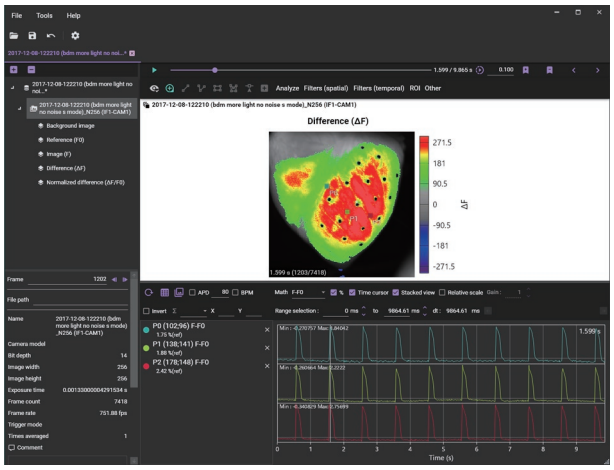
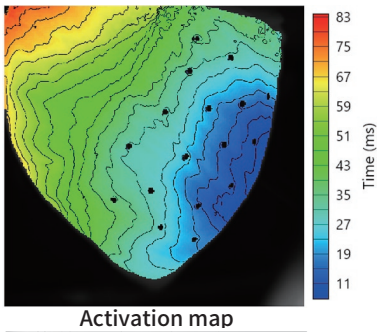
Brainvision

Data Analysis Software for Cardiac Imaging

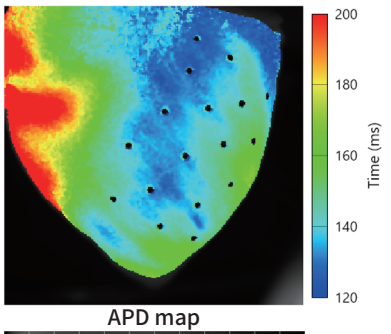
BV Workbench Ver 2.6



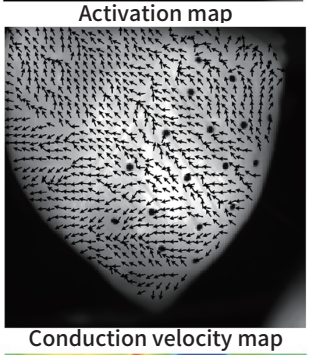
Main screen



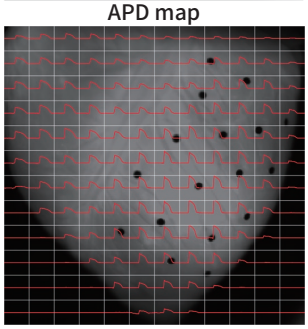
Activation map



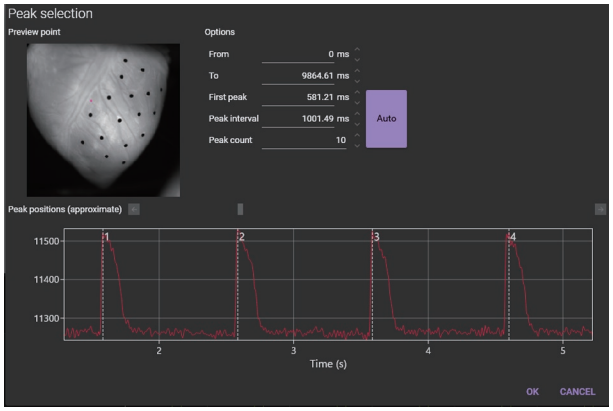
APD map



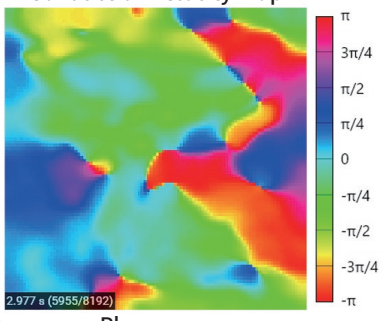
Conduction velocity map



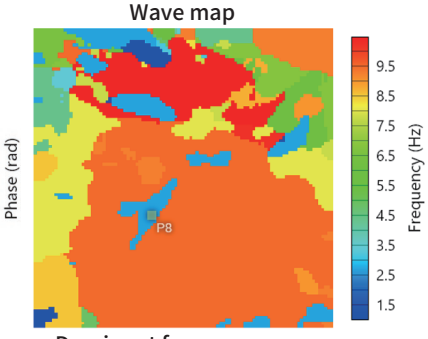
Wave map



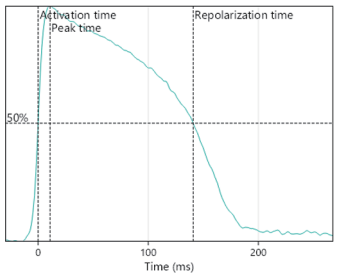
Peak selection



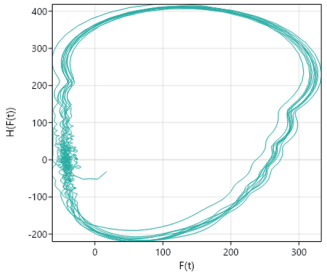
Phase map



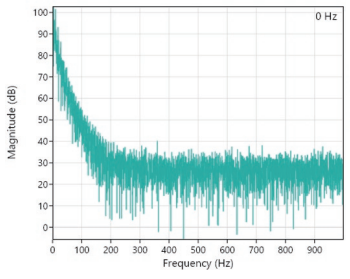
Dominant frequency map



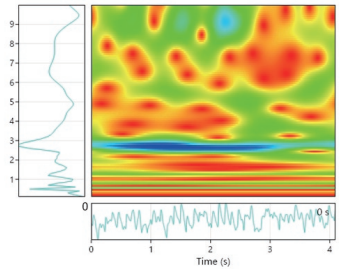
Peak analysis



Phase analysis



Frequency analysis



Time-frequency analysis

- **For analysis of voltage sensitive dye / calcium imaging data**
- **Can easily create various maps such as activation map and APD map with intuitive operation**
- **Peak detection and optimum value setting can be performed quickly with semi-automatic data analysis.**

BV Workbench is analysis software for image data acquired by the imaging systems (MiCAM05, MiCAM03, MiCAM ULTIMA, MiCAM02, etc.) manufactured by Brainvision Inc. It also supports 16-bit grayscale TIFF files, and can read images and analyze data acquired by commercially available cameras.

Main Screen

Movie display

- Playback / stop
- Adjustment for playback speed
- Frame forward / frame back

Image display

- Enlarging / reducing image
- Selecting/ moving points
- Display of numerical data, XY coordinates, frame number
- Change color map

Display of analysis results

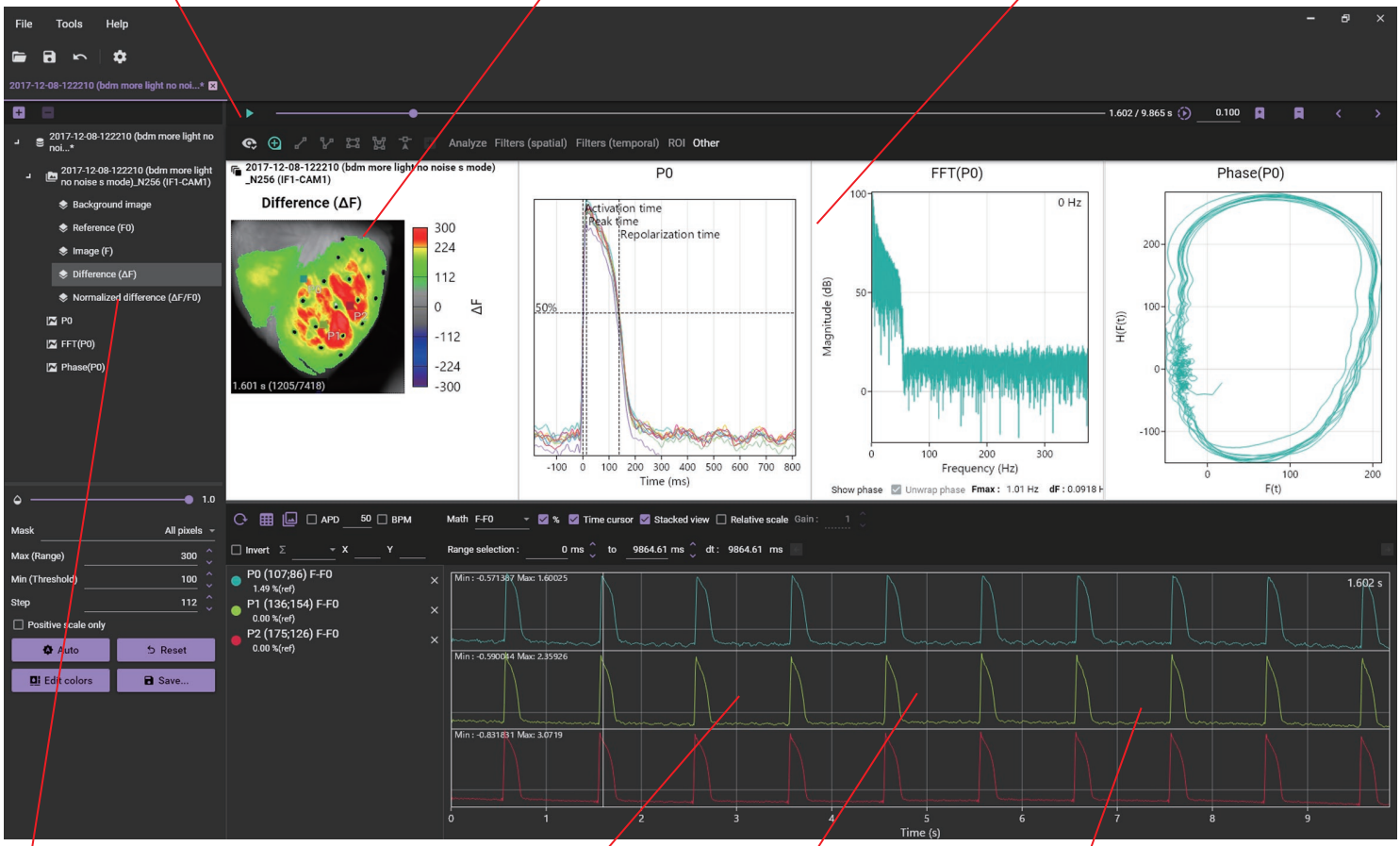
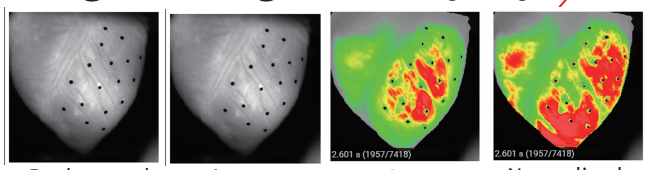


Image management by layer

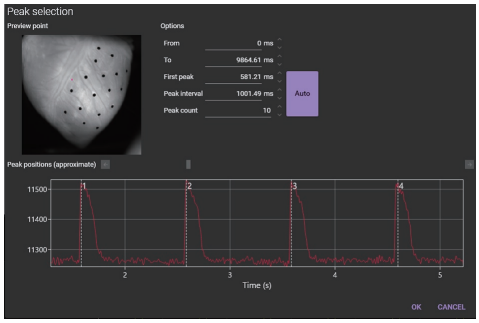


Background | Image | Difference | Normalized Difference

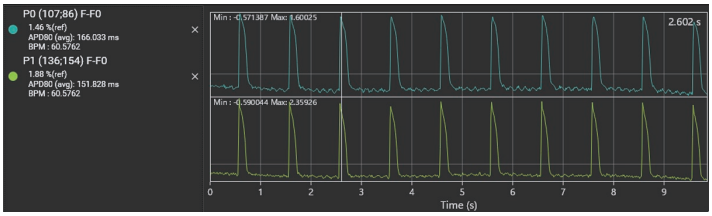
Wave display

- Click image to display waveform at that point
- Waveform display by specifying coordinates
- Simultaneous display of analog waveforms such as ECG
- Inversion of waveform polarity
- Change of waveform value display method（F, F-F0, dF/dt）

Automatic peak detection

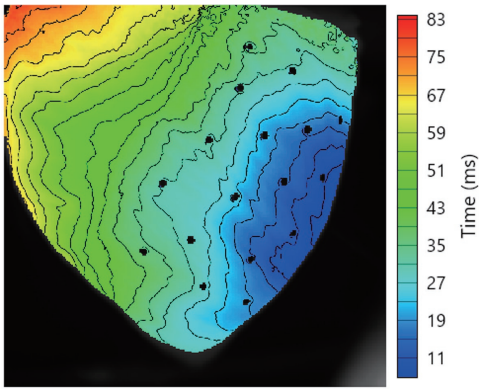


Automatic detection of heart rate and APD

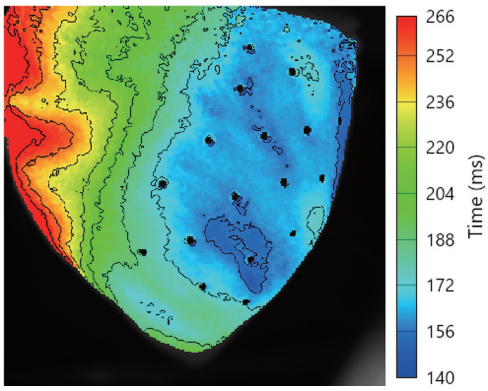


Various Maps

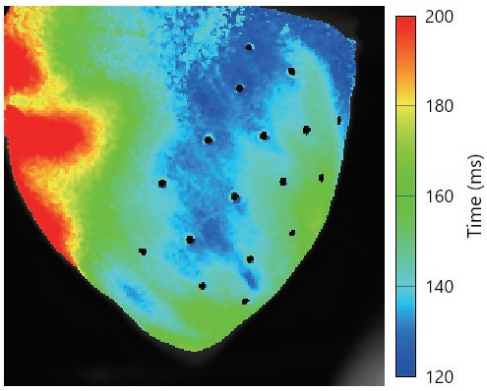
Activation time



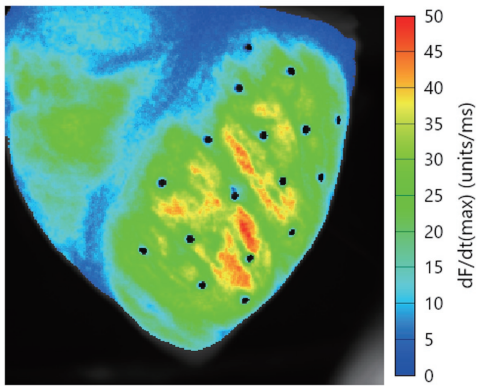
Repolarization time



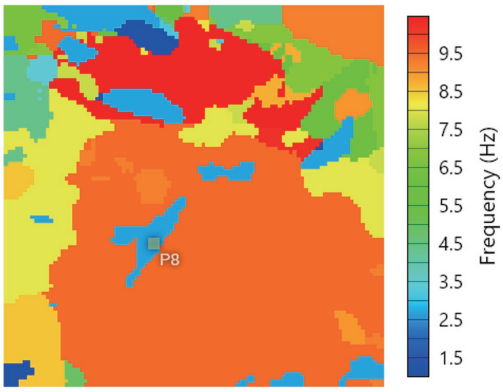
Action potential duraion(APD)



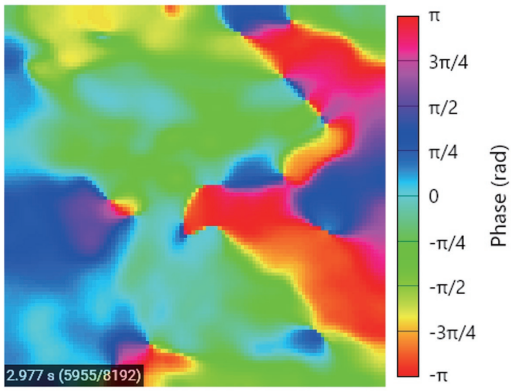
Maximum upstroke velocity



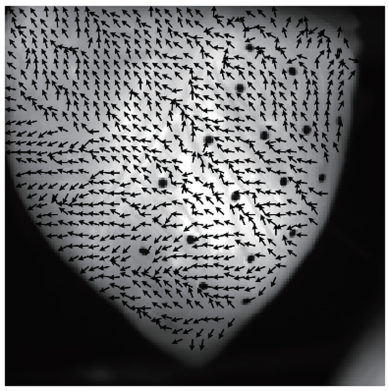
Dominant frequency



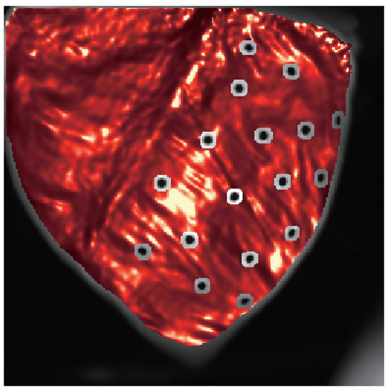
Phase



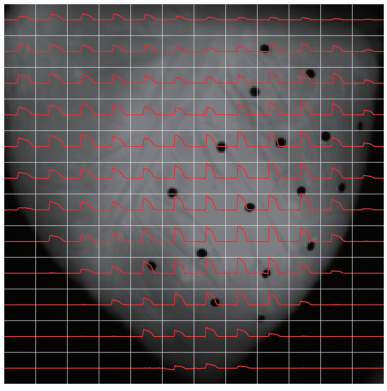
Conduction velocity (vector)



Conduction velocity (scalar)



Wave



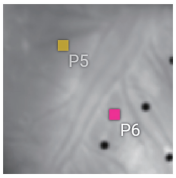
Action potential

Activation time
Repolarization time
Action potential duration (APD)
Activation to peak time
Peak to repolarization time
Peak time
Peam amplitude
Decay tau
Maximum upstoke velocity

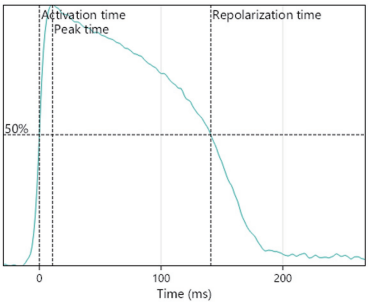
Calcium transient

Half rise time
Half decay time
Calcium transient duration (CaD)
Half rise to peak time
Peak to half decay time
Peak time
Peam amplitude
Decay tau
Maximum upstoke velocity

Point Analysis



Peak wave analysis

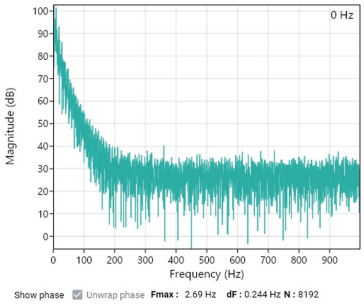


Peak time (ms)			
Mean :	10.895	Std.dev. :	0.167
Peak amplitude (delta-F)			
Mean :	399.733	Std.dev. :	2.682
APD50 (ms)			
Mean :	133.003	Std.dev. :	0.538
Decay tau (ms)			
Mean :	134.844	Std.dev. :	0.694
Max. upstroke velocity (units/ms)			
Mean :	31.629	Std.dev. :	0.434

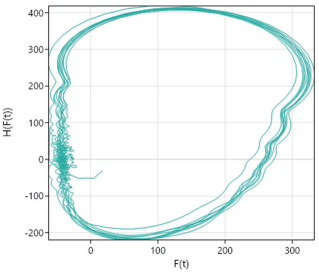
Show mean and standard deviation of

- Peak time
- Peak amplitude
- APD
- Decay tau
- Maximum upstroke velocity

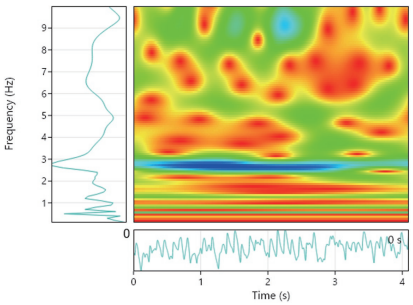
Frequency analysis



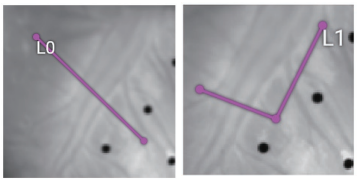
Phase analysis



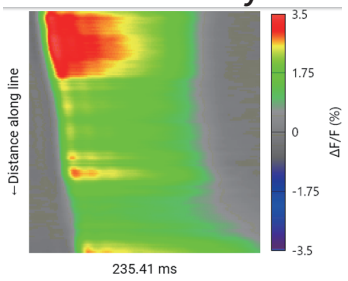
Time-Frequency analysis



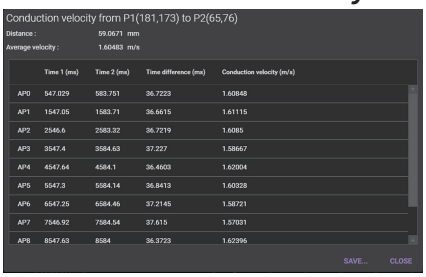
Line Analysis



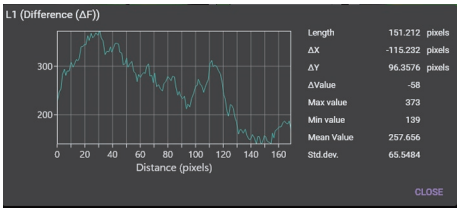
Line scan analysis



Conduction Velocity

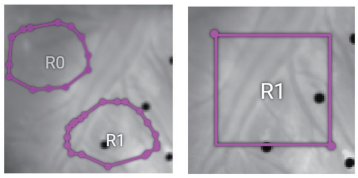


Line information

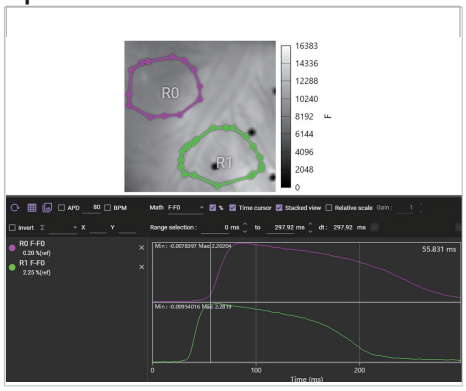


- Length (pixel numer)
- Amount of change in light intensity
- Maximum value
- Minimume value
- Average value
- Standard deviation

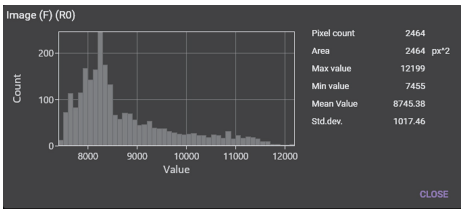
Area (ROI) Analysis



Average waveform display for specified area



Area information

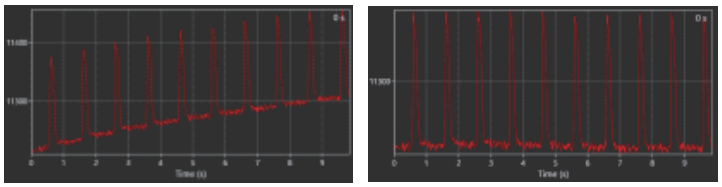


Total number of pixels, Maximum value, Minimum value, Average value, Standard deviation

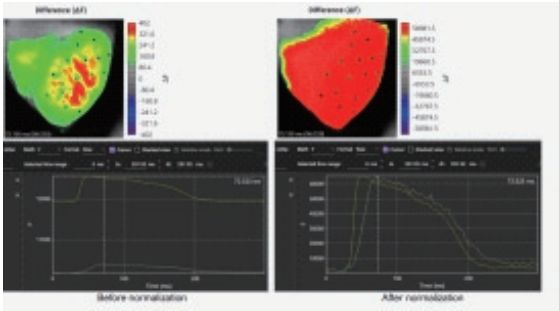
Various filters

• **Undo**	Undo last filter
• **Invert polarity**	Reversal of image and waveform polarity
• **Binning**	Combine multiple pixels into one pixel
• **Brightness/Illumination correction**	Brightness correction / illumination light unevenness correction
• **Gaussian filter**	Gaussian filter (noise removal)
• **Mean filter**	Mean filter (noise removal)
• **Median filter**	Median filter (noise removal)
• **Drift removal**	Correct drift of baseline
• **FIR Filter**	FIR temporal filter (noise removal)
• **Dynamic range optimization**	Optimize dynamic range
• **Normalize wave amplitude**	Make maximum amplitude uniform
• **Filter batch**	Apply multiple filters at once
• **Deinterleave frames**	Divide frames of two wavelength imaging data into two data

Drift removal



Normalize wave amplitude



Other functions

• **Image align**	Enlarge / reduce, rotate, move, and overlay two images
• **Crop**	Image crop
• **Arithmetic operation**	Calculation processing between two data
• **Batch average**	Manual averaging of multiple data
• **Create subset**	Cut a part of data and save it as another data

Data export

- **Image CSV (*.csv)**
- **Movie (*.avi)**
- **Image / Map data (*.png)**
- **Wave CSV (*.csv)**

Supported data formats

	GSD	RAW	TIFF/BigTIFF
Description	Format designed for BV Analyzer. Has many custom fields and user settings hard coded in the file structure. Analog data can also be embedded (MiCAM only).	New format designed for image with multiple regions and extensible metadata. Uses less disk space than other formats when regions of interest are small.	Standard file format. BV Workbench will switch to BigTIFF automatically when the file is larger than 4 GB.
Pixel bit depth	14 bit	8 to 16 bits	8 to 16 bits
Max frames / file	65,535 (6.5 seconds at 10,000 fps)	4,294,967,295	-
Max file size	-	-	4GB (Standard TIFF), 2^64 bytes (BigTIFF)
Compression	×	○ (In future version)	○ (In future version)
Regions support	×	○	×
BV Ana backward compatibility	○	×	△ (Standard TIFF only <= 4GB)
BV Workbench support	△ Basic write support only. Automatically splits files when the number of frames is over the maximum.	○	○

In order to read the MiCAM Ultima data format (* .rsd), it needs to be converted to gsd format.

Software license

In order to use BV Workbench, you need to activate using a dedicated license (charged). This license is issued on a per computer basis using a hardware ID created based on information specific to an installed computer. You cannot authenticate with a license issued for another computer. Please contact us for details on how to obtain and set the license.

Download

The installer can be downloaded from the “Support” page of SciMedia Ltd.

https://www.scimedia.com/fis/support/download/micam05/
https://www.scimedia.com/fis/support/download/micam03/

Recommended specifications

OS	Windows 10 64-bit
Software	.NET Framework 4.8
RAM	16GB or more
Graphic card	NVIDIA GPU Compute Capability 3.0 or more
Monitor	1,280x1,028 dot or more

* Specifications & appearance are subject to change without prior notice due to continuous improvements.
* This software is made in Japan.

Developed by:

BrainVision

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