DS-0321 FFT Analysis Software

Integration method of the time waveform by using the IFFT

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■Overview of the function

This document describes the method to convert the time waveform of acceleration into displacement by using the IFFT function.

Obtain the Fourier spectrum by the FFT analysis of the time waveform of acceleration.

After that, perform the frequency axis ($j\omega$ calculation) double integration to the obtained Fourier spectrum. Then, cuts out unnecessary low-frequency component and limits the bandwidth. The time waveform of the displacement that is double integrated can be obtained by returning it to the time waveform by IFFT calculation.

This document describes the operation procedure which uses a frequency differential and integral function and IFFT calculation function. The basic operation procedure is omitted in here.

■ Operation flow

· 1. Displaying the time waveform and power spectrum of acceleration value

2. Displaying the Fourier spectrum

3. Operating double integral

4. Operating IFFT calculation by using band limitation

■Operation procedure

1. Displaying the time waveform and power spectrum of the acceleration value.

Display the shock waveform measured by accelerometer. Select rectangular for the window function. Click [Input/ Output Setting] > [Window Function Setting] in this order to select [Rectangular].
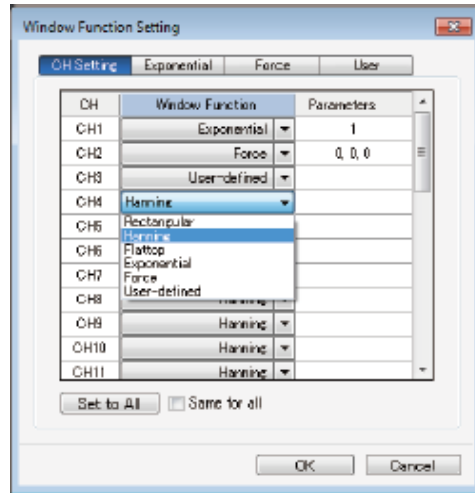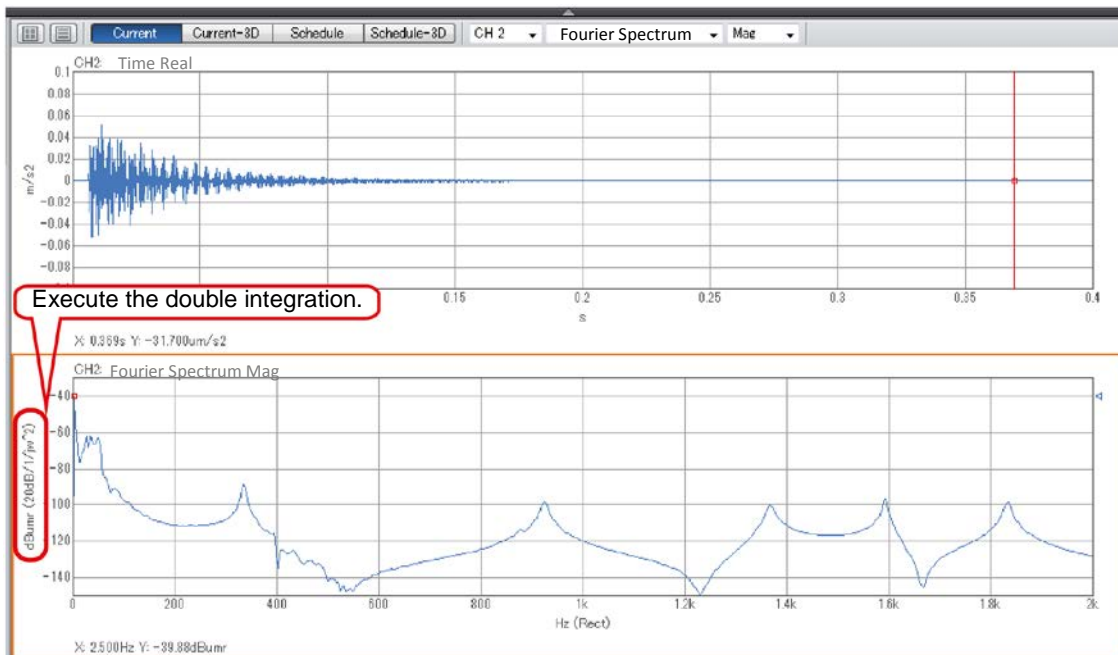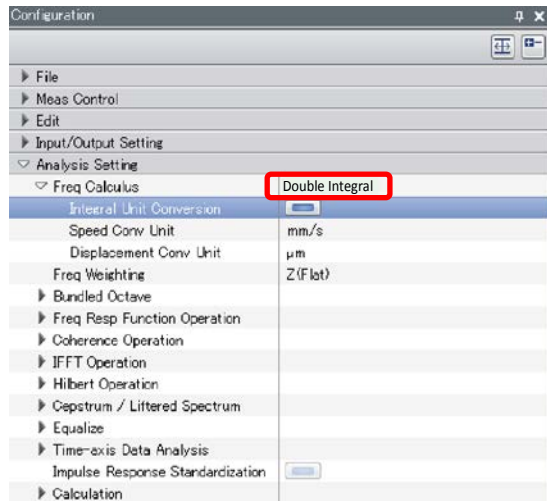

Display the time waveform in the upper side and Fourier spectrum in the lower side.
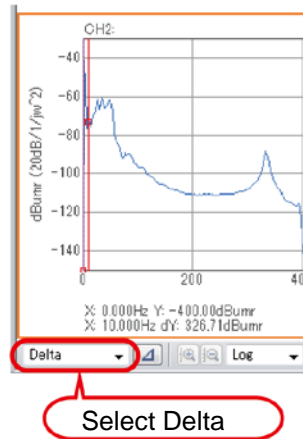

Change the graph display and data kind.
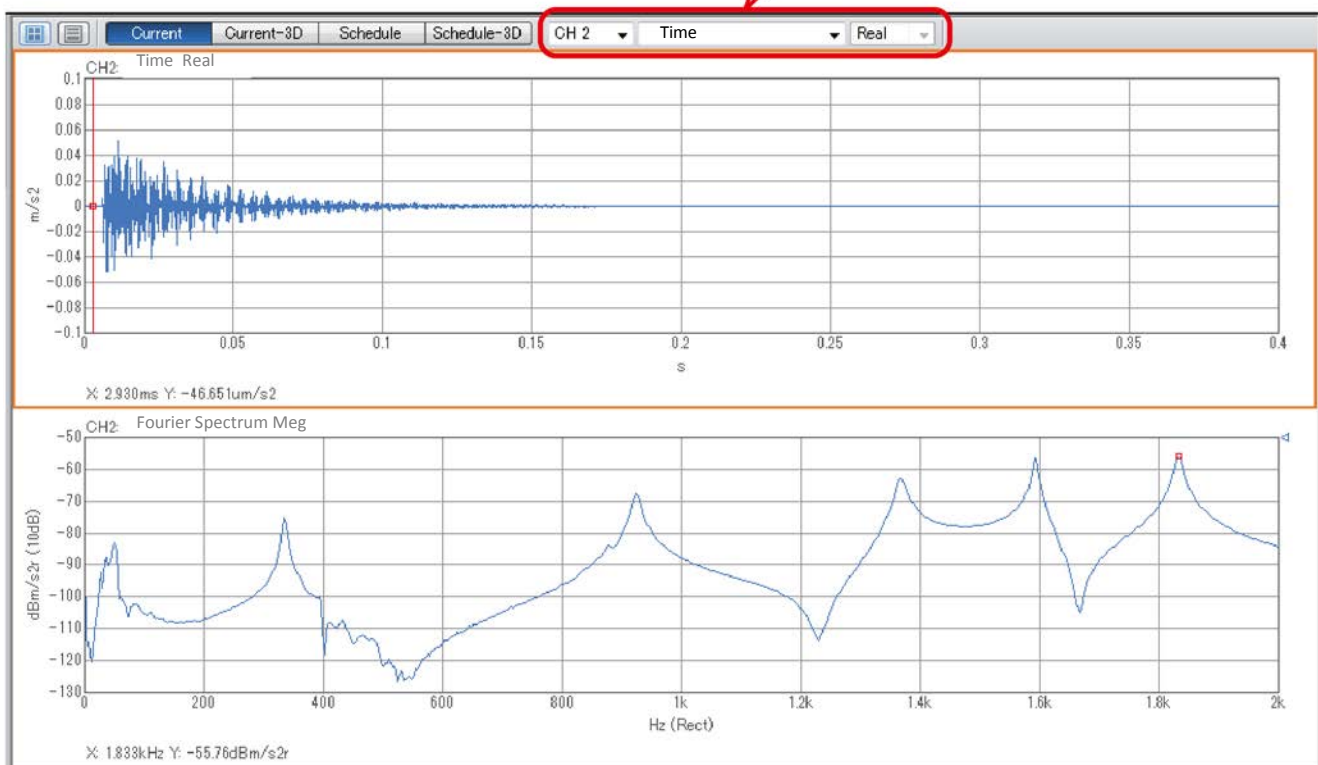
2. Perform double integration to the Fourier spectrum.

    Select the lower Fourier spectrum graph, and click [Analysis Setting] > [Freq Calculus] in this order to select [Double integral].

3. Execute the IFFT calculation by applying the band-limit.

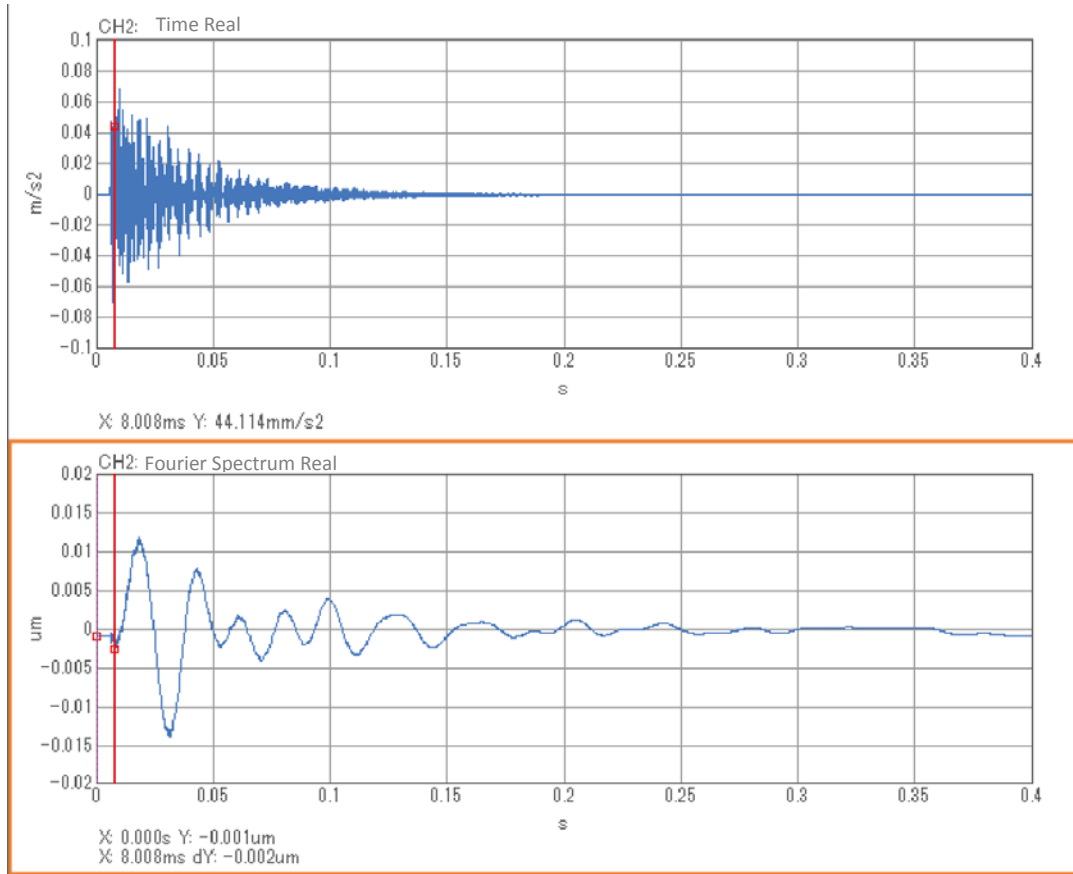Set a band to be limited by using the Delta cursor. Select 0 Hz to 10 Hz in here and cut out this range.

Select Delta

Execute the IFFT calculation by applying the band limitation.

When executing the registration of band limitation frequency, the upper and lower frequencies are registered to the Delta cursor and Search cursor. Actual selected upper and lower frequencies are set to the upper and lower limit regardless of two cursors' pointed frequencies. Inside or outside of selected upper/ lower limit frequency band will be cut out. In this example, inside frequency band will be cut out.

Activate the band limitation function and IFFT function. The horizontal axis of the Fourier spectrum graph becomes time and the graph is changed from acceleration to displacement time waveform.

CH2: Time Real

X: 8.008ms Y: 44.114mm/s2

CH2: Fourier Spectrum Real

X: 0.000s Y: −0.001um
X: 8.008ms dY: −0.002um

When you operate the analysis setting, the time waveform of acceleration can be converted to the time waveform of displacement which applies band limitation in the real-time measurement.

— END —