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In Vivo Imaging System

Luminescence / Fluorescence **Small animal / Plant**

Make In Vivo Imaging Easy !!

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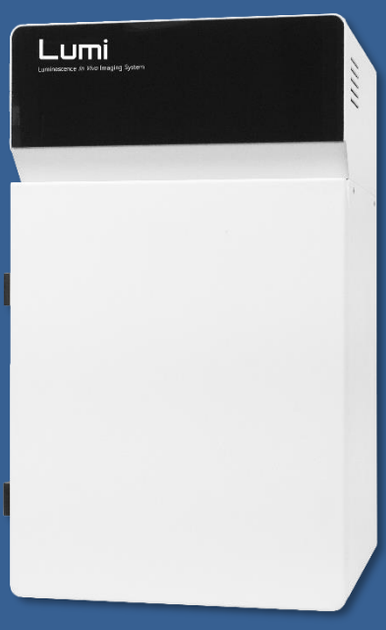
In Vivo Imaging equipment



Luminescence

Fluorescence

Excellent images, separately !!

Optical image analysis systems are widely used in biology.

In the case of fluorescence imaging, various applications are possible, but many elements such as excitation light source, excitation filter, and emission filter are required to obtain the image. For luminescence imaging, a highly sensitive image sensor is required to obtain an image of weak light but it's structure is simple. Although both types of images are optical images, it is advantageous to create separate devices for luminescence imaging and fluorescence imaging because different elements and specifications are required to obtain the images. A very complex system is required to obtain both images with one device. In addition, it is difficult to satisfy both types of images, and the emphasis is placed on configuring the system for luminescence imaging, which requires a high-sensitivity sensor. Fluorescence imaging can result in relatively low-level images.

Unlike luminescence imaging, fluorescence imaging does not require a highly sensitive image sensor because relatively bright light is emitted compared to luminescence. However, it is important to distinguish background due to reflected excitation light and auto-fluorescence from animal's skin. And using a color sensor instead of a black-and-white sensor can provide more intuitive data when obtaining an image with color information.

LUCI Luc Imaging System

Bio Luminescence *In Vivo* Imaging System

High Quality Image sensor

Exceptional QE: 95% max

Cooling to -80ºC

Personal Imaging System

(Compact, Easy, Cost effective)

Bio Luminescence *In Vivo* Imaging

Small animal and Plant

Tumorization, Cell tracking and Gene expression

LUCI is a device designed to image and analyze luminescence signals from tissues and organisms. With its optimized macro-imaging camera, LUCI can obtain high-quality images that are both intuitive and easy to interpret. The NEOimage program that comes with LUCI allows for easy analysis of luminescence images. LUCI has a simple design, is user-friendly, and offers fast and reliable performance.

High Sensitive Camera Sensor

LUCI utilizes a highly innovative 1 Megapixel back-illuminated CCD camera that provides single photon sensitivity across a large field of view at 26 frames per second. The camera sensor has a 1024 x 724 sensor format and 13 μm pixel size, which provides exceptional resolving power, field of view, and speed, making it an attractive and versatile option for *In Vivo* imaging applications.

Easy to use

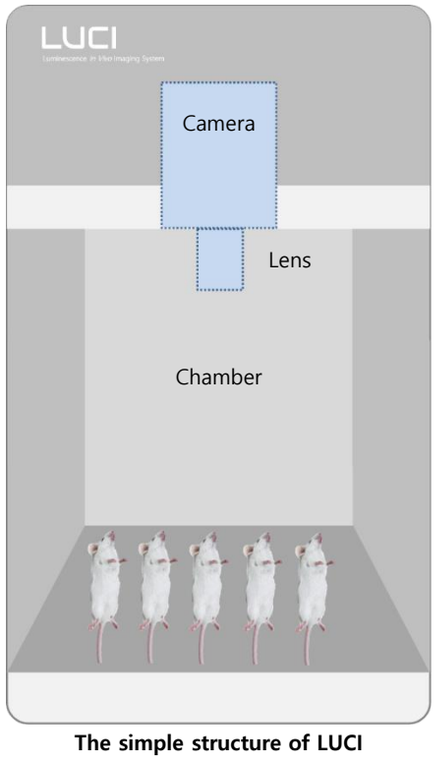
Hardware and software are user-friendly. Camera and LED light are controlled by NEOimage program. All of functions: live window, adjust exposure time and gain, capture, quantitation and merging image are simple and intuitive.

Compact size

LUCI's compact size of 30 x 30 x 51 cm makes it ideal for use in small spaces. Additionally, its portability allows for easy transportation, making it suitable for a wide range of applications.

Simple Structure

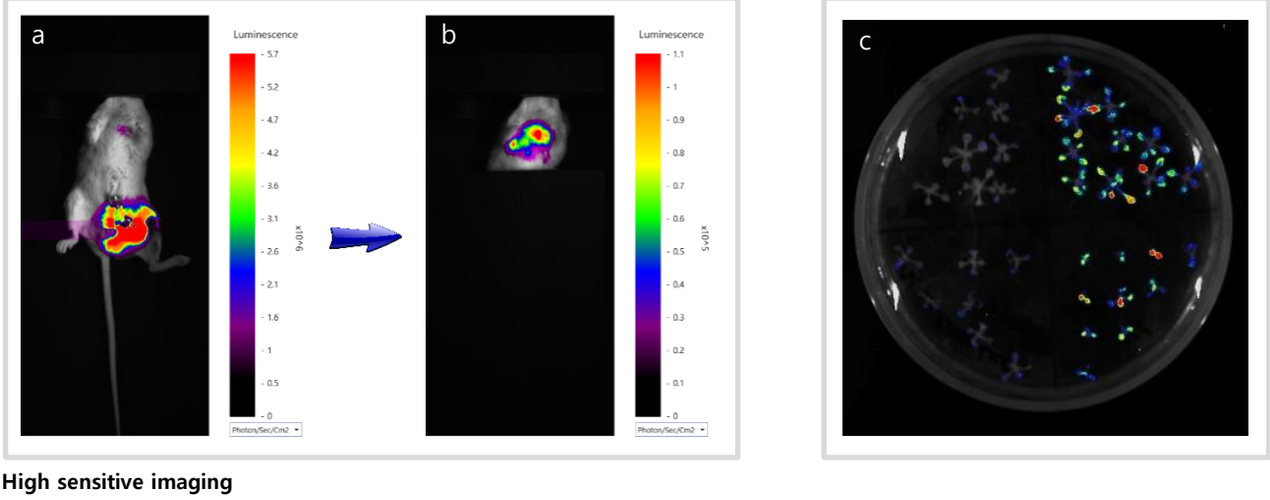
LUCI has a simple structure, consisting of only the most essential components: a highly sensitive camera, high-performance lens, heating floor and anesthesia module. The product is designed to prioritize its main function, which is detecting signal, while minimizing the risk of malfunctions. This makes it not only convenient for obtaining strong and high quality images, but also easy to maintain with minimal effort.



The simple structure of LUCI

One Click Imaging

Sometimes it can be challenging to determine the appropriate exposure time for imaging. However, with LUCI, this process is simplified and can be done with just a click. The software automatically captures the images, merges the bright image and signal image, and calibrates the quantification for various conditions. Therefore, you don't have to worry about determining the exposure time, and you can simply click once to obtain accurate quantification



High sensitive imaging

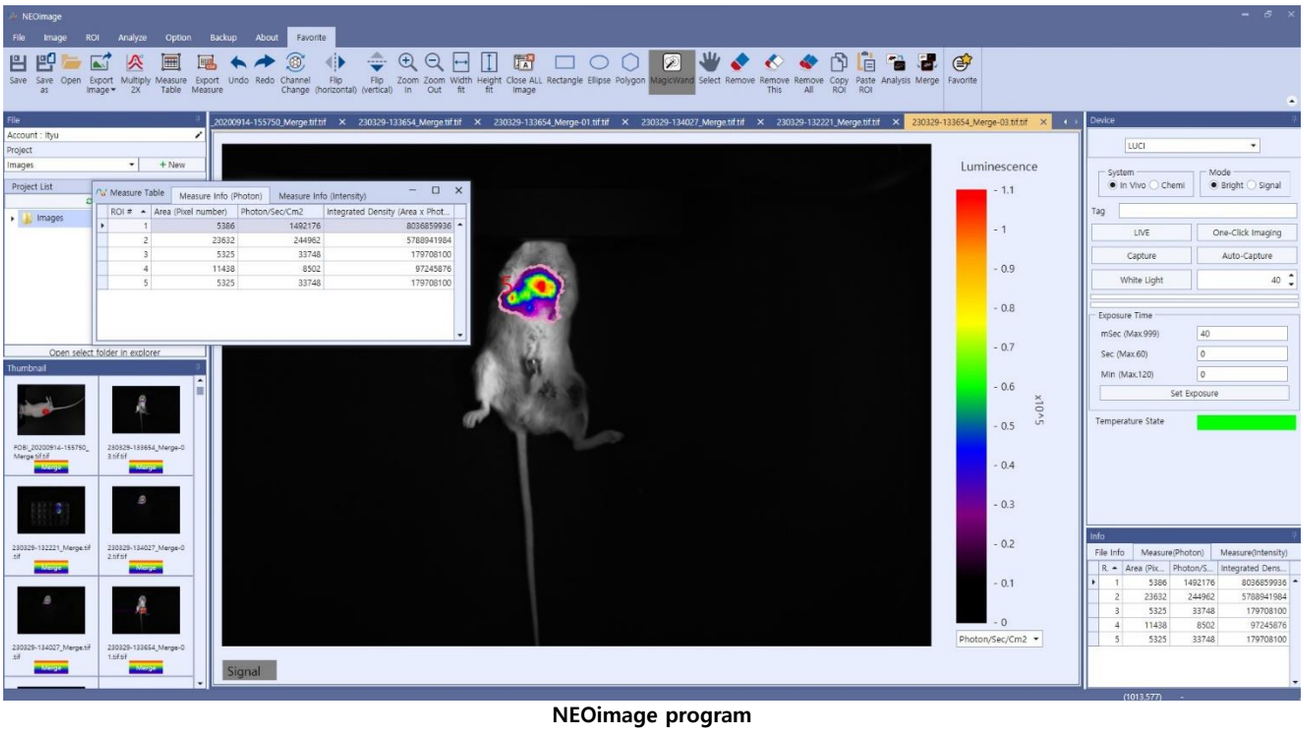
a. The cancer cells that were injected subcutaneous of the leg were too large in size, which caused the signal to become saturated. Although the signal transferred to the lung appeared weak, it was difficult to confirm due to the significant difference in signal size.
b. To obtain a clear signal from the lung, a black plastic plate was used to cover the leg, and the exposure time was increased. This allowed the cancer cells that had metastasized to the lungs to be clearly visible.
c. The image displays the expression of luciferase in Arabidopsis plants and negative control.

Excellent image data

LUCI can provide high-quality image data with high resolution. It shows the signal image in its original form without using the binning function, resulting in clear and sharp image data. The signal intensity is displayed in a rainbow color scheme, making it easy to interpret the data intuitively. The signal can be modified to appear in rainbow or 8 different colors, depending on the user's preference.

In the image data, the signal region can be defined manually or automatically. This allows for the measurement of the number of photons per unit time and area, enabling precise and accurate quantitative comparisons. By utilizing the automatic signal area detection, researchers can eliminate any subjective bias and obtain more objective results.

Software - NEOimage



NEOimage program

Specifications

	LUCI	Lumi
Image Sensor	CCD sensor	CCD sensor
Resolution	1024 x 724	1024 x 724
Frame rate	Up to 26 fps	Up to 26 fps
Quantum Efficiency	95% max	95% max
Cooling	-80ºC	-75ºC
Pixel Size	13 x 13 um	13 x 13 um
Digital Output	16-bit	16-bit
Aperture	Physical	By software
Interface Connector	USB 3.0	USB 3.0
Stage Heating	Yes	Yes
Capacity (Mouse)	5	5
Field of View	235 x 180 mm	235 x 180 mm
Weight	23 Kg	23 Kg
Size (W x D x H)	300 x 300 x 510 mm	300 x 300 x 510 mm

FOBI

Fluorescence *In Vivo* Imaging System

High Quality Image Data

Personal Imaging System

(Compact, Easy, Cost effective)

In Vivo, Ex Vivo* and *In Vitro

Small animal and Plant

Tumorization, Cell tracking, Drug tracking and Gene expression

FOBI is an imaging device specifically designed to detect and analyze fluorescent signals in tissues and organisms. It uses a set of four channels - Blue, Green, Red, and NIR - to capture images of various fluorescent proteins and dyes. Equipped with an optimized light source, filter, and color camera for macro-imaging, FOBI can produce high-quality images with clear distinction between background and signal. It can effectively remove autofluorescence and reflected light using the NEOimage program, making fluorescence imaging more reliable and accurate. The uniform light intensity of the LED light also enables precise measurements. With its simple design and easy-to-use interface, FOBI is a fast and reliable tool for fluorescence imaging.

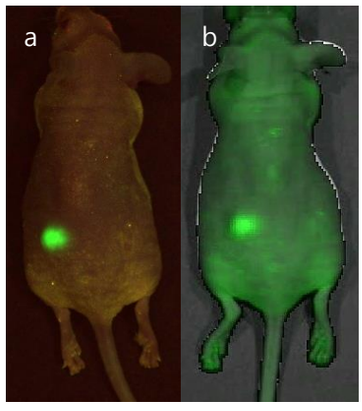
Features

Intuitive color data

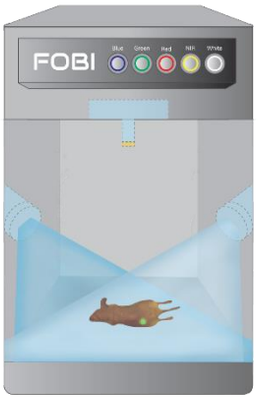
FOBI uses a color sensor and optimized filter for the fluorescence signal through the live window without any special analysis. This live window allows you to intuitively identify the position and intensity of the fluorescence and to get image data as it shown.

Fast

FOBI has a fast frame rate capable of recording videos. Due to the fast video speed, many samples can be processed quickly and instantly observed and responded.



Intuitive data by FOBI's color sensor
a. Image with color sensor.
b. Image with mono sensor (pseudo color).



Structure of FOBI

Simple

FOBI utilizes a simple, optimized structure, making installation quick and easy. It is also easy to move, manage, and maintain.

Compact size

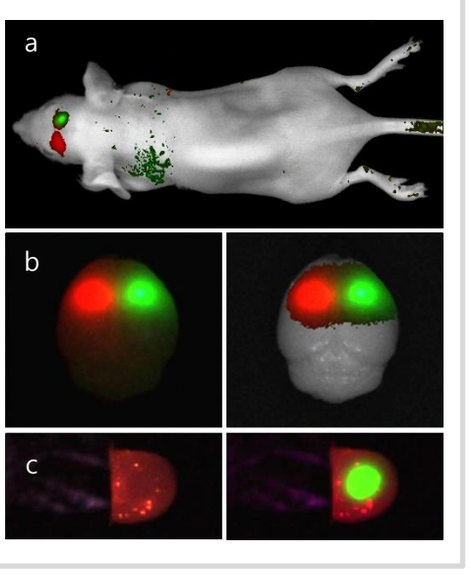
The FOBI has a compact size (26 x 26 x 40 cm), so it is ideal for small spaces. Due to its convenient size and portability, it can be used for a wide variety of applications.

Easy to use

Hardware and software are user-friendly. Filter mounting, exposure control, and image capture are all simple and easy to use.

Multi function

It is possible to apply most fluorescence proteins and fluorescence materials from GFP to ICG using four channels of Blue, Green, Red and NIR. Since more than one fluorescent substance can be imaged, different functions can be observed in one sample. For example, tumor imaging and drug imaging can be performed in the same animal, so targeting and tumorization can be observed simultaneously. You can also merge bright images in order to localization the fluorescence within the animal.



Multi function imaging
a. *In Vivo* image of Tumor cell (green) and Stem cell (red) in the same brain.
b. Whole brain image after sacrificed. c. Sliced brain image.

Applications

Tumor imaging

GFP stable cell line can be used to confirm tumorization. The created GFP stable cell line can be imaged *In Vitro* using FOBI. GFP cells are injected into subcutaneous tissues and fluorescence images as cell proliferation. In this way, one can obtain images of metastasis to other tissues, in addition to quantifying and comparing tumor size. Over time, the signal strength of the fluorescence changes, and the camera exposure time may vary accordingly. The NEOimage analysis program can quantify this change by taking into account different conditions such as exposure time and gain; the results of samples with different images can also be compared and analyzed.

Cell tracking

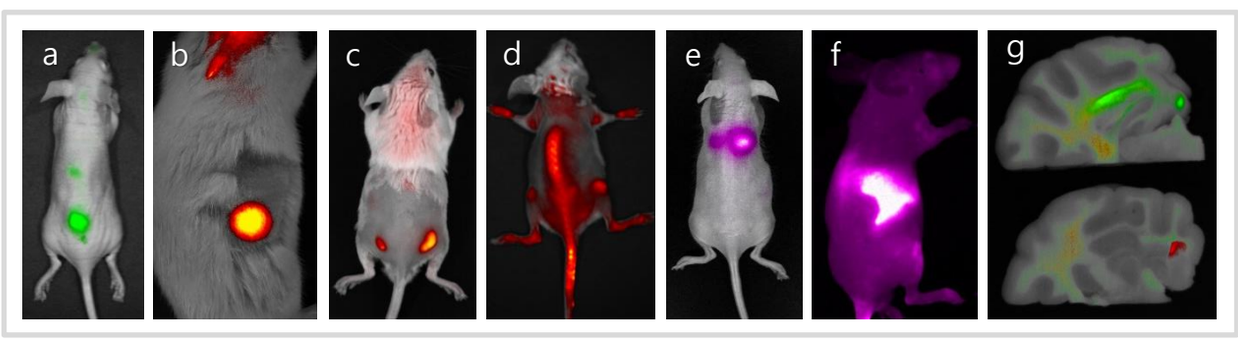
Stem cells or immune cells with enhanced functions for various purposes can be imaged within the animal so as to ascertain their location and viability. Stem cells and immune cells are difficult to label with fluorescent genes. So, cells can be stained with fluorescent reagents in a variety of ways. Stem cells and immune cells stained with a fluorescent reagent can be put into an animal using various methods such as intravenous injection, intraperitoneal injection, and subcutaneous injection. These cells can be located using FOBI imaging. One can determine cell survival using quantitative analysis.

Plant imaging

FOBI can image GFP labeled plant leaves. Plant leaves are difficult to obtain images of due to the strong autofluorescence of Chlorophyll. Chlorophyll's autofluorescence can be removed and analyzed with GFP using a specific filter. The autofluorescence of chlorophyll itself can also be used as data. The degree of activity of chlorophyll can be confirmed by the intensity of the autofluorescence. In addition, images can be obtained from plant seeds and callus. Fluorescence imaging is possible with plants throughout their entire life cycle.

DDS (Drug Delivery System)

Drugs confirmed *In Vitro* can be injected into animals for experimental purposes. By taking images at certain intervals, you can check the movement and accumulation pattern of the drug in the living tissues of the animal. The image of the drug confirmed *In Vivo* can be checked again *Ex Vivo*. Because the fluorescence is still expressed even after the animal is sacrificed, it is possible to quantify each tissue separately. The resulting *Ex Vivo* data, together with the *In Vivo* data, can provide excellent evidence for an experiment.



Animal imaging by FOBI

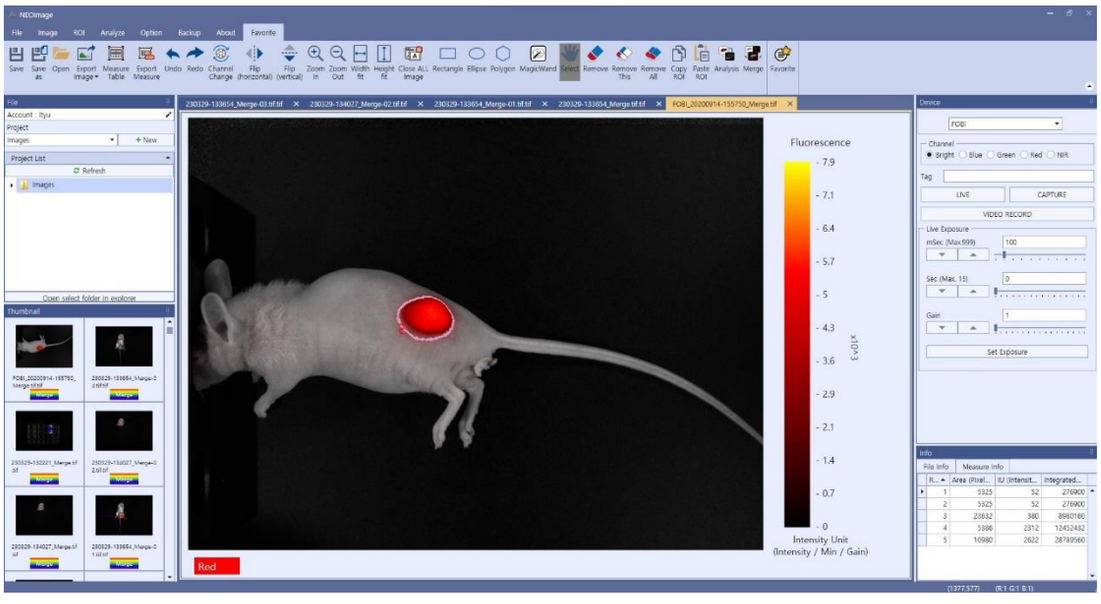
a. Tumorization of GFP expressing stable cell line injected subcutaneous. b. A rat drug injected subcutaneous. c. iRFP (near infrared fluorescence gene) tumor. d. DiD labeled immune cell injected via tail vein moved to inside the spine. e. ICG labeled drug targeted to the lung. f. Cy7 labeled drug moved to the liver. g. GFP expression and drug targeting in the sliced ape's brain.

Optimized Filters for *In Vivo* Imaging

FOBI uses optimized filters for *In Vivo* imaging. Fluorescent *In Vivo* imaging should be able to remove a reflected light of a remaining light source and a background light originated from self-fluorescence existing in biological tissues. FOBI uses differentiated filters with a fluorescence microscope since such a background light shows different patterns with cell imaging getting from a fluorescence microscope.

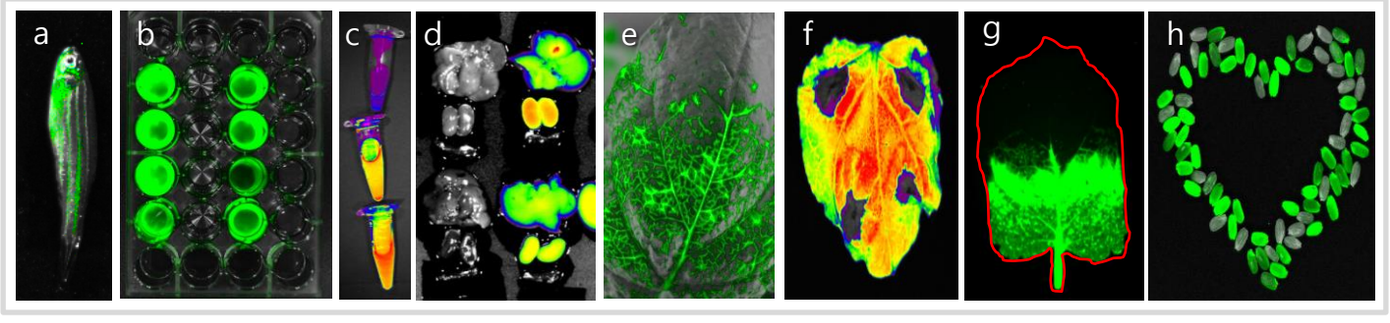
Filters for *In Vivo* Imaging

Software - NEOimage



NEOimage software for FOBI

The dedicated software, NEOimage, can capture and analyze fluorescent signals in a very intuitive and easy to use manner. The Live window displays the fluorescent image in real time. It helps determine the optimal exposure time and gain. The fluorescence live window helps you to find the fluorescence signal and observe the operation scene in real time. Background can be removed using a simple method. When the analysis is complete, a scale bar appears to show the degree of fluorescence. The color can be displayed in monochromatic, two-color, or rainbow colors range. You can also compare and analyze samples with different exposure times by adjusting the highest and lowest values of the scale bar.



Fluorescence imaging of various materials and methods

a. Fluorescence labeled chemicals in the Zebrafish. b. GFP cell in the 24well plate. c. Fluorescence labeling test. d. *Ex Vivo* imaging for drug delivery system. e. GFP expression leaf infected gene by virus vehicle. f. Auto-fluorescence from the chlorophyll. g. Gene expression on the leaf with marker gene. h. Gene transfected seed seperated by GFP imaging.

FOBI

Product Type

There are two types of FOBI. One is a standard type that takes a picture with the door closed and outside light blocked. The other is an open type with no doors and walls on the right and left. The open type FOBI can be used when the sample size is large, such as rabbits and apes, or when recording a video of a surgical scene.

Types of FOBI

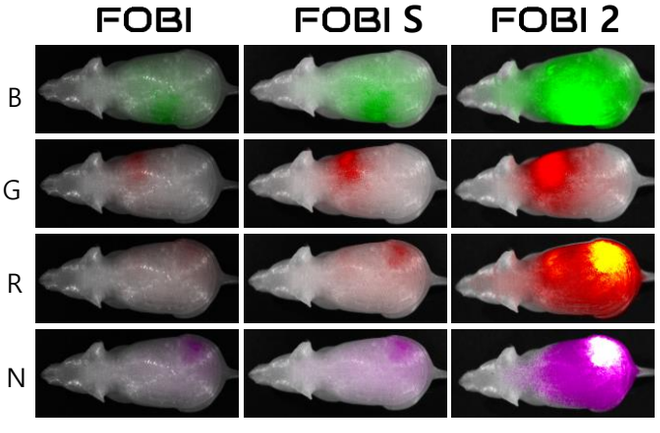
Mini *In Vivo* Imaging System

FluoroMini is available as a mini *In Vivo* Imaging system. Tumorization, Stem cell, Immune cell, DDS and Plant, Various applications can be applied. FluoroMini is a compact version of FOBI that does not come with a camera. But if you need an image, you can use normal camera to get the image and analyze.

FluoroMini, Mini *In Vivo* Imaging System

Enhanced fluorescence signal

FOBI's functionality has been improved. The camera's sensitivity is improved by about 3 times, and the excitation light source is about up to 10 times stronger. Improving the overall sensitivity by about 10 times. In addition, FOBI 2 minimizes the interference of fluorescent images by changing the location of the light source (Light angle: 67º to 45º). And a heating bed is added to protect the experimental organisms from hypothermia.



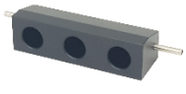
Fluorescence signal comparison

Specifications

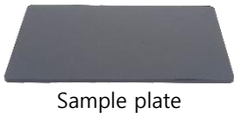
	FOBI	FOBI S	FOBI 2	FOBI NIR2
Image Sensor	1/2″ color CCD sensor	4/3″ Color CMOS sensor		1/2″ SenSWIR InGaAs
Resolution	1392 x 1040	1400 x 1050		1280 x 1024
Frame Rate	15 fps	30 fps		70 fps
Digital Output	24-bit	24-bit		8-bit
Interface Connector	USB 2.0	USB 3.0		
Power consumption (B G R N)	8.6 8.6 5.8 1.9		15 15 10 10	8
Ex light angle	67°		45°	
Distance of ex light	275 mm		135 mm	
Stage heating	no		yes	
Chamber type	Standard or Open		Standard	
Channel	Blue (GFP, FITC...) Green (RFP, Cy3...) Red (Cy5.5, DiD...) NIR (Cy7, ICG...)			3 ch + NIR2
Channel number	1, 2, 3 or 4 (upgradable, maximum 4ch)			
Capacity (Mouse)	3			
Field of View	155 x 115 mm	140 x 105 mm	140 x 105 mm	135 x 110 mm
Weight	9 Kg		12.5 Kg	
Size (W x D x H)	260 x 260 x 400 mm			

Accessories


Emission filters


Anesthesia mask


Anesthesia tube


Sample plate


Mouse trap

Anesthesia system (Option)

Accessories for FOBI

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