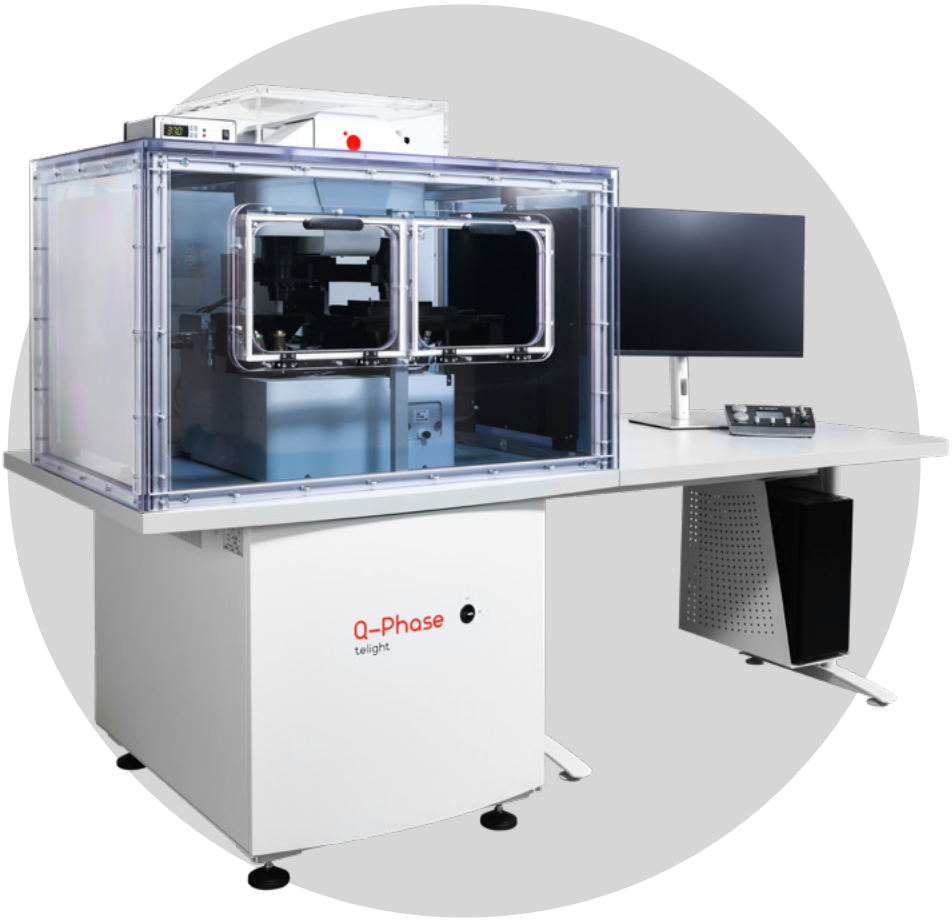
Q-Phase

QPI solution for reliable automated segmentation and cell culture analysis



Q-Phase is a holographic microscope based on a patented technology for Quantitative Phase Imaging (QPI).
Q-Phase creates time-lapse phase images with realistic values for precise measurement of biophysical cell parameters including cell dry mass distribution.

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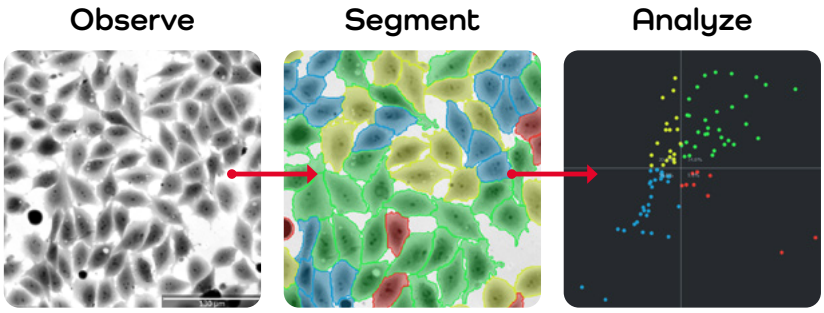
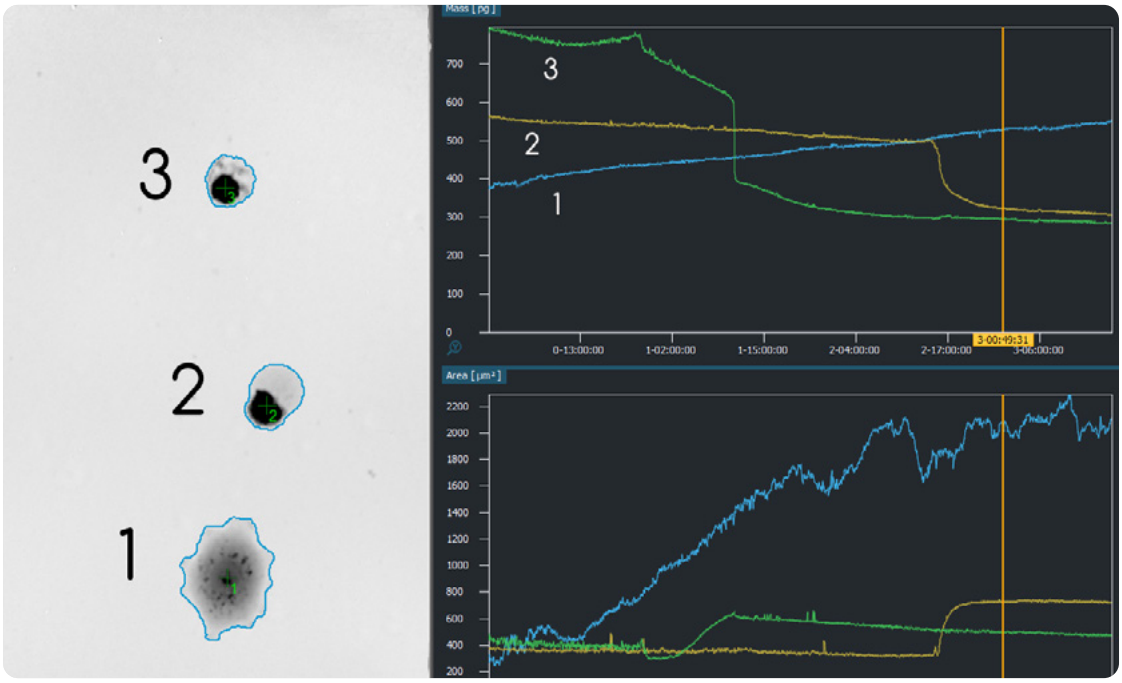
Telight Q-Phase

Q-Phase is a fast and accurate tool for assessment the influence and toxicity of tested drugs or biomaterials on living cells. Due to the label-free technology and the extremely low phototoxicity, the tested agent would represent the major variable that affects the cells behavior during the experiment.

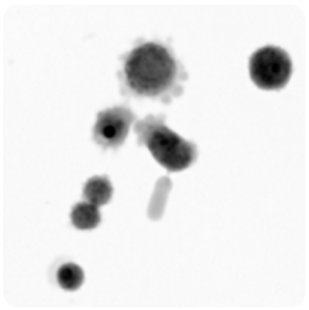




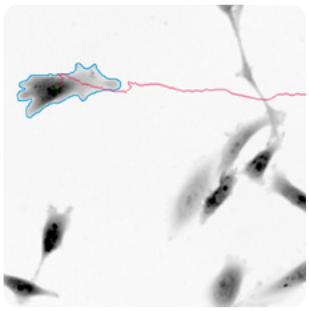
Drug toxicity assessment

88 hours cultivation of prostate cancer cells with Mtor and AKT inhibitors. Cells with higher cell mass (mostly in S, G2M phases) were more sensitive to treatment combination. Right curves show cell dry mass in pg/µm² and cell area in real time.

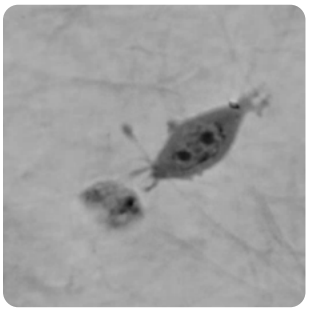
Application examples



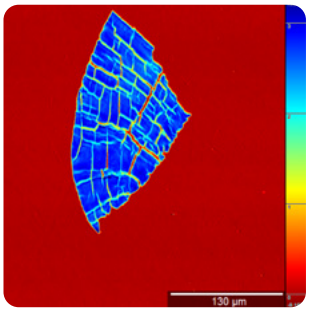
Cell biology



Migration studies



Extracellular matrix



Refractive index

Key advantages

- **Fully equipped live-cell imaging system**
- **Quantitative |** cell dry mass and cell morphology profiling
- **Label free |** non-destructive with no phototoxicity
- **Accurate segmentation of cells outlines**
- **QPI in scattering and turbid media**
- **Multimodal imaging |** combining QPI and fluorescence
- **Integrated software** for live cell imaging analysis

Specifications

Microscope

Microscope configuration	transmission inverted microscope
Microscopy techniques	holography (quantitative phase imaging), epifluorescence, simulated DIC, brightfield, high-pass filtered phase
Objectives	magnification 4× to 60×
Objective turret	6-position, motorized exchange
Light source	halogen lamp
Operating wavelength	650 nm
Sample stage	motorized, 130 mm × 90 mm travel range
Focusing	motorized objective turret, 8 mm travel range
Piezo-focusing	optional, travel range 500 µm
Lateral resolution	3.3 µm with 4× NA 0.1 objective 0.57 µm with 60× NA 1.4 objective
Field of view	objective dependent, up to 1.7 mm × 1.7 mm with 4× objective
Acquisition framerate	5.5 fps at full frame (option: higher framerates possible)
Reconstructed phase image size	1200 px × 1200 px
Illumination power at sample plane	down to 0.2 µW/cm^2
Phase detection sensitivity	down to 0.0035 rad (0.7 nm at Δn = 0.5) Δn - difference between refractive indexes of sample and surrounding media
Power	230 V/50 Hz (120 V/60 Hz optional), 1200 VA
Dimensions (W × L × H)	1100 mm × 950 mm × 1620 mm microscope with incubator 2515 mm × 974 mm × 1620 mm total with operator table
Weight	350 kg (including microscope table, fluorescence module and microscope incubator)
Field and aperture diaphragms	
Side port available for fluorescence module or other additional techniques	
Microscope table with anti-vibration suspension	
Control panel with multifunctional touchscreen, sample stage joystick and rotary knobs	
Microscope incubator with computer temperature setting and temperature data logging (optional)	
Incubation chamber for precise and long-term control of temperature, humidity and CO_2 concentrations (optional)	

Fluorescence module (optional)

Light engines	Lumencor with 3 channels (optionally up to 5 channels)
Detectors	standard CCD 1.4 Mpix (1392 px × 1040 px) optional high-sensitivity sCMOS 5.5 Mpix (2560 px × 2160 px)
Filters	3 multichannel filter cubes, motorized channel switching

Q-Phase users

University of North Florida & Mayo Clinic, Jacksonville, USA

- Cancer research

Max Planck Institute of Molecular Cell Biology and Genetics (MPI-CBG), Dresden, Germany

- Quantitative analysis of protein droplets, mouse skull progenitors, growth & degrowth in planarian flatworms

Masaryk University Brno, Czech Republic, Faculty of Medicine, Department of Pathological Physiology

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- L. Strbkova, et al.: The adhesion of normal human dermal fibroblasts to the cyclopropylamine plasma polymers studied by holographic microscopy, Surface and Coatings Technology 295, 2016.
- J. Collakova, et al.: Coherence-controlled holographic microscopy enabled recognition of necrosis as the mechanism of cancer cells death after exposure to cytopathic turbid emulsion, J. Biomed. Opt. 20(11), 2015.
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- M. Lostak, et al.: Coherence-controlled holographic microscopy in diffuse media, Opt. Express 22(4), 2014.
- H. Janeckova, et al.: Proving Tumour Cells by Acute Nutritional/Energy Deprivation as a Survival Threat: A Task for Microscopy, Anticancer Res. 29(6), 2009.

Institute of Molecular Genetics AS CR, Prague, Czech Republic, Laboratory of Light Microscopy and Cytometry

- Osmotic changes in cells, cell reaction to treatment, cells in 3D environment
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