Opera
High Content Screening System

A New Era of Cell Screening Sciences

PerkinElmer®
precisely.

Opera

Superior Performance, High Resolution and Ultra-High Speed

Only the combination of these key features ensures the potential for fully flexible assay development and the industrialization of the screening process. Central to high resolution are true point scanning confocal imaging and the use of water immersion objectives. Drivers for speed are simultaneous image acquisition and data processing. The most prominent areas of use are cell screening with sub-cellular resolution as well as bead based screening applications – from conventional plate formats to nanoplate scale.

Features

- Fully automated point scanning confocal high throughput screening system prevents photo-bleaching and photo-toxicity
- Simultaneous four-color imaging and on-line analysis for multiplexed assays in high speed
- Water immersion objectives for optimized signal-to-noise
- Environmental control unit, liquid handling and robotics options enabling kinetic experiments and full screens using live cell samples
- Comprehensive and fully flexible image analysis software Acapella for user-defined applications

Applications

Toxicity and survival
Cell viability, cell differentiation, cell proliferation, cytotoxicity, apoptosis, transporter phenomena

Cell signaling and pathway screening
Calcium flux, second messengers, ion channels, membrane potential, protein translocation and redistribution

Gene expression
Analysis of house-keeping gene and reporter gene expression, gene activity and protein regulation, and siRNA library screens

Receptor activation
Ligand binding, receptor activation and desensitization, translocation and endocytosis, recruitment of signaling molecules

Phenotypic assays
Neurite outgrowth, cell differentiation, cell adhesion and spreading

Immunochemical assays
Bead-based homogeneous antigen-antibody interaction

The Opera Workflow

Assay development

Run test plates with “high” and “low” values for the assay under investigation in micro well plates of choice:
96-well, 384-well, or 1536-well plates
user definable

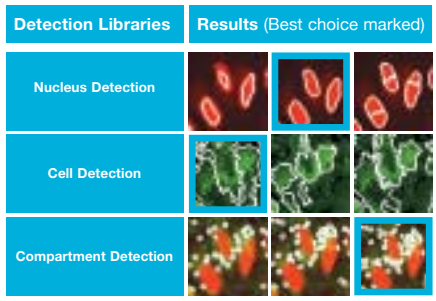
Make choice of plate reading:
one, two, three, or four colors in parallel
10x, 20x, 40x, or 60x magnification, water immersion or air objectives
single or multiple image fields per well
z-sectioning
time lapse

Read and analyze plates automatically using an existing analysis script

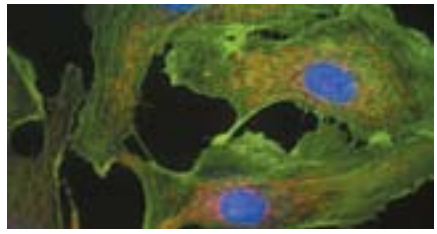
Optimize image analysis using the script development toolbox or generate a new analysis algorithm using the Acapella Detection Libraries

Combine modules for cell and cellular compartment detection according to cell type and staining conditions.

Create input and output parameters as required



Creating analysis scripts using the Acapella Detection Libraries



Three color image taken with a 60x water immersion lens

High Throughput Screening

Run assay in a suitable screening environment e. g. cell::explorer screening system or live cell workstation with plate handling, liquid handling, and incubator for live cell applications System with compound transfer, plate fixation and plate washing for fixed cell assays

Transfer plates to the Opera, run screen in a fully automated fashion using the pre-configured measurement and analysis parameters

Analyze images on-line
Images and data are available for display while the screen is running
Store raw and processed data in the file based High Throughput Analysis System

Export the results automatically or batch-wise to a user defined evaluation software

Generate higher level results with the evaluation software (dose-response, QC, compound profiling, hit list generation, SAR,...)

Plate handling for the Opera:
The plate::handler™ II

Virtual Re-Screening

Re-analyze data using modified or different algorithms
Optimize Z’
Screen for systemic artifacts
Side effects of compounds
Compound toxicity

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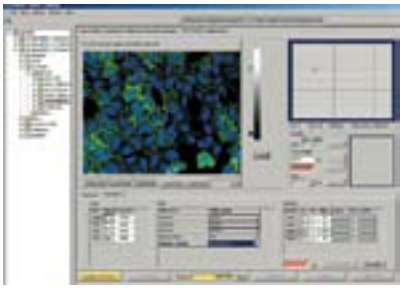
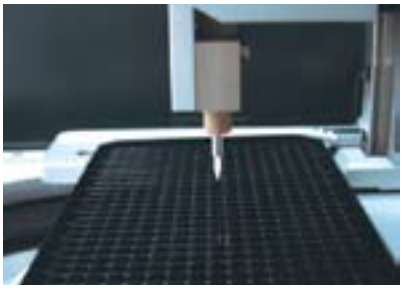
Water immersion objectives on an automated turret



Microscope dialogue



Dispensing unit

CLASS 1
LASER PRODUCT

Optics

Confocal imaging unit

Point-scan confocal Nipkow-spinning disc
Ultra fast laser-based auto focus
Fully automated exchange of objectives, four-position objective turret
Choice of air objectives (10x, 20x, 40x) and water immersion objectives (10x, 20x, 40x, 60x)
Automated water immersion fluid supply
Three parallel confocal detection channels plus optional fourth non-confocal detection channel

Excitation

Solid state lasers: 405 nm, 488 nm, 561 nm or 532 nm, 640 nm

Automation

Fully automated objectives, filters, and beam splitter selection
Computer-controlled laser power
Scalable PC cluster for on-line data analysis
Four-color parallel and sequential exposure image acquisition
Data acquisition and analysis rates of > 100,000 image sets per day
Accepts wide variety of micro titer and nano titer plates
Integration-ready into a screening environment

Further Options

UV unit

UV light source
High pressure Xe lamp
Additional, non-confocal detection channel including fourth camera

Environmental control unit

Temperature, CO_2, and humidity control

Dispensing unit

Dispenser for µl volume reagent addition
Software for single and multi-delay time kinetics

Work station extensions

Plate loading with stacker for fixed cell samples
Live Cell Monitoring Workstation extension including plate transfer to and from an incubator

Fluorescence lifetime imaging (FLIM)

External pulsed laser source for confocal fluorescence lifetime imaging
Fast gated CCD camera

Data Handling

Distributed data processing system with a variable number of evaluation clients with load balancing
Real-time image analysis
Automatic load balancing
Multiple field image acquisition enabling full coverage of each well
Fully flexible choice of image acquisition: number and location fields, focus height, volume imaging
All experiment definitions and results are stored and exported in XML files.
Flexible export system for result to post-analysis software.
Interface to Genedata's Screener® platform providing a seamless automated workflow form primary to secondary data analysis (pattern analysis, IC50, MOA, etc.) in high throughput.

Image analysis

Fully flexible image analysis software, Acapella, providing a large choice of image analysis modules and standard procedures for algorithm development
Automated flat-field correction
Extensive image processing and analysis functions
Cell recognition and counting
Object recognition and identification of subcellular structures
Classification of recognized objects based on user defined properties
Extraction of predefined and user defined properties of objects and cell structures

PerkinElmer Inc.
940 Winter Street
Waltham, MA 02451 USA
Phone: (+1) 781 663 5900
www.perkinelmer.com

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For a complete listing of our global offices, visit www.perkinelmer.com/lasoffices

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