New from Hamamatsu

HCIMAGE

Imaging Software Optimized for Image Acquisition and Analysis

HCImage is designed to solve a wide range of imaging applications. It includes an extensive range of image processing tools that can be used during live image capture or post acquisition analysis. For greater control, HCImage allows image capture, processing and analysis with the ability to select from over 150 measurements. Data are saved in a hierarchical file structure, allowing images and measured data to be easily displayed in a variety of graphical formats or exported to Excel.

HCImage is optimized to take full advantage of the established DCAM camera drivers, maximizing the performance and usability of Hamamatsu cameras.

HCImage provides an easy-to-use, flexible solution to many applications in Life and Material Science; including particle sizing, intensity analysis over time, object tracking and multi-dimensional time-lapse.

Applications

- Fluorescence Microscopy
- Ratio Imaging
- Multi-dimensional Time-lapse Imaging
- Object Counting and Quantification
- High Speed Image Streaming
- Vesicle Fusion Event Monitoring
- Protein-protein Interactions
- Motion Tracking
- Particles Size Analysis

www.hcimage.com

HAMAMATSU

HCImage Live

HCImage is designed to utilize high resolution and sensitivity from Hamamatsu cameras, and is highly optimized for DCAM driver. HCImage provides the necessary tools for image acquisition, processing and analysis, all in a flexible, easy-to-use application. Careful thought went into the design of the user interface to maximize functionality, optimize workflow and increase efficiency.

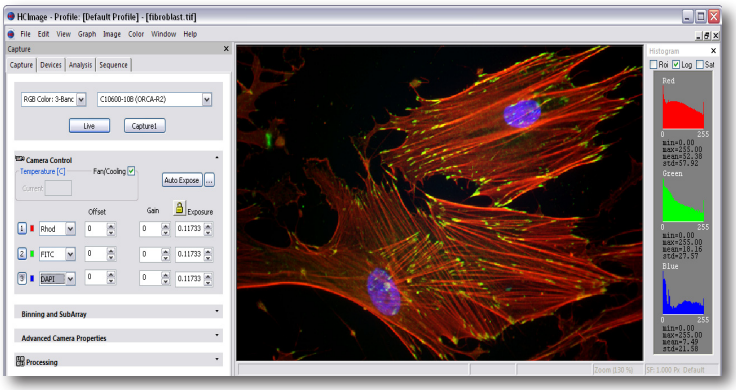
■Layout

Dynamic Panel

A side panel provides comprehensive user control of the imaging system from Acquisition through Analysis. Panes and expanding panels provide easy access to controls.

Custom Layout

Customize the screen layout by editing the panes and toolbar



■Time-lapse

Visual Feedback

Use the live intensity histogram to increase dynamic range and check for saturation.

Real-time Hardware or Software Image Processing

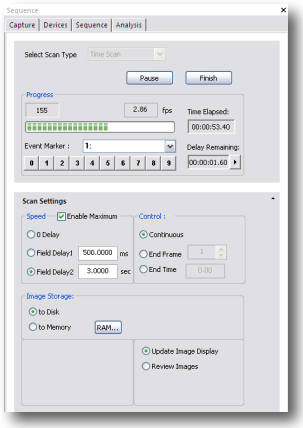
Perform background subtraction, shading correction or frame averaging while capturing images using HCImage on a selected camera.

Stream or Delayed Time-lapse Acquisition

Stream images at maximum speed or dynamically switch between multiple time-lapse intervals.

TTL I/O

Use TTL to control image capture or synchronize with other events.



■Measurement

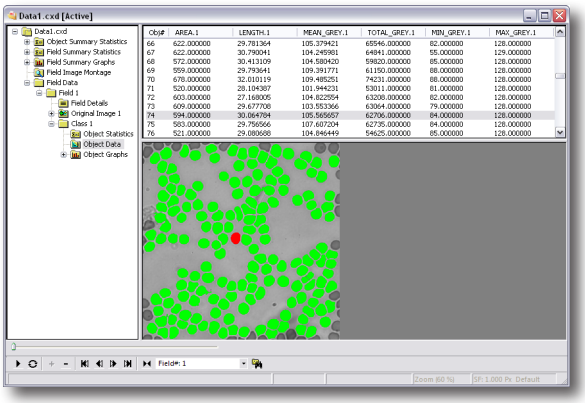
Data Collection and Object Management

Select multiple measurements for intensity, line length, endpoint length and area on individual images with data saved in a data document or spreadsheet.

Plot Intensity of an Object Over Time from Images Saved in an Image Sequence

View the Data

Image sequences saved in a data document can be reviewed and measured. Measured data can be presented as a list, statistics, spreadsheet or graphically.

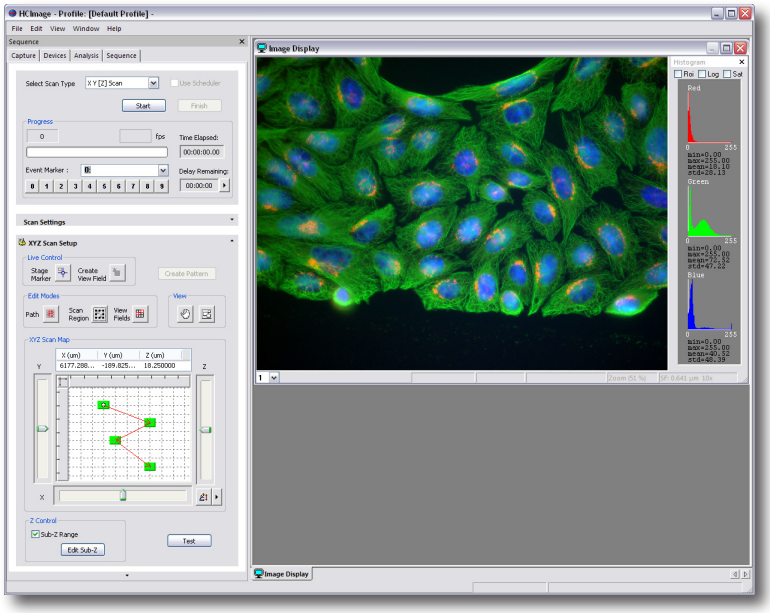


HCImage Acquisition

HCImage Acquisition includes all functionality of HCImage Live, plus the ability to perform multi-dimensional acquisition and control a wide range of motorized devices. Designed to provide a fast and flexible workflow to facilitate image acquisition, HCImage is an elegant solution to cover many experimental designs. Multi-dimensional collection of large image sequences are organized into data tree file structure for easy access to images and measurements. Support for an extensive list of Hamamatsu cameras, microscopes, and associated peripheral hardware provides a cost effective solution to all your image acquisition requirements.

■Flexible Multi-dimensional Acquisition

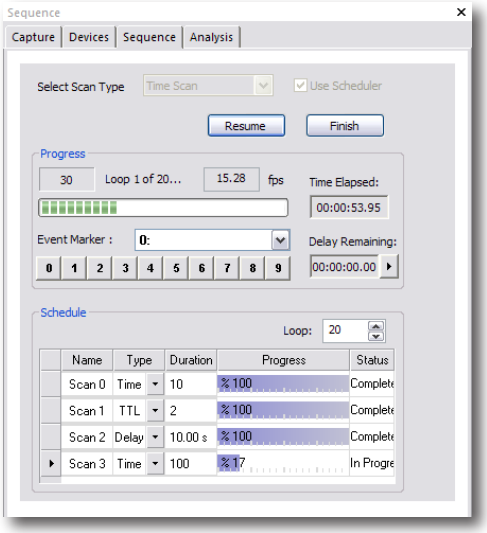
- **Multi-site Time-lapse**
  Automated capture of XYZ and wavelength scans over time
- **Multi-channel Acquisition**
  Capture up to 5 different filter settings over time
- **Z Scan Acquisition**
  Capture Z scans of a single or multiple locations
- **High Speed Image Streaming**
  Acquire large data sets at maximum camera speed
- **Modify Settings during Time-lapse**
  Modify exposure, focus and XYZ location
- **TTL Input and Output Control**
  Internal and external TTL control for acquisition and data synchronization
- **Create Large Image Montage**
  Scan large image area at high resolution for montaging



■Scheduler

Run a time-lapse with variable events, for example, Time1, Time2, TTL, Z, Delay with loops

- **Time-lapse Scheduler**
- **Variable Time Delay**
- **TTL Output Control**
- **Z Scans**
- **Multiple Loops Time-lapse**



■Extensive Selection of Imaging Tools

- **Real-time Image Processing**
  Real-time noise averaging, shading and background correction
- **Exposure Protection**
  Advanced exposure protection to minimize bleaching
- **Advanced Auto-exposure**
  Customize Auto-exposure parameters to optimize image dynamic range
- **Dynamic Auto Contrast**
  Minimize sample bleaching by using short exposure
- **Sub-Array Image**
  Select sub-array on the camera CCD to increase acquisition speed
- **Auto Focus**
  Correct for focus drift by performing auto-focus at user-specified interval
- **XYZ Stage Offset**
  Automatically shift XYZ for each filter setting
- **Review Large Data Set with Ease**
  Images are organized in a data tree format for easy access to image information and analysis

■Comphrensive Camera Support

- **DCAM Support**
  Support for Hamamatsu DCAM based cameras, Including ImagEM, ORCA-R2, ORCA-AG, C9300-221
- **Nanozoomer File Format Support**
  Support for **ndpi**, **vms**, and **vmu** NanoZoomer file formats
- **Dual Camera Support for DCAM**
  Use two identical cameras for high speed simultaneous acquisition

■Support for Motorized Devices

- **Automated Microscopes**
  Support for a wide range of automated microscopes including: Olympus IX81; Nikon 90i and TE2000; Leica DMI6000; and Zeiss microscopes supported under MTB 2004
- **Wavelength Switchers**
  Sutter DG4 and DG5, TILL Polychrome V,
  Spectral LMM5 merge module, CAIRN Optoscan Monochromator
- **Filter Wheel Controllers**
  Hamamatsu Filter Wheels, Ludl Mac 5000 & 6000, Prior ProScan and OptiScan, Prior Lumen Pro, Sutter Lambda 10-2, 10-3, 10-B, SC and Smart Shutter
- **Shutter Controllers**
  Support for Hamamatsu shutter, Sutter, Ludl, Prior, ASI SC-2, ASI-1000, and Uniblitz controllers
- **XY Stage Controllers**
  Ludl Mac 5000 & 6000, Prior ProScan and OptiScan, Märzhäuser: Tango, LSTEP, ECO-STEP
  ASI MS-2000, Olympus, Leica, Zeiss, Nikon Biostation XYZ Stage
- **Z Motors**
  ASI-Z, Prior Z-motor, Märzhäuser, Ludl, Olympus, Nikon, Zeiss, Leica, Physik Instrument E662 and E665
- **Camera Emission Splitters**
  Image Splitter Dual View
- **I/O Devices**
  Parallel and Serial I/O support, AEQUORIA digital I/O support, National Instrument DAQ board, Visitech AOTF

HCImage Analysis

HCImage Analysis includes all functionality of HCImage Live and Acquisition, plus an extensive selection of image analysis tools. It features image processing and analysis tools to enable quantitative analysis on a wide range of complex images. Imaging tools are selected using customized icons to derive workfiles (macros), which are saved and can be used multiple times. Images are saved with measured data allowing dynamic interaction between images, objects, graphs, and tables to provide instant user feedback. Custom measurements can be created with a built-in equation editor expanding over 150 measurements, including count, size, shape, position, intensity and color of objects. Tracking is available for multiple objects across time separated image sequences.

Image Processing and Analysis Tools

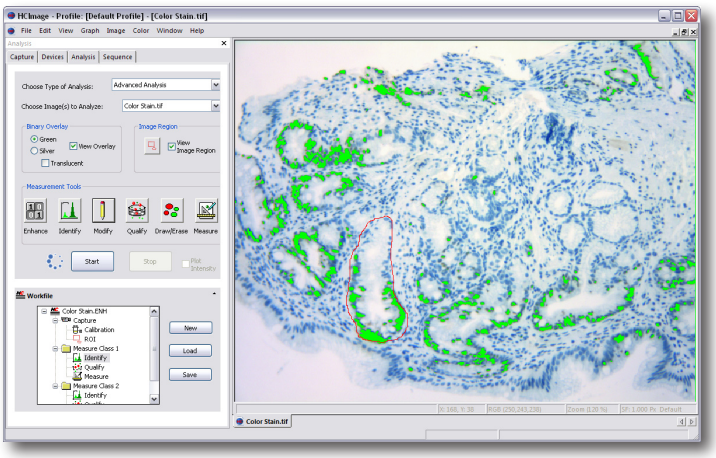
- **Image Processing**
  Includes frame average, background correction, smooth, median, Laplacian, Sobel, Kirsch, erode, dilate, separate, erode, dilate, skeleton, prune, node, AND/OR/NOT/NOR plus others.

- **Identify Objects**
  Objects are identified by intensity, color threshold, or may be manually drawn.

- **Qualify**
  When objects do not meet the desired criteria for measurement, they can be removed with a special size, shape, intensity or position qualifier, thus ensuring distribution statistics that meet acceptable standards.

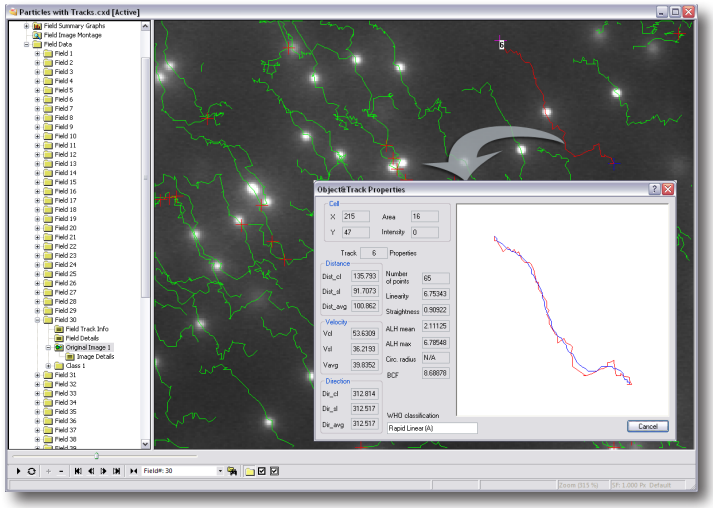
- **Workfile**
  Workfiles are available to process single images or multiple images throughout a sequence.

- **Extensive List of Measurements**
  Over 150 measurements including, area, diameter, length, width, perimeter, shape, position, intensity. Customize your own measurement with built-in equation editor.



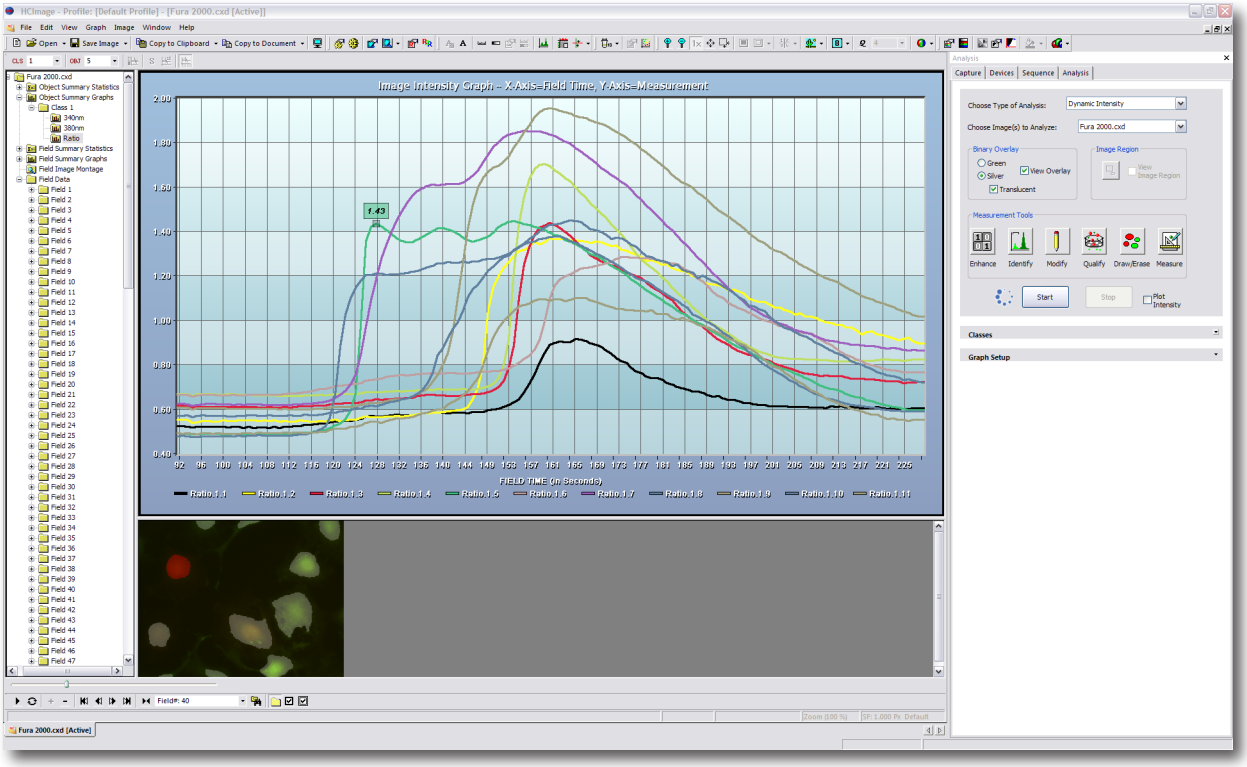
Motion Tracking

- **Object Position -** X, Y coordinates
- **Velocity -** Average speed along the track
- **Distance -** Length of a line in calibrated units
- **Direction -** Angle measured in degrees
- **Number of Points -** How many consecutive images contain the same object in a track
- **Linearity -** Numerical factor indicating how close the track is to a straight line
- **BCF -** Beat Cross Frequency, reports how often a track crosses its mean path

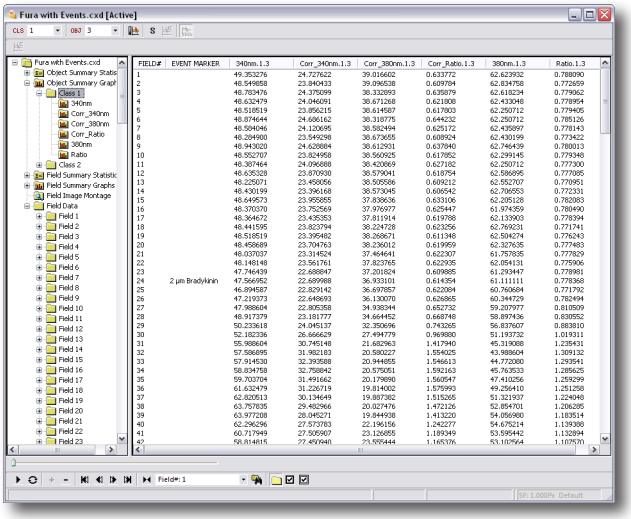


■Dynamic Intensity Analysis

HCImage Analysis conveniently plots intensity of multiple objects in real-time or post capture on time separated image sequences. Objects can be identified by intensity, color threshold, or may be manually drawn. Critical details of an experiment are easily investigated by viewing a time course as an animation tightly linked to measured data. Custom measurements are available to deal with complex situations such as background correction on a field-by-field basis. To ensure synchronization of the experiment, event marking is possible using interactive key presses or TTL signals for automatic tagging.



HCImage analysis is ideally suited for live cell applications including colocalization, FRET, FRAP, FURA2, BCECF, Indo, SNARF as well as other dynamic measurement techniques. These applications all benefit from the ability to indentify objects in the images for plotting intensity change over time.

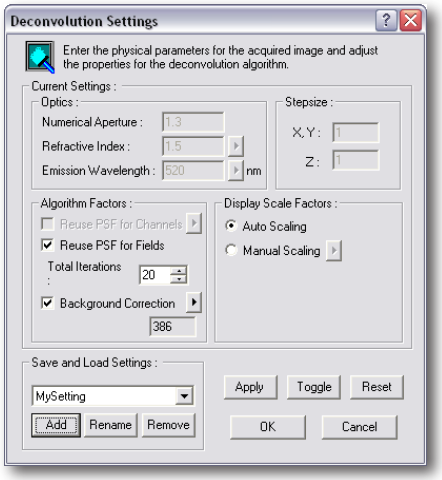


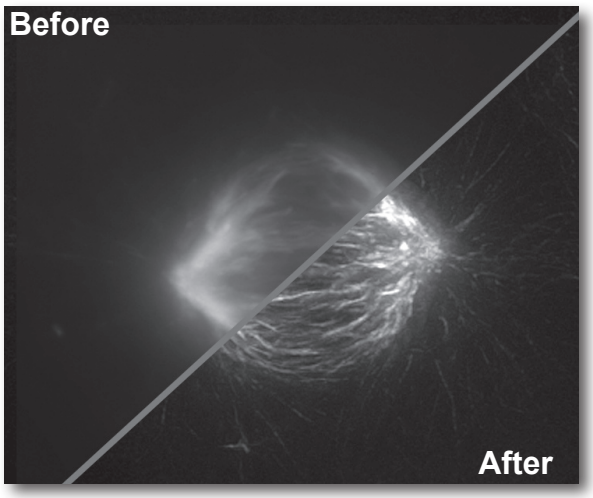
- **Event Markers**
  Acquire image sequences with dynamic I/O event marking during an experiment
- **Define Objects**
  Objects are identified by intensity, color threshold, or may be hand drawn
- **Flexible Data Plot**
  Plot one, multiple or average measurements over time
- **Ratio Analysis**
  Plot ratio intensity for Ca++, pH ratio and more
- **Dynamic Data Interaction**
  Interact between data plots and corresponding images

Option for HCImage Acquisition and Analysis

Optional 2-D Blind Deconvolution combines restorative deconvolution algorithms identifying out-of-focus haze and restoring it to its original point. A Point Spread Function (PSF) is automatically derived from an image and used in the restoration process.

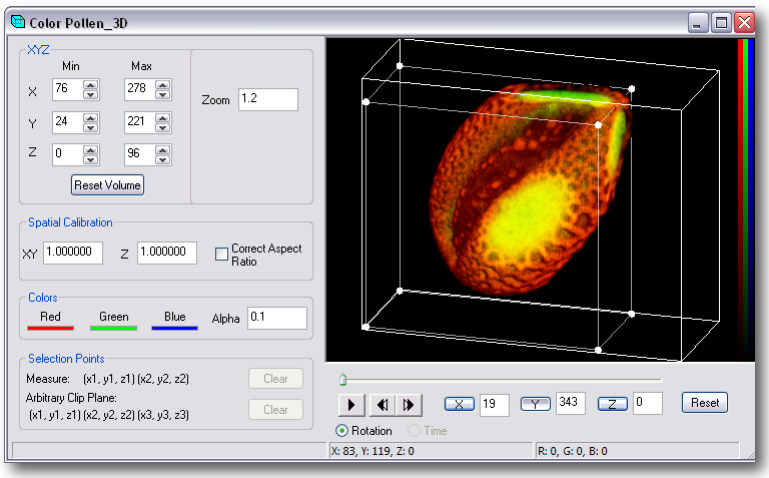
- **Apply to Image Sequence Automatically**
- **Automatically Computes PSF**
- **Work with Widefield, Brightfield and Confocal Images**
- **Ideal for Time-lapse Imaging**
- **Monochrome or Multi-color Fluorescence Images**
- **Apply to Full Image or Image Region for Fast Parameter Tuning**
- **Enhance Details for 3-D Reconstruction**





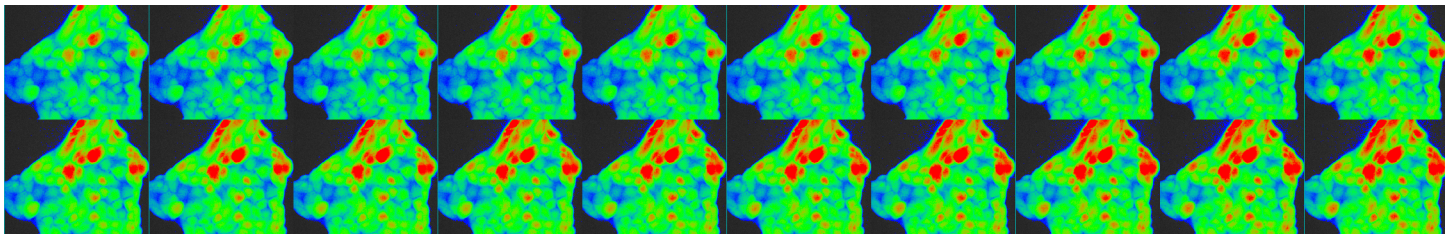
Optional Visualizer allows the user to easily view and interact with multi-dimensional data sets. A typical image data set would be a series of optical sections through a specimen. HCImage Visualizer can reconstruct and render a multi-dimensional data set for interactive 3-D viewing. HCImage Visualizer renders images using optimized software and hardware acceleration.

- **Support for Multi-site Timepoints**
  Render Z scan over time of multiple locations
- **Measure Distance Between two Points**
  Interactively compute the distance of two points
- **Visible Volume Measurement**
  Compute the volume of a visible 3-D object
- **Visualize Colocalization**
  Dynamically view colocalization
- **Export Data to AVI or Image Sequence**
  Share your rendered data set by exporting as AVI movies or as a series of tiff images



Matrix of Levels and Functions Available

HCImage	Live	Acquisition	Analysis	Review
Vista and XP Compatible	✓	✓	✓	✓
Multi-threaded and SSE2 Support	✓	✓	✓	✓
Full DCAM Support	✓	✓	✓	✗
TTL I/O	✓	✓	✓	✗
XYZ Stage, Filter Wheel, Shutter, and Microscope Device Drivers	✗	✓	✓	✗
Monochrome, Multi-channel or RGB Color	✓	✓	✓	✗
Time-lapse Streaming to Memory and Hard Disk	✓	✓	✓	✗
Time-lapse Scheduler, TTL, Delay, Scans over Multiple Loops	✗	✓	✓	✗
XYZλT Multi-dimensional Scans	✗	✓	✓	✗
Live Processing: Noise Reduction, Shade & Background Correction	✓	✓	✓	✗
Export to Tiff, AVI…	✓	✓	✓	✓
Image Correction and Image Processing	✓	✓	✓	✓
Intensity Threshold to Identify Objects	✓	✓	✓	✓
Area, Length, Intensity Measurement	✓	✓	✓	✓
Full Range of Morphological Measurements	✗	✓	✓	✗
Macro Building using Workfiles for Image Processing and Analysis	✗	✗	✓	✗
Data Statistics, Lists and Histograms	✓	✓	✓	✓
Analysis During Data Collection	✗	✗	✓	✗
Analysis Post Data Collection	✓	✓	✓	✗
Intensity & Ratio Plotting Live and Post Acquisition	✗	✗	✓	✗
Intensity Plotting for a Single Object Post Data Collection	✗	✓	✓	✓
Colocalization and FRET	✗	✗	✓	✗
2-D Blind Deconvolution and 3-D Visualization on image sequences	✗	Optional	Optional	✗



HAMAMATSU

Homepage Address http://www.hamamatsu.com

HAMAMATSU PHOTONICS K.K., Systems Division
812 Joko-cho, Higashi-ku, Hamamatsu City, 431-3196, Japan, Telephone: (81)53-431-0124, Fax: (81)53-435-1574, E-mail:export@sys.hpk.co.jp

U.S.A. and Canada: Hamamatsu Corporation : 360 Foothill Road, Bridgewater, N.J. 08807-0910, U.S.A., Telephone: (1) 908-231-0960, Fax: (1)908-231-0852, E-mail: usa@hamamatsu.com
Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-2658, E-mail: info@hamamatsu.de
France: Hamamatsu Photonics France S.A.R.L.: 19, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10, E-mail: infos@hamamatsu.fr
United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road, Welwyn Garden City, Hertfordshire, AL7 1BW, U.K., Telephone: (44) 1707-294888, Fax: (44) 1707-325777, E-mail: info@hamamatsu.co.uk
North Europe: Hamamatsu Photonics Norden AB: Smidesvägen 12, SE-171-41 Solna, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01, E-mail: info@hamamatsu.se
Italy: Hamamatsu Photonics Italia S.R.L.: Strada della Moia, 1/E 20020 Arese (Milano), Italy, Telephone: (39)02-935 81 733, Fax: (39)02-935 81 741, E-mail: info@hamamatsu.it

Cat.No.SCAS0061E01
FEB/2009 HPK