



LiTone LBS Light-sheet Microscope

The ideal platform for 5D live-cell fluorescence imaging

Product Information V 2.1







A better tool for imaging live at high resolution



Two-color 3D image of the tubulin (green) and mitochondria (red) in a cell captured with LiTone LBS light-sheet microscope

The LiTone LBS light-sheet microscope will let you observe the live specimen with sensitivity, resolution, and speed that have never been simultaneously achieved 5D biological imaging, thus squeeze ever more and better data out of their samples.

The Line Bessel Sheet (LBS) technology is an efficient and robust method to provide extreme fine optical sections at the plane being observed. With LBS, even the most sensitive specimen can now be imaged for much extended period with uncompromised signal to noise ratio and improved temporal-spatial resolution.



Fast living sampling imaging

✓ Capable to acquire over 500 sections per second

Stunning 3D resolution

✓ 250nm lateral resolution and 350nm axial resolution

Ultra-low photo toxicity ✓ 1000 times less than confocal

LiTone LBS Light-sheet microscope open the new era for 5D imaging: 3D space + 1D in time and 1D in fluorescent channels.



LiTone LBS Light-sheet Microscope

for 5D live-cell fluorescence imaging

Better than Confocal

LiTone LBS light-sheet microscope tightly confines the excitation light to a sheet with only a few hundred nanometer in thickness along the focal plane, thus almost every photon emitted from the specimen can be captured and contribute to the final image. Comparing to confocal microscope, LiTone[™] LBS light-sheet microscope offers:

- 1000x less photo-damage to sample
- 1000x faster acquisition
- 2x better axial resolution



Illumination strategy of LiTone™ LBS light-sheet microscope

Better than Traditional Light-sheet Microscopes





Thin (but short) or Long (but thick) light sheet created by swept Gaussian beam (or cylindrical lens)



Ultrathin long LBS in LiTone Microscope



LBS provides improved optical sectioning and SNR than traditional light-sheet at cellular level. Scale bars: 3um

Currently, most of the light-sheet microscopes create the light sheet by sweeping a Gaussian beam or by using cylindrical lens to compress a Gaussian beam into a sheet. The LBS is sophistically crafted to be much thinner and longer than these traditional light sheets, therefore the LiTone LBS is not only powerful in its low rate of photo toxicity and imaging speed, but also excels in 3D resolution and signal to noise ratio owing to its much improved sectioning ability.



LiTone LBS Light-sheet Microscope for 5D live-cell fluorescence imaging

for 5D live-cell fluorescence imaging

Your good data is only a few clicks away

LitScan is the interface software that offers a comprehensive and simplified control of the microscope. It can preforms real-time 3D rendering during acquisition and integrates many useful imaging processing gadgets including deconvolution and particle/vesicle tracking. It outputs the image data in a standard tiff-stack format that can be imported to any third-party post-processing software





3D tracking of vesicles inside a Hela cell Click to watch the video online





Lysotracker stained lysosomes in a Hela cell. LitScan enables real-time 3D rendering to effectively visualize your sample during acquisition

Simple and smart data acquisition settings

✓ Turn-key operation

On-the-fly data processing

✓ Optimized algorism for fast and reliable image processing

Built-in 3D rendering

✓ Get your data the moment acquisition ends

Golgi (green) and the protein to study (red) in yeast cells. 3D deconvolution function can further increase the sharpness and contract and helps to extract more information. Scale bar: 2 µm



LiTone LBS Light-sheet Microscope for 5D live-cell fluorescence imaging

It's all integrated

Every LiTone LBS light-sheet microscope is carefully pre-configured immediately for your applications: It integrates a live cell incubation/perfusion system that offers accurate temperature/ CO_2 environment control for long-term live imaging; an EPI-fluorescent imaging module for easy FOV targeting; all motorized sample positioning with nanometer accuracy; and a Solar 2.0 multi-channel fiber-pigtail laser system that can host up to 6 channels.



Integrated lasers with fiber pigtail

- Configurable, with up to 6 channels
- Single-mode fiber output up to 150mW
- Digital/Analogy modulation at MHz



Temperature/CO₂ conditioned live sample perfusion bath

- Holds 2-5ml of culture medium or any liquid for sample immersion
- Allows change medium/add in drugs during image acquisition
- Integrates an EPI-fluorescent imaging port with 4x/10x/50x dry objective



Solar 2.0 fiber laser system

Optics by LiT

 LiT makes its own objectives specially optimized for delivering the Line Bessel Sheets (LBS) in culture medium to achieve the best imaging quality



LiTone LBS Light-sheet Microscope for 5D live-cell fluorescence imaging

Maximized adaptability



Holder for 5mm coverslips



Mounting the sample holder to the microscope



Examples of imaging with coverslip mounting: mitochondria dynamics in a Hela cell during mitosis Click to watch the video online

The large sample imaging module includes a accurate rotatory stage to adjust the orientation of the embryo/larva. The module also includes a 0.5x intermediate zoom system to increase the field of view for large samples

Although it is best for cellular level high resolution imaging, the LiTone LBS light-sheet microscope accepts a wide range of samples. It can host adhesive specimen grown or mounted coverslip (e.g. cell а culture) or on embryos/small animals mounted in agarose pushed out of a glass tube (e.g. c-elegant, zebrafish) with the help of the large sample imaging module.



Embryos or small animals can be mounted by agarose embedding. Holder is made of a syringe



Inserting the syringe sample holder to the large sample imaging module on microscope



Examples of imaging with large sample imaging module: development of motor neuron network in zebrafish tail

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Examples of applications

The LiTone LBS light-sheet microscope is the best of its kind to image fast 3D dynamic in the most photo-sensitive specimens. It has been widely used to image from intracellular structures to small animals. It is your turn to find out how amazing life can be under LiTone LBS light-sheet microscope



Dynamics of chromosomes during mitosis of a Hela cell. Blue: actin; Green: cell matrix; Red: chromosomes Click to watch the video online

Dynamics of target protein (GFP tagged, green) and Golgi (mCherry tagged, Red) in yeast cells. Deconvolution is applied to enhance the SNR. LiTone LBS shows its power in resolving the subcellular structures that can be easily damaged or bleached under confocal microscopes.



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Dynamics of primary cultured neurons under chemical stimulation Click to watch the video online



The beating heart of a 24hpf zebrafish. Visualizing the GPF labelled myocardium and captured at 300fps. The dynamics of heart muscle can be studied with high temporal resolution Click to watch the video online



The fast growth rate and photosensitivity makes pollen tube a difficult objective to study under traditional fluorescent microscopes. Dynamics of actin filaments in a growing pollen tube can be easily captured by LiTone LBS. Green: actin; Red: Cell matrix

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LiTone LBS Light-sheet Microscope

for 5D live-cell fluorescence imaging¹

Specifications

Available wavelengths	Any combinations of 405nm (DAPI), 488nm (GFP), 532nm (Cy3.5), 561nm (mCherry), 647nm (Alexa647); Others also possible
Field of View ²	400 um diagonal Increase to 800um diagonal with optional x0.5 intermediate zoom lens
Objectives	Detection Obj.: 25× N.A. 1.1 Water Dipping Excitation Obj.: 63× N.A. 0.75 Water Dipping / 29× N.A. 0.55 Water Dipping / 15× N.A. 0.27 Water Dipping Epi Fluorescent Obj.: 4× N.A. 0.18 Air / 10× N.A. 0.25 Air / 50× N.A. 0.35 Air
Sample Size ³	up to 2.5 mm radius hemisphere
Max Acquisition speed ⁴	500 frames/s (400 $ imes$ 2048 pixels) with sCMOS camera
Spatial Resolution ⁵	250nm lateral by 350nm axial
Temporal Resolution ⁶	2Hz per channel per volume with highest spatial resolution for sample no larger than 30 μ m (W) by 30 μ m (H) by 30 μ m (L)
Imaging Modes ⁷	Epi fluorescent mode; FLIP/FRAP mode; Large sample imaging mode and LBS 3D imaging mode
Sample Mounting	Config. 1: cells or tissue grown or fixed on coverslip Config. 2: embryo or small animals mounted in glass tube with Agra
Sample Positioning	Full motorized sample stages with optional rotatory stage for imaging tube-mounted samples (e.g. zebrafish/embryo)
Imaging Depth	Usually 30 -150 μ m depending on optical property of sample
Incubation	Integrated live cell incubator. 25-40 ^o C temperature controlled by water circulation, with CO ₂ and perfusion system for adding drugs or change medium during acquisition
Software	LitScan 2.0 microscope control & data rendering software. Real time 3D rendering & deconvolution included

¹5D stands for: 3D space + 1D time + 1D color

²The parameter is for using a 25x LWD detection objective.

³The parameter indicates the maximum size of sample that can be hosted by the system. Note that the actual imaging depth strongly depends on the optical property of the specimen

⁴Determined by the speed of sCMOS camera; Reduce the image height can linearly increase the acquisition speed e.g. 1000 frames/s at 480 × 2048 pixels

⁵The parameter is given for a system calibrated for sample size up to 30µm

⁶The temporal resolution depends on the volume of image. The parameter is for imaging a 30 um by 30 um by 30 um volume with highest spatial resolution in sample scan mode

⁷Epi fluorescent mode offers larger field of view with a 4x or 10x objective for targeting the FOV before 3D imaging in LBS mode; Large sample imaging mode uses Gaussian light sheet for imaging sample with size over 50um

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