
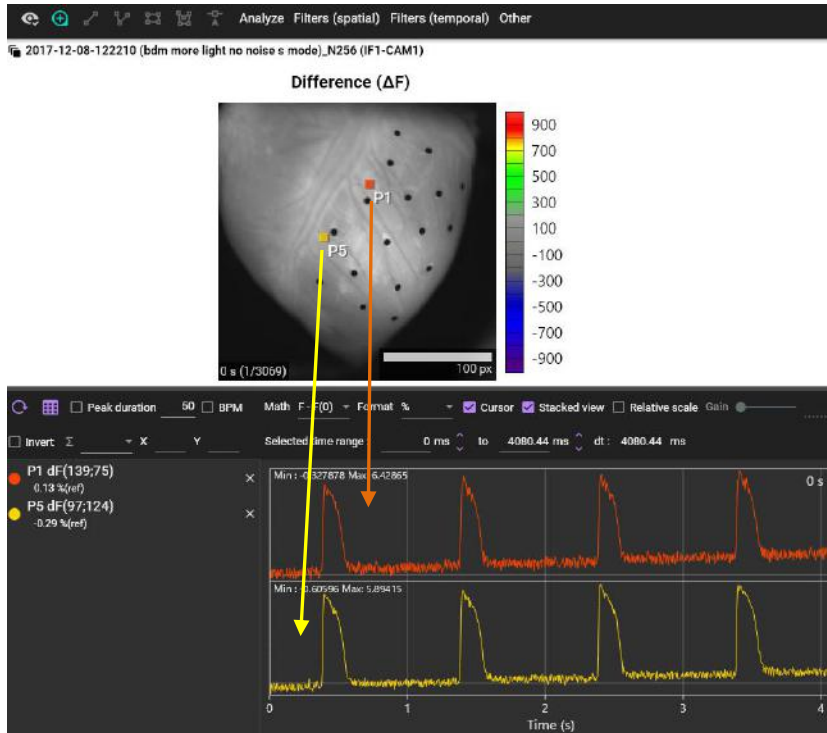


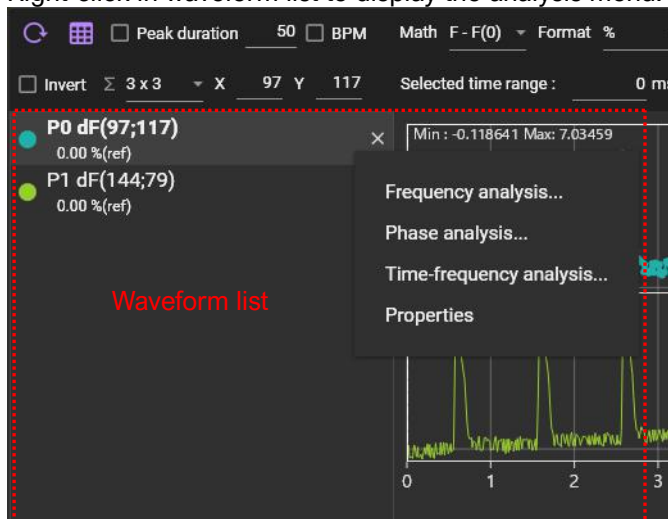
8-2. Waveform analysis

8-2-1. Waveform display

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



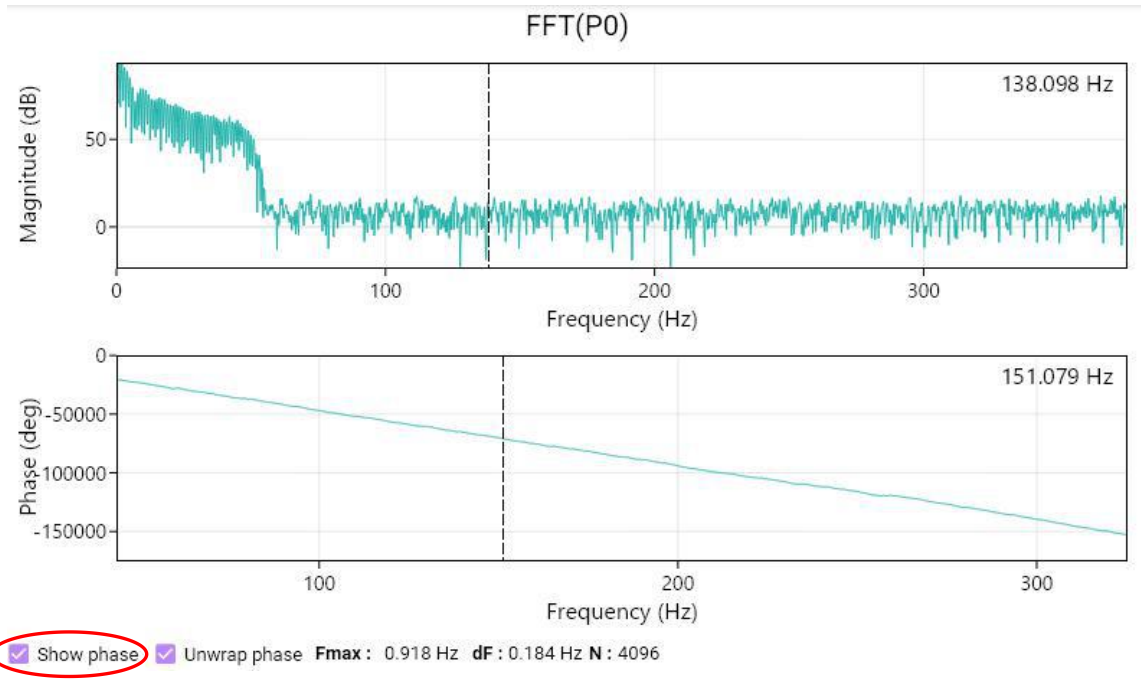
Right-click in waveform list to display the analysis menu.



8-2-2. Frequency analysis

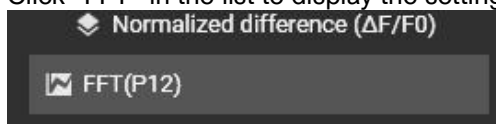
Performs frequency analysis using the Fast Fourier Transform (FFT). If the data length is not a power of 2, it is padded with 0s. Available window functions are Rectangular (none), Hann, Hamming, Blackman-Harris.

Right-click on waveform list and select [Frequency analysis] to display the frequency response graph (horizontal axis: frequency, vertical axis: amplitude) of a 1 point waveform. Also, when you click [Show phase] at the bottom left, a graph with the horizontal axis showing frequency and the vertical axis showing phase is displayed.

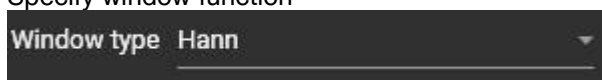


Operation	Description
Left click or drag vertical cursor with mouse	Frequency selection (frequency display at upper right of graph changed)
Scroll mouse wheel	Enlarge/reduce graph size
Right click	Export raw values: Save numerical data (Frequency, Magnitude, Phase) to CSV file. Export image: Save frequency response graph in PNG/JPG/BMP format.

Click "FFT" in the list to display the setting screen below.



Specify window function



- None (Rectangular)
- Blackman-Harris
- Hamming
- Hann

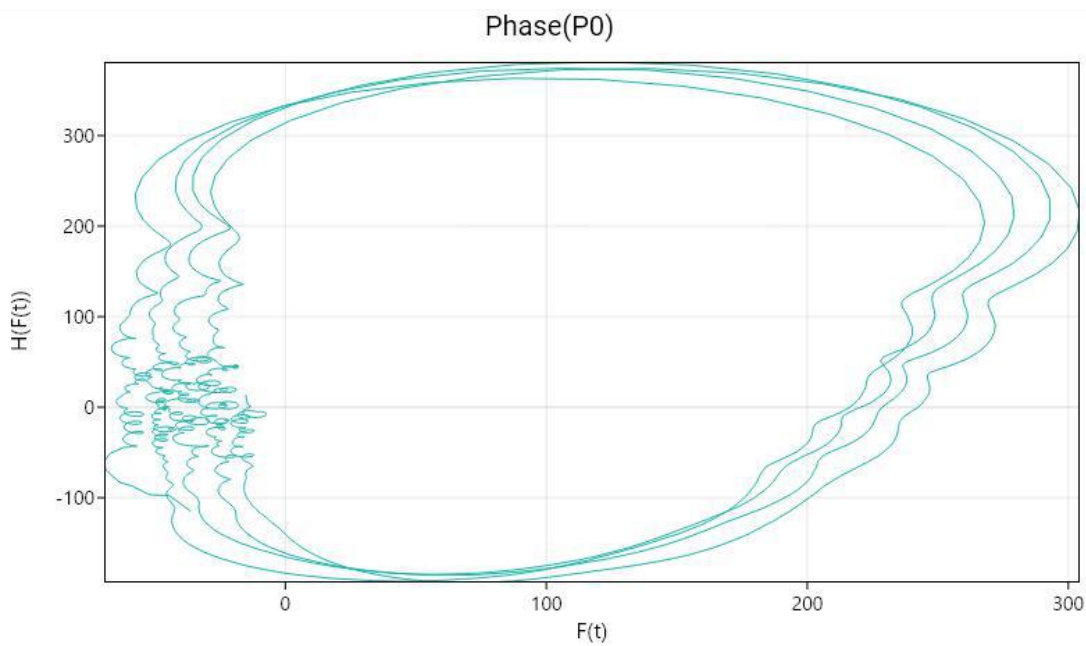
8-2-3. Phase analysis

Right-click on waveform list and select [Phase analysis].

Phase is calculated using formula below, where $x(t)$ is the input time signal, H the Hilbert transform and $z(t)$ a complex signal.

$$z(t) = x(t) + i[H(x(t))]$$

$$\phi(t) = \text{phase}(z(t))$$

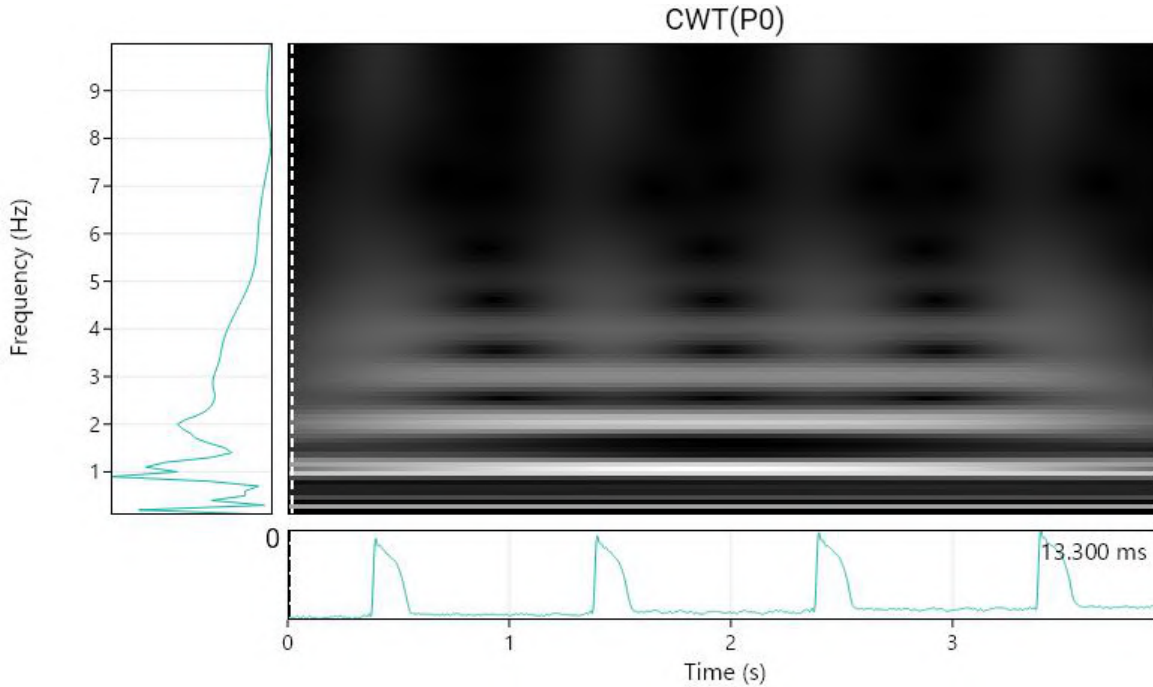


Operation	Description
Right click	Save data: Save numerical data in CSV file. Save image: Save images in PNG/JPG/BMP format.

8-2-4. Time-frequency analysis

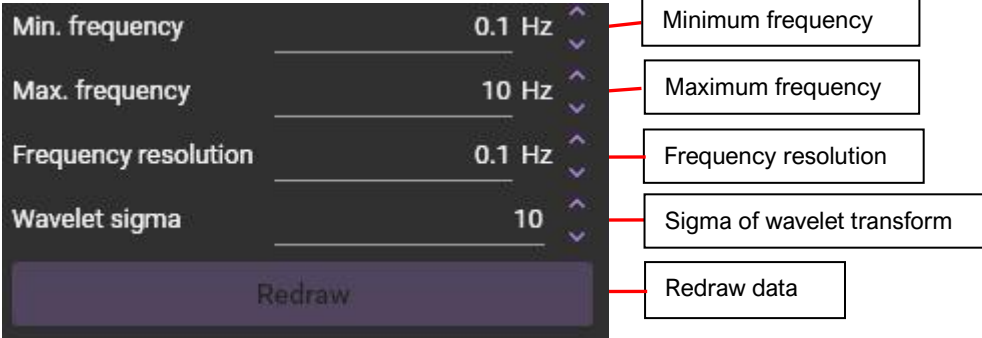
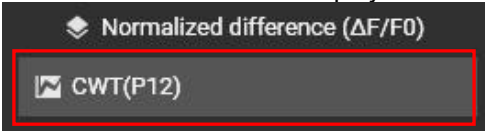
Right-click on waveform list and select [Time-frequency analysis].

Performs time-frequency analysis by using the Continuous Wavelet Transform (CWT) with the Morlet wavelet.



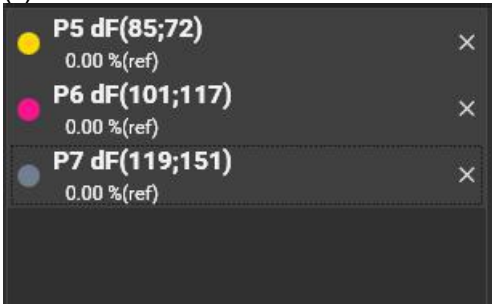
Operation	Description
Left click or drag vertical cursor with mouse	Selection of time
right click	<p>Show title: Set On/Off of title displayed above map.</p> <p>Show color bar: Set On/Off of color bar displayed on right side of map.</p> <p>Save data: Save time frequency data in CSV format.</p> <p>Save image: Save time frequency data in image format (png/bmp/jpg).</p> <p>Edit colors: Change color map.</p>

Click "CWT" in the list to display the setting screen.



8-2-5. Automatic display of APD (TD) average value and BPM of displayed waveform

(a) Click the waveform list and select the waveform.

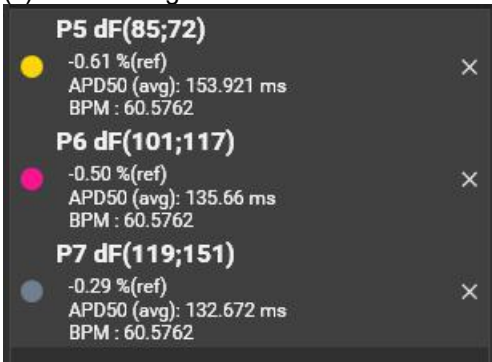


Multiple waveforms can be selected by holding down the "Ctrl" key and clicking the waveform list

(b) To display average value of APD (Action potential duration) or TD (Transient duration), check "Peak duration" and enter the repolarization point% (e.g. APDXX, TDXX). To display BPM (Beats per minute), check "BPM".



(c) APD average value and BPM of each waveform are displayed as shown below.



8-2-6. Waveform information display (maximum value, minimum value, average value, standard dev)

Right-click on the waveform list and select [Properties].
 The following waveform information is displayed.

● P5 dF(85;72)	
Sampling time :	1.33 ms
Number of points :	7418
Min :	-0.846 %(ref)
Max :	3.766 %(ref)
Mean :	0.144 %(ref)
Standard dev. (σ) :	1.257 %(ref)
OK	

← Sampling time

← Number of frames

← Minimum value

← Maximum value

← Average value

← standard deviation