

# **NIGHTSHADE EVO LB 985N IN VIVO PLANT IMAGING SYSTEM**

Visualize what plant biology has been hiding

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Better Imaging. Better Understanding

The NightSHADE evo LB 985N *In vivo* Plant Imaging System is a modular, easy to use optical imaging system dedicated to *in vivo* analysis of plants. Equipped with an absolutely light-tight cabinet and a deeply cooled CCD camera it enables sensitive luminescence and fluorescence monitoring in tissues, seedlings and whole plants.

The camera can be attached either to the top or the side of the darkroom – the sample chamber – to enable imaging from above and from the side. The side position of the camera enables processing of multiple seed-

lings in parallel while growing plants vertically oriented to enable observation of the complete plant.

Furthermore, key environmental conditions like temperature or humidity as well as daylight can be simulated to provide a controlled growth environment.



# PLAN YOUR EXPERIMENT WITH EASE AND CONFIDENCE

Standardized conditions, reliable results

## Smart imaging chamber – full compatibility for diverse applications

The NightSHADE evo provides a light-tight imaging chamber that you can set up according to your experimental needs

- ▣ **multi-position camera** – the camera can be mounted either on top of the instrument to take images from above or laterally for side view images, enabling you to maintain seedlings upright in their natural vertical orientation.
- ▣ **easy handling of samples** – drawer-like base plate for easy exchange of samples and accessories (e.g. turntables).
- ▣ **direct sample chamber access** – light-tight ports for the introduction of lightguides, cables or tubings, e.g. to water plants inside the chamber.

## Control key environmental conditions

The NightSHADE evo helps creating a standardized environment for your experiment.

- ▣ **temperature control** – temperature-controlled base plate to keep the temperature stable at user defined settings between 15 and 30 °C.
- ▣ **daylight simulation** – 2 LED panels with 4 different colours each. LEDs are individually tunable in intensity and duration to simulate daylight with both, spectral and intensity gradients.
- ▣ **humidity control** – place the system into an appropriate environmental chamber e.g. to control humidity.

## Flexible optical setup and exquisite sensitivity for consistent, high quality results across many different experiments

With this one system, your lab can be ready for many types of experiments, no matter if you want to detect luminescence, fluorescence or delayed fluorescence.

- ▣ **better data** – the slow-scan CCD camera cooled to a delta of –100 °C for lowest background and highest sensitivity, even ensures at long exposure times.
- ▣ **detect multiple events simultaneously** – up to 4 filters for excitation and 5 filters for emission can be used simultaneously to detect multiple events in a single experiment.
- ▣ **illumination flexibility** – depending on the sample size and type you are able to choose between different excitation devices:
  - built-in ringlight for single microplates or dishes
  - other fibre optic components with standard connector (dual gooseneck) using the switchable light output inside the dark box





**“The controlled environment and exquisite sensitivity provided by the NightSHADE evo *In Vivo* Plant Imaging System allows you to perform the experiments that were difficult in the past.”**

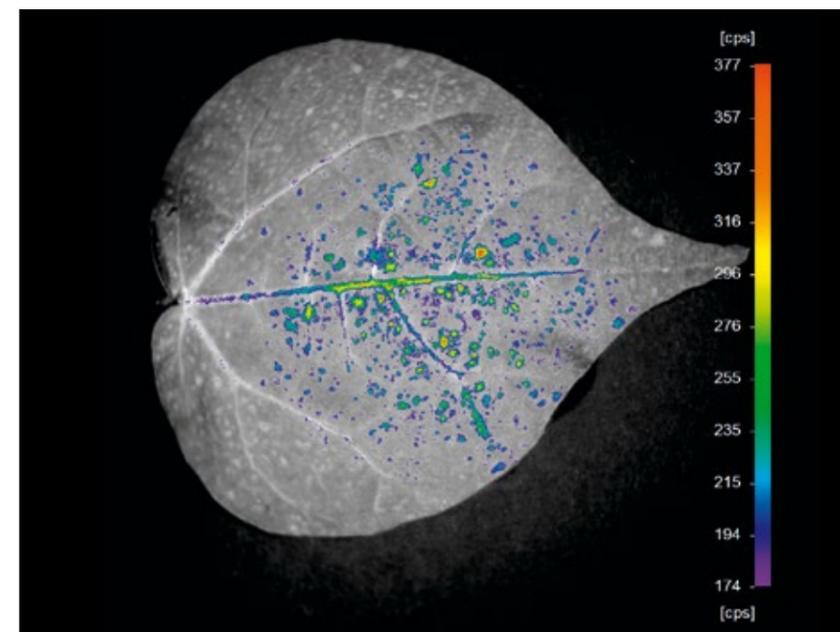
*Dr. Anselm Berthold, Berthold Technologies*

## APPLICATIONS & SOFTWARE

When cell biology meets physiology

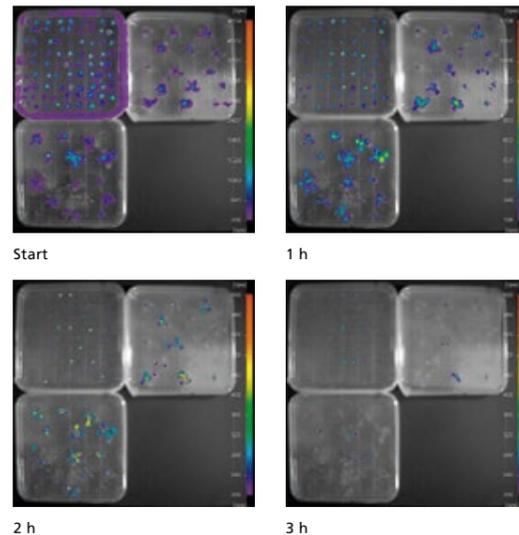
In the plant research field, there’s an increasing need for *in vivo* imaging that enables researchers to visualize multiple events simultaneously and to detect and localize them in real-time. Plant researchers can utilize both, bioluminescent and fluorescent agents to collect a wealth of information out of their samples like concentration, protein-protein interactions and metabolic activity. However, it is the combination of these sensitive and affordable detection chemistries with advanced macroscopic visualization methods that enables them to really extract the maximum amount of information from each sample.

The NightSHADE evo *In vivo* Plant Imaging System delivers results you can trust, leading to greater biological understanding in a wide variety of applications.



*Measurement of prompt fluorescence of a spray pattern of umbelliferone labelled compounds on a cotton leaf, excitation filter 475 nm, emission filter 520 nm, exposure time 1 sec*

## Better understanding of circadian rhythms



Time course study of circadian rhythms in *Arabidopsis thaliana* seedlings transfected with luciferase, exposure time 1 min

Endogenous biological clocks drive daily rhythms enabling plants to anticipate environmental changes as well as to coordinate and adapt their physiology in a synchronized manner.

The NightSHADE evo provides the controlled experimental setup required to monitor temporally regulated events automated and in real-time.

With NightSHADE evo *In vivo* imaging, you benefit from

- ▣ **real-time monitoring:** the NightSHADE evo provides easy setup of time-course studies according to your research needs.
- ▣ **better data:** the controlled experimental setup of the system enables you to reduce variation between replicates.

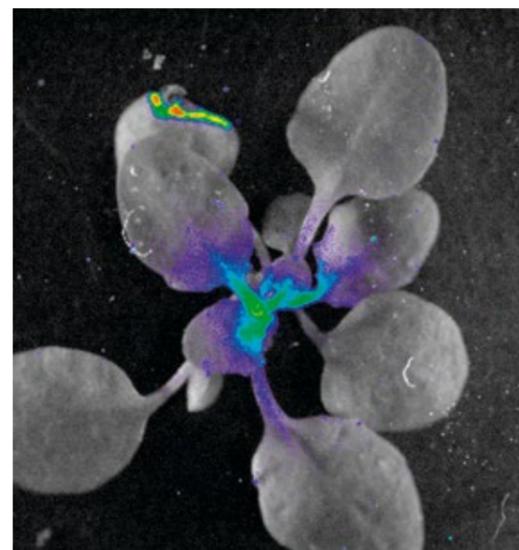
## Better GFP expression study results

The usage of fluorophores such as GFP is a widely distributed and established method to analyze protein localizations, protein trafficking, expression patterns and protein interactions in plant research.

While microscopic analysis offers superior resolution it does not provide the option to monitor reporter gene expression in plants in a high temporal and spatial resolution.

With NightSHADE evo *In vivo* imaging, you benefit from

- ▣ **more information:** collect both, high temporal and spatial resolution in a single experiment
- ▣ **efficient workflows:** monitoring of plants over longer periods of time in a controlled environment and higher throughput vs field or CLS microscopy.



GFP-transfected *Arabidopsis thaliana* plant, excitation filter 475 nm, emission filter 520 nm, exposure time 20 sec, 60 mm macro lens

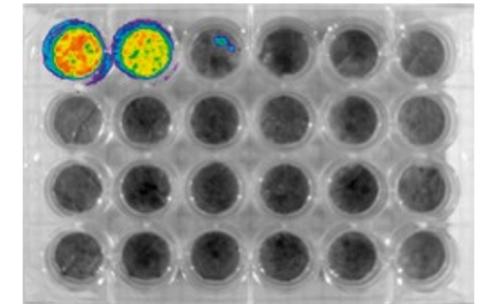
## Better monitoring of stress factors

Delayed fluorescence (or afterglow) acts as an indicator not only for chlorophyll content, but also for the physiological state of the plant.

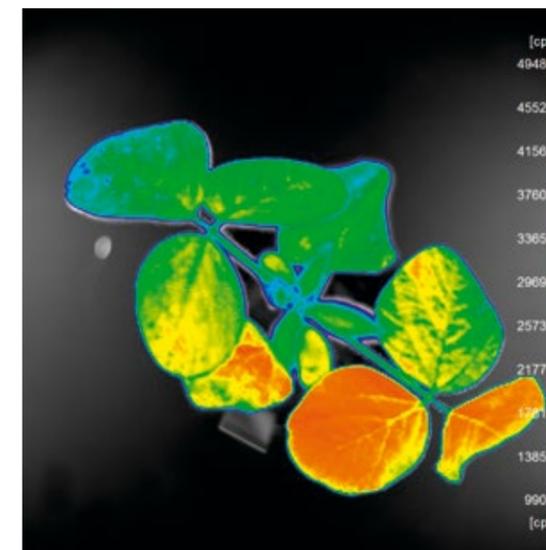
The NightSHADE evo simplifies analysing the impact of herbicides, pathogens, drought and other stress factors that can act on the chloroplasts and thereby alter the delayed fluorescence reaction.

With NightSHADE evo *In vivo* imaging, you benefit from

- ▣ **high sensitivity:** the sensitive deeply-cooled CCD camera of the NightSHADE evo enables the detection of low light intensities.
- ▣ **user friendly software:** simple data acquisition and advanced analysis with IndiGO™ software.



Delayed fluorescence of tomato leaves after fungal infection. Well A1+A2: untreated leaves, well A3-D6: leaves infected with fungus, 8 days after infection. No delayed fluorescence is visible due to destroyed chlorophyll.



Delayed fluorescence of soybean plants after drought stress. Left: watered plant, Right: fluorescence in the same plant after 2d of drought. Red colour shows high intensities representing high chlorophyll content, blue colour shows low intensities of fluorescence, indicating low amounts of chlorophyll.

## Intuitive, easy-to-use software

The user-friendly, IndiGO™ software controls the instrument and makes image processing easy. It provides the following innovative features:

### Easy filter management

The filter management system of IndiGO™ makes it simple to use different dyes in your experimental setup. Dedicated filters for both, excitation and emission are selected via a filter inventory that provides you with information about the filter properties.

### Daylight simulation

A set of 2 LED panels, 4 colours each can be mounted at different heights inside the imaging chamber for daylight simulation. With IndiGO™ software you can control intensity and duration of each colour individually to provide homogeneous illumination up to 1,800  $\mu\text{E}$  or 15,000 Lux.

### Integrated user management system

The user management system of IndiGO™ provides you with different access levels to prevent unauthorized access to your images and projects.

### Powerful multi-wavelength view

Display your multiple wavelength measurements in a single experiment to locate different events simultaneously. Up to 10 colours can be visualized in a single experiment.

### Information-rich 3D results

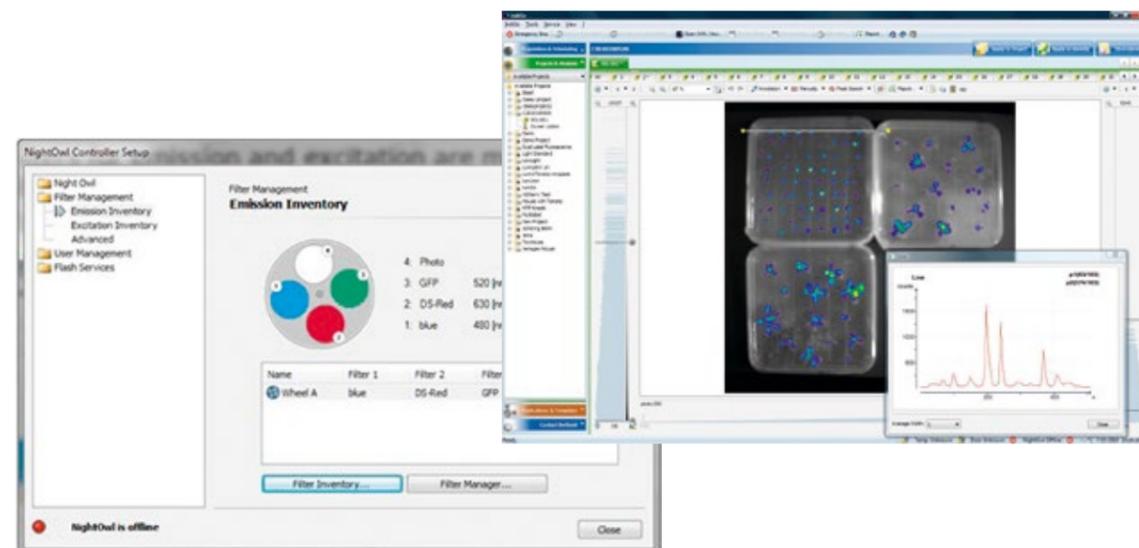
Get quantitative data in 3D to get a deeper understanding of the biology behind your targets of interest.

### Integrated video generation tool

IndiGO™ provides you with an integrated tool to create video files from sequential measurements in just a few mouse clicks.

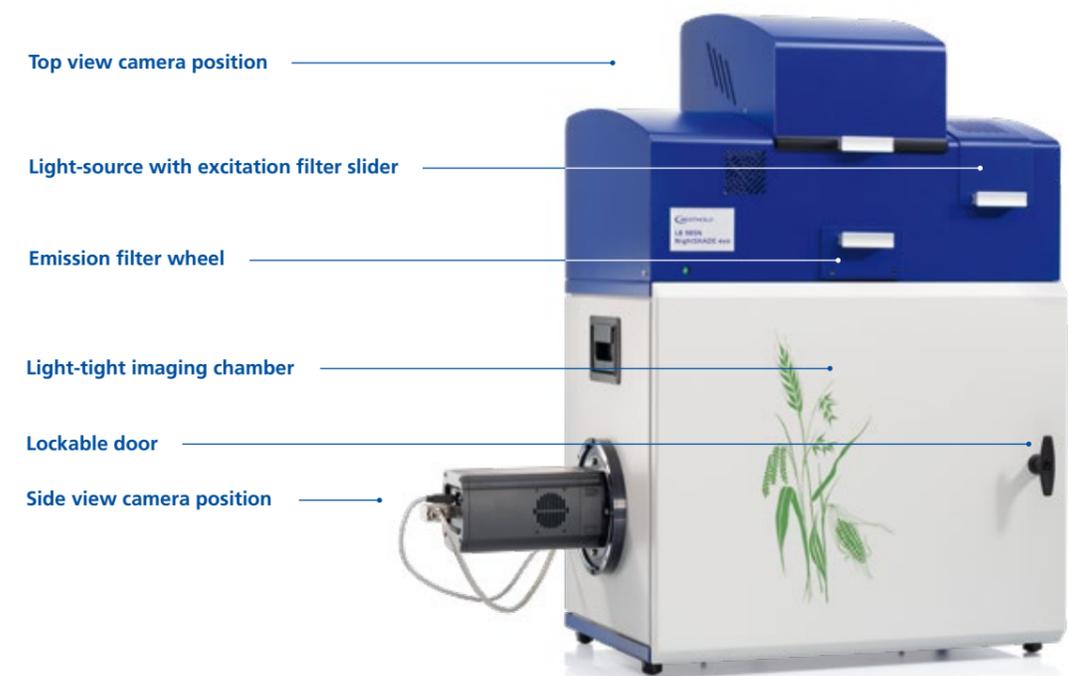
### Sequential or multi-day measurements made simple

An integrated scheduler makes the setup of kinetic measurements and multi-day experiments simple. The scheduler runs in the background, providing access to the user interface at all times. This enables data analysis while data acquisition is still active.

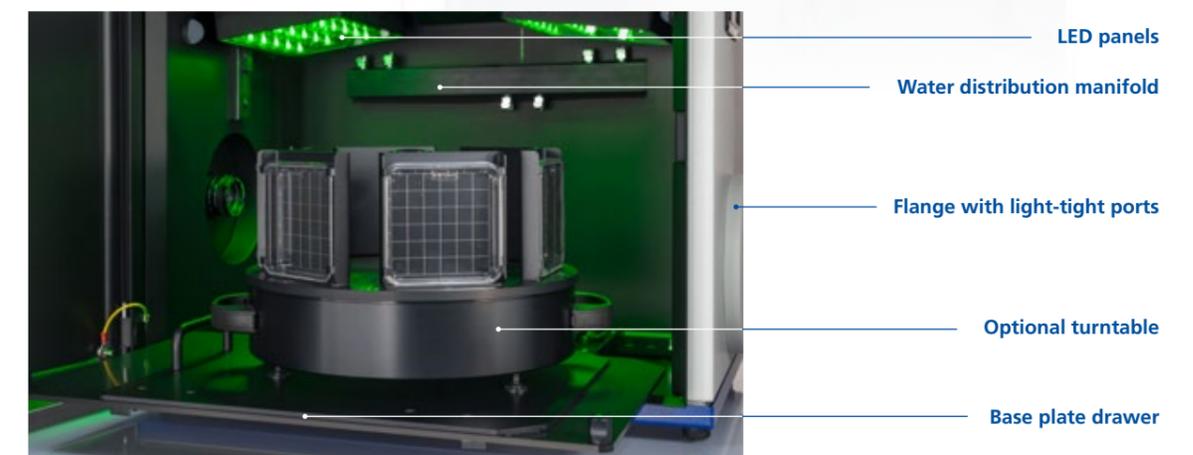


## THE NIGHTSHADE EVO LB 985N IN VIVO SYSTEM AT A GLANCE

### Outside view



### Inside view



## ACCESSORIES

Setup your system according to your research needs

With the NightSHADE evo *In vivo* Imaging System your lab can be ready for many types of experiments.

### LED panels for daylight simulation

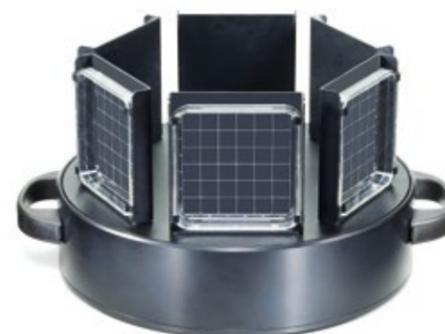
Two different LED panels can be mounted inside the imaging chamber to simulate daylight with both, spectral and intensity gradients. Each panel is equipped with 4 different LED colours.

LED Panel A		LED Panel B	
Blue	470 nm	Blue	470 nm
Green	520 nm	White	na
Red	660 nm	Red	660 nm
Far-Red	730 nm	Far-Red	730 nm



### Anti-condensation table

The Anti-Condensation Table for up to 9 Petri dishes utilizes a water heating for temperature control. An integrated fan system creates a constant, circular air flow above the Petri dishes, preventing condensation in the lids to keep the Petri dishes clear for the duration of your experiment to facilitate imaging.



### Turntables

The Turntable can be equipped with different sample holder, e.g. to analyze either square Petri dishes or DeWit tubes. In combination with the CCD camera mounted in lateral position unattended processing of multiple samples can be performed. This way, seedlings can be maintained upright in their natural vertical position.

## ORDERING INFORMATION

NightSHADE evo	73037-10
<b>Options Accessories</b>	
Sideview Kit	60798
LED plant growth illumination panel A: blue/green/red/far-red	56589-01
LED plant growth illumination panel B: blue/white/red/far-red	56589-10
Cooling/heating unit for LED plant growth illumination, 230 V	56695
Cooling/heating unit for LED plant growth illumination, 110 V	56706
Turntable for square Petri dishes 100 x 100 mm	56625-01
Turntable for square Petri dishes 130 x 130 mm	56625-02
Turntable for DeWit tubes	56625-03
Turntable Base Unit	56625-04
Turntable attachment for square Petri dishes 100 x 100 mm	56599-01
Turntable attachment for square Petri dishes 130 x 130 mm	56599-02
Turntable attachment for DeWit tubes	56599-03
Macro lens, 50 mm F0.95	60223
Anti-condensation table	61632
Lab jack with table 200 x 200 mm	64469
Macro table with temperature control	51578

# TECHNICAL SPECIFICATIONS

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<b>CCD Camera</b>	1024 x 1024 pixels slow scan mode pixel size: 13 x 13 $\mu\text{m}^2$ Thermoelectrical air cooling down to $-70^\circ\text{C}$ Back-lit midband-coated full frame chip Spectral range: 350 – 1050 nm Quantum efficiency: 90 % at 620 nm Pixel binning: variable, up to 16 x 16 Exposure times: from ms to hours
<b>Lens</b>	25 mm, f 0.95, C-mount for most efficient light collection Field view: Standard lens: 270 x 270 $\text{mm}^2$ Macro lens: 130 x 130 $\text{mm}^2$
<b>Light Source</b>	Halogen lamp, 75 W, 340 – 750 nm Software controlled lamp stabilisation
<b>Imaging Chamber</b>	Dimensions: Inner: 520 x 400 x 360 (W x H x D) Outer: 670 x 900 x 450 (W x H x D) With flange for light tight port, mounting areas for side view mounting option and LED panels, software-controlled mains socket. Interface: USB 3.0 Weight: 45 kg
<b>Laboratory Environment</b>	Power supply 100 – 240 V; 50/60 Hz; max. 400 VA Minimum 4 free sockets Temp. Range max. 30 $^\circ\text{C}$ Humidity 10 – 80 %, non-condensing Bench: stable to sustain 45 kg of the instrument; minimum size 900 x 600 (L x D) plus space for PC

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