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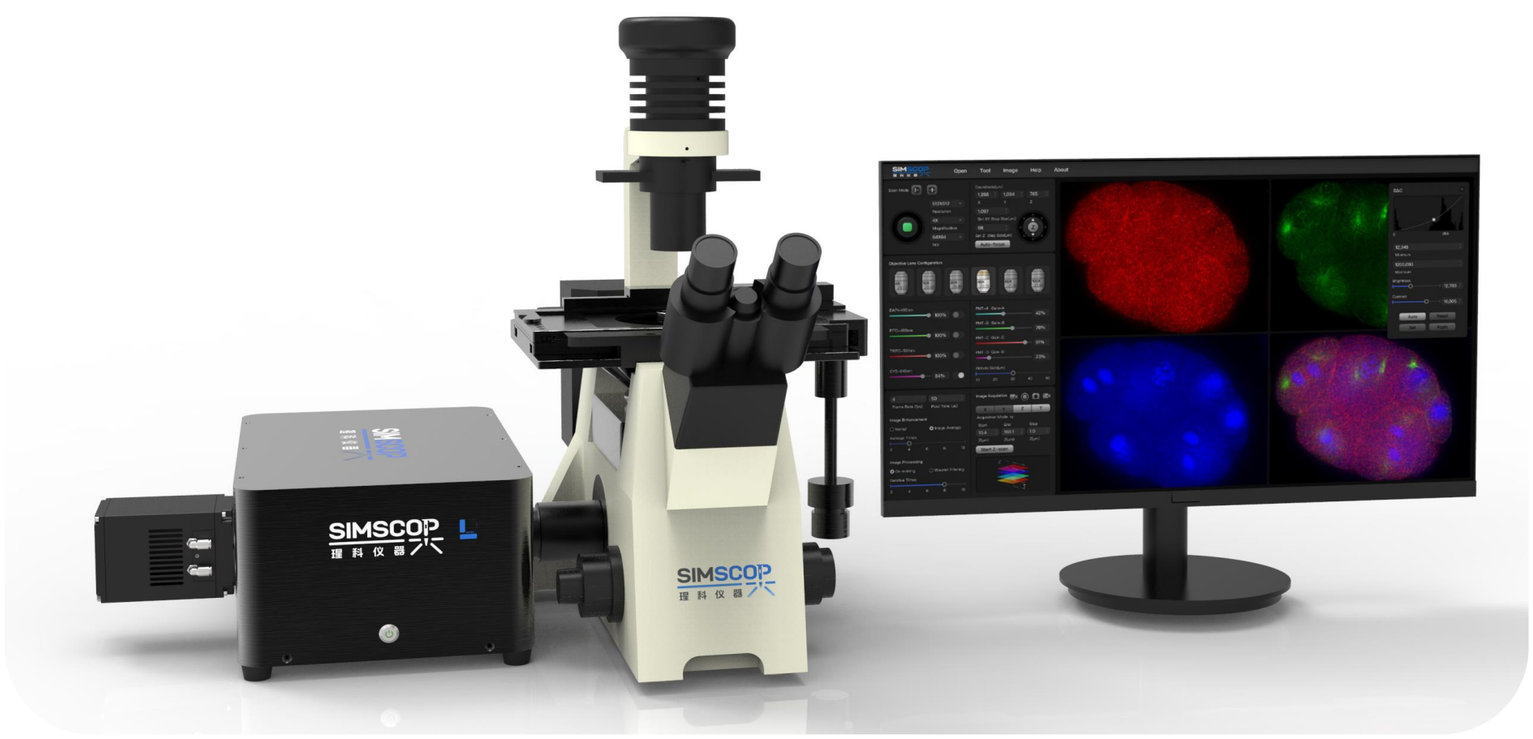
Line Scan Confocal Microscope

SIMSCOP L Series



2023 V2

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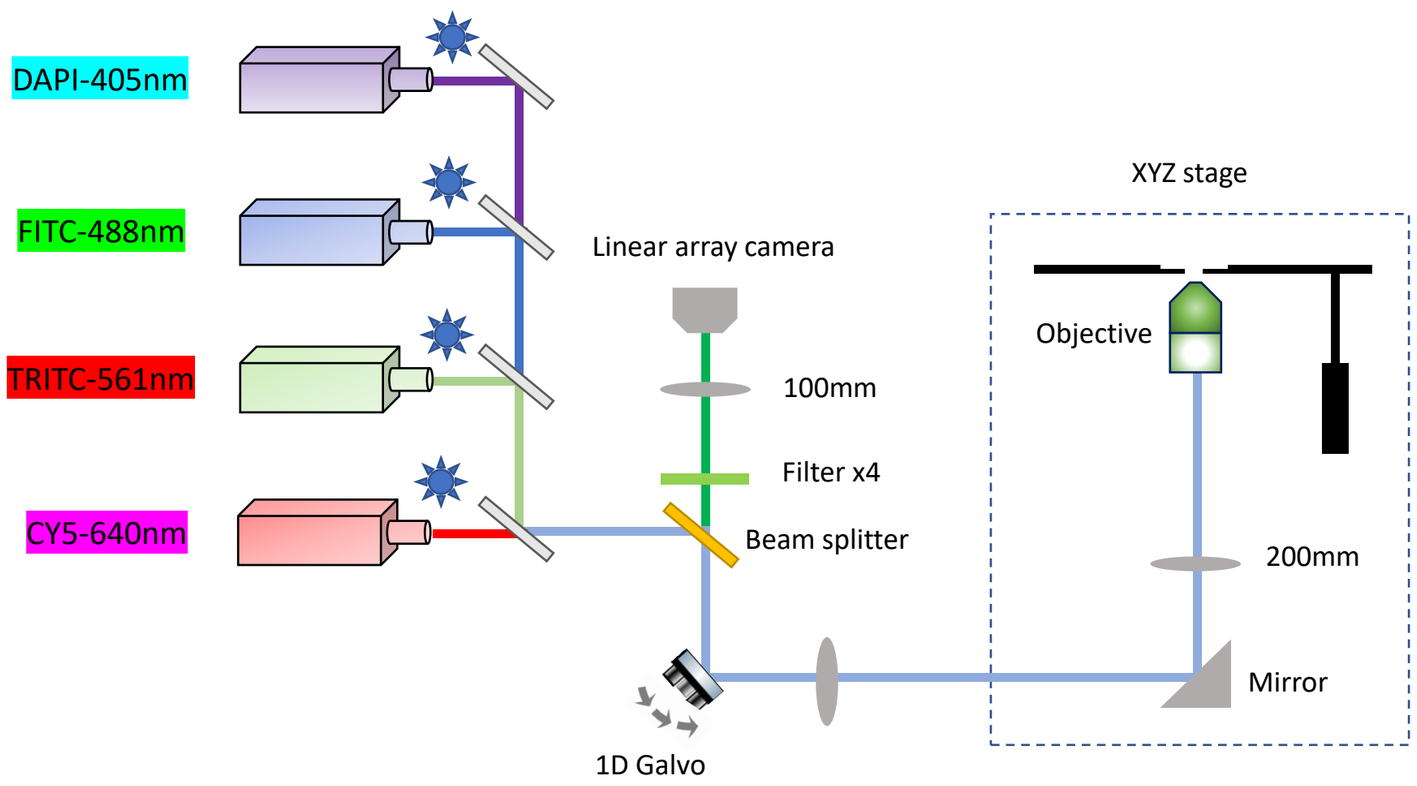
Line Scan Confocal microscope(L series) is a powerful imaging tool that combines the principles of confocal microscopy with the capability to rapidly acquire images along a single line, or linear scan, at exceptionally fast rates. This innovative microscopy technique has revolutionized the study of dynamic biological processes and the examination of rapid events in materials science.

Unlike traditional confocal microscopy, where images are acquired pixel by pixel in a raster scan pattern, a line-scan confocal microscope captures an entire line of information simultaneously. This dramatic reduction in acquisition time is ideal for observing fast-moving objects, dynamic cellular processes, and live biological specimens with minimal motion artifacts.

The heart of the high-speed line-scan confocal microscope is its ability to scan laser light or illumination across a sample along a line, while simultaneously collecting emitted fluorescence or reflected light from that same line. This synchronized approach not only provides rapid image acquisition but also minimizes out-of-focus light and enhances image contrast, similar to conventional confocal microscopy.

The introduction of high-speed line-scan confocal microscopy has opened up new frontiers in research, offering a window into the previously inaccessible world of fast biological and materials events. Its ability to provide detailed, time-resolved images with minimal photobleaching and phototoxicity makes it a valuable tool for scientists and researchers across a wide range of disciplines.



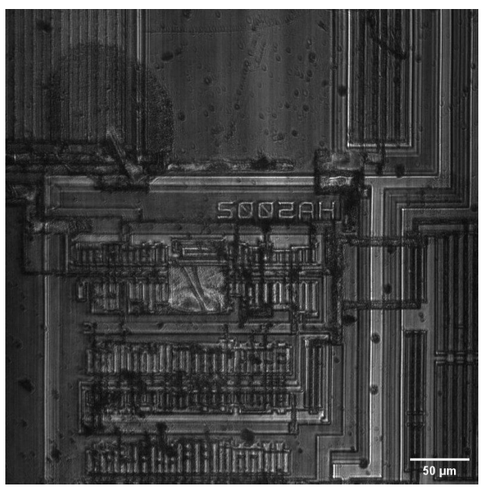
Features & Benefits

- High-speed acquisition(50fps@1024x1000 pixels)
- Multi-color fluorescence(Max. 4 channels)
- Deep imaging module(Max. depth:600μm)
- High sensitivity
- Large field of view(60X: 0.36mm, 40X: 0.54mm)
- Low photobleaching and phototoxicity
- Strong optical sectioning

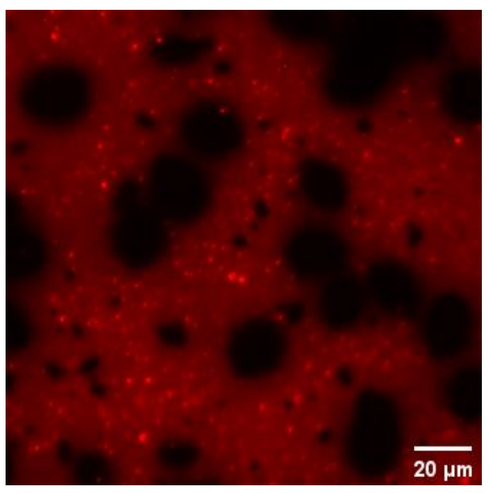
Applications

L series Industry: Single-wavelength ordinary linear array detector, designed for simple strong fluorescence imaging and reflection imaging, used for materials science, compound fluorescence detection and surface defect detection.

L Series Research: Four-wavelength high-sensitivity back-illuminated CMOS detector, designed for biological weak fluorescence imaging and used for the study of life science cells and pathological tissues. The depth module can be used for in vivo imaging of thick tissue and small animals, targeting major research projects in biomedical research institutes and users of public instrument platforms, as well as medical laboratory testing institutions.

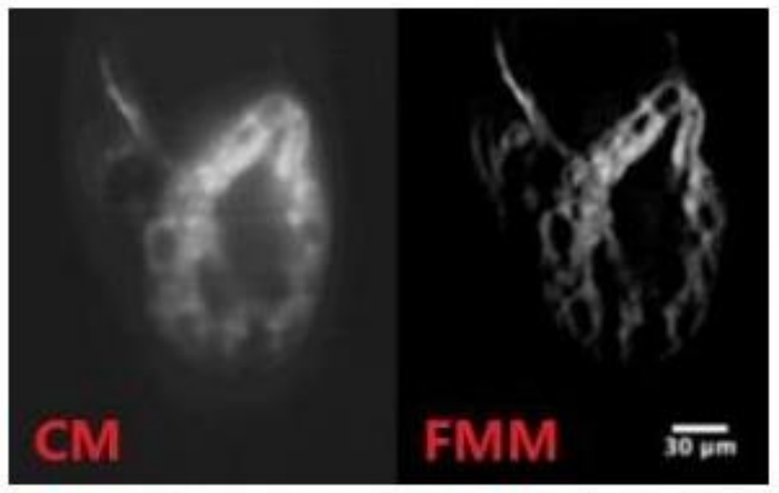


Wafer(10X)



Calcium Titanium Quantum Dots (10X)

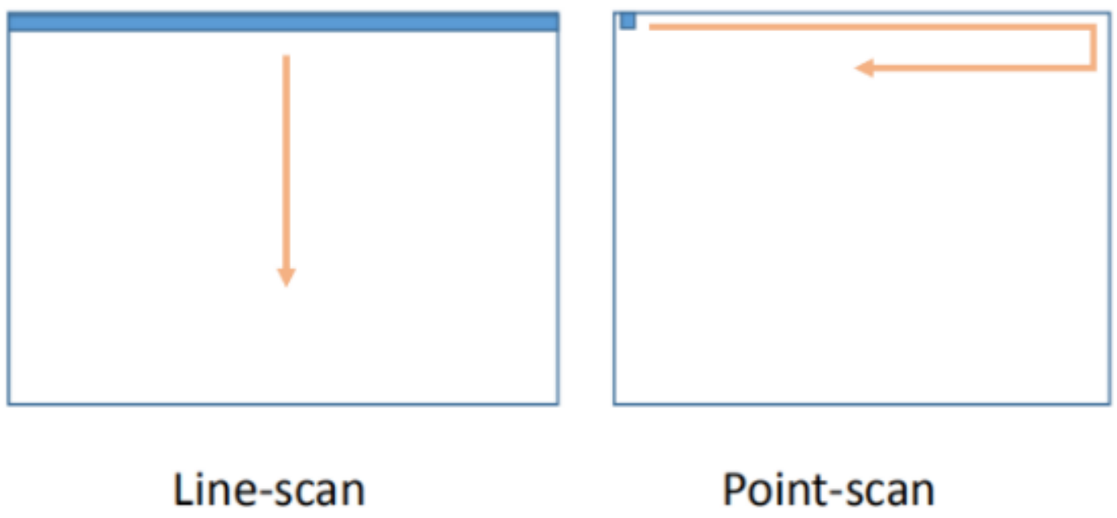
L Series Industry



3-day post-fertilized zebrafish heart labelled by EGFP

L Series Research

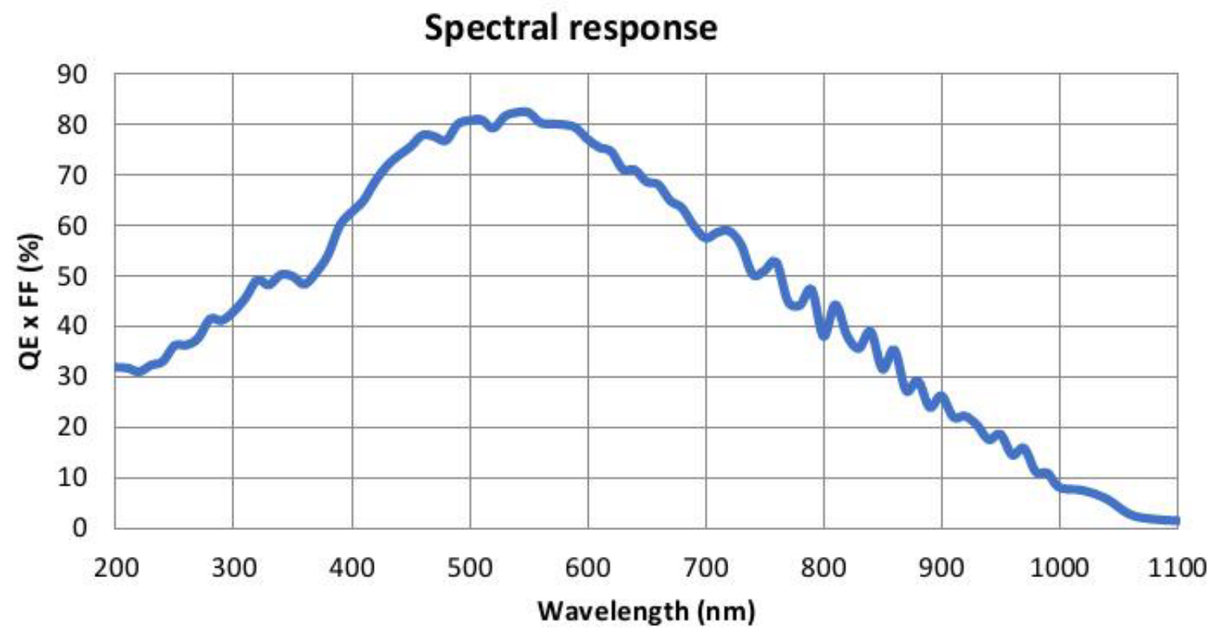
High-speed Acquisition(50fps@1024x1000 pixels)



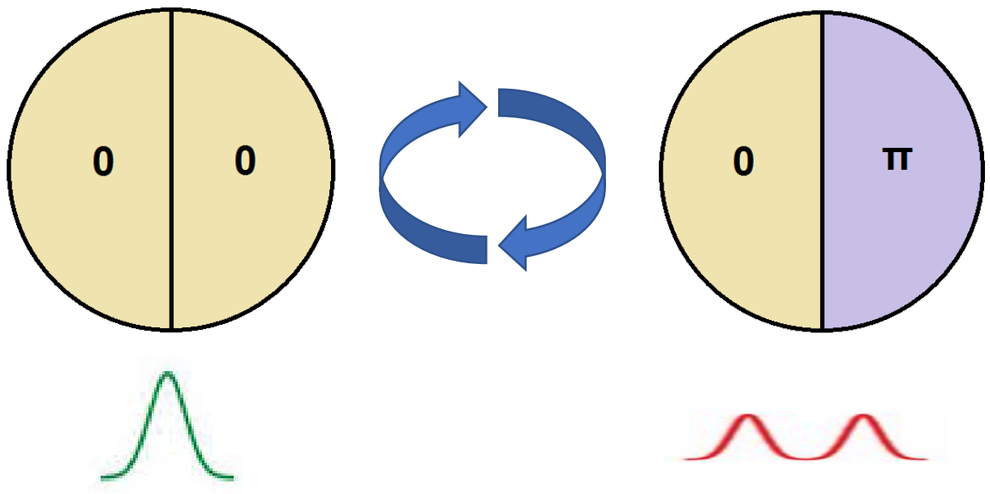
Due to the different scanning methods, the capture speed of line scan copolymerization is at least 100 times faster than that of conventional confocal technology, and the phototoxic reaction and photobleaching reaction are low. It is not only the best choice for imaging living cells and tissues, but also very suitable for fixation. Rapid volumetric collection of samples, even from small live animals.

Large FOV & High Sensitivity

With a large usable field of view (FOV), our scientific-grade CMOS cameras offer up to a 5.5-megapixel sensor with both a 60x objective lens (0.36mm) and a 40x objective lens (0.54mm) for maximum field of view. Maximizing the field of view of fluorescence microscopy is becoming increasingly important in a wide range of applications, including high-content scanning of large areas of cells, imaging of developing embryos, neuronal mapping, and tissue imaging.



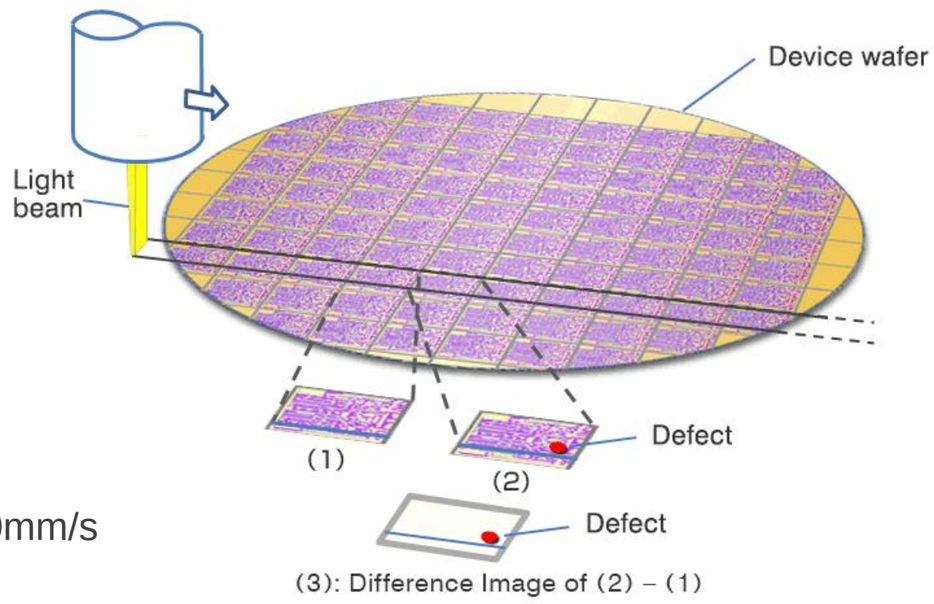
Deep Imaging Module (Max. imaging depth:600μm)



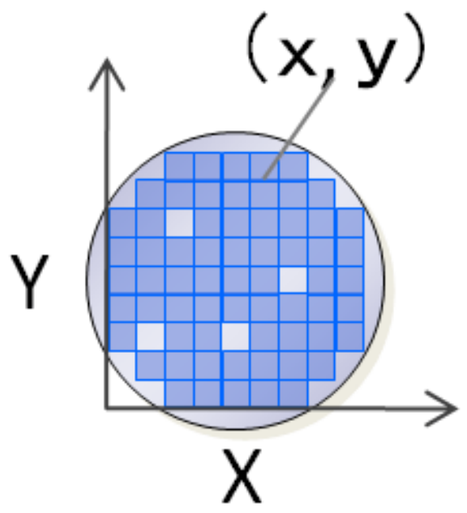
The line scan focus modulation module is a novel microscopy observation method that achieves deeper penetration depth based on confocal microscopy. Using a combination of an electro-optical modulator and a self-designed liquid crystal phase plate, only the intensity of the signal fluorescence at the focus is modulated, while stray light and background light are not modulated. Through the principle of modulation and demodulation technology, a strong focal area signal is extracted, thereby improving the signal-to-noise ratio and signal-to-background ratio of the image by 20-30dB, thereby improving the imaging depth. This penetration depth is approximately two to four times that of conventional confocal microscopy.

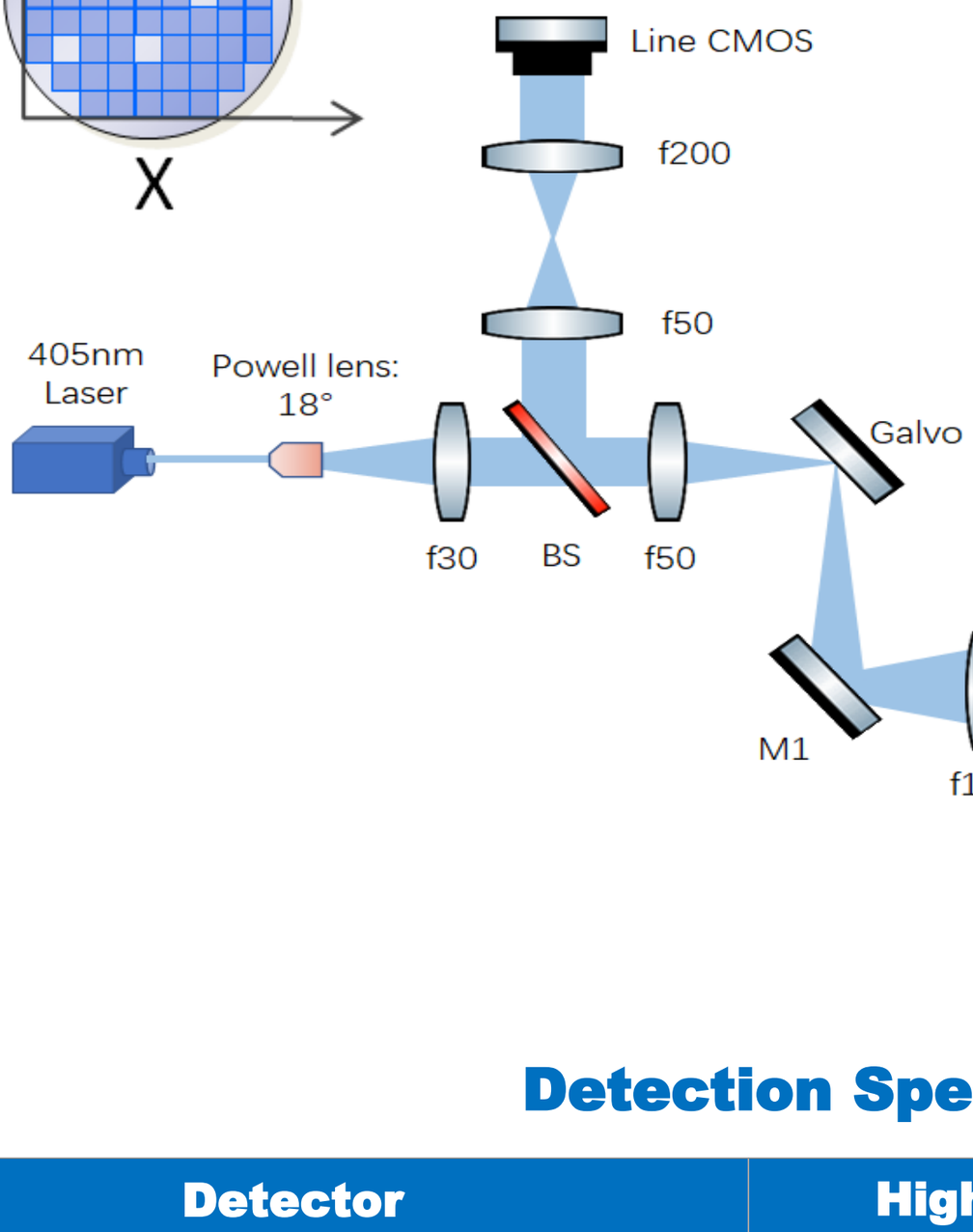
Wafer defect inspection system detects physical defects (foreign substances called particles) and pattern defects on wafers and obtains the position coordinates (X, Y) of the defects.

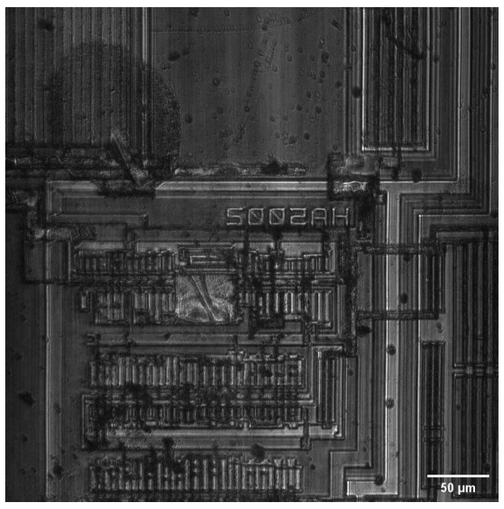
Using line-scan confocal technique can speed up the inspection time by more than 10 times



- Speed of linear scan:100mm/s
- Line width： 1mm
- Finish defect inspection of one 8-inch wafer in only 6 minutes







Sample (8-inch wafer)
Laser wavelength 405nm
Objective lens 20X and 60X dry lens

Detection Speed Reference

Detector	High-speed CCD		High-speed sCMOS	
Pixels per Line	4096 x 256		9072 x 256	
Pixels per Line (Horizontal)	4096		9072	
Pixel Width (mm)	0.0050		0.0050	
Linear Array Camera Scan Rate (Lines/Second)	200000		510000	
Magnification (Dry Lens)	20X	60X	20X	60X
NA	0.50	0.90	0.50	0.90
Imaging Resolution(nm): 0.61λ/NA	494nm	274nm	494nm	274nm
Scan Time(s): Sample Area/Scanning Area per Second	397.3	2136.6	72.0	379.9
Single Wafer Inspection Time	**6m37s**	**35m36s**	**1m12s**	**6m20s**
with Traditional Microscope Series	**60X Objective lens 1 - 1.5 hours**			

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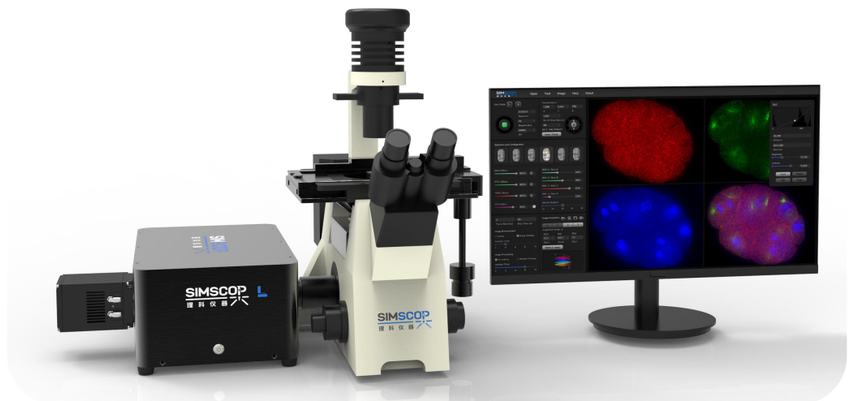
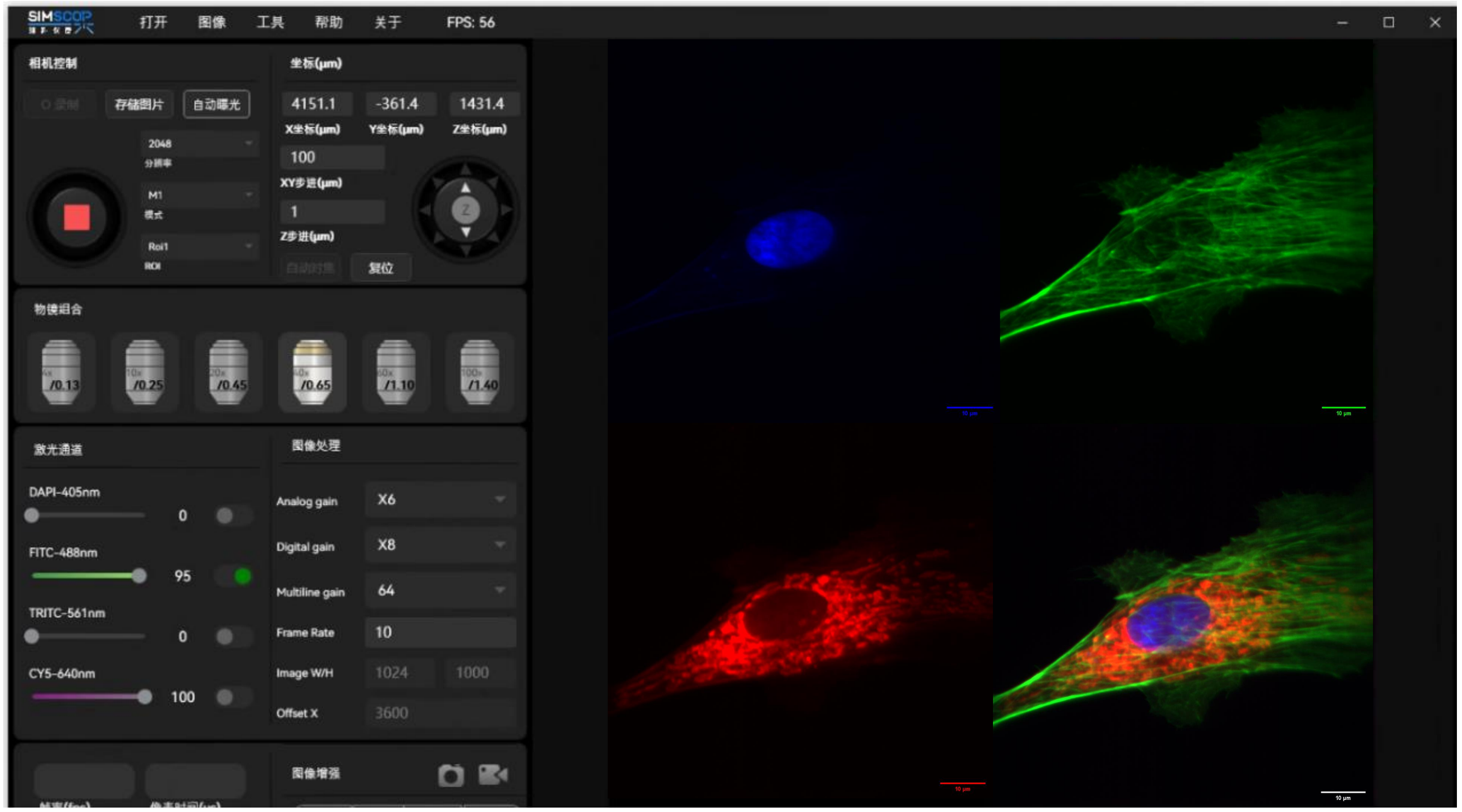
Specifications



Parameters	L Series Industry	L Series Research
Laser Light Source	Standard wavelength:405±5 nm Output mode:single-mode polarization-maintaining fiber (TEM00) Single wavelength output power: >20mW; Power stability: <1% Spectral linewidth: <3nm TTL modulation, 1kHz Accuracy of laser power adjustment:1% Optional single wavelengths include 375nm/445nm/473nm/515nm/525nm/532nm/ 633nm/660nm/685nm/785nm/808nm	Standard wavelength:：405±5nm / 488nm±5nm /561nm±1nm / 640nm±5nm Output mode:single-mode polarization-maintaining fiber (TEM00) Single wavelength output power: >20mW; Power stability: <1% Spectral linewidth: <3nm TTL modulation, 1kHz Accuracy of laser power adjustment:1%, multi-wavelength AOTF power adjustment Optional multi-wavelengths include 375nm/445nm/473nm/515nm/525nm/532nm/ 633nm/660nm/ 685nm/785nm/808nm
Detectors	TDI line-scan camera; Resolution: 4095x256; Wavelength: 380nm-1000nm; Pixel bit width: 8/10/12bit,Peak quantum efficiency (QE):85%@480nm; Read noise: 16e- Frame rate: 200kHz	Back-illuminated CMOS; Resolution: 9072x256; Wavelength: 200nm-1100nm; Pixel bit width: 8/10/12bit; Peak quantum efficiency (QE):82%@550nm；50%@350nm, Read noise: 3.5e- Frame rate: 12bit：300kHZ； 10bit：350kHZ；8bit：510kHZ
Scan Module	Scanning pixels 100x100-2048x2048 Frame rate:20fps (1024x1000 pixels), 200fps (1024x100 pixels) fast scanning mode	Scanning pixels 100x100-2048x2048 Frame rate:50fps(1024x1000pixels) 500fps(1024x100pixels) fast scanning mode
XY Resolution	Standard scanning module: 230nm@100x Oil objective	Standard scanning module: 230nm @ 100x Oil objective Deep scanning module: 150nm-200nm
Image Depth	Surface scanning	Standard scanning module< 100um Deep scanning module< 600um
FOV	5x：1mmx1mm | 10x：0.51mmx0.51mm | 20x：0.26mmx0.26mm 40x：0.13mmx0.13mm | 60x：85umx85um | 100x：51umx51um	
Filter Unit	1 set from: DAPI EM 445nm/50nm FITC EM 530nm/50nm TRITC EM 605nm/60nm Cy5 EM 695nm/40nm	4 sets: DAPI EM 445nm/50nm FITC EM 530nm/50nm TRITC EM 605nm/60nm Cy5 EM 695nm/40nm
Eyepiece	WF10X/23 wide field eyepiece; High eye point; Centering telescope	
Eyepiece Tube	45°inclined,50–75mm adjustable interpupillary distance; Adjustable diopter	
Objective Converter	Converter with five-hole internal positioning ; Ball bearing for internal positioning	
Stage	Manual: 240mm x 260mm fixed stage; Range of movement:135mm x 85mm Motorized: Minimum step size:50nm; Repeatability +/- 0.1 μm Maximum speed：≥100mm/s; Stage size:≥270x170mm Stroke : X:110mm,Y:75mm; Maximum load capacity >1KG (Horizontal)	
Z Driver	Focusing resolution/minimum step size: 0.05μm; Repeatability: +/-0.2μm; Maximum stroke:10mm	
Focusing Mechanism	Coaxial coarse/ fine adjustment with limit and locking devices, Low level coaxial focusing handwheel ; Handwheel graduations of fine adjustment:1μm	
Transmitted Illumination System	Warm LED light, continuously adjustable brightness Brightness adjuster with LED rotation Condenser:72mm ultra-long working distance,NA=0.30,Equipped with a three-hole phase contrast annular plate	
Epi-fluorescence Illumination System	Multi-band LED light source MG-100 6-hole fluorescence module UV(U)EX:375/30nm； DM:415； EM:460/50nm Blue(B)EX:475/30nm； DM:505； EM:530/40nm Yellow(Y)EX:540/25nm； DM:565； EM:605/55nm Red(R)EX:620/50nm； DM:655； EM:692/45nm	
Software Feature	Multi-color fluorescence localization processing； Z-stack data processing; Large image stitching； Image analysis; Imaging data management； 3D imaging constrution	

Software Surface

SIMSCOP CM Series Confocal Microscope Software Key Features

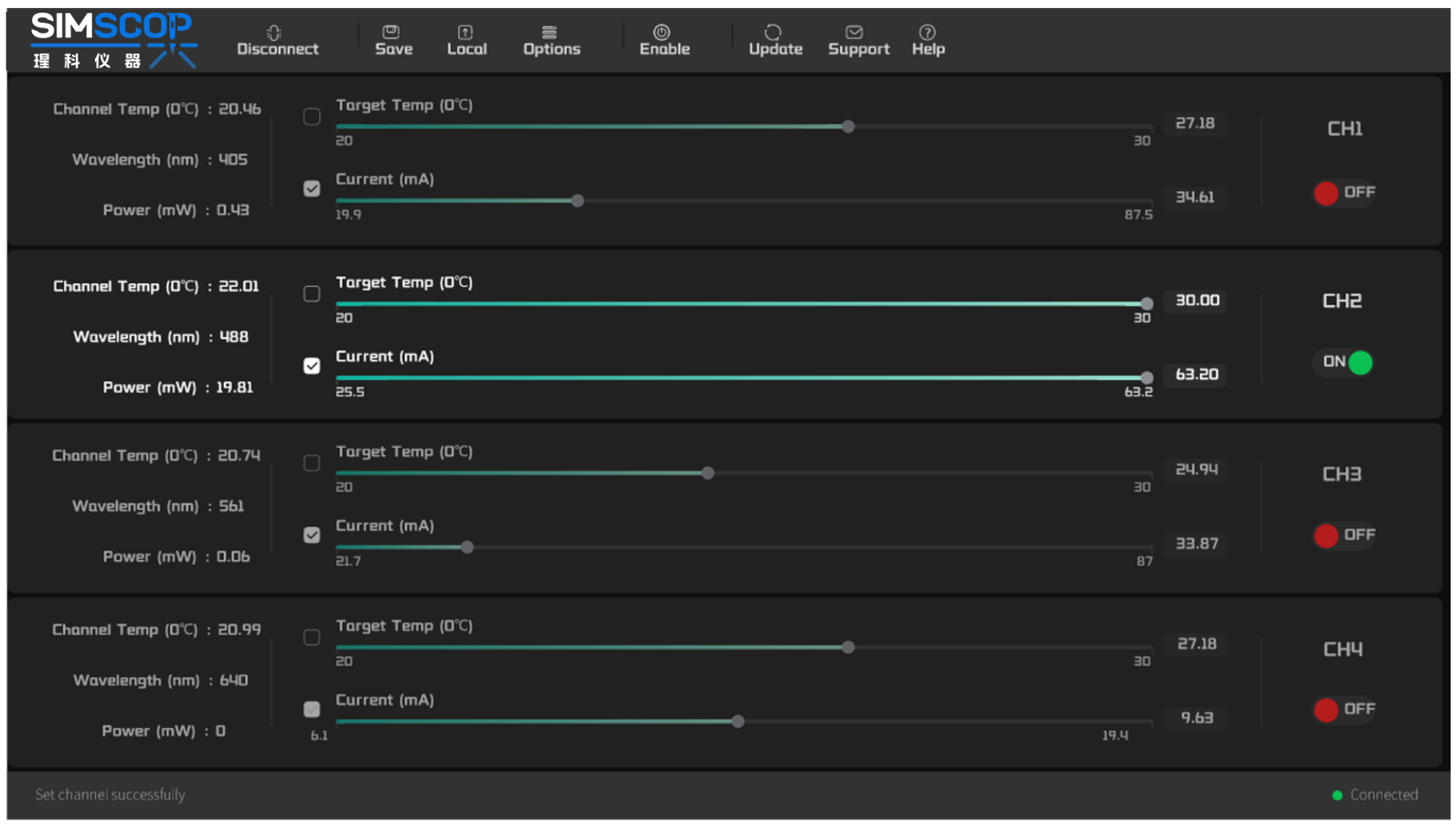


Functional GUI Panel

Easy-to-Recognize Display for Setting Lasers, Detectors, etc.

Scanning Parameter Settings of XYZ Motorized Stage

Parameter Settings of Microscope Image Acquisition

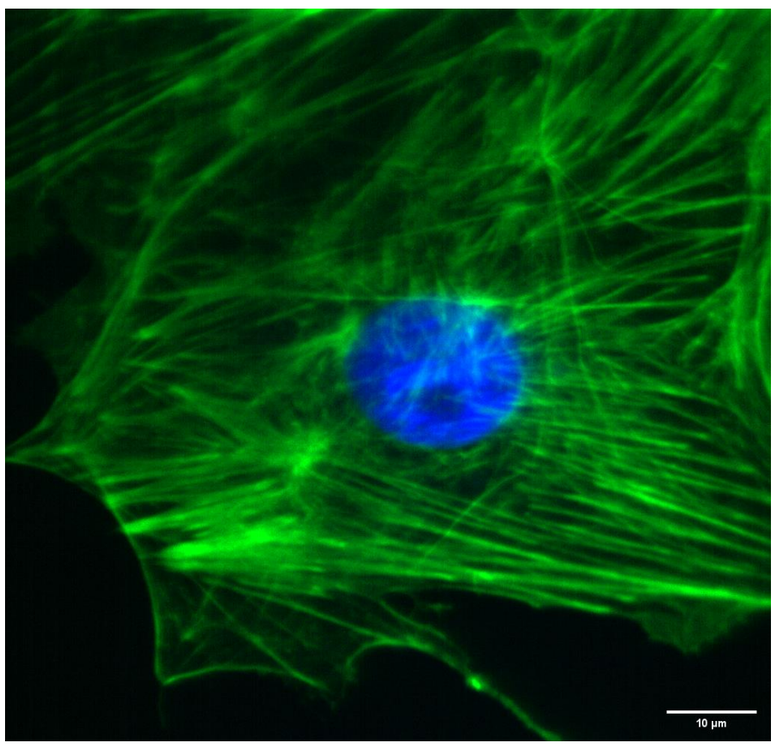


Laser Control Panel

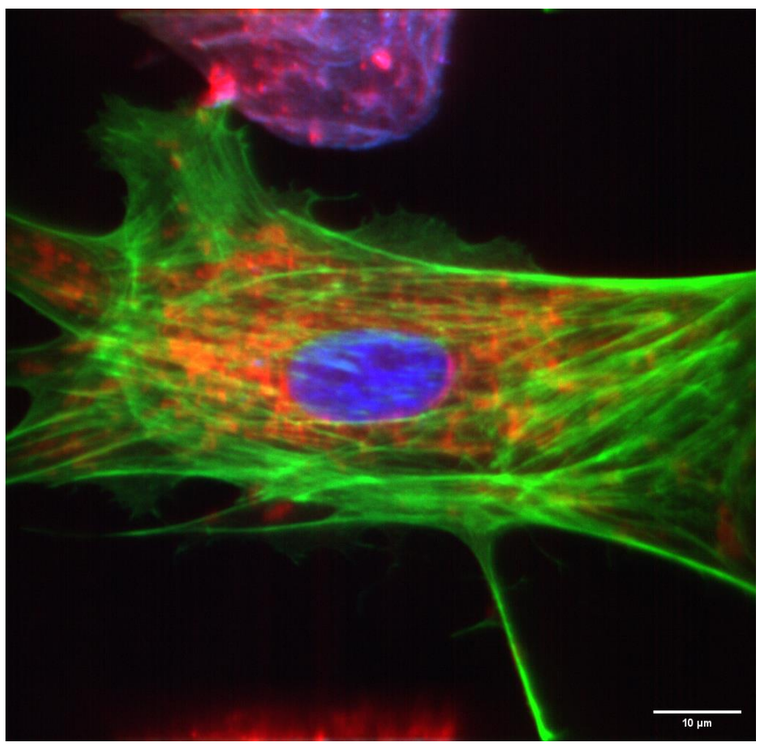
Camera Parameter Setting

Applications

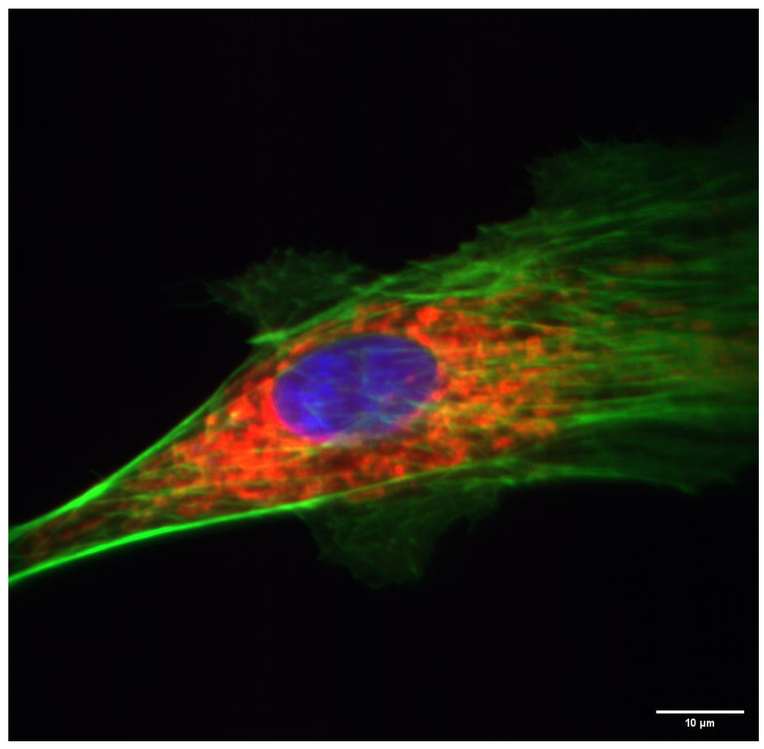
BPAE cells with MitoTracker™ Red CMXRos, Alexa Fluor™ 488 Phalloidin, and DAPI, 60X objective lens NA 1.2



DAPI & FITC, 60X objective lens

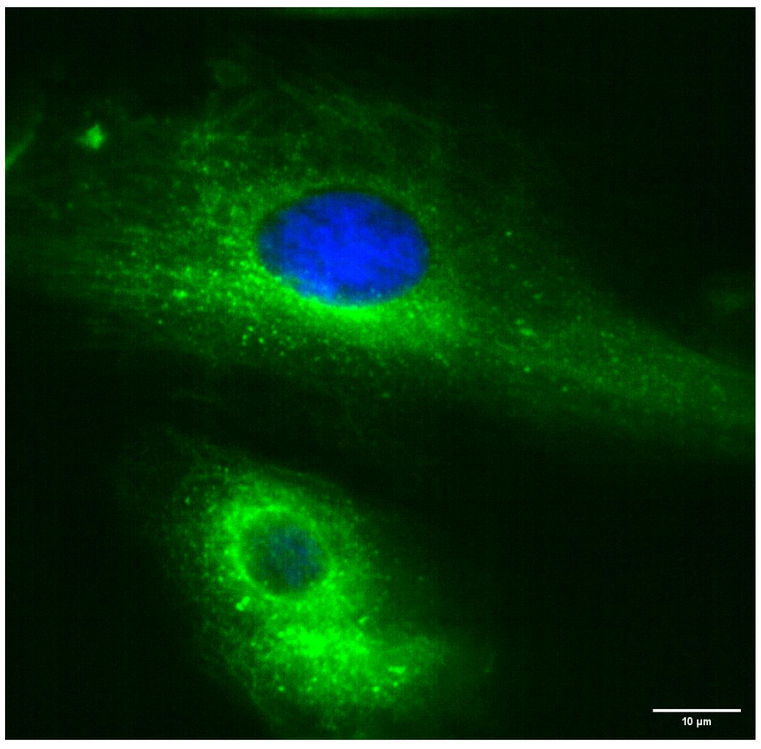


DAPI & FITC & Cy5, 60X objective lens

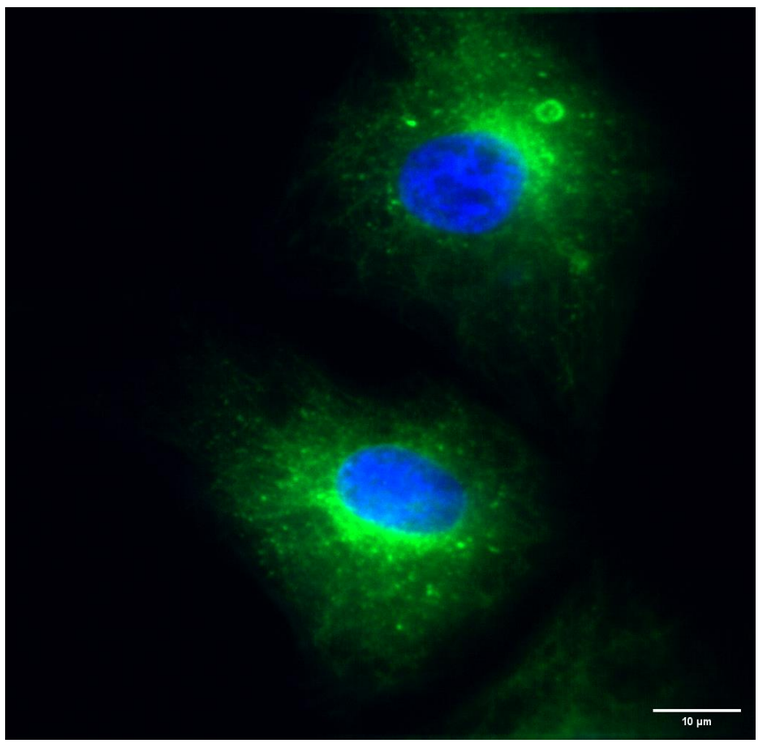


DAPI & FITC & Cy5, 60X objective lens

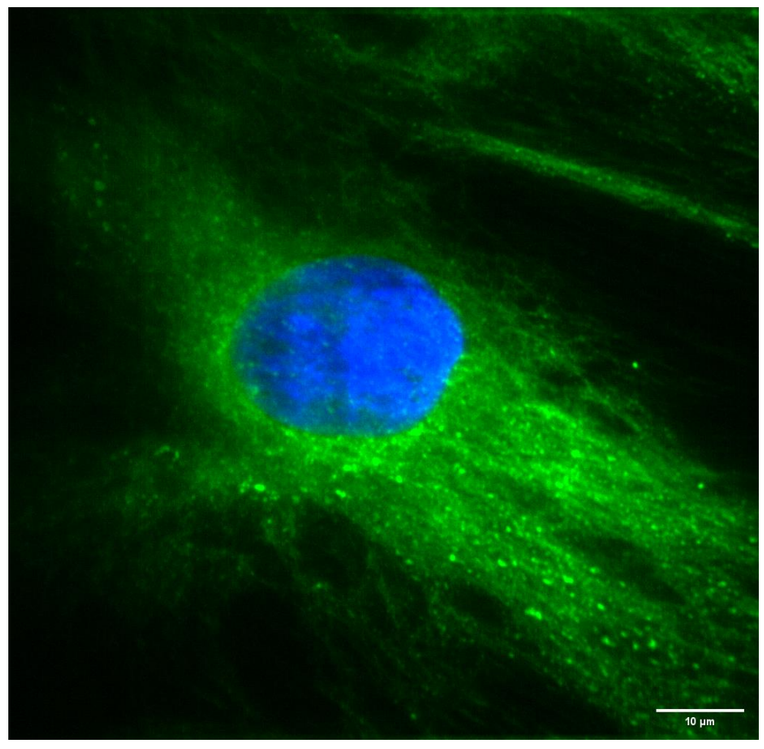
BPAE cells with Mouse Anti-α-tubulin, AlexaFluor™ 488, FL Goat Anti-Mouse IgG, Texas Red™-X Phalloidin, and DAPI, 60X objective lens NA 1.2



DAPI & FITC, 60X objective lens

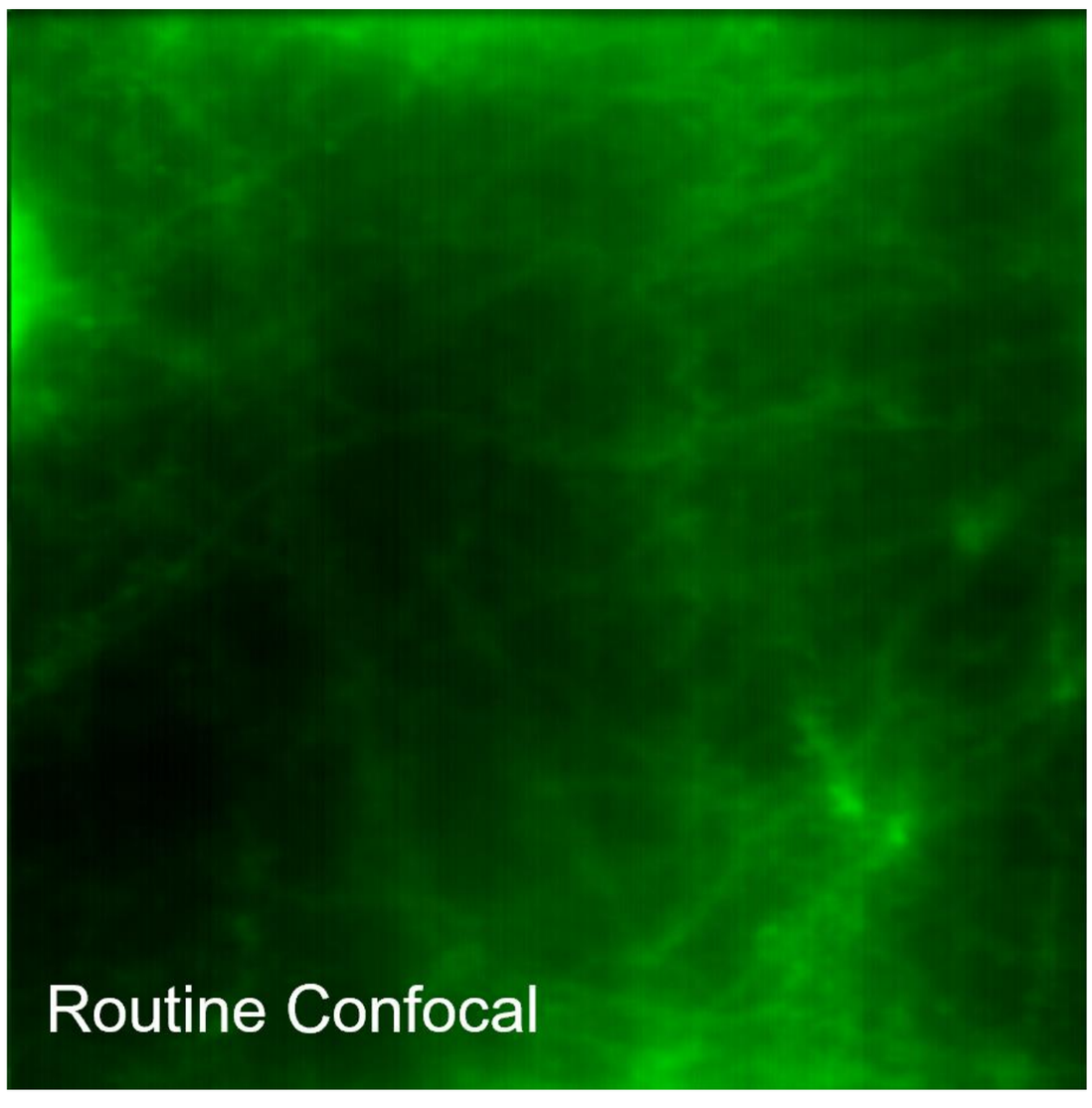


DAPI & FITC, 60X objective lens

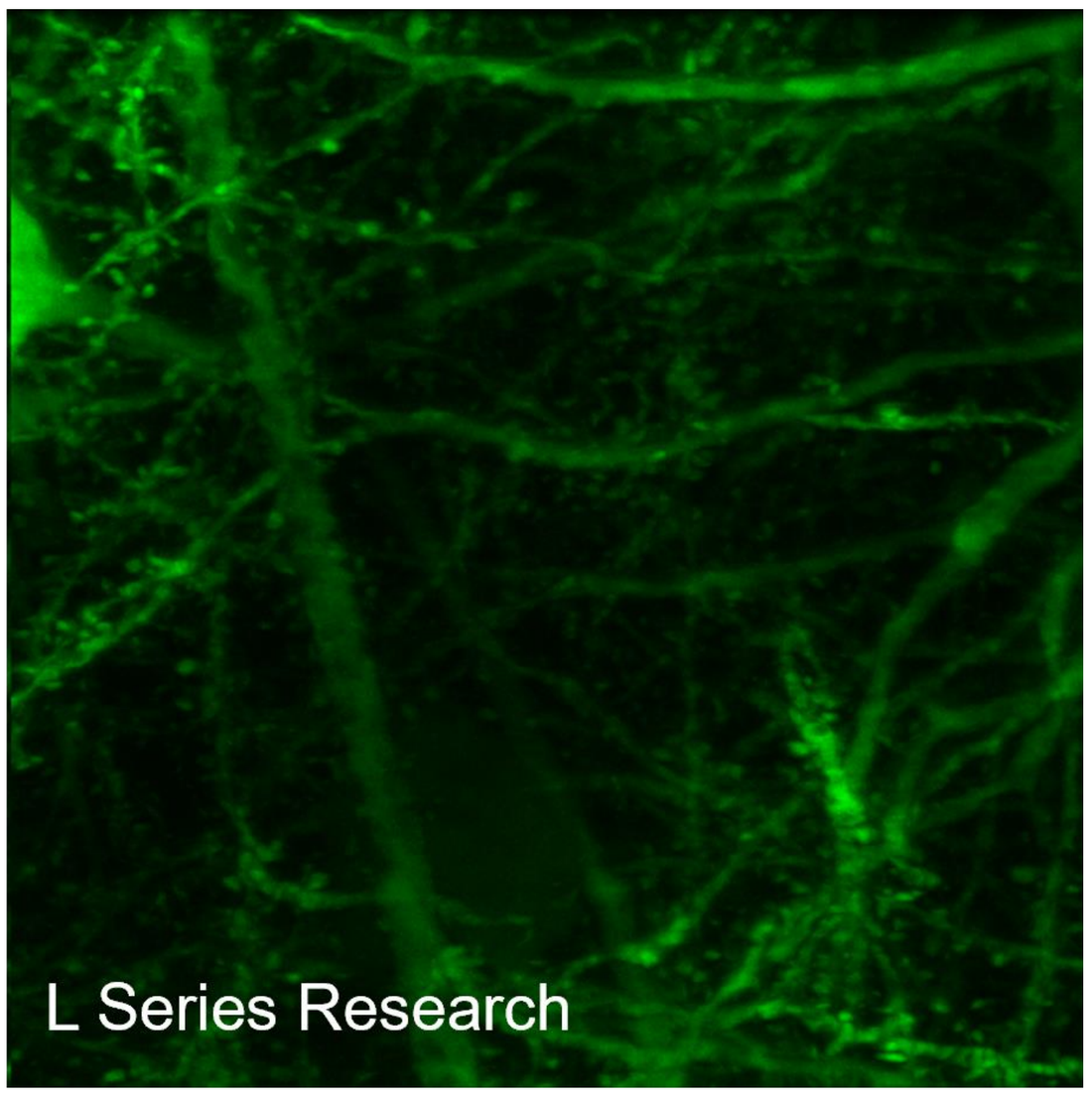


DAPI & FITC, 60X objective lens

Mouse Brain GFP Neurons (20x/0.95, 3D Projection)



Routine Confocal



L Series Research

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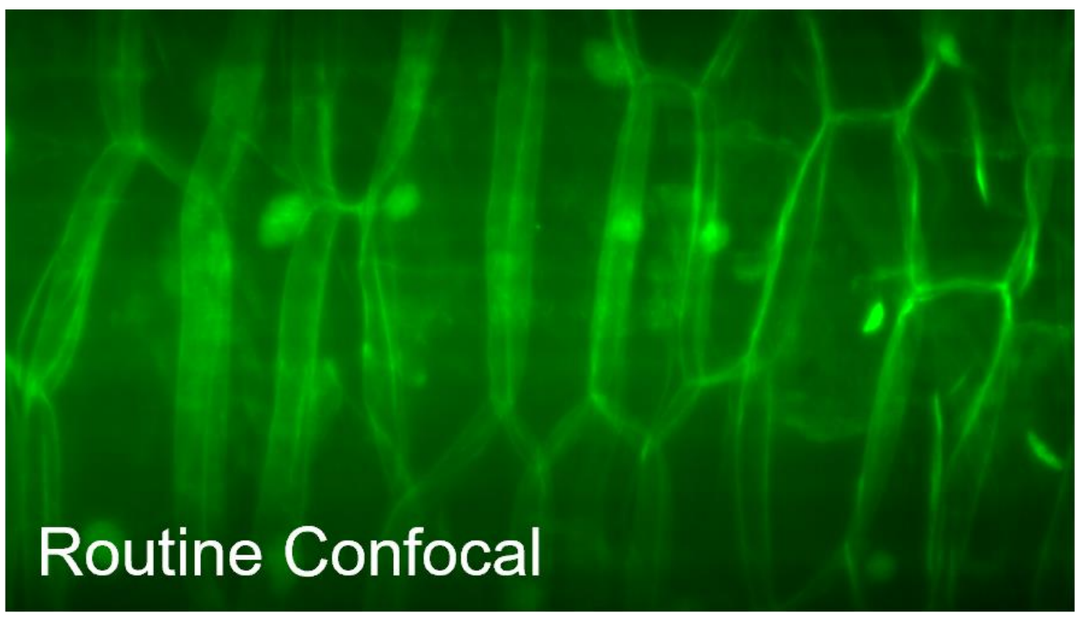
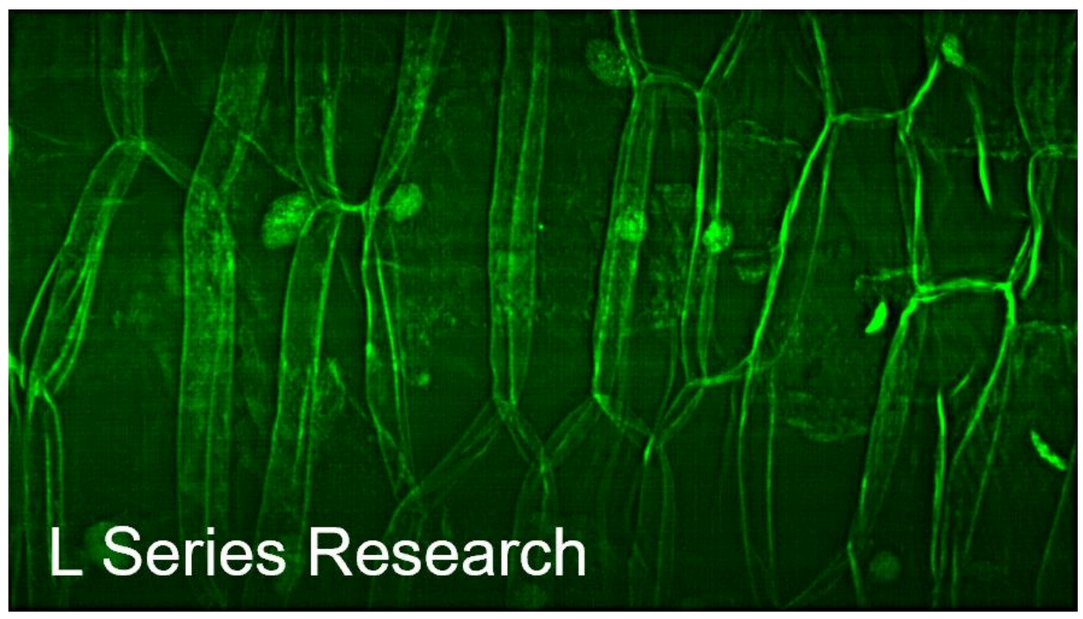
Onion Cell Imaging (20x/0.45)

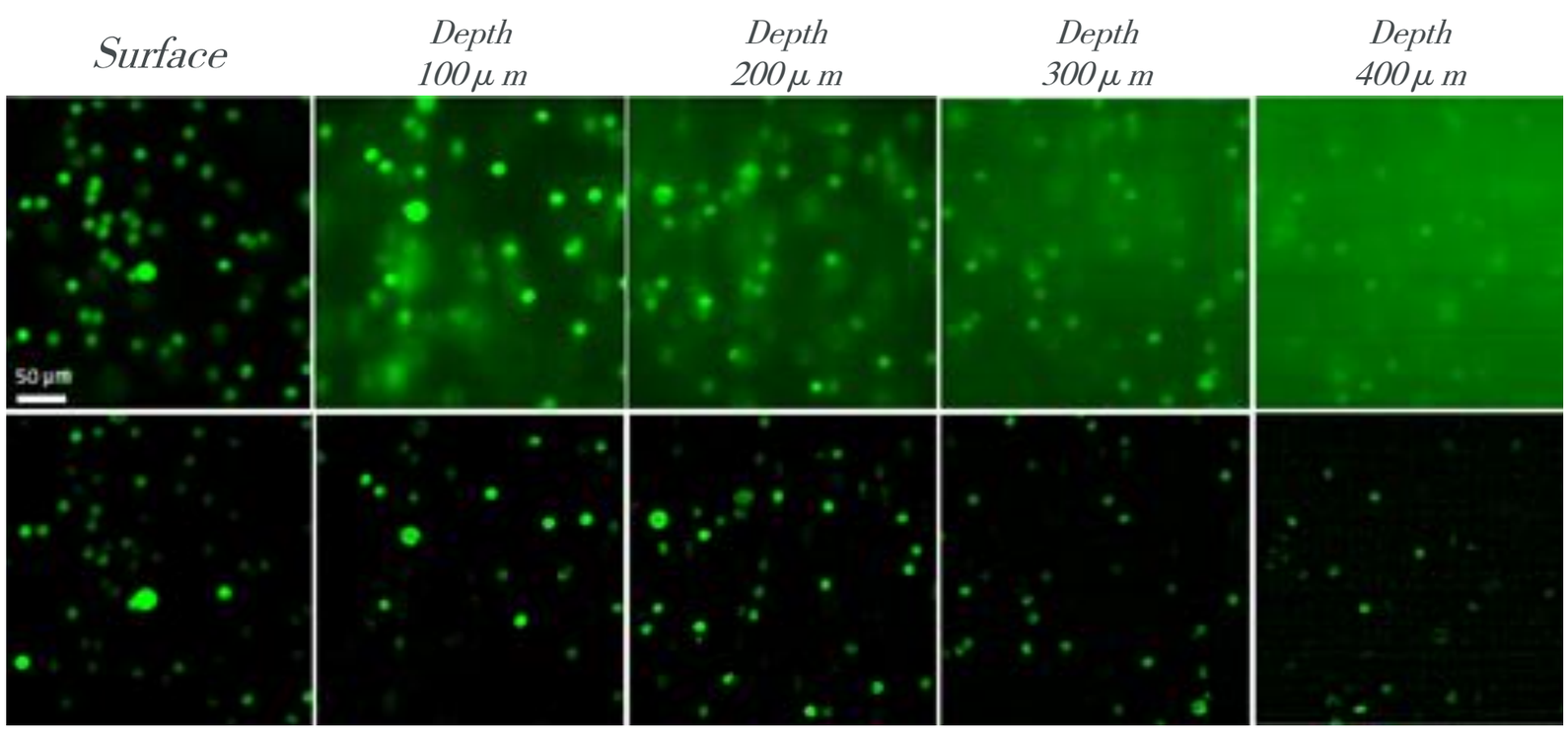


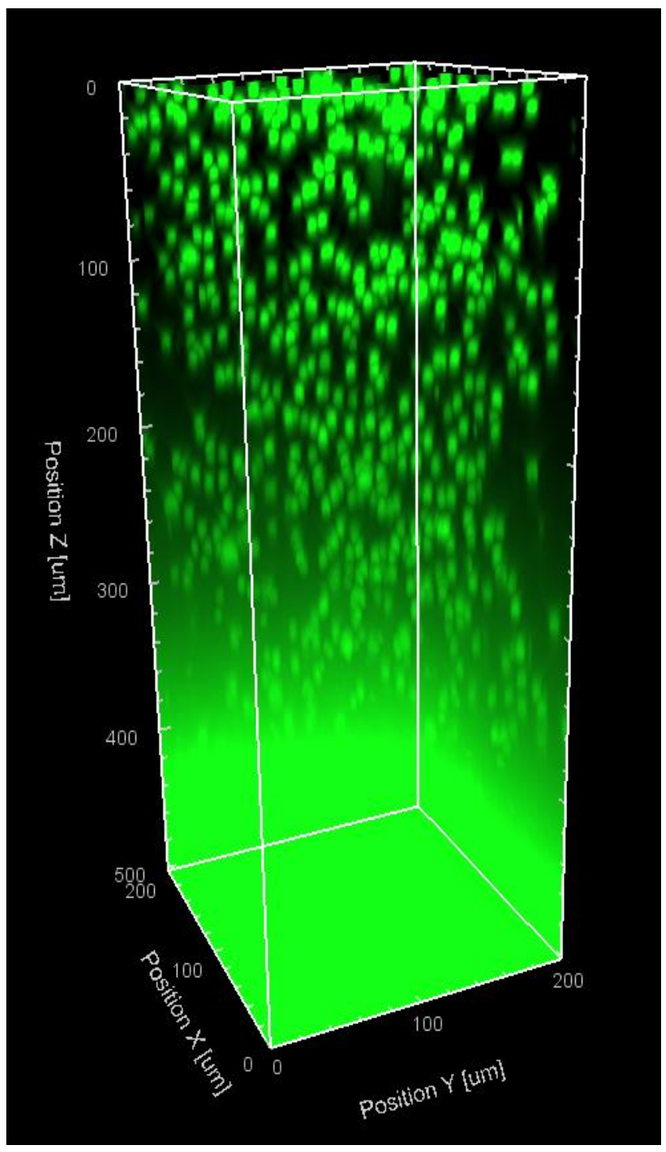
Routine Confocal



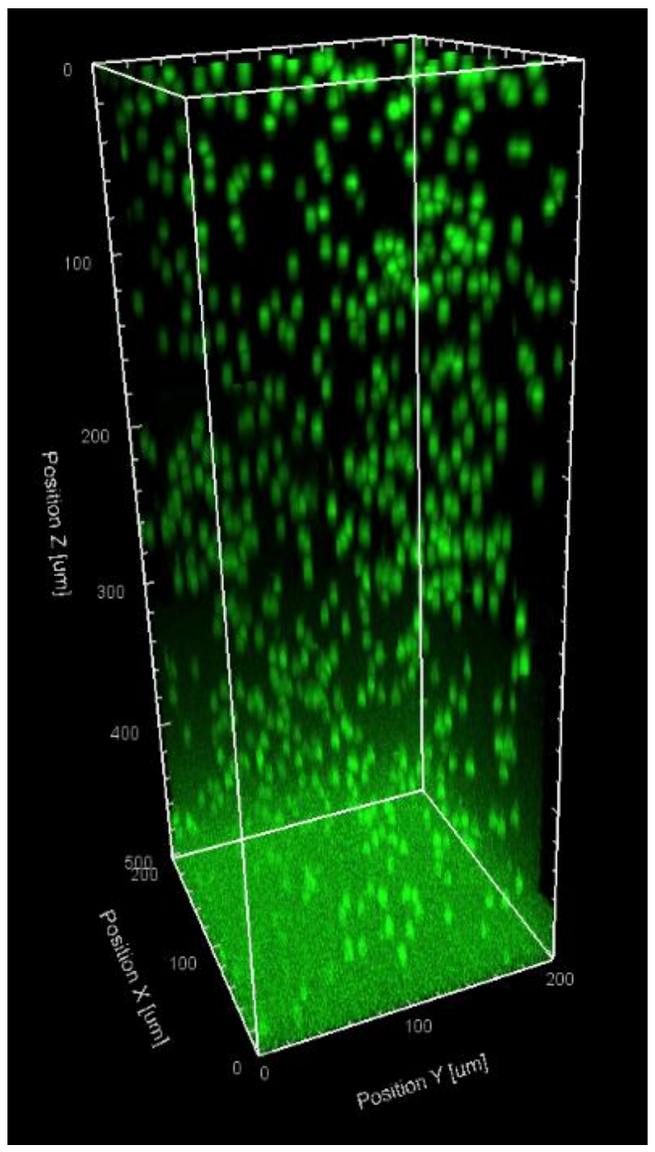
L Series Research

Three-dimensional Imaging of Fluorescent Beads





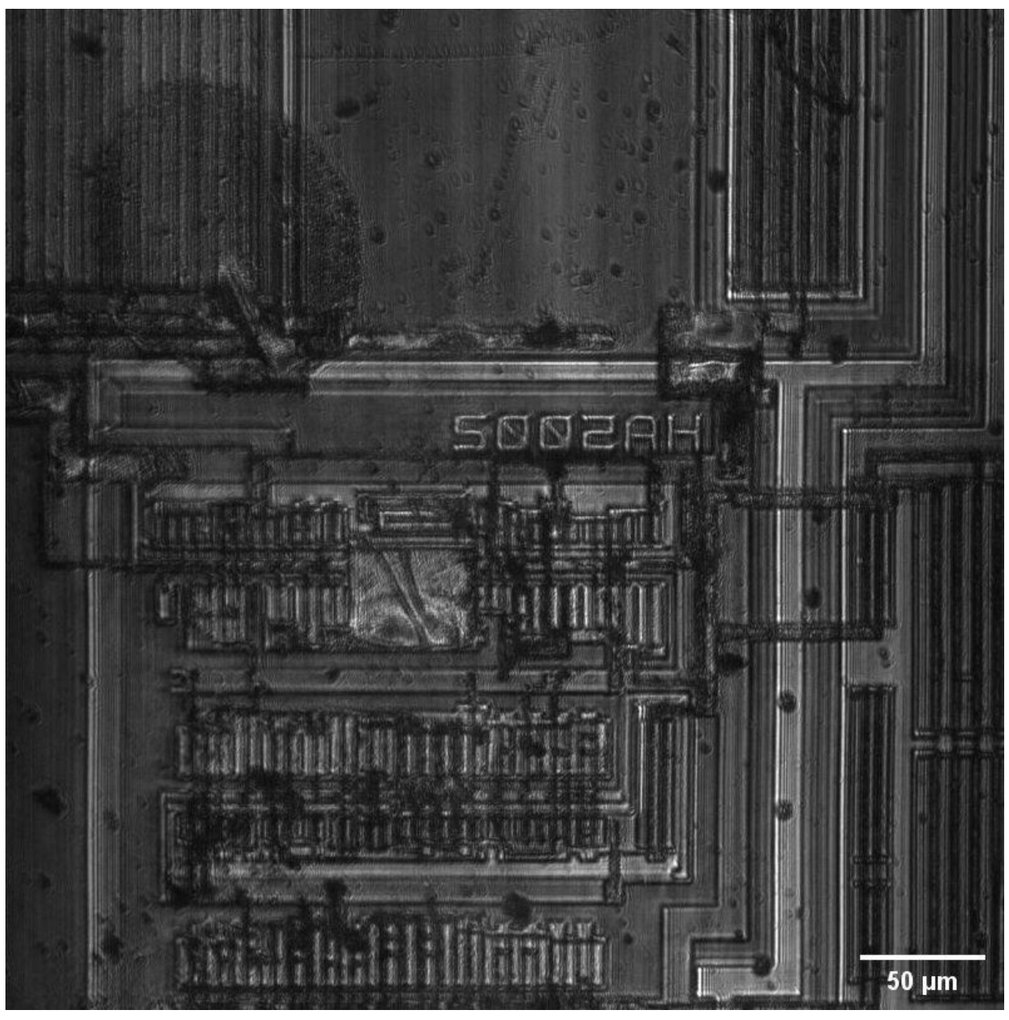
Routine Confocal



L Series Research

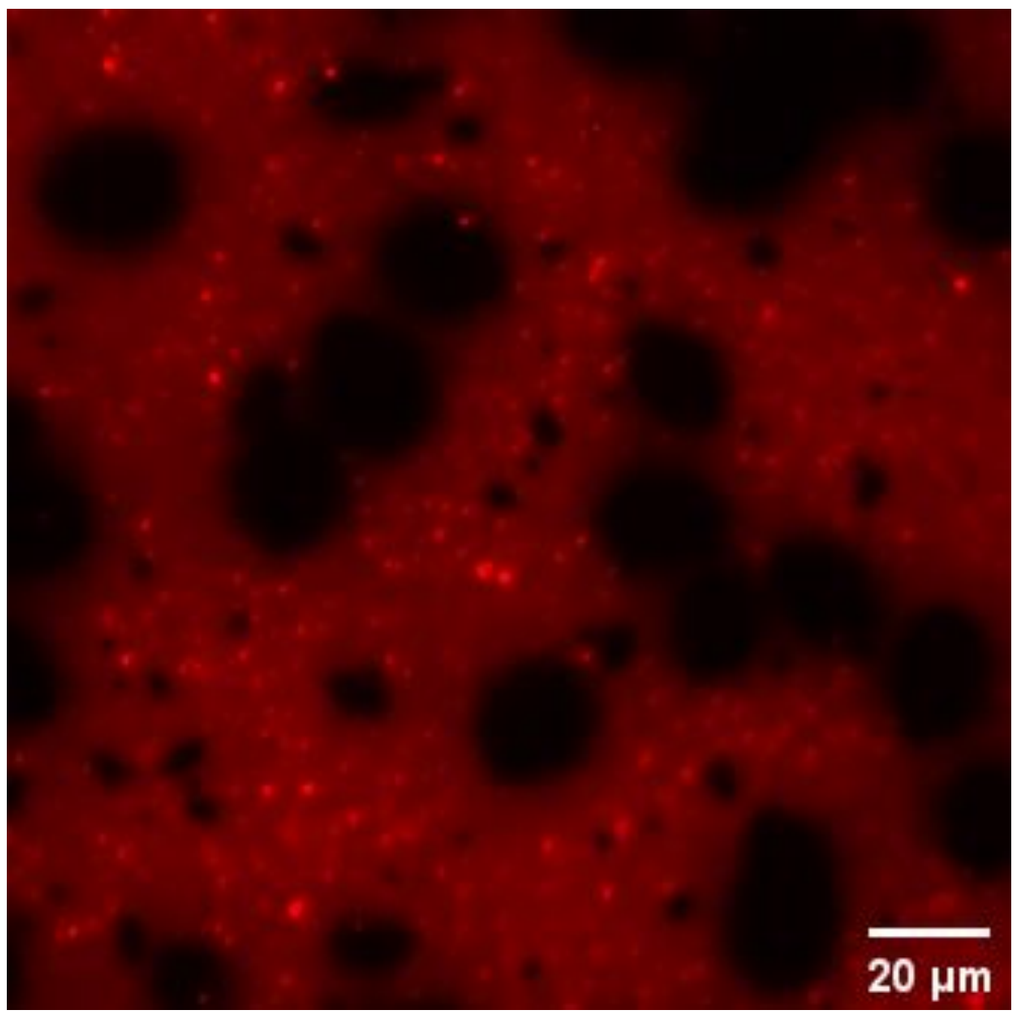
High-speed Line Scanning Inspection

8-inch wafer surface inspection



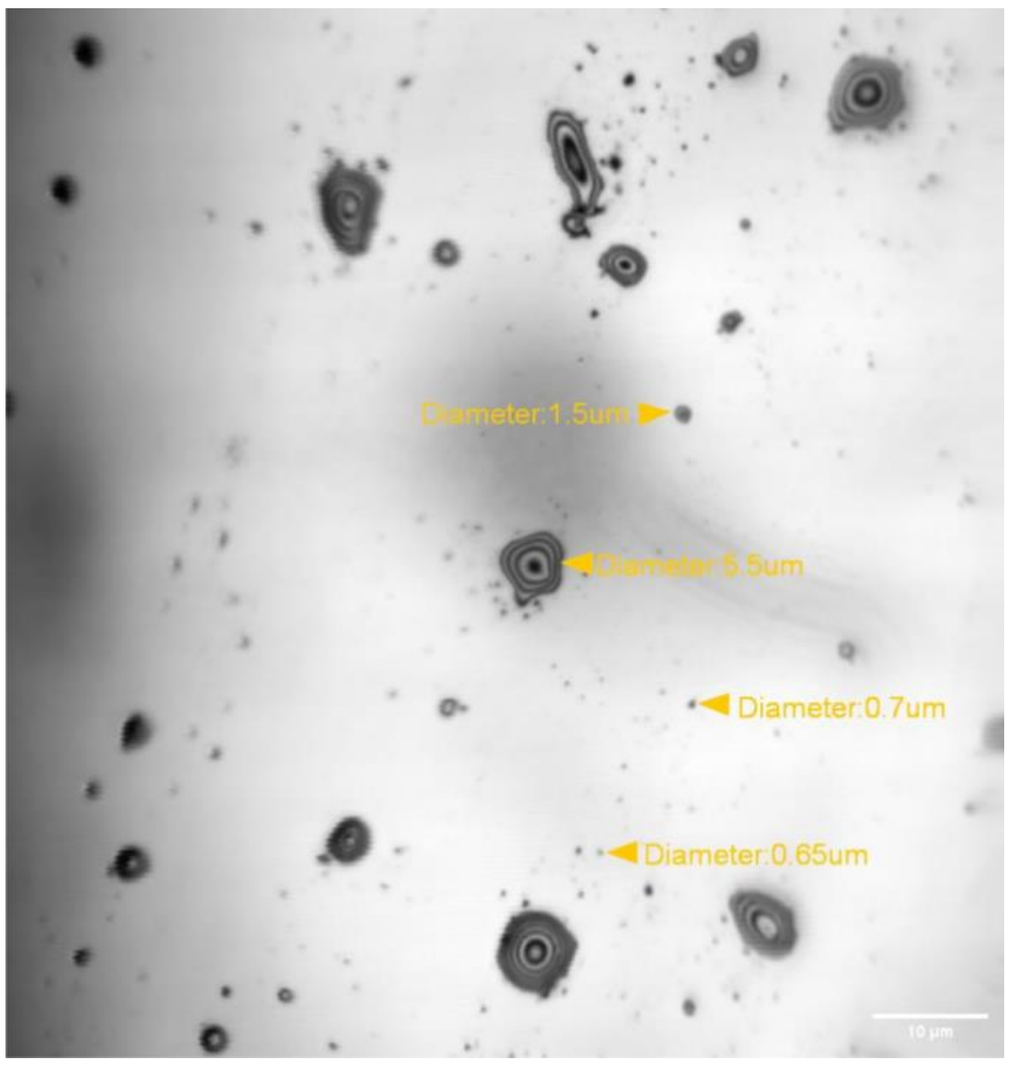
10X objective lens, full-chip inspection time 50s

Perovskite quantum dots

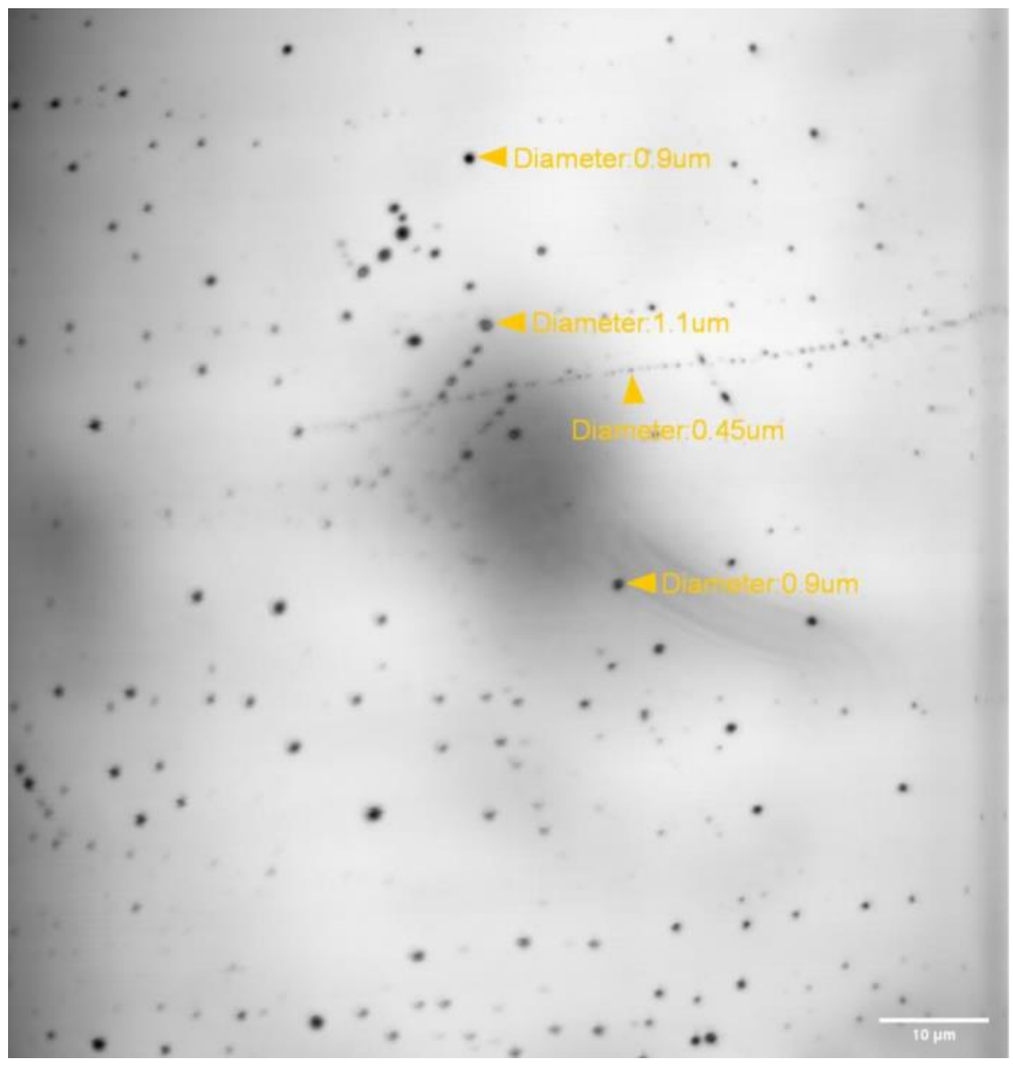


10X objective lens, perovskite quantum dots

6-inch wafer surface inspection



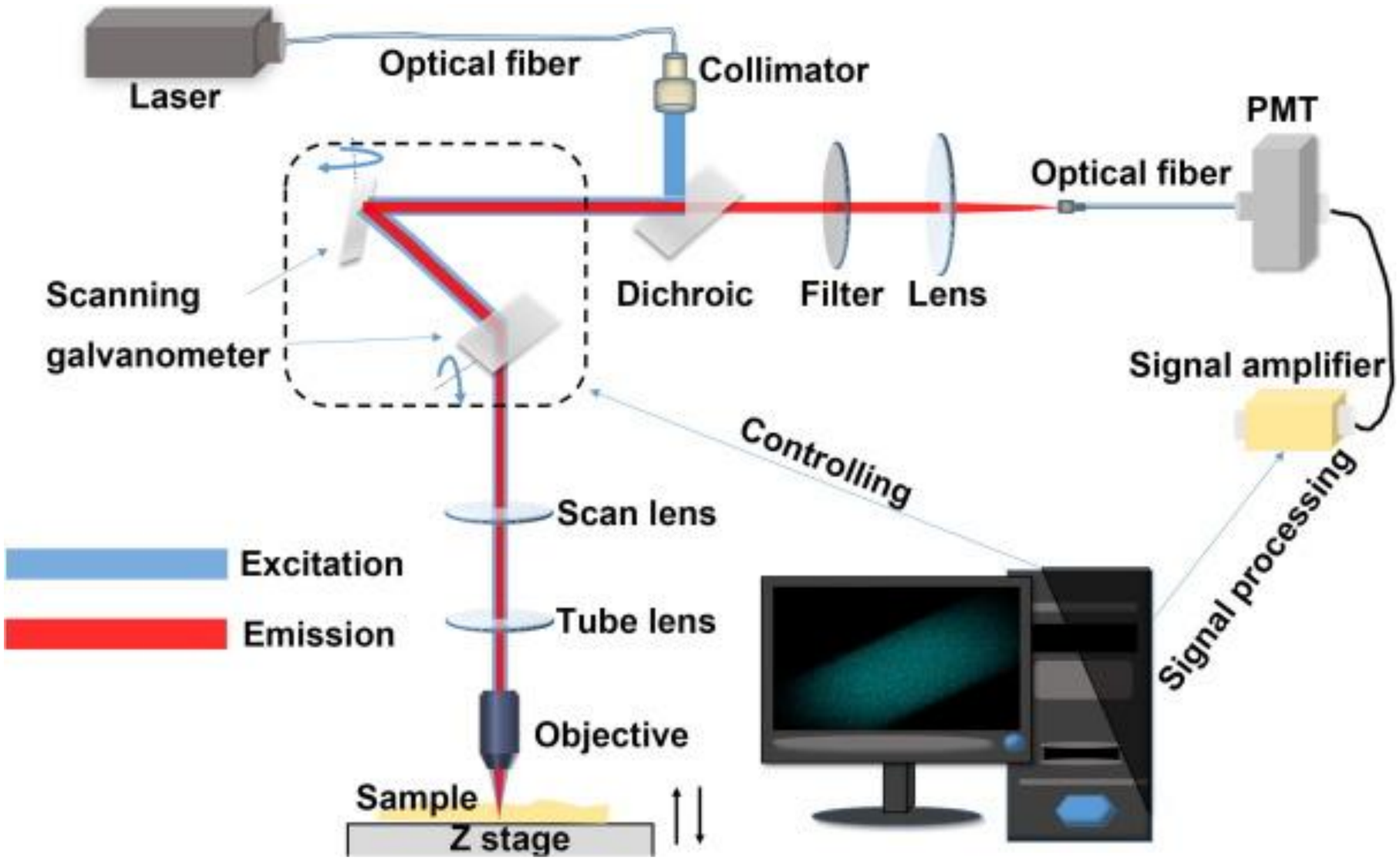
20X objective lens
Micro-pit diameter 5.5 μm, defect diameter 1.5 μm, 0.7 μm, 0.65 μm



20X objective lens
Defect diameter 1.1μm, 0.9μm, 0.9μm, 0.45μm

Solution One : Confocal Spectral Microscope (Near-Infrared I/II Confocal)

- Upgrade to Confocal Spectral Microscope (NIR I/II confocal)
- Wavelength Range UV to NIR (200nm-2.5nm)
- Spectral resolution up to 0.2nm
- Large NA setup for high-sensitivity application

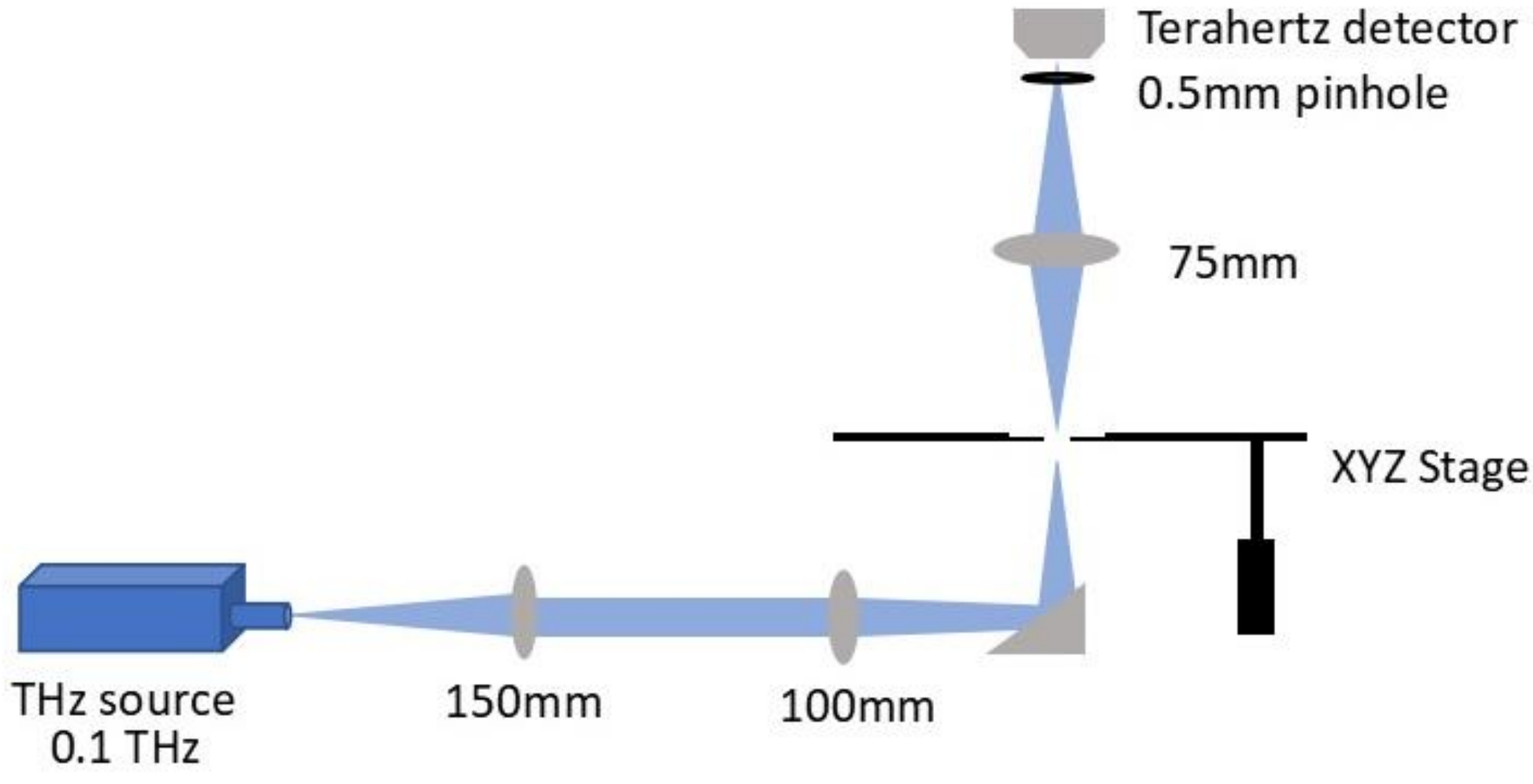


Solution Two : Terahertz Confocal Microscope System

- 100GHz,output power:80mW
- Spatial resolution 150-200um

The terahertz confocal microscope uses a focused beam of terahertz radiation to scan the sample being analyzed. This beam is then reflected back and collected by a detector, which creates an image of the sample based on the intensity of the reflected radiation. By using a confocal design, this microscope can achieve high resolution and can selectively focus on different depths within a sample.

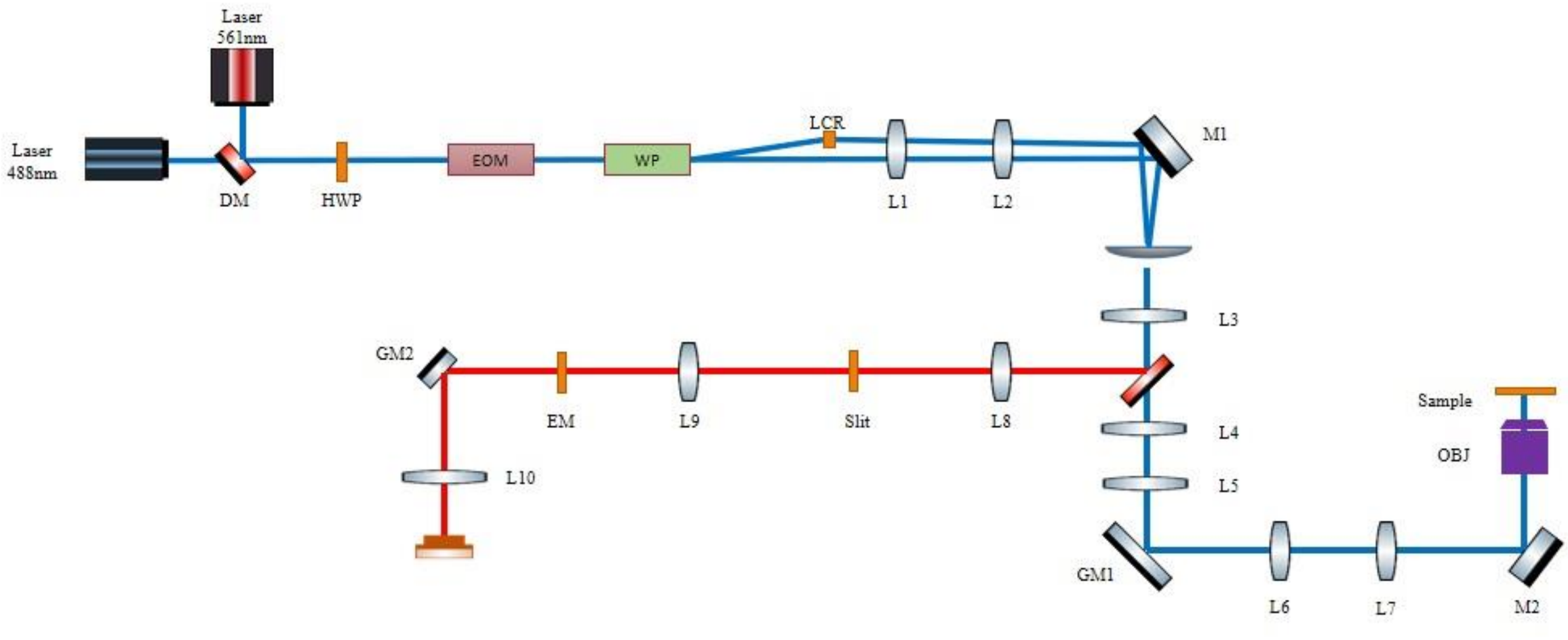
It can be used to study the microstructure and properties of materials, such as polymers, ceramics, and semiconductors, and to detect defects or anomalies in their structures. In biology and medicine, it can be used to image and study biological tissues, including skin, teeth, and cartilage, which are transparent to terahertz radiation.



● Solution Three: Super Resolution Confocal Re-scan Structure Illumination Microscope

A "re-scan" confocal microscope is a type of confocal microscope that uses a rapidly moving mirror or scanner to scan across the sample multiple times, producing even higher resolution and better contrast images than standard confocal microscopes.

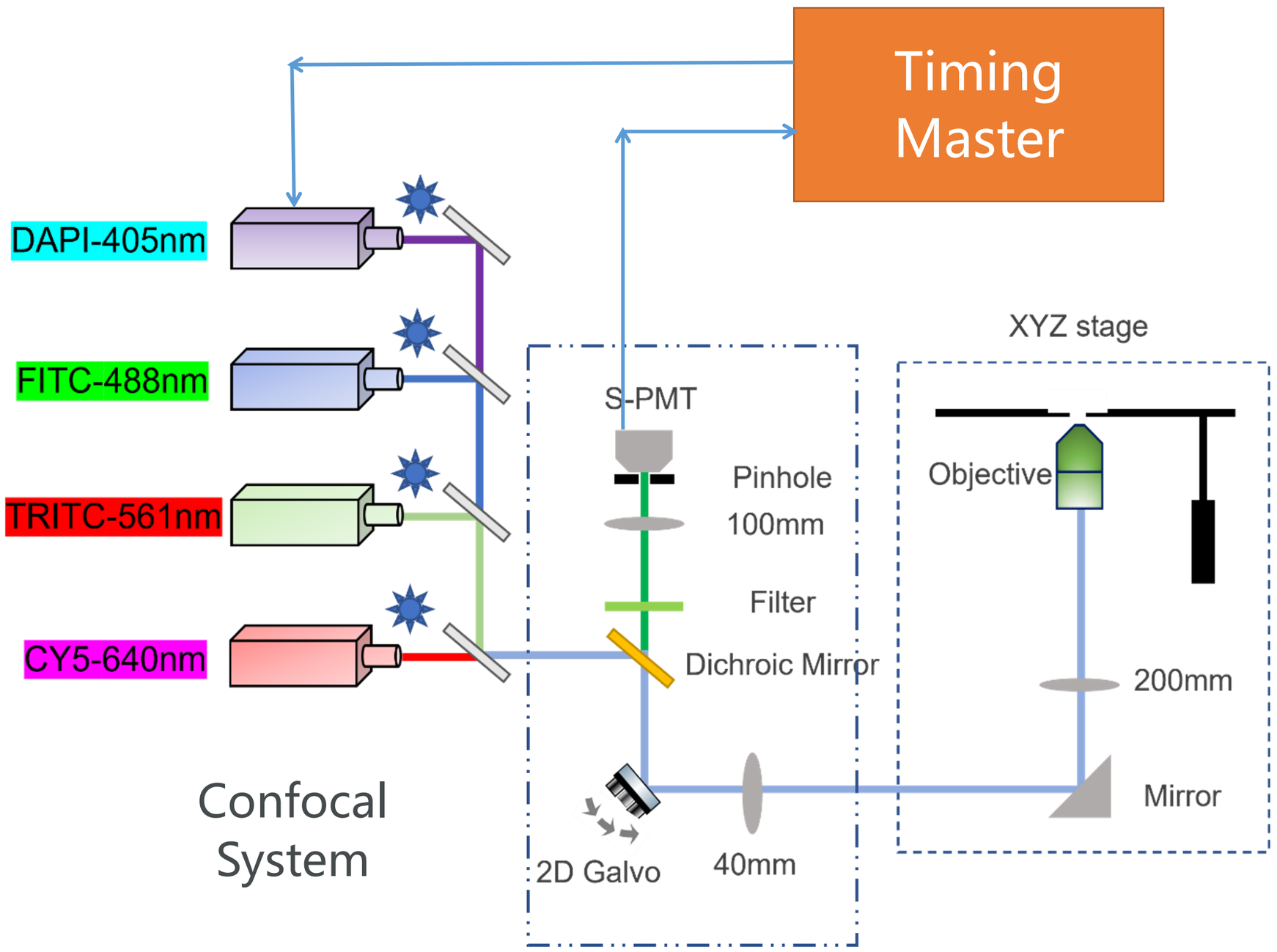
Overall, re-scan confocal microscopes are very powerful tools for studying biological tissues, cells, and other samples, and are widely used in research labs, medical facilities, and other scientific settings.



● Solution Four: Fluorescence Lifetime Imaging Microscopy (FLIM)

FLIM is a type of microscope that allows visualization and analysis of biological samples based on the fluorescence lifetime of the fluorophore being used. FLIM measures the time between the excitation and emission of photons in a sample, which can provide information about the properties of the fluorophore and the environment in which it is located.

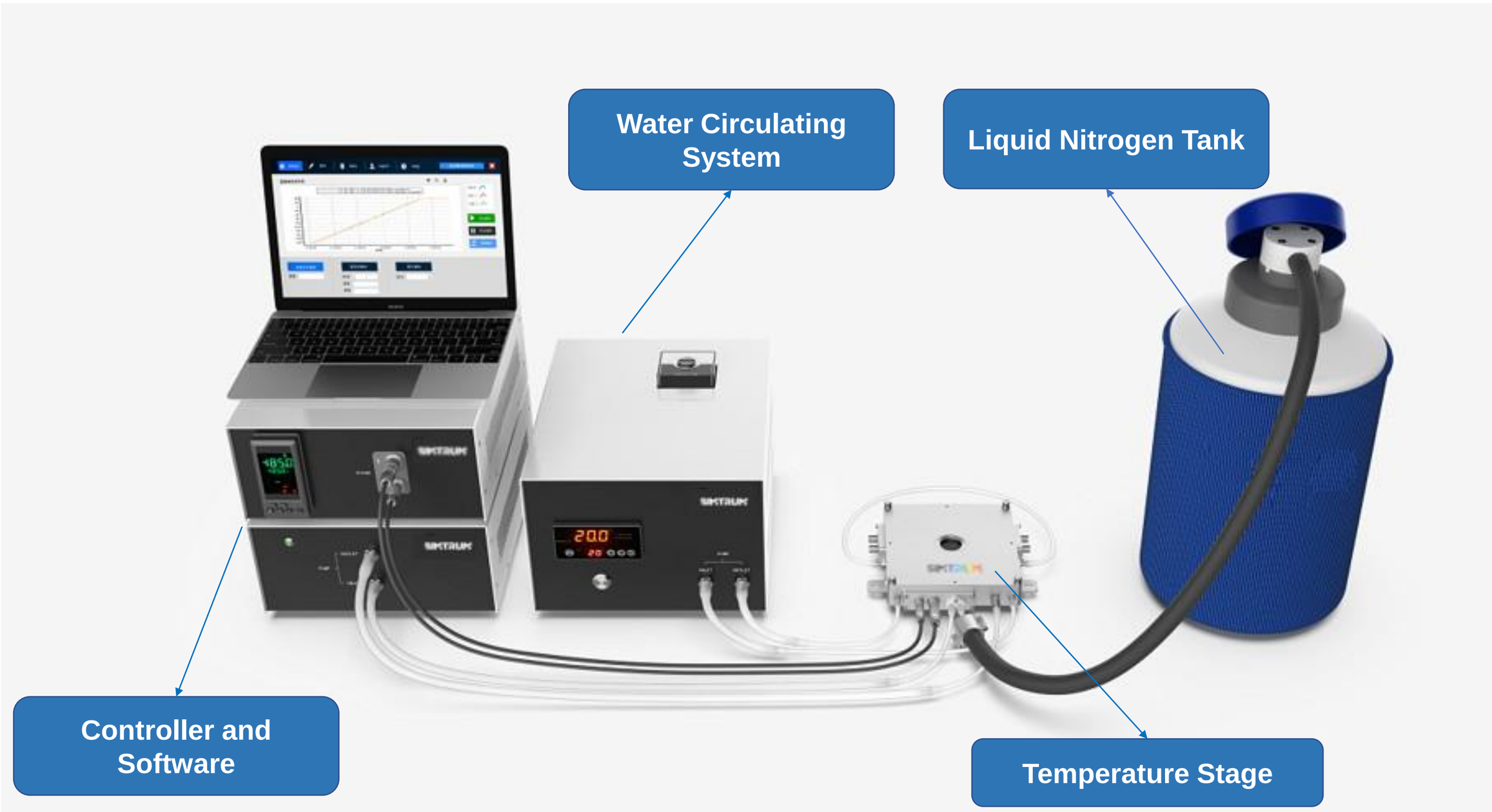
FLIM can be used to study a wide range of biological processes, including protein-protein interactions, enzyme activity, and ion concentration changes. It is often used in combination with other imaging techniques, such as confocal microscopy, to provide more detailed information about the sample.



Solution Five : Low Temperature Confocal Microscope

Compatible with SIMTRUM Cryostat to perform Low-temperature Raman measurements -190 to 600 degrees

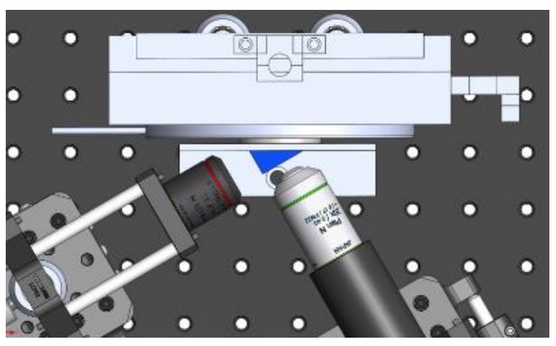
- 8 probe arms able to upgrade to adjustable probe arm
- Reflection or transmission mode available

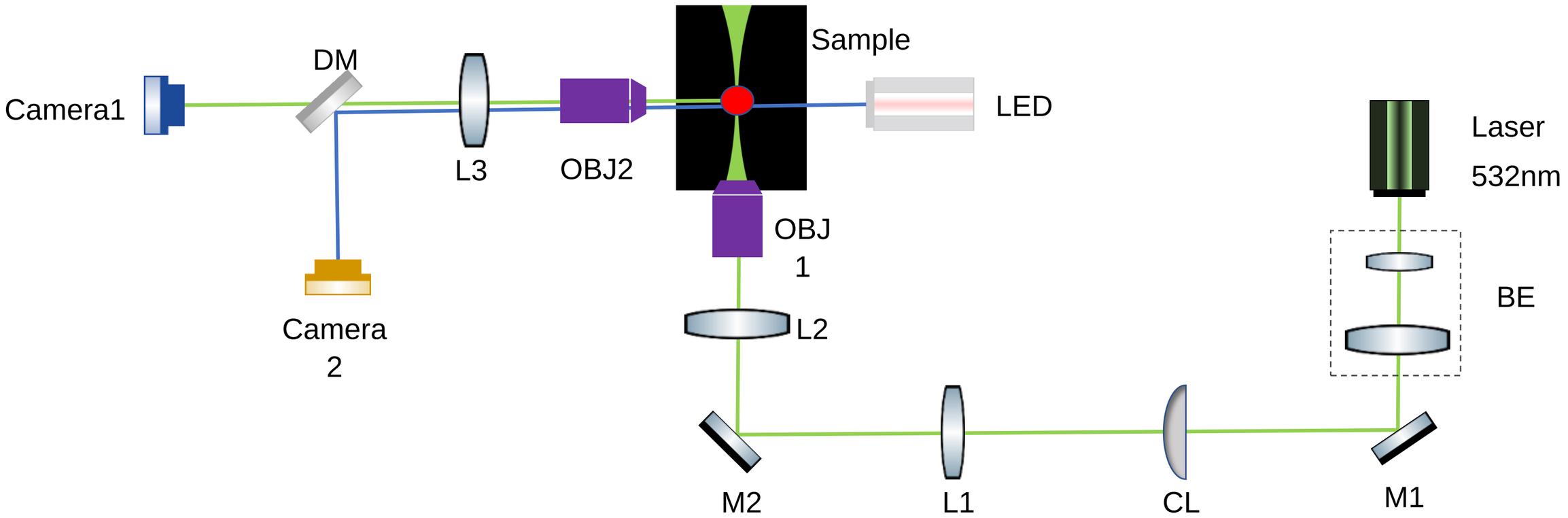


Solution Six: Light Sheet Microscope

The working principle of LSM involves separating the illumination and detection paths into two orthogonal planes. The illumination plane is a thin sheet of light produced using a laser or LED light source and a cylindrical lens. This sheet of light then scans through the sample, illuminating only a thin slice of the sample at a time. The light emitted by the sample is then detected by a camera or photomultiplier tube positioned perpendicular to the illumination. It allows for rapid, high-resolution imaging of three-dimensional (3D) structures within living organisms while minimizing light damage.

LSM has a wide range of applications in biological research, including the study of embryonic development, neural circuits, and the response of cells and tissues to stimuli. They are also used for imaging of entire organisms, such as zebrafish embryos and fruit fly larvae, to gain deeper insights into their behavior.

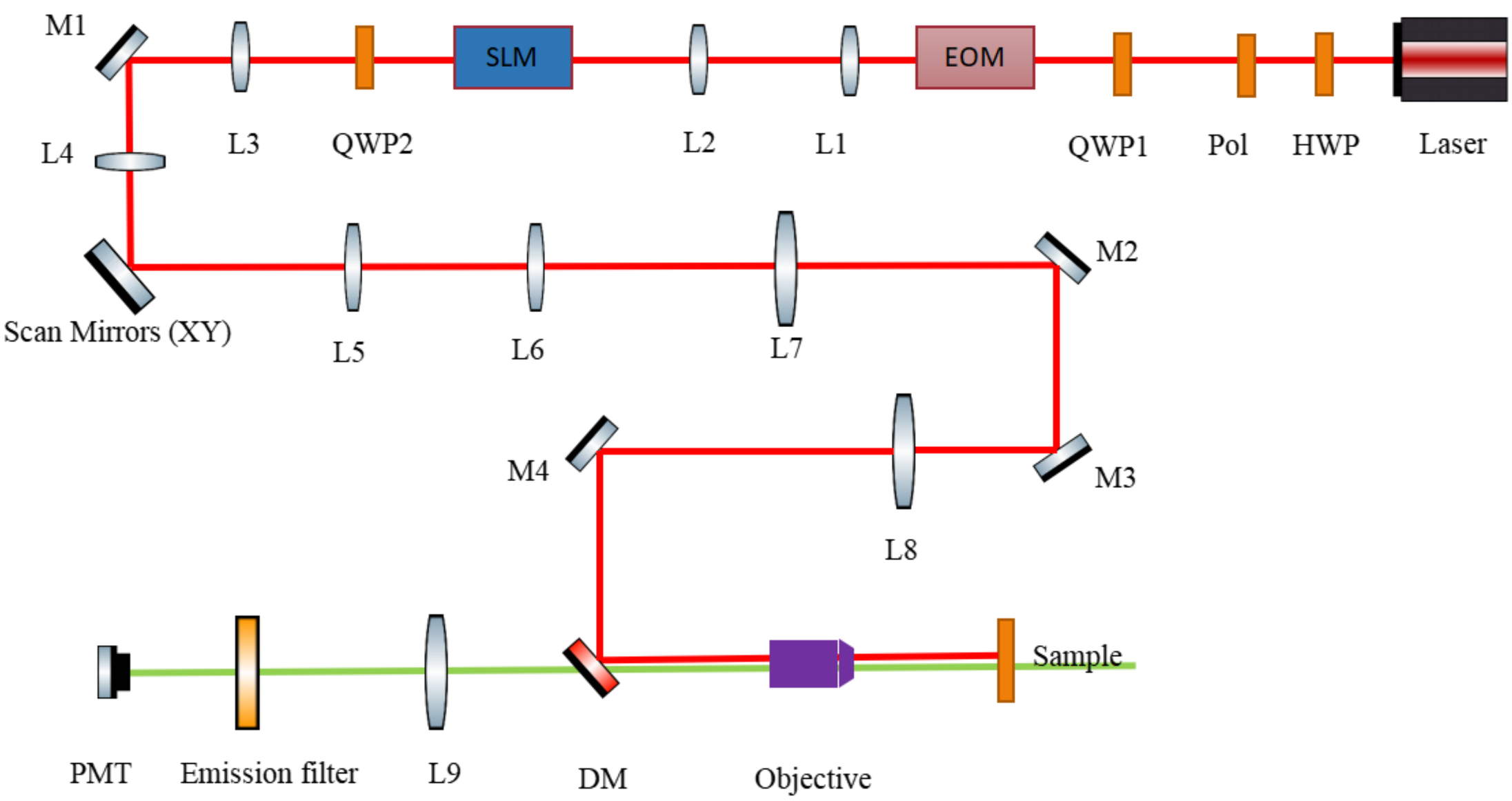




● Solution Seven：Single / Two /Multi Photon Microscope

In two-photon microscope, a laser emits light at a specific wavelength that is absorbed by the fluorescent molecules in the sample. When two photons of this light are absorbed simultaneously, they provide enough energy to excite the fluorescent molecule and cause it to emit light at a longer wavelength, which can be detected by the microscope. Because two photons are required to excite the molecule, the probability of fluorescence emission is low and only occurs at the focal point of the microscope, allowing for high-resolution imaging and greater depth than conventional microscopes.

Two-photon microscope has a number of applications in neuroscience, biology, and biomedical imaging. For example, it has been used to study the activity of individual neurons in the brain, to visualize the structure and function of blood vessels, and to track the behavior of cells in living tissues.



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