Specifications

For more information, please contact us:

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AB-2270 Luminescencer OCTA
Tube type luminometer

AB-2350 PHELIOS
16/384 well plate luminometer

AB-2550 KronosDuo
Luminometer for Live-cell & tissues

Model No./Name | AB-3000B /Cellgraph
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<table>
<thead>
<tr>
<th>Feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CCD type</td>
<td>Back-illuminated EMCCD</td>
</tr>
<tr>
<td>Active pixel</td>
<td>512 x 512 pixel</td>
</tr>
<tr>
<td>Pixel size</td>
<td>16 x 16μm</td>
</tr>
<tr>
<td>AD Resolution</td>
<td>14/16-bit</td>
</tr>
<tr>
<td>Cooling temperature</td>
<td>-80°C with an air-cooling system when the air temperature is 25°C, -90°C with a water-cooling system* when the water temperature is 20°C, -85°C with an air-cooling system when the air temperature is 20°C, -100°C with a water-cooling system* when the water temperature is 10°C</td>
</tr>
<tr>
<td>The water-cooling unit is an optional accessory.</td>
<td></td>
</tr>
<tr>
<td>Objective Lens</td>
<td>4x (NA 0.53), 10x (NA 0.50) (Other magnification lenses are also available as optional accessories)</td>
</tr>
<tr>
<td>Stage</td>
<td>X-Y-Z axis manual stage, Z axis motorized stage</td>
</tr>
<tr>
<td>Culture dish</td>
<td>35mm culture dish</td>
</tr>
<tr>
<td>Constant temperature function</td>
<td>Room temperature (9°C to 45°C, 0.1°C step)</td>
</tr>
<tr>
<td>Lighting</td>
<td>White LED with dimming function, Blue LED with dimming function</td>
</tr>
<tr>
<td>Optical Filter</td>
<td>Up to three filters can be set (525LP, 560 LP, 620 LP are standard equipment)</td>
</tr>
<tr>
<td>Exposure time</td>
<td>30 milliseconds to 90 minutes</td>
</tr>
<tr>
<td>Imaging interval</td>
<td>Indefinite</td>
</tr>
<tr>
<td>Control software</td>
<td>OS : Windows 7/Vista/XP</td>
</tr>
<tr>
<td>System requirement</td>
<td>Hard Drive: 30GB or more, free disk space required</td>
</tr>
<tr>
<td>Interface</td>
<td>Full-size PCI slot x1, serial port x1, USB port x1</td>
</tr>
<tr>
<td>Size (main body)</td>
<td>430 mm (W) x 600 mm (D) x 650 mm (H)</td>
</tr>
<tr>
<td>Weight (main body)</td>
<td>Approx. 40kg</td>
</tr>
<tr>
<td>Power (main body)</td>
<td>AC100-240V, 106VA</td>
</tr>
</tbody>
</table>

Optional Accessories

- CCD camera water-cooling unit
- CO₂ gas injection unit
- CO₂ gas humidifying unit
- Perfusion culture chamber unit
- Objective lens

References


Superior performance for biological variation research with high sensitivity, accuracy and resolution by ATTO imaging system
Capturing extremely weak bioluminescent signals in living cells

Cellgraph AB-3000B is an imaging system developed to detect low-level light emission in a single living cell using a highly sensitive EM-CCD camera.

The detection of low level light emission has been achieved by employing an optical system with high condensing efficiency and a cooled EM-CCD camera with the highest level of absolute sensitivity. By using a temperature and CO₂ gas concentration control system and a humidifying unit, the atmosphere inside the sample holding chamber is the same as that of inside CO₂ incubators. This incubation system enables long-term observation of cultured cells and tissue slices in the living state. The Cellgraph system also includes a color separation mechanism with built-in optical filters, enabling multicolor reporter gene assay using multiple luciferases. The accompanying analysis software makes it possible to measure the intensity of the light emitted from individual cells on the acquired images, and to collect continuous data of the bioluminescence intensity on a cell-by-cell basis. The Cellgraph system is an ideal imaging system to observe faint bioluminescence emitted by cells and tissue for an extended period of time while keeping them alive.

* The CO₂ gas injection unit is an optional accessory.

Z-axis Motorized Stage

When the bioluminescence of the target is too dim and it is too difficult to focus on it, stage control mode is available. With this imaging mode, serial images are acquired as the stage moves along its z-axis automatically, thus making it easy to find the optimum stage position.

Ultra Sensitive EM-CCD Camera

An ultra sensitive CCD Cooled camera with Electron Multiplying (EM) gain function, which achieves absolute sensitivity of a single photon/count, is mounted.

Bright optical system by allowing light to travel for more sensitive &...
Visualization of ATP oscillations in the early stage of chondrogenesis

Cellular condensation in embryonic limbs that occurs in the early stage of chondrogenesis is considered to play a critical role in the secretion of adhesion molecules and extracellular matrixes. However, the mechanisms that regulate the secretion of these factors remain uncertain. The following data were collected with the Cellgraph system. It shows the visualization of ATP oscillation after the induction of chondrogenesis in ATCD5 cells transfected with an ATP-dependent Phyxothrix hirtus luciferase gene. Blockade of the ATP oscillation prevented cellular condensation. The degree of cellular condensation also increased with the frequency of ATP oscillations. These results suggest that ATP oscillations play a critical role in the early stage of chondrogenesis. As demonstrated in this study, the Cellgraph system is an effective tool for examining intracellular metabolic mechanisms.

Data Supported: Dr. HJ. Kwon, Hokkaido Univ., JAPAN
Reference: HJ. Kwon et al., Cell Death and Disease, Vol. 3 (2012)
The ultimate system for bioluminescence imaging

- Acquire images of cultured cells or tissue samples on a φ35 mm dish in the living state
- Provide a CO₂ incubator equivalent atmosphere by controlling the temperature, CO₂ gas concentration and the humidifying
- Highly sensitive and accurate detection of faint bioluminescence with an EM-CCD camera
- Isolates and captures multicolor faint bioluminescence
- Easy operation via a user-friendly interface
- Full control from a PC with dedicated software
- Completely lightproof, compact design

Simple and Easy to Use Workflow

1. Setting the sample
   Place the sample with a bioluminescent substrate such as luciferin in the chamber.

2. Setting the objective lens
   Place the objective lens in the lens holder.

3. Setting the illumination and focusing
   After setting the lighting, adjust the field of view and focus the camera while looking at the display monitor of the PC.

4. Starting image capturing
   Set the capturing condition and click “Start-button.” The system will start the imaging procedure.

Specifications

The graph shows the time course of the bioluminescence signal intensity in each selected area. The y-axis can also be displayed on a logarithmic scale.

Spot (ROI) measurement
In this mode, bioluminescence can be measured individually in any given region of interest; for example, each cell in the area. You can select regions simply by clicking on the image. The intensity of the bioluminescence in the selected area will be quantified, and its corresponding graph will be plotted automatically. The result of analyzed bioluminescence intensity data can be exported as CSV format files. There are four outline tools: circles, rectangles, polygons, and spline (encircled by a curved line).

Superimposition of acquired images
Images acquired through each optical filter can be superimposed and edited. When superimposing images, the display mode of each image can be selected from the gray scale, color scale, or pseudo color. The contrast or position of each image can be adjusted as well. Sequential images or a movie can also be created from the superimposed images.

Creating sequential images
The time course changes can be displayed as a sequence of images (montage). Montage sequencing can be created in spot display, pseudo color display, or superimposed display mode.

Grid measurement
In this mode, a grid is set on an image and the signal intensity in each compartment of the grid will be measured. The size and the number of elements of the grid can be set freely, and the grid can be rotated in any given angle.

Removal of hot pixels
Removes dot-like noise on images. The signal intensity of the removed pixel will be substituted with the mean brightness value of adjacent pixels.
Data analysis

CellGraph Viewer, simple and easy to use analysis software

Spot (ROI) measurement
In this mode, bioluminescence can be measured individually in any given region of interest; for example, each cell in the area. You can select regions simply by clicking on the image. The intensity of the bioluminescence in the selected area will be quantified, and its corresponding graph will be plotted automatically. The result of analyzed bioluminescence intensity data can be exported as CSV format files. There are four outline tools: circles, rectangles, polygons and spline (encircled by a curved line).

Sequential images of a selected spot can also be created (montage).

Creating a movie file
An entire sequence or a specified sequence of time-lapse images can be saved as a movie in AVI format. Images can be superimposed, and the outline of an area can be reflected.

Data exported as CSV file
Spot (ROI) measurement

A bright optical system delivers the best performance

Ultra-sensitive EM-CCD camera
An ultra-sensitive cooled and back-illuminated CCD that achieves absolute sensitivity of single photon/count (at 535 nm) is mounted. The absolute sensitivity is calibrated by ATTO’s unique method using a laser light source. This absolute sensitivity test enables measurement of total bioluminescence intensity at the focus point as photon counts (Japanese patent number: 3585439).

By amplifying the luminescent signal by setting the EM (Electron Multiplying) gain, images can be acquired with a shorter exposure time.

Active pixels: 512 x 512
Pixel size: 16 (W) x 16 (H) mm
Image area: 8.2 x 8.2 mm
Quantum efficiency: Over 90%

Extra-low Noise Floor with -90°C Cooling
With a CCD camera, the longer the exposure time, the higher the background noise accumulates. The figure shown left indicates a dark image captured by Cellgraph with an exposure time of 10 minutes. Compared to a conventional CCD camera it has an extremely low background noise.

With the Cellgraph system, the background noise is minimized by cooling the EM-CCD camera to -90°C with a water-cooling system (to -80°C with an air-cooling system), enabling a prolonged exposure time of 60 minutes.

*The water-cooling system is an optional accessory.

Bright low-magnification objective lens
When considering which objective lens to choose, the most critical aspect is the numerical aperture (NA). When comparing lenses with the same magnification, a lens with a larger NA value has higher resolution and greater light-gathering capacity. Therefore, an objective lens with a large NA value is needed to detect faint bioluminescence. A low magnification 4x lens is suitable to observe specimens like cultured tissue slices. The Cellgraph system employs a 4x magnification objective lens with NA = 0.53 with conventional 4x objective lenses (NA = 0.1 to 0.2), which provides bright images at low magnification. For higher magnification, the Cellgraph system offers 10x, 20x, 40x and 60x objective lenses with large NA values.

The graph shows the time course of bioluminescence value (brightness value) of each grid block. The y-axis can also be displayed on a logarithmic scale.
Optimum environmental designing for live cell imaging

Cell-friendly incubation function

The Cellgraph system has the same incubation function as commonly used CO₂ incubators in the laboratory for cell culture. The system stably provides an atmosphere (controlled temperature, CO₂ gas concentration and humidifying) that is suitable for the long-term observation of living cells or tissues.

The inner structure of Cellgraph chamber is illustrated in the figure on the right. The temperature is controlled by an air conditioning unit and a heat glass. When the room temperature is 20°C, the temperature of the sample-holding chamber can be set and maintained at 25-45°C for a long period of time. The CO₂ gas injection unit* keeps the CO₂ gas concentration at 5% and humidifies the air before injecting. Other available optional units include an injection unit that allows you to inject reagents such as stimulant drugs during observation and a perfusion unit that flows the culture medium.

Filter system that captures light of various wavelengths

The Cellgraph system is suitable for continuous, real-time monitoring of faint bioluminescence (up to three colors), fluorescence (GFP), and bright field images of cells or tissue slices cultured on a φ 35 mm culture dish for several hours to several days. ATTO’s color separation function uses fewer optical filters compared to conventional methods. As a result, the signal loss through the optical filters is minimized, and the captured images are close to the actual signals. The system also employs long path filters with excellent light transmittance of over 90%, making it suitable to capture faint bioluminescence. The system stably provides an atmosphere (controlled temperature, CO₂ gas concentration and humidifying) that is suitable for the long-term observation of living cells or tissues.

Signal amplifying of the CCD camera

The Cellgraph system has various amplifying modes for the CCD camera to secure capturing of faint bioluminescence images.

Up to two imaging conditions can be set. Dual imaging with a combination of bright-field and bioluminescence, or fluorescence and bioluminescence, is possible. The acquired images can be edited and analyzed by specialized software called “Cellgraph Viewer.” Using this software, it is easy to quantify the amount of bioluminescence, or to create movie files, montage of images, merged images, etc.

Various imaging modes that capture any biological event

**Live mode**

Shows the capturing image in real time. Used to adjust the position of sample and focusing while looking at the bright field image.

**Interval mode**

Captures images at a regular interval, one by one, for a specified period of time. Used to create time-lapse images of bioluminescence.

**Stage control mode**

Captures serial images while moving the motorized z-axis stage. Used for fine adjustment of the focus.

**Combination mode**

Captures time-lapse images of bioluminescence and bright field images (or fluorescence images) simultaneously.

**Background mode**

Captures the background images. The captured images will be used for background subtraction of bioluminescence imaging.

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