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Transfer Function and Coherence Analysis Module

You need the **Pro Version**.

Use the **Transfer Function** module to calculate the transfer function or the coherence function of channel pairs. The transfer function calculates the complex relation between the spectra of two signals: For each frequency, the function calculates the result when one signal is divided by another. Coherence is a measure of the rank of the linear relation between measured input and output signal of each frequency ω.

Two outputs belong to every two inputs. The first input receives the values of the system stimulation function fx(t) and the second input the values of the response function fy(t). The opposite outputs output the real part or the amplitude in relation to the selected output function to the top output and output the imaginary or the phase at the bottom output to the worksheet.

A flexibility measurement consists of the excitation of the structure with a measurable force, the measurement of the response, and the subsequent calculation of the relation between the force spectrum and the response spectrum. In a practical context a number of problems arise such as mechanical interference signals in the structure including non-linear behavior which can be prevented with a conditional check.

Use statistical averaging to compensate electric noise in measurement devices. The limited resolution of the analysis must be regarded and the Hardware requirements must be met.

Input and Output Parameters

Number of input channels	8x2
Input block size	Minimum 16, must be a power of two
Number of output channels	8x2
Output block size	The same as the input block size
Maximum number of modules	255 and another 255 with each Black Box

Use the Channel bar to enable and to select channels and to set each channel individually.

Settings for the Output Function

The following settings specify the output function.

- Output function — Specifies which function DASYLab uses for the data channel pair.
  - **Transfer function Hxy(f)** — Specifies that DASYLab calculates the transfer function.

    Physically the transfer function means that a sinusoidal input force with a frequency ω causes a sinusoidal output quantity with the same frequency. The output amplitude is the input amplitude multiplied by |H(ω)| and the output phase is moved by <H(ω) towards the input. Show explanations
    - **Transfer function** — Specifies which transfer function DASYLab calculates.
      - **Hxy(f) = Fy(f)/Fx(f)** — Specifies the transfer function as the relation of output signal to input signal.
      - **Hxy(f) = Fxy(f)/Fxx(f)** — Specifies the transfer function as the relation of the transfer function to the autospectrum of the input signal Show formula
      - **Hxy(f) = Fyy(f)/Fxy(f)** — Specifies the transfer function as the relation of the autospectrum of the output signal to the transfer function. Show formula
    - **Display functions** — Specifies what DASYLab calculates of the input signals.
      - **Real and Imaginary Part** — Specifies that DASYLab calculates the real part and the imaginary part of the transfer function.
      - **Amplitude and Phase** — Specifies that DASYLab calculates the amplitude and the phase spectra of the transfer function.

- **Coherence function** — Specifies the coherence function.

  The coherence function specifies the linear dependency of two time signals over the frequency. The function is mathematically the square of the absolute value of the normed mean cross power spectrum. The following equation calculates the function.

- **Fxx(f)** — Specifies the autospectrum of the input signal x(t). ??? Product with the reciprocal???

  $F_{xx}(f) = F_x^*(f) \times F_x(f)$ Fx*(f) is the complex conjugate of Fx(f)

- **Fyy(f)** — Specifies the autospectrum of the output signal y(t).

  $F_{yy}(f) = F_y^*(f) \times F_y(f)$ Fy*(f) is the complex conjugate of Fy(f)

- **Fxy(f)** — Specifies the spectrum for both time signals x(t) and y(t).

  $F_{xy}(f) = F_x^*(f) \times F_y(f)$ Fx*(f) and Fy*(f) are the complex conjugates of Fx(f) and Fy(f)

  - **Display function** — Specifies what DASYLab calculates of the input signals.

    - **Real and Imaginary Part** — Specifies that DASYLab calculates the real part and the imaginary part of the transfer function.

    - **Amplitude and Phase** — Specifies that DASYLab calculates the amplitude and the phase spectra of the transfer function.

Averaging Function Settings

These settings specify the averaging type. For the transfer function and the coherence function DASYLab averages the counter and the denominator separately and for the spectra Fxx(f), Fyy(f), and Fxy(f) the intermediate results.

- **Single values** — Specifies that DASYLab calculates the arithmetic mean values column-wise for the specified **Number of blocks** and outputs them in a data block with the mean values.

  This setting reduces the number of values to be output to the number of input values divided by the **Number of blocks**. If you select this setting, DASYLab cannot output characteristic values before all data blocks are complete. Show explanations

  - **Number of blocks** — Specifies the number of data blocks for which DASYLab specifies the mean values or after which DASYLab restarts the mean value calculation.

- **Ascending**— Specifies that DASYLab calculates column-wise the mean values for all incoming data blocks and continually outputs a data block with the last calculated mean values. Because DASYLab calculates the mean values for each input block, the number of output values is the same as the number of input values. Show explanations

- **Ascending after restart**— Specifies that DASYLab calculates column-wise the mean values for all incoming data blocks and continually outputs a data block with the last calculated result values. DASYLab restarts calculating the characteristic values periodically after the specified **Number of blocks**. Because DASYLab calculates the characteristic values for each input block, the number of output values is the same as the number of input values.

  - **Number of blocks** — Specifies the number of data blocks for which DASYLab specifies the mean values or after which DASYLab restarts the mean value calculation.

FFT Settings

These settings specify that DASYLab calculates a fast Fourier transform for data blocks of any length.

- **FFT without the power of two** — Specifies that DASYLab calculates the FFT for data blocks whose length does not have a power of two.

Further Settings

- **Condition** — Opens the Dialog box in which you define two conditions that block frequency ranges for the output of the signal.

Actions

Use the **Action** module to restart calculations event-related during a measurement. Select the receiver **Transfer** in the action module and specify the number of channels, for example, `0` for the first channel or `3-4` for the fourth and fifth channel. Specify the event and select one of the following actions.

Related Topics

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