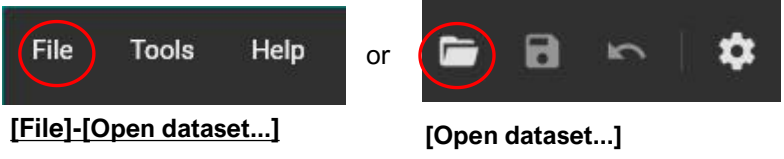


# 1. Open data

There are two ways to open the data.



The [Open dataset] screen opens, and you can open the data in “gsd”, “bvx”, “raw”, and “tif” format.

**Select file extension**  
gsd/bvx/raw/tif

**Check this when reading data with a file size larger than available memory of a PC. Directly access and display files on disk without copying data to memory.**

**Select drive name**

**Show file path**

**Move up one level**

**Reload file list in the folder**

**List of files in the folder displayed in "Path"**

**Select with a single click**

**Double click to load data**

**Display acquisition conditions saved in data file**

**Show comments stored in data file**

**View filter history stored in data file**

**Load selected data**

**Cancel**

**File type** .gsd

**Do not copy image sequences to memory**

**Name** My Experiment2017-09-01-104427\_N256 (IF1-CAM1)

**Camera model**

**Bit depth** 14

**Image width** 256

**Image height** 256

**Exposure time** 0.01 s

**Frame count** 2000

**Frame rate** 100 fps

**Trigger mode**

**Times averaged** 1

**Comment**

**History**

**Drive** C:\

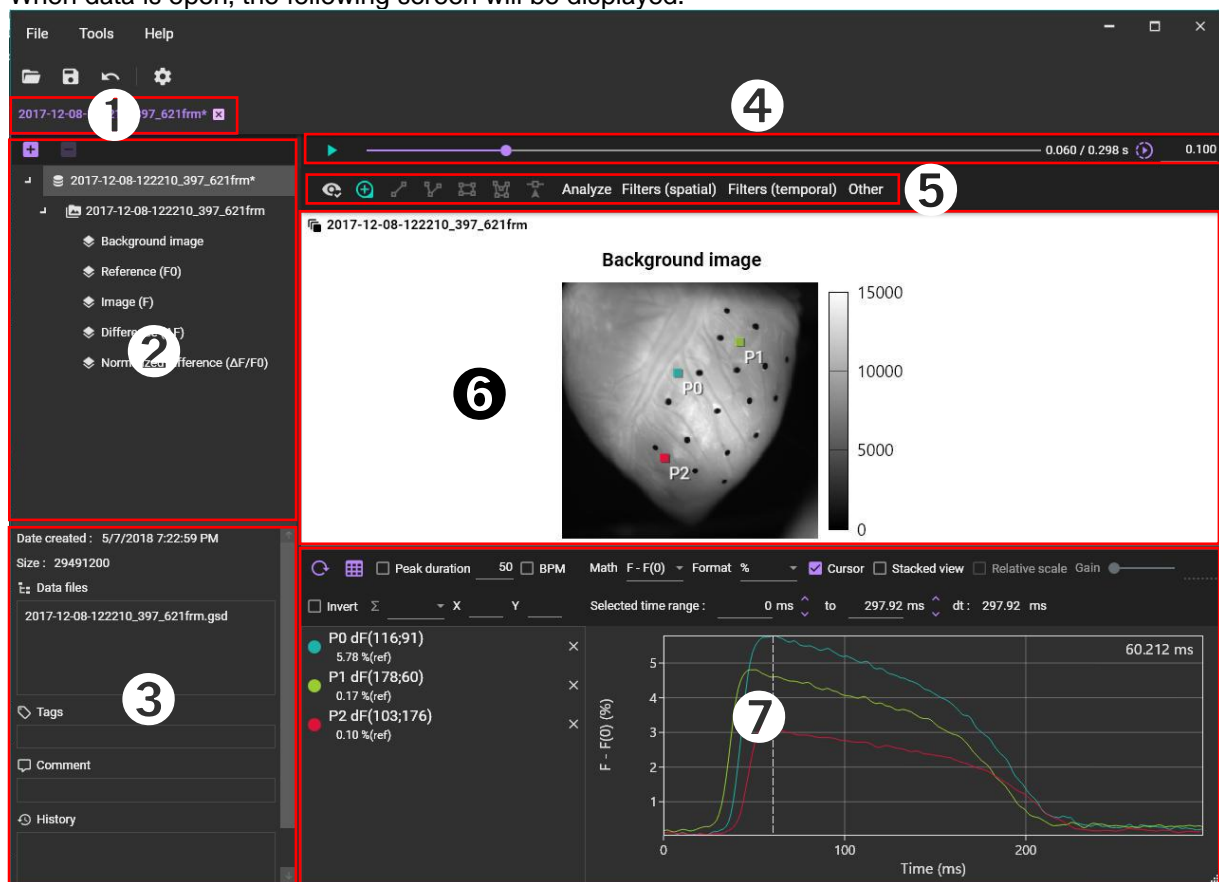
**Path** C:\brainvision\data

**Files in folder:**

- My Experiment2017-09-01-105417\_N256 (IF1-CAM1).gsd
- My Experiment2017-09-01-105340\_N256 (IF1-CAM1).gsd
- My Experiment2017-09-01-105317\_N256 (IF1-CAM1).gsd
- My Experiment2017-09-01-104427\_N256 (IF1-CAM1).gsd
- connect\_631\_632frm.gsd
- connect\_480\_481frm.gsd
- ANA0831004A.gsd
- connect2.gsd
- connect.gsd
- ANA130517005A.gsd

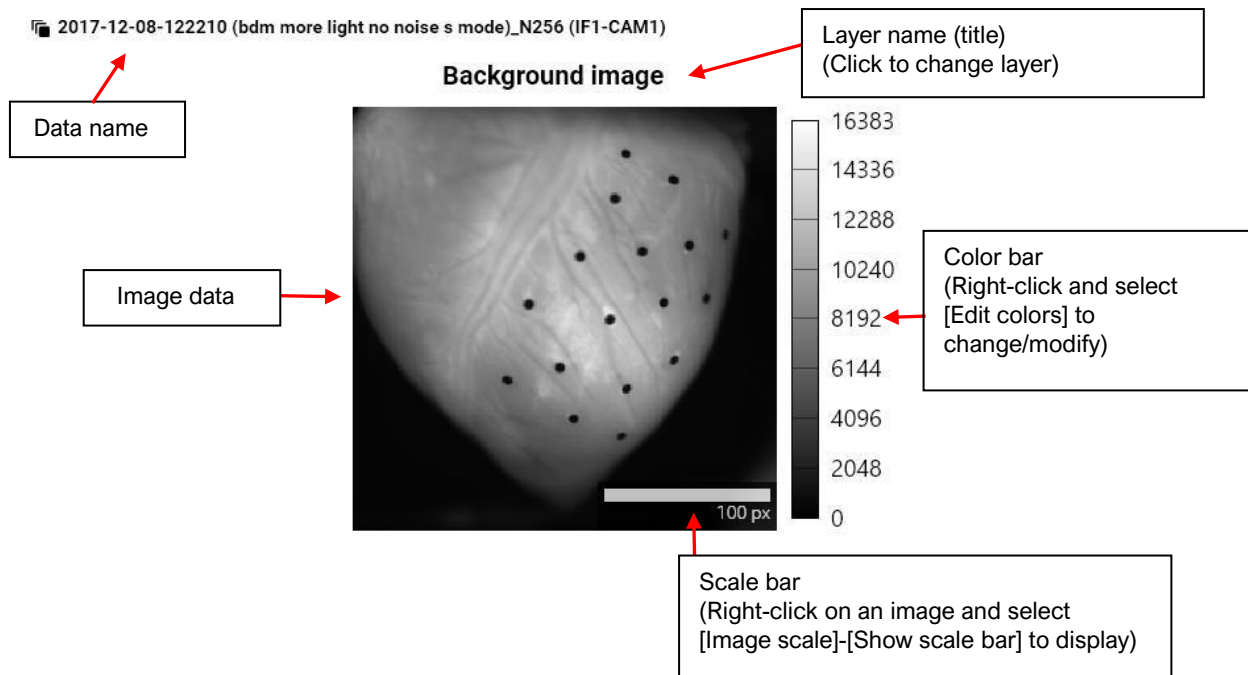
**Buttons:** OPEN, CANCEL

When data is open, the following screen will be displayed.




①	Switching tabs
②	View and select dataset, data, and layers
③	Data information display/Layer setting
④	Movie playback
⑤	Specify Point, Line, ROI / Data Analysis / Filtering
⑥	Image display
⑦	Wave display

## 2. Image display



### Image data

Display image and analysis result of each layer. The following mouse operations are possible.

Operation	Description
Left click	When the point tool  is selected, a waveform showing brightness change of clicked point is displayed under the image. When line/polyline/rectangle/polygon tool is selected, you can draw a line/polyline/rectangle/polygon on image and perform various data analysis.
Mouse drag point	Move position of point. Waveform display also changes accordingly.
Scroll mouse wheel	Enlarge or reduce image.

### 3. Show difference image

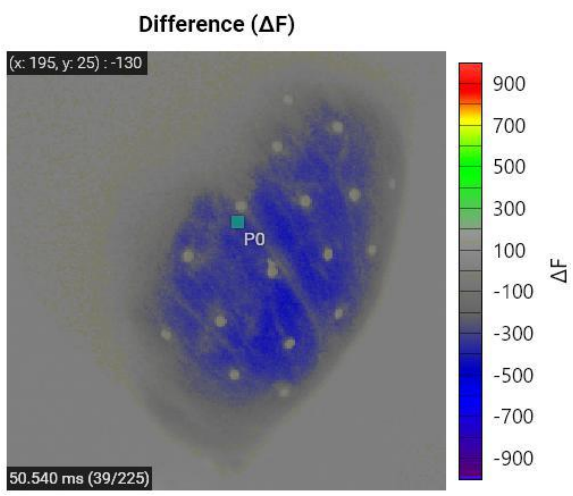
Click “Difference ( $\Delta F$ )” to view difference image.

The screenshot shows a software interface with a layer list on the left. The layers are: Pig Heart20200430, 2017-12-08-122210 (bdm more light no noise s mode)\_N256 (IF1-CAM1), Background image, Reference (F0), Image (F), Difference ( $\Delta F$ ), and Normalized difference ( $\Delta F/F0$ ). The 'Difference ( $\Delta F$ )' layer is highlighted with a red box. Callouts point to various elements: 'Add data (\*.raw, \*.tif, \*.gsd)' points to the top left; 'Data deletion or layer deletion (only analysis result layers can be deleted)' points to the top right; 'Dataset name' points to the top layer; 'Data name' points to the second layer; 'Layer' points to the list of layers; and a larger callout points to the 'Difference ( $\Delta F$ )' layer, explaining its function and export options.

Layer name	Description
Background image	When difference value display (Difference ( $\Delta F$ ) layer) or normalized difference value display (Normalized difference ( $\Delta F/F0$ ) layer) is selected, set layer used as background image.
Reference (F0)	Set layer used as reference value when calculating difference value.
Image (F)	Set layer that displays real image represented by real brightness value F.
Difference ( $\Delta F$ )	Set layer that displays difference value image from F0.
Normalized difference ( $\Delta F/F0$ )	Set layer to display image with difference value divided by F0.

**Difference ( $\Delta F$ )**

Select **Difference ( $\Delta F$ )** layer.



Set layer to display difference value image.

1.0 ← Layer opacity (left: transparent↔right: opaque)

Mask All pixels ← Area to enable layer (e.g.: all pixels, ROI, line...)

Max (Range) 1000 ↑ ↓ ← Specify range of values to be displayed in color. Specified value becomes the maximum/minimum value

Min (Threshold) 0 ↑ ↓ ← Specify threshold of value to be displayed in color. Only the pixels having a value greater than or equal to the threshold are displayed in color

Step 100 ↑ ↓ ← Spacing between color bar separator

Auto ← Reset settings


Edit colors ← Automatic setting of optimum brightness value

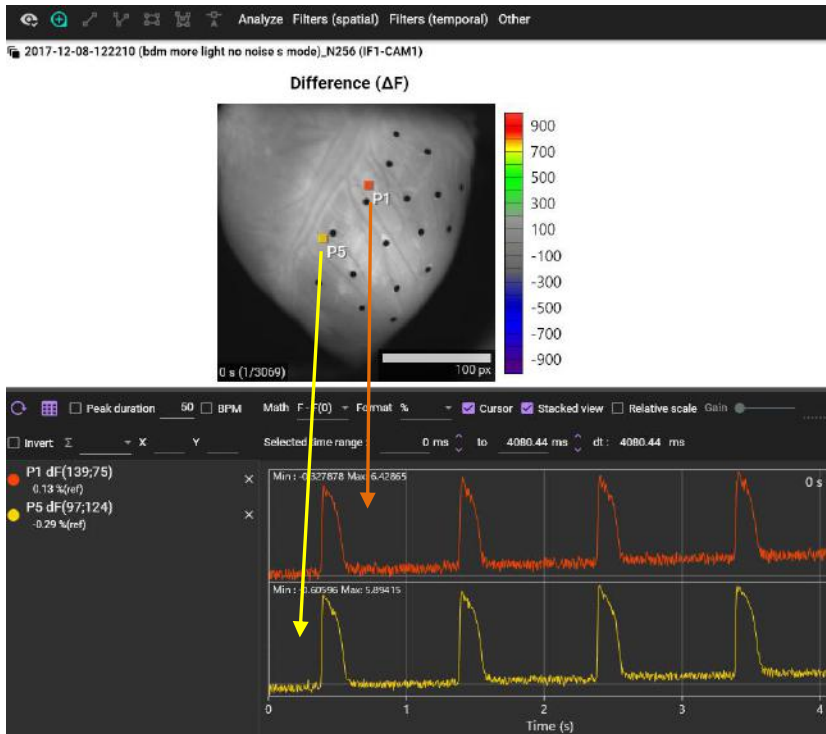
Save... ← Save image (16bit grayscale TIFF, PNG, BMP, JPEG)

Change pseudo color settings

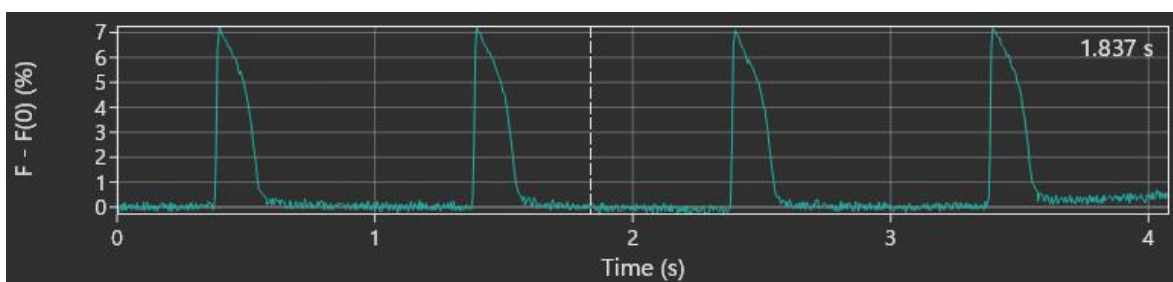
## 4. Waveform display

Click on image to display the following waveform.

Specify point by clicking on image with "Add point"  selected. Change in light intensity at that point is displayed as a waveform.




The horizontal axis represents time and the vertical axis represents brightness. Select "Math" as numerical calculation method and "Format" the unit.



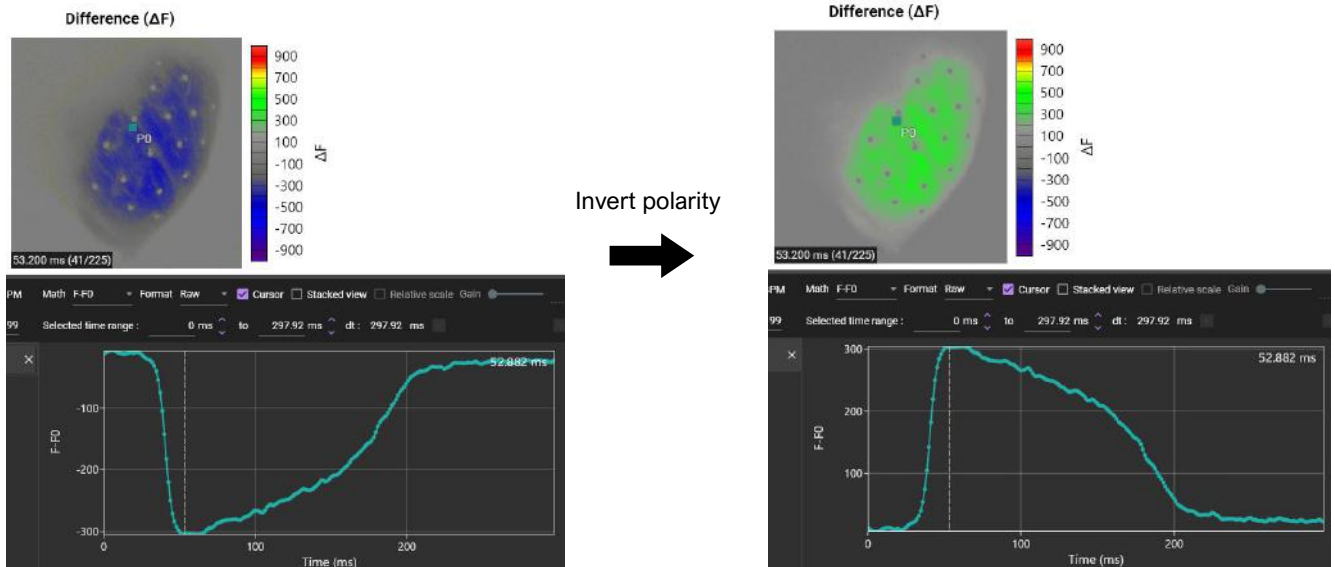
The following mouse operations are possible.

Operation	Description
Click on waveform	Move frame position
Drag mouse pointer left or right on waveform	Move frame position

Hold "Ctrl" key and drag mouse pointer to right	<p>Select time range of waveform. It is possible to create various maps and analyze various data based on the range selected here.</p> <p>You can select time range with "Selected time range" at top of waveform.</p>
Hold "Ctrl" key and drag mouse pointer to left	Deselect time range selection for waveform and select all ranges.
Scroll mouse wheel	Enlarge/reduce waveform size
Right click	<p>A popup menu is displayed.</p> <p>Show extents: Change scale so that entire waveform can be displayed.</p> <p>Show cursor: Display a vertical line cursor that indicates current frame on waveform. When you click mouse on waveform, the cursor also moves and the image display changes.</p> <p>Stacked view: When set to ON, multiple waveforms are displayed vertically.</p> <p>When turned OFF, multiple waveforms are displayed in a layered manner.</p> <p>Export CSV: Saves displayed waveform in CSV format. It is the same operation as the  icon.</p>

## 5. Invert polarity

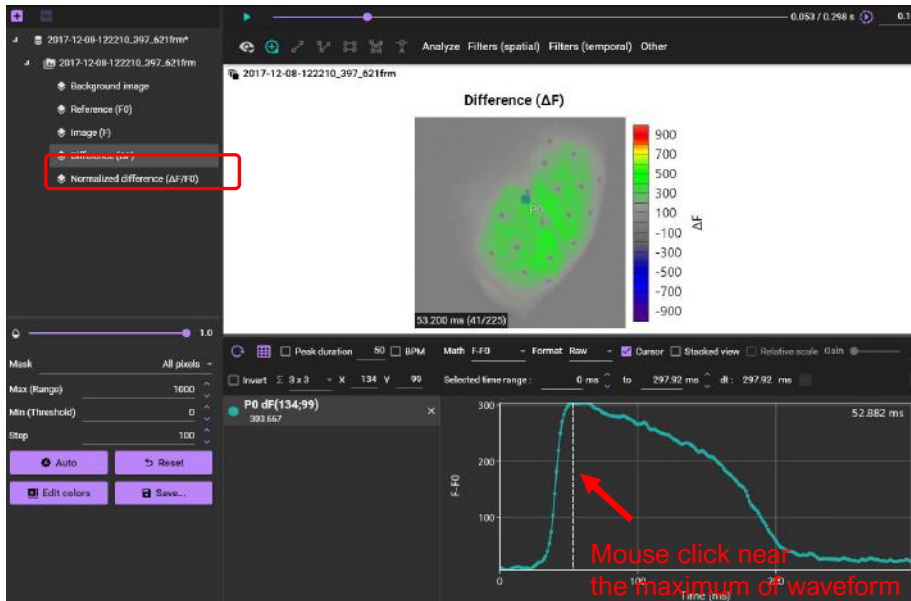
When [Filters (spatial)]-[Inver polarity] is executed, polarity of change of F-F(0) is inverted while maintaining brightness value of background image.



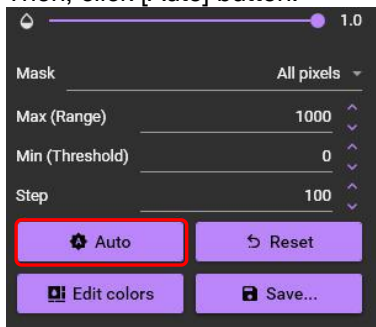


## 6. Adjust gain and threshold of difference image

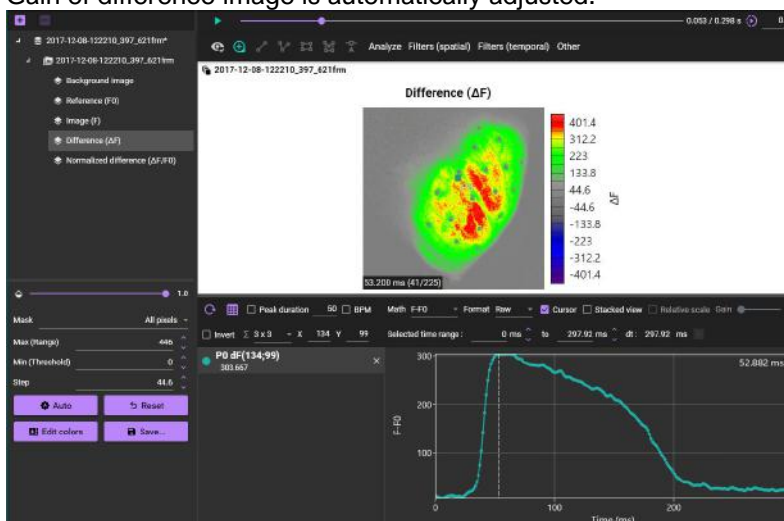
Mouse click near the maximum of waveform.



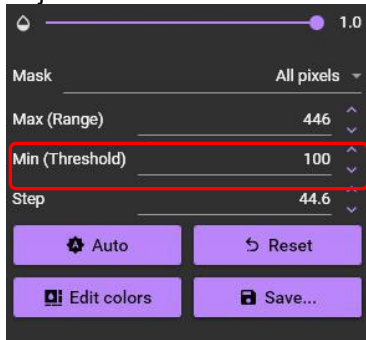
Then, click [Auto] button.



Gain of difference image is automatically adjusted.

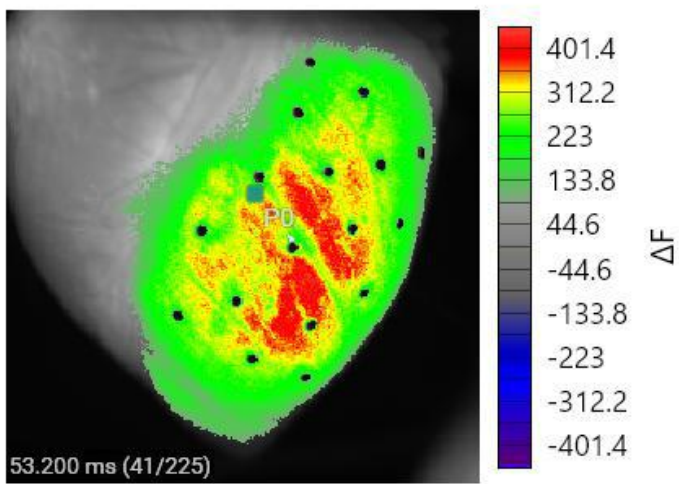


Adjust "Threshold".



Color difference value is displayed on black and white background image.

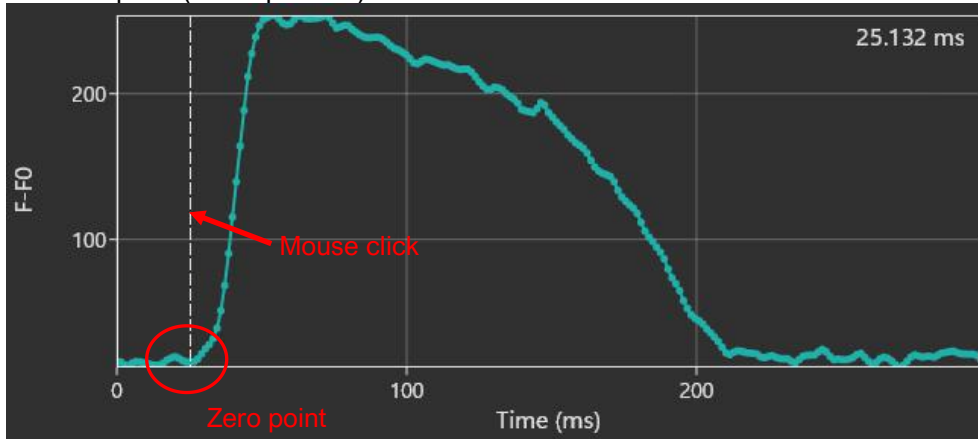
### Difference ( $\Delta F$ )



## 7. Change reference frame

By default, the first frame (frame# 0) is the reference frame (F0). You can change this reference frame

Click the point (frame position) that should be 0 on the waveform

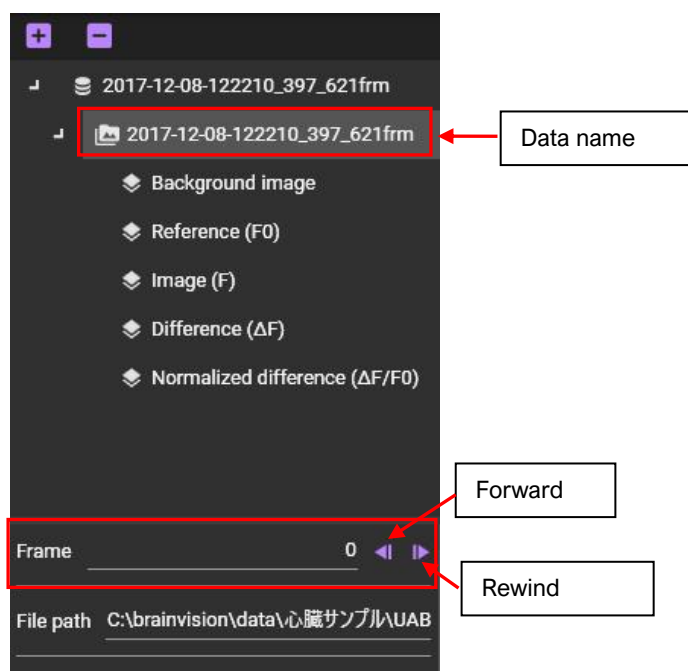


Right click on image and select [Current intensity (F)]-[Set as reference (F0)].



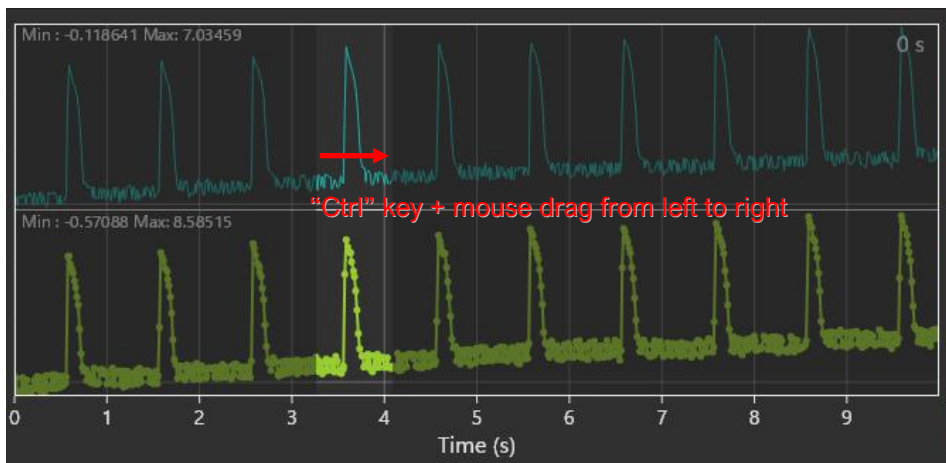
## 8. Forward and rewind one frame


Click data name in the list on the left of the software to display “Frame” on the lower side.  
The arrow pointing to the left rewinds one frame, and the arrow to the right forwards one frame.

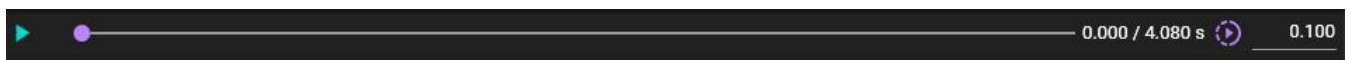





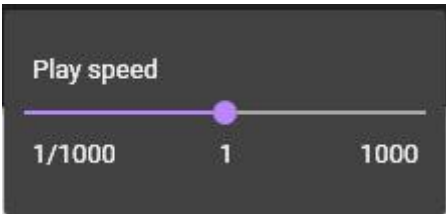

## 9. Movie display

Hold down “Ctrl” key and drag mouse from left to right on waveform to select waveform range.



Click  to start playing movie. Only the selected range will be played back.



	Click to start playing movie.
	Click to stop playing movie.
	Display frame position. Also, you can move frame position by dragging ● with mouse or clicking bar.
<b>0.303 / 4.080 s</b>	Display time of displayed frame and total time.
	Click  to display. Drag ● with mouse to specify movie playback speed.
<b>1.000</b>	Movie playback speed is displayed. You can also the video playback speed by inputting.