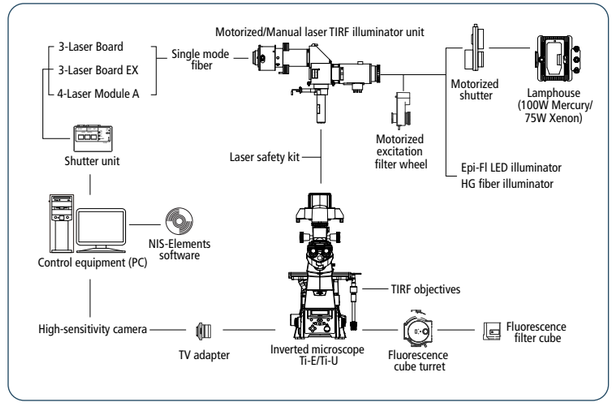
SRIC image



Overlay image

HeLa cell
Photos courtesy of: Dr. Masaya Hashido, Cellular and Molecular Pharmacology, Faculty of Medicine, the University of Tokyo

System diagram



White light TIRF | Oblique light fluorescence | Epi-fluorescence | SRIC

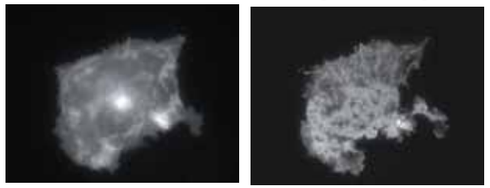
High S/N near membrane imaging with white light TIRF

Ti-E Ti-U Ti-S

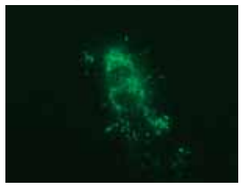
Nikon's unique white light TIRF system enables TIRF microscopy using affordable mercury lamps. By exciting a confined depth, white light TIRF enables imaging of fluorescence images with a much higher signal-to-noise ratio than is possible using widefield epi-fluorescence methods. Increasing the angle of incident light to slightly more than that of laser TIRF allows a deeper range of imaging in the area near the coverslip.
White light TIRF, epi-fluorescence, oblique light fluorescence and SRIC (surface reflection interference contrast) techniques are all possible using a single mercury illumination. As mercury illumination has a broad wavelength range, the wavelength of the TIRF excitation can be selected by changing fluorescence filters.

Configuration with the Ti-E

Epi-fluorescence image | **White-light TIRF image**



White-light TIRF image

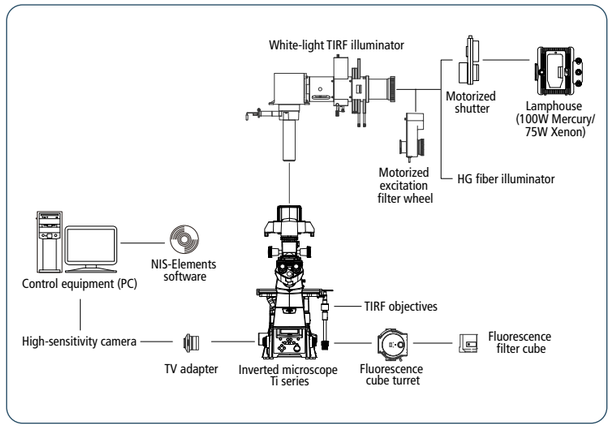


A YFP-fusion protein is targeted to the membranes of COS cells. As both modes use the same light source, switching between them is simple. Fluorescence emitted from various cell membranes, including the Golgi apparatus is seen in epi-fluorescence imaging, while white-light TIRF imaging allows specific visualization of the cell membrane adjacent to the coverslip.
Images courtesy of Dr. Yasushi Okada, Laboratory for Cell Polarity Regulation, Quantitative Biology Center, RIKEN

GFP-myosin X motor protein was expressed in cultured cells. Dynamic activities of myosin X can be observed in the cell's fine filopodia.
Image courtesy of Richard Cheney Ph.D., UNC Chapel Hill

Epi-FL illuminator unit with White Light TIRF

System diagram



Photoactivation | Epi-fluorescence

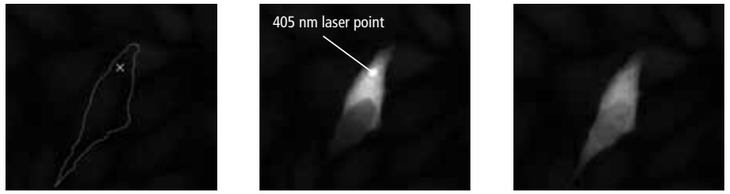
Photoactivation of PA-GFP/Kaede for cell marking and observation of cell dynamics

Ti-E Ti-U

The photoactivation illuminator unit can pinpoint a selected area in a cell with a laser. The excitation with a specific wavelength such as 405 nm allows fluorescent time-lapse observation of the dynamic behavior of living cells by causing photoactivation or photoconversion. For example, by marking cells with PA-GFP photoconvertible protein, which increases fluorescence intensity 100 times, or Kaede, which changes fluorescence colors from green to red, fluorescent time-lapse observation of localization of intercellular proteins and dynamic changes is possible.

Photoactivation illuminator unit configured with the Ti-E

Photoactivation of PA-GFP in a living mammalian cell by 405 nm laser irradiation



Photos courtesy of Dr. Tomoki Matsuda and Prof. Takeharu Nagai, Research Institute for Electronic Science, Hokkaido University

Photoactivation illuminator unit

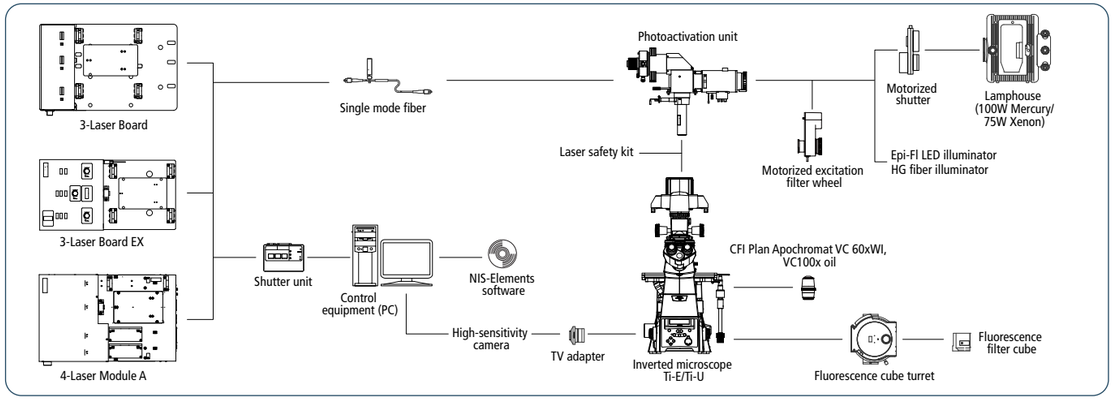
TIRF-photoactivation illuminator unit

Photoactivation | Laser TIRF | Epi-fluorescence | SRIC

With the integration of the laser TIRF illuminator and photoactivation unit, both functions are now combined on one microscope. The user can switch between the two functions with ease.

TIRF-photoactivation illuminator unit

System diagram

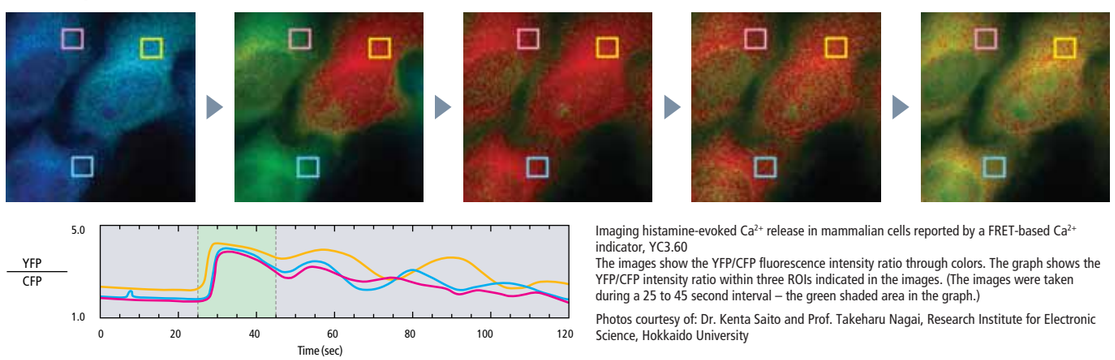


High-definition and accurate FRET analysis imaging

Ti-E Ti-U Ti-S

The stratum structure of the Ti microscope enables each optical path to be mounted with two fluorescence cube turrets and cameras, allowing the simultaneous capture of a two-wavelength FRET. The new high-transmittanceλS objectives correct chromatic aberrations over a wide wavelength range, enabling more accurate measurement of wavelength ratios between fluorophores.

FRET analysis of intracellular calcium concentration ([Ca²⁺]i)



Imaging histamine-evoked Ca^{2+} release in mammalian cells reported by a FRET-based Ca^{2+} indicator, YC3.60
The images show the YFP/CFP fluorescence intensity ratio through colors. The graph shows the YFP/CFP intensity ratio within three ROIs indicated in the images. (The images were taken during a 25 to 45 second interval – the green shaded area in the graph.)

Photos courtesy of: Dr. Kenta Saito and Prof. Takeharu Nagai, Research Institute for Electronic Science, Hokkaido University

Nikon's exclusive multi-level stratum structure

By using a stratum structure, two different systems, such as laser tweezers and a photoactivation unit, can be simultaneously mounted and operated on Ti series microscopes. This is in addition to a PFS unit*.

*For use with the Ti-E only

Example: In addition to PFS, a photoactivation module (upper tier) and a back port (lower tier) are attached.

High NA objectives optimized for live-cell imaging

Lambda objectives and Lambda-S objectives with high NA and long working distances employ Nikon's unique Nano Crystal Coat technology, an antireflective coating that enables very high transmission rates over a broad range of wavelengths. These lenses are designed to correct chromatic aberrations up to infrared range. In particular, the correction capability of the Lambda-S series extends from ultraviolet to infrared. Both series are ideally suited for multi-stained fluorescence and spectral imaging

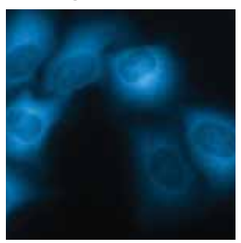
CFI Apochromat 40x WI λS
CFI Apochromat LWD 40x WI λS
CFI Apochromat 60x oil λS

CFI Plan Apochromat λ Series

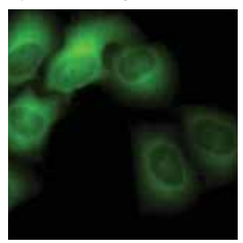
Simultaneous multi-camera imaging of two-wavelength FRET

Taking advantage of the stratum structure of the Ti microscope, two motorized fluorescence cube turrets can be stacked, while the filter cube in each turret can be exchange independently. Furthermore, two cameras can be attached to each optical wavelength path. High-resolution images using the full field of view for each camera can be captured simultaneously with the two emission wavelengths, while individual camera settings can be adjusted when the intensity difference between wavelengths is considerable.

ECFP image from YC3.60



cp173Venus image from YC3.60



When the intensity difference between CFP and YFP is considerable, individual camera sensitivity can be adjusted.
Photos courtesy of Dr. Kenta Saito and Prof. Takeharu Nagai, Research Institute for Electronic Science, Hokkaido University

Back port unit

Simultaneous image acquisition for two wavelengths with two cameras is possible.

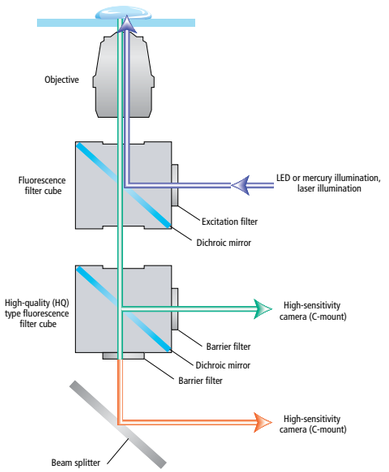
Motorized barrier filter wheel

Changing barrier filters allows image acquisition for multiple wavelengths.

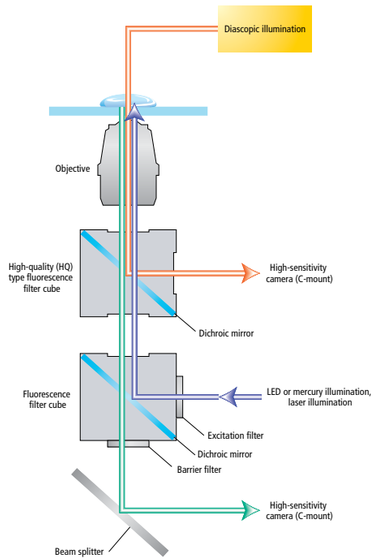
Ti-E configured with back port and two-tier fluorescence cube turrets

Configuration Examples of Stratum Structure

Two-tier cube turret configuration allows simultaneous image capture for two wavelengths with two cameras.



Simultaneous acquisition of two-color fluorescence images



Simultaneous acquisition of fluorescence and brightfield images

Epi-Fl LED illuminator

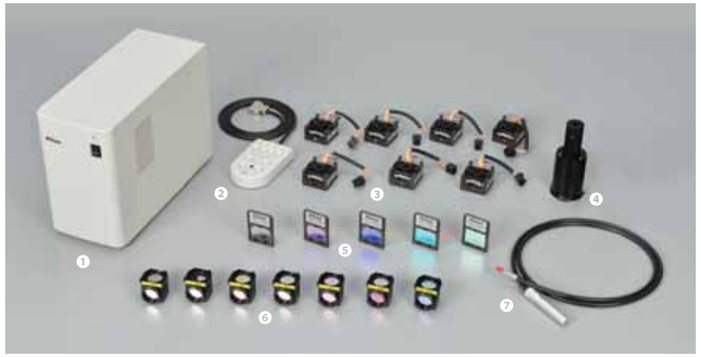
NEW

Ti-E Ti-U Ti-S

Nikon has developed a new epi-fluorescence illuminator equipped with an LED light. It ensures more stable and quantitative brightness of illumination and easier operation than a mercury illuminator. It is particularly suited to long periods of fluorescence time-lapse imaging.

1 Epi-FL LED Illuminator main unit
2 Simple remote control pad
3 LED unit
4 HG100W Adapter R
5 Dichroic mirror unit
6 Epi-Fl Filter Cube
7 Fiber (1.5 m/3.0 m)

C-LEDFI Epi-Fl LED Illuminator



Stable light intensity

Stable illumination brightness ensures quantitative and reliable fluorescence intensity measurement.
The LED illuminator ensures minimal output fluctuation of less than 0.1% in 100 Hz (10 ms.). In addition, it maintains output fluctuation at below 3% even when the illuminator is switched on and off intermittently over 72 hours of time-lapse observation.

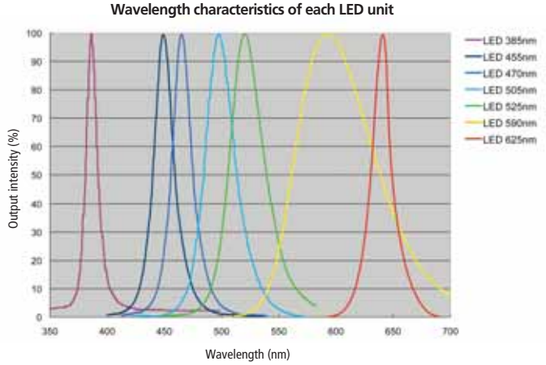
Zero warm-up time

The illuminator requires zero warm-up time and enables observation immediately after it is switched on. Thus it can even be employed only when capturing images during time-lapse imaging, thereby eliminating the need for fluorescence shutters.

Wavelength intensity control

The illuminator allows for a flexible combination of LED units, enabling simultaneous lighting with multiple wavelengths for multi-color observation. The intensity of the excitation LED light for each wavelength can be consecutively controlled, thereby eliminating the need for ND filters.

Wavelength characteristics of each LED unit



Control with NIS-Elements software

Turning the illuminator on and off and changing wavelengths in synchronization with image acquisition is possible with NIS-Elements imaging software.

Maintenance free

An LED has a minimum lifespan of 10,000 hours, eliminating the need for frequent lamp replacement.

Alignment free

The LED and dichroic units do not need to be aligned each time they are changed over. Furthermore, the Epi-Fl LED Illuminator is connected to the microscope fluorescent attachment using a dedicated optical fiber cable, eliminating the need to center the light source.

Specifications

LED unit		7 types; up to 4 units can be assembled 385/455/470/505/525/590/625 nm
Dichroic mirror unit		5 types, up to 3 units can be assembled 425/455/470/565/610 nm
LED control	Simple remote control pad	Selection and ON/OFF of LED unit is possible Light intensity control step: 7 steps (0, 10, 20, 40, 60, 80, 100%)
	NIS-Elements software	Selection and ON/OFF of LED unit is possible Light intensity control step: Minimum 0.5% linear control Intensity control of multiple LED units while retaining intensity ratios is possible Trigger Acquisition function available
ON/OFF switching speed		Less than 100μs
LED auto detection		Automatic detection and display of LED unit (using NIS-Elements)
External dimensions		135 (W) x 227 (H) x 303 (D) mm
Weight		Approx. 5.4 kg

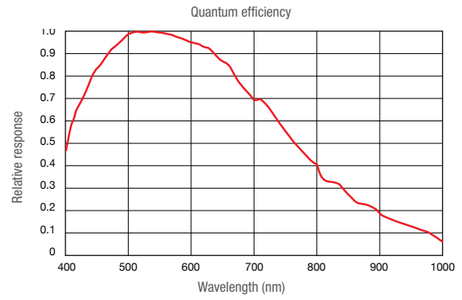
High-sensitivity cooled monochrome camera head DS-Qi1

Ti-E Ti-U Ti-S

By combining low-noise electronics and a high-quantum efficiency detector, Nikon's Digital Sight series cooled monochrome camera DS-Qi1 can capture a wide dynamic range of intensities while maintaining quantitative linearity. Added features, including a fast analog-to-digital converter (ADC), very low read noise and programmable gain control, make the DS-Qi1 an ideal detector for fluorescence imaging and reliable quantitative analysis.

High sensitivity

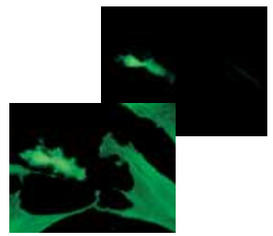
The high-sensitivity CCD, which has outstanding quantum efficiency (>65% at 500nm), allows the capture of even low light fluorescence signals.



Low noise

The cooling mechanism reduces the average dark current to 0.7e-/pixel/s. Moreover, with the new CCD drive circuit, the readout noise is reduced to 8e- rms. This enables clear, high-contrast fluorescence images to be captured at a dynamic range of over 2000:1.

A larger dynamic range allows acquisition of weak fluorescence signals and of very bright signals, even in the same image.



Superior linearity

Linearity, a quantitative index, has been improved to >98%. This assures comparable, quantitative image data collection over a wide exposure range.

High frame rate

A high frame rate of up to 32fps with 640 x 480 pixel image size (2 x 2 binning) is possible with a fast 36MHz analog-to-digital converter.

Stage Top Incubator WSKM series

Ti-E Ti-U Ti-S

The WSKM series offers three heater temperature control methods—sample temperature feedback control, automatic temperature setting based on room temperature and manual temperature setting.

- Sample temperature feedback control regulates sample temperature between 30°C and 40°C by providing feedback of sample temperature during incubation via sterilized sensor.
- Automatic temperature setting determines optimal top heater temperature by measuring room temperature during preliminary operation, enabling sample incubation without inserting sensor into dish during operation.
- Using NIS-Elements software (ver. 4.13) with optional module NIS-D Stage Incubator, temperature/CO2 concentration control and monitoring, and recording of log data with captured images are possible.

Manufactured by
Tokai Hit Co., Ltd.