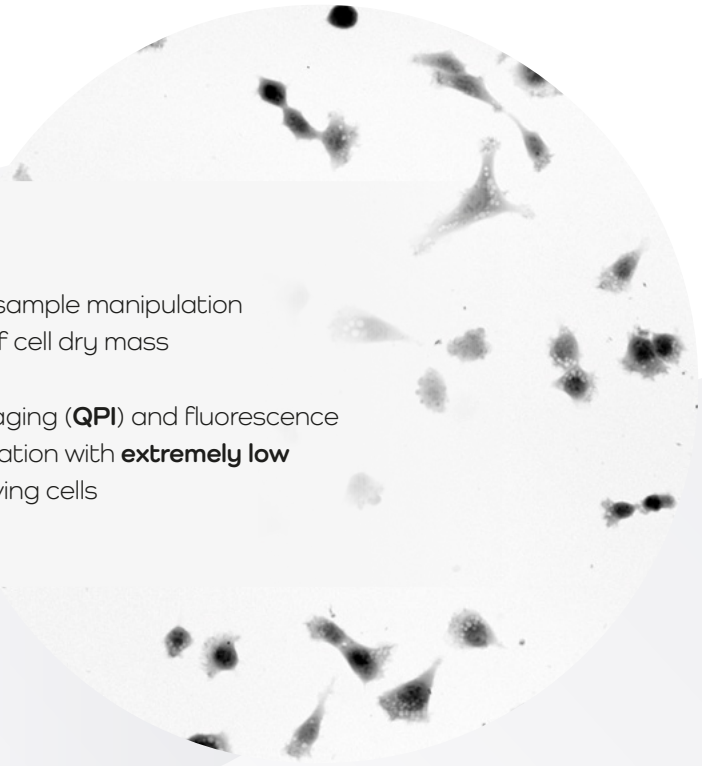
telight

Q-Phase

Quantitative Phase Imaging

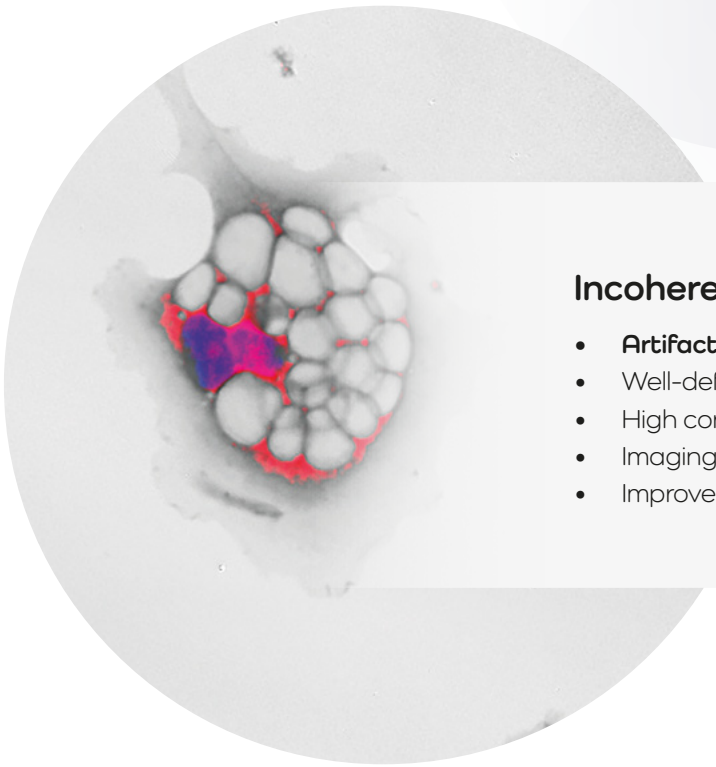
Holographic Microscope for Advanced Live-cell Analysis

Key features



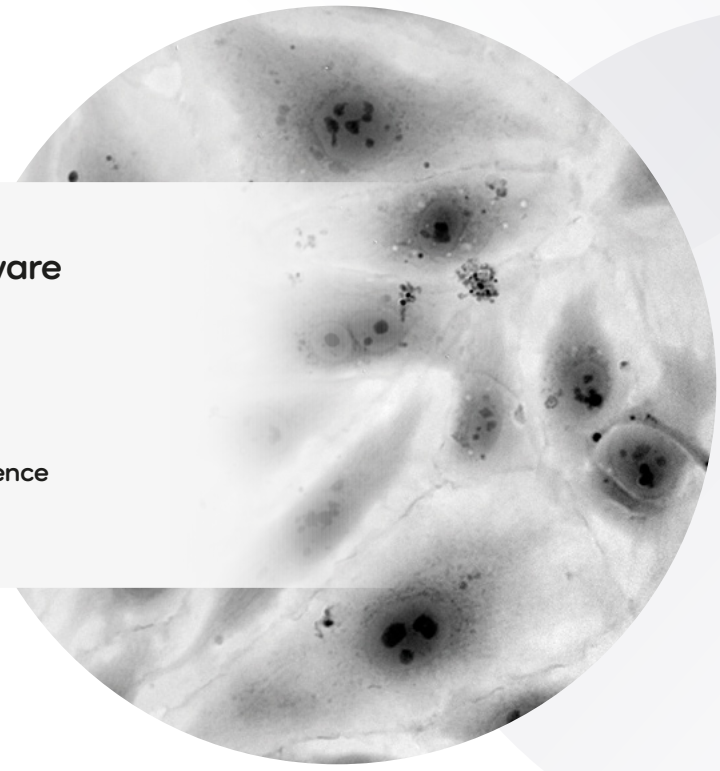
Versatile imaging system

- **Label-free**, non-invasive, with the least sample manipulation
- Quantitative and direct measurement of cell dry mass distribution in real-time
- Combining both **Q**uantitative **P**hase **I**maging (**QPI**) and fluorescence
- Equipped with incubator and full automation with **extremely low phototoxicity** for long-term studies of living cells
- Different magnifications



Incoherent light source

- **Artifact-free images**
- Well-defined background and cell boundaries
- High contrast and visualization of cellular compartments
- Imaging in scattering matrices and turbid media
- Improved lateral resolution



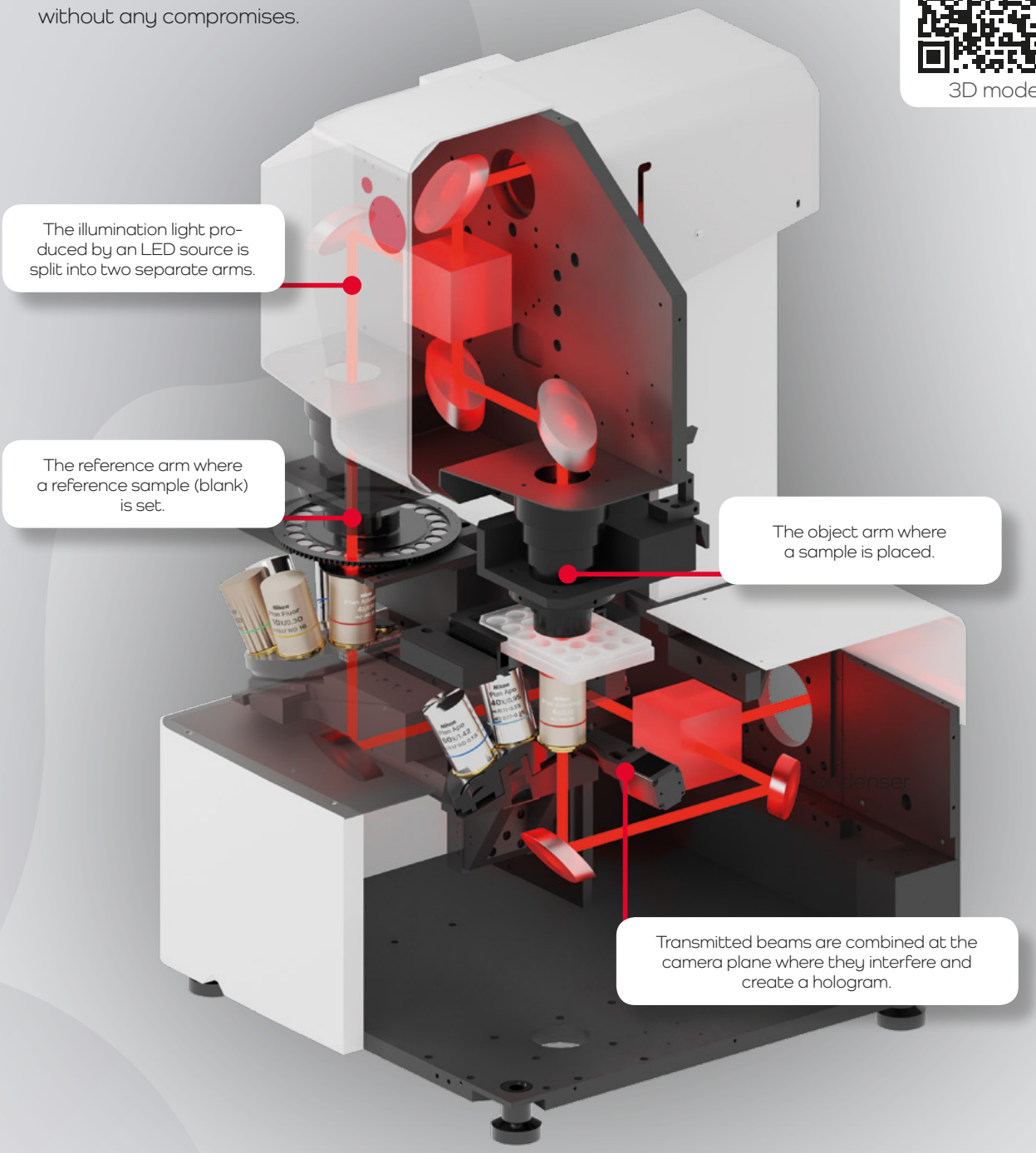
Comprehensive data analysis software

- From **acquisition to analysis**
- Accurate cell segmentation and tracking
- Quantification of cell motility and morphology
- Gating according to different parameters
- Data and images **suitable for artificial intelligence** and machine learning

Principle behind Q-Phase

Q-Phase is based on patented technology of coherence-controlled **holographic microscopy using an incoherent light source** to generate high-quality images without any compromises.

3D model

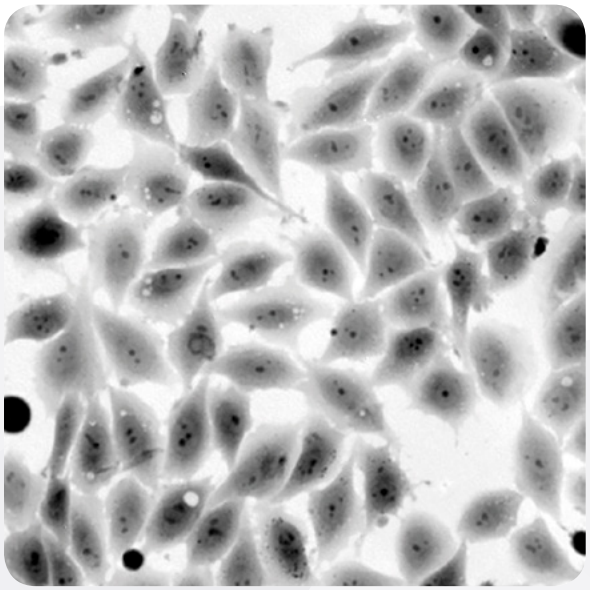


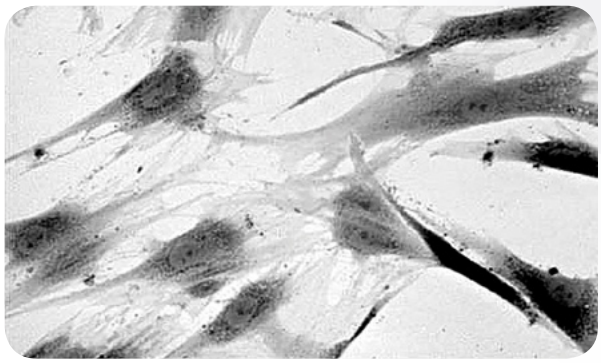
The hologram is then recorded by a detector and a quantitative phase image is extracted from the hologram in real-time by Telight software SophiQ.

Hologram | Reconstruction | Quantitative Phase Image

Observe

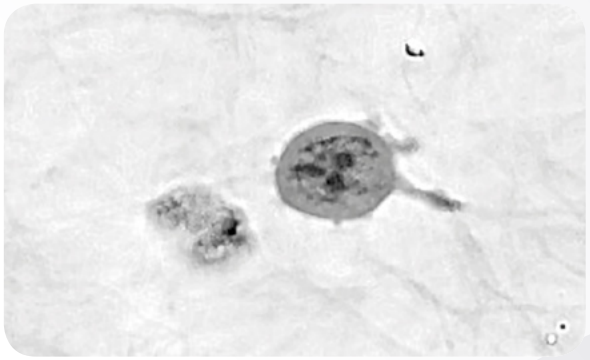
High-quality QPI is our destination. We use an incoherent light source to eliminate the frequent optical artifact produced by systems using a highly coherent light source (laser). Quantitative data obtained by Q-Phase are used for **direct quantification of cell dry mass** changes in real-time.



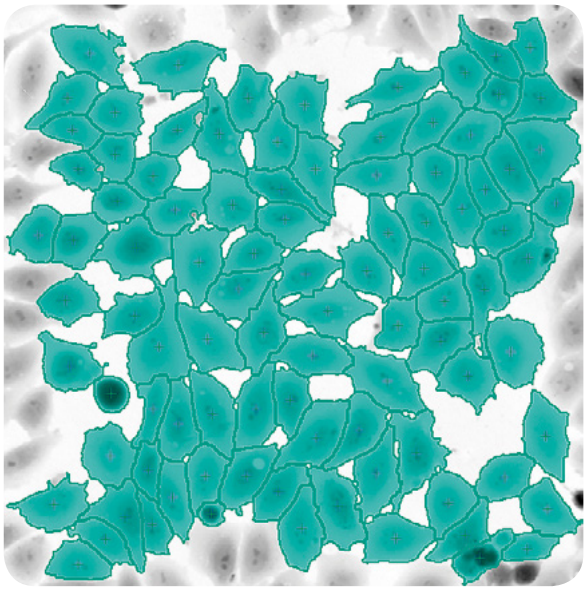


Thanks to the high sensitivity, even the slightest mass changes can be detected and quantified, thus even the most **transparent cells** and their delicate parts can be distinguished from the background.

The **coherence gating effect** enables performing QPI for samples in turbid media and scattering matrices such as collagen or Matrigel.

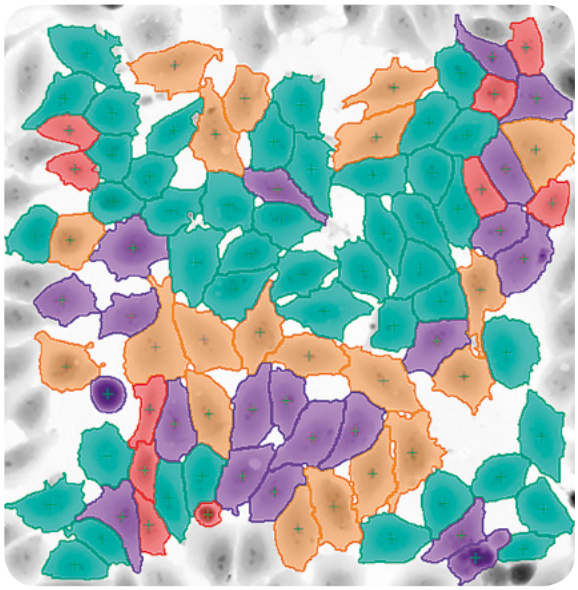


Segment

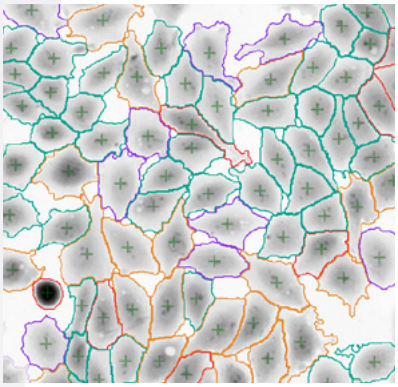


Q-Phase creates **high-quality QPI data** for **live-cell imaging**, allowing researchers to obtain clear contrasted images for cells and analyze and track them effectively.
Automatic cell segmentation represents a potent advantage in the Q-Phase system due to the precise detection of cellular boundaries and **cell dry mass quantification** of individual cells in large populations.

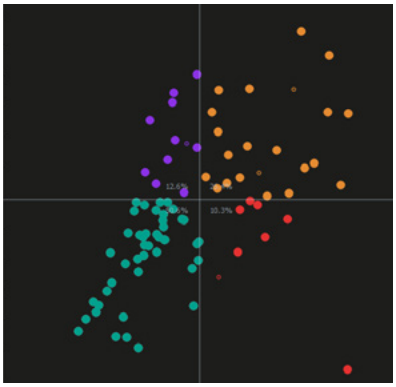
The powerful **SophiQ analysis toolbox** processes segmented images on-the-fly and provides a complex portfolio of tools for data visualization, subpopulation gating and **multi-parameter data mining**. It links quantitative data to images and individual cells, which makes optimizing gates and checking outliers extremely easy and efficient. The resulting data can be exported in common file formats for further processing and analysis.



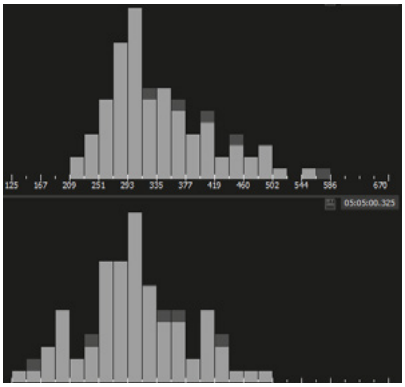
SophiQ



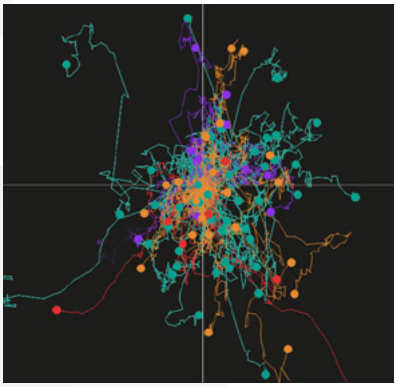
Segmentation



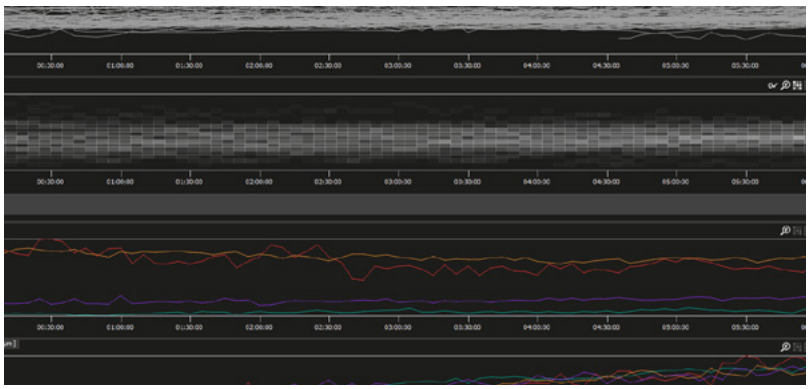
Multiple population gating



Histograms



Motility rose diagram



Time graphs and heatmaps

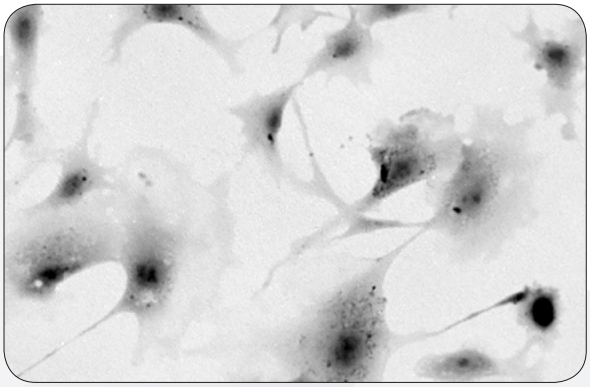
Parameters

- Cell dry mass, density, area, circularity, perimeter, growth speed
- Cell speed, Euclidean distance, meandering index
- Confluence
- Fluorescence

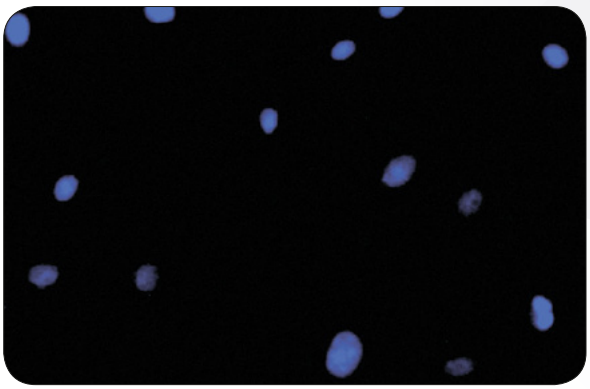
Multimodal imaging with the Q-Phase platform

Additional imaging modalities are accessible such as **widefield fluorescence, simulated DIC, bright-field or high-pass filtered phase**. Multiple dimensions can be combined in a single experiment and automatically acquired by the Q-Phase system (time-lapse, multi-position, multi-channel, Z-stack).

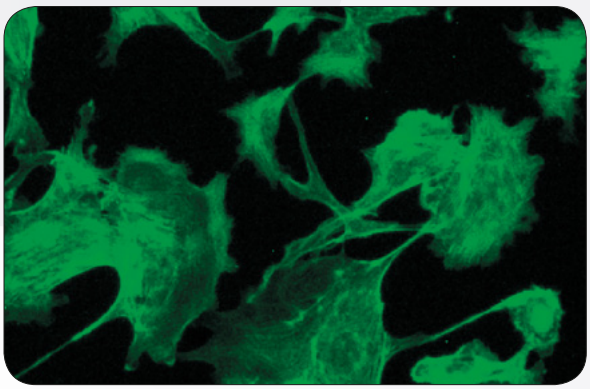
3 different outputs of imaging of BPEA cells, labelled with DAPI for nuclei, MitoTracker for mitochondria and Alexa Fluor 488 for F-actin.



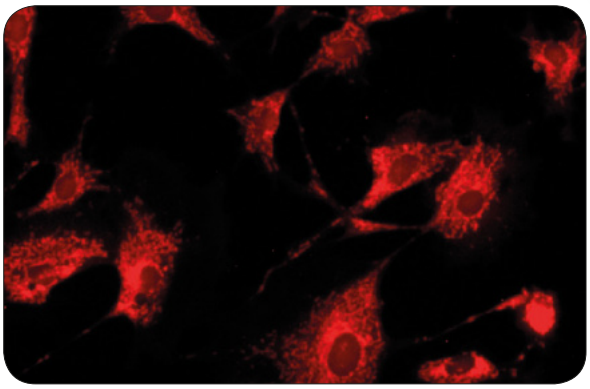
QPI



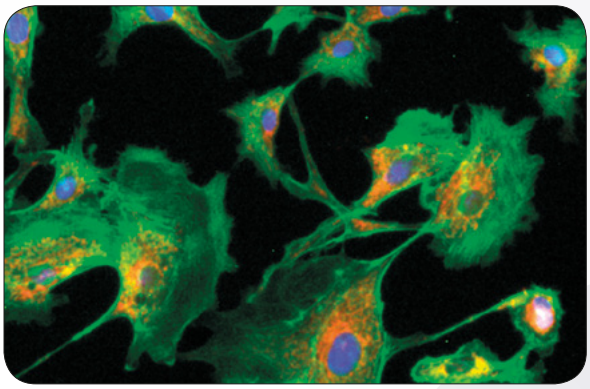
DAPI



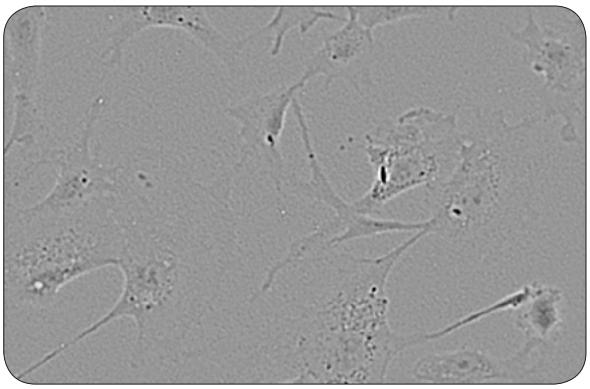
Alexa Fluor 488



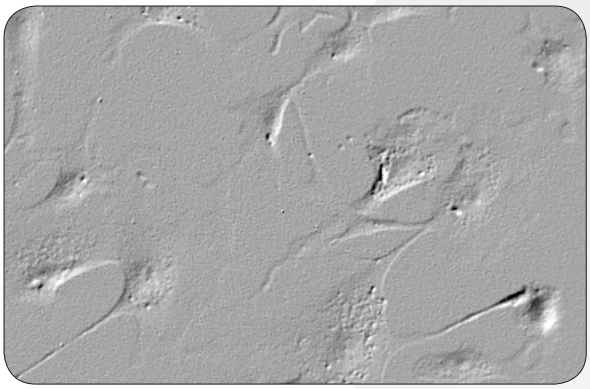
MitoTracker



Merged



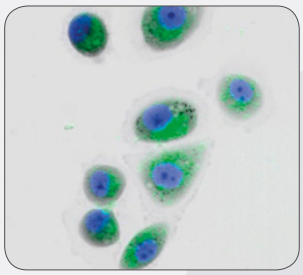
High-pass filtered phase

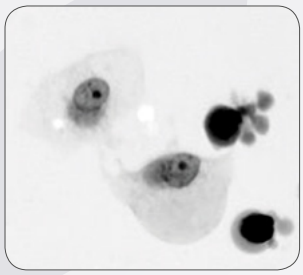


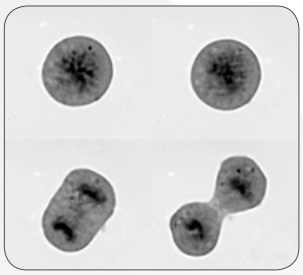
DIC

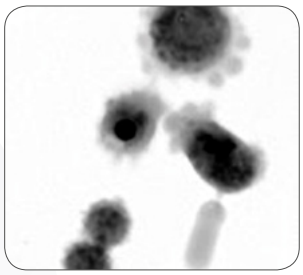
Key application areas

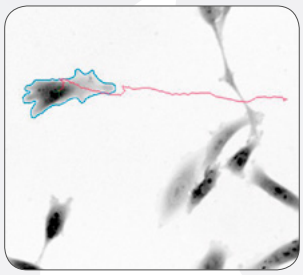
Q-Phase is aimed at applications in the area of live-cell imaging, where you can quantify cell growth, morphology, dynamics, and changes in cell dry mass distribution in real-time. Cell dry mass serves in many aspects as a sensitive parameter for cell integrity, growth and metabolism, allowing various applications from fundamental cell biology to pharmaceutical research.

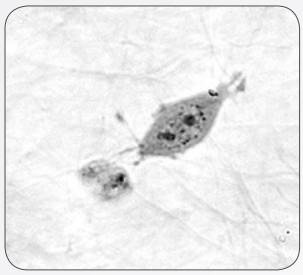

Cancer research

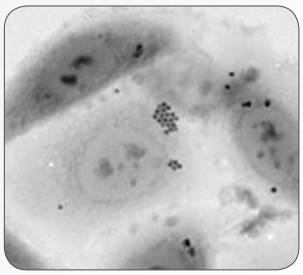

Cell death

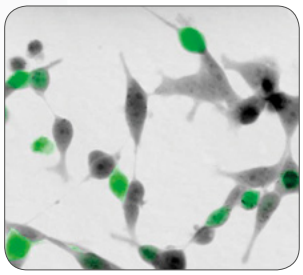

Cell cycle

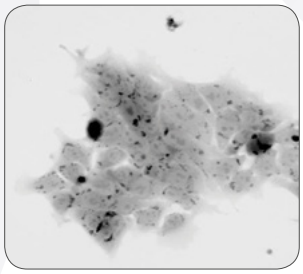

Cell morphology

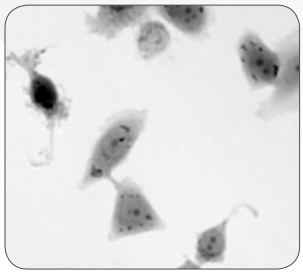

Migration studies

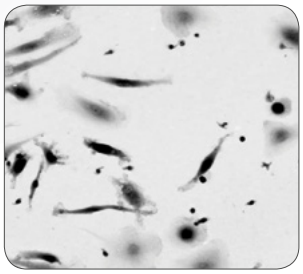

Extracellular matrix

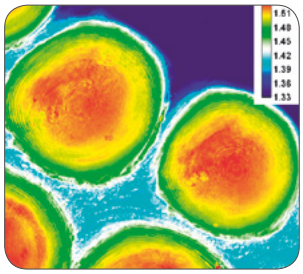

Drug testing


Virology


Stem cells


Cell interaction


Immunology



Refractive index

Specifications

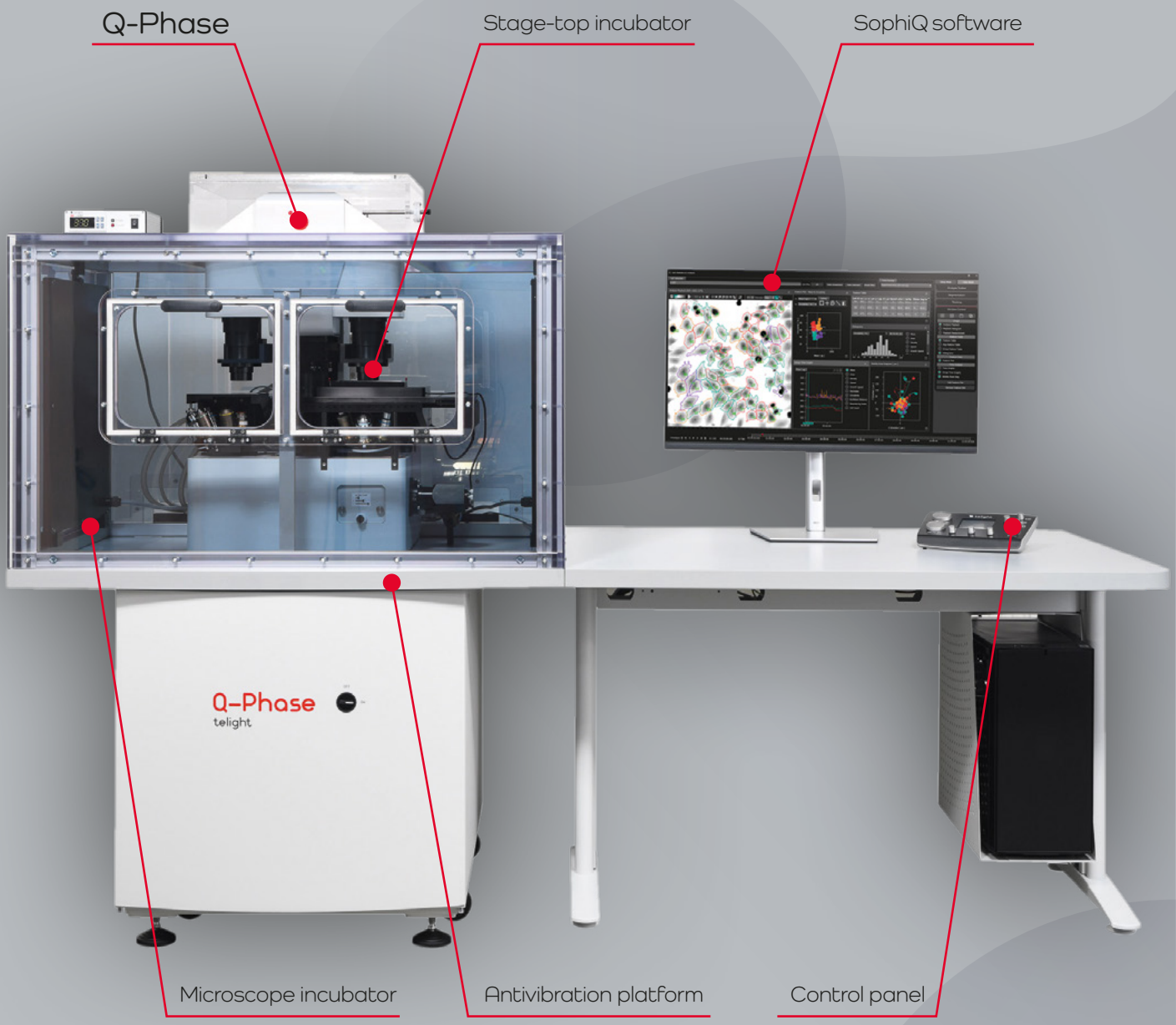
Light source	LED, 660 nm
Illumination power	down to 0.9 mW/cm^2
Objectives	magnification 4× to 60×
Lateral resolution	4 µm with 4× NA 0.1 objective, 0.58 µm with 60× NA 1.4 objective
Field of view	objective and camera dependent, up to 1.48 mm × 1.48 mm with 4× objective
Acquisition framerate	16 fps (higher framerates on request)
Image size	1200 × 1200 px
Phase detection sensitivity	down to 0.011 rad
Accessories	control panel, microscope incubator

Optional

Fluorescence module	LED illuminator, 3 multichannel filter cubes, motorized channel switching
Piezo-focusing	travel range 500 µm
Stage-top incubator	for precise and long-term control of temperature, humidity and CO_2 concentration

More details about Q-Phase specifications and relevant publications can be found at our website www.telight.eu.

Q-Phase workstation



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