DADiSP / Octave

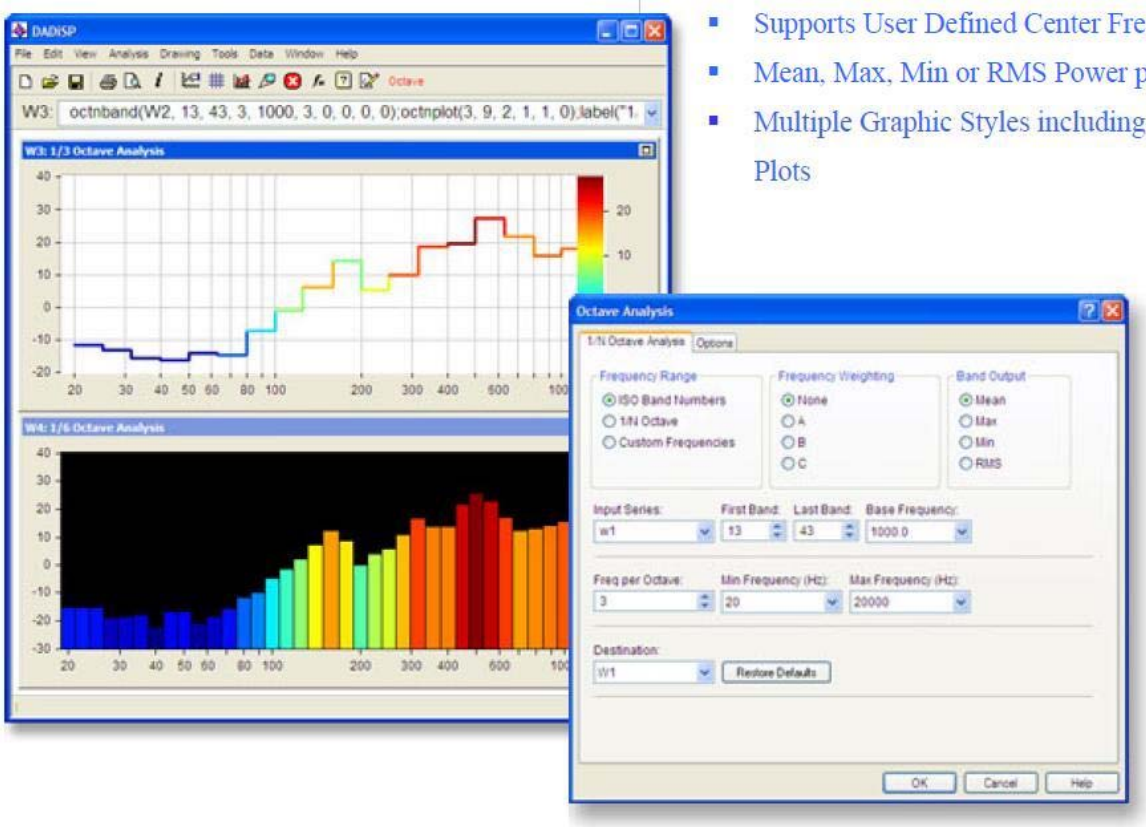
1/N Octave Analysis Module

DADiSP/Octave is a menu driven module designed to simplify the task of octave, 1/3 octave and 1/N octave analysis used to characterize acoustic energy in a wide variety of applications.

DADiSP/Octave provides 1/N octave analysis using true IIR digital filters that conform to ANSI S1.11 and IEC 1260 specifications. A, B and C weighting filters can be applied to the input data. Output results include mean power, max power, min power and un-weighted RMS values. The output can be normalized with a calibration value. The results can be plotted on log or linear axes and exact or preferred frequency values are supported. All options can be specified through a straightforward dialog box interface.

KEY FEATURES

- Simple Dialog Box User Interface
- True IIR digital filter implementation
- Conforms to ANSI S1.11 and IEC 1260 Specifications
- Optional A, B and C Frequency Weighting Filters
- Whole Octave Frequency Spacing
- Fractional (1/N) Octave Frequency Spacing
- Support for Preferred or Exact Frequency Values
- Binary and Decimal Frequency Ratio Methods
- ISO Band Number Center Frequency Option
- Output Coefficent Form Conversion
- Supports User Defined Center Frequencies
- Mean, Max, Min or RMS Power per Band Outputs
- Multiple Graphic Styles including Bar and Step Plots



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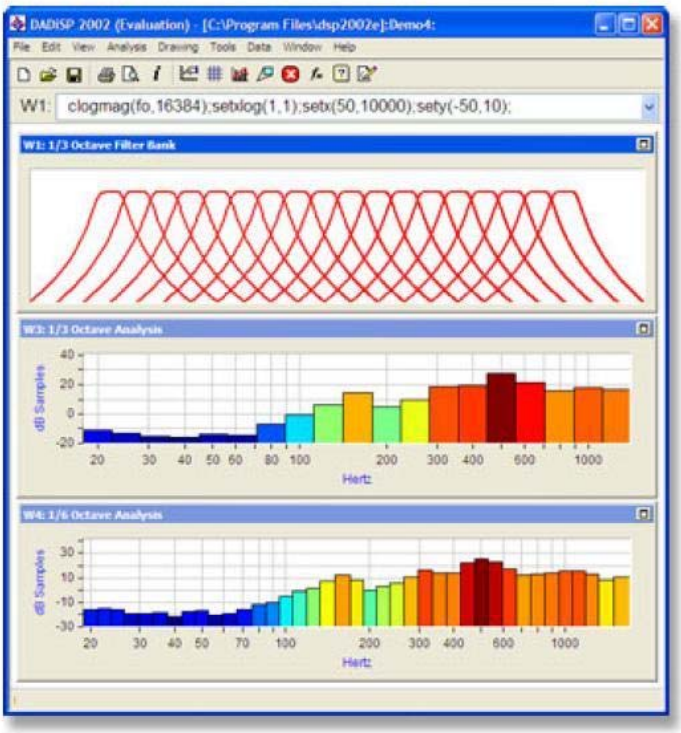
1/N Octave Analysis Module

Octave analysis displays the frequency characteristics of a signal by passing the signal through a bank of bandpass filters. The center frequency of each filter is twice the center frequency of the previous filter. Each filter covers a bandwidth that is twice as wide as the previous band and half as wide as the next band. One octave corresponds to a doubling of frequency.



Proportional Bandwidth Octave Filters

Unlike standard FFT spectrum analysis, octave filters exhibit proportional bandwidth. If the lower and upper cutoff frequencies of a bandpasss filter are f_l and f_h, then the center frequency, fc, can be determined with:

$$fc = (f_l * f_h)^{1/2}$$

This proportional bandwidth property divides frequency information over a log scale and is very useful in analyzing a variety of natural systems. For example, the human response to noise and vibration is very non-linear and many mechanical systems have a behavior that is best characterized by proportional bandwidth analysis.

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Fractional Octaves

For greater resolution, the frequency range can be divided into proportional bandwidths that are a fraction of an octave. For example, with 1/3 octave analysis, there are 3 bandpass filters per octave where each center frequency is $2^{1/3}$ the previous center frequency and

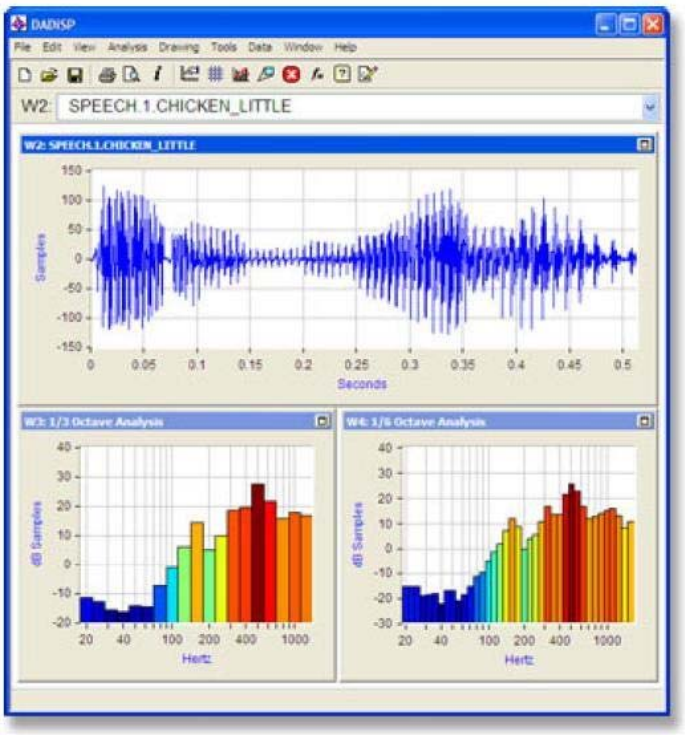
$$fc = (f_l * f_h)^{1/6}$$

In general, for 1/N octave analysis, there are N bandpass filters per octave such that:

$$fc_{i+1} = 2^{1/N} * fc_i$$

$$fc = (f_l * f_h)^{1/(2N)}$$

where 1/N is called the fractional bandwidth designator.



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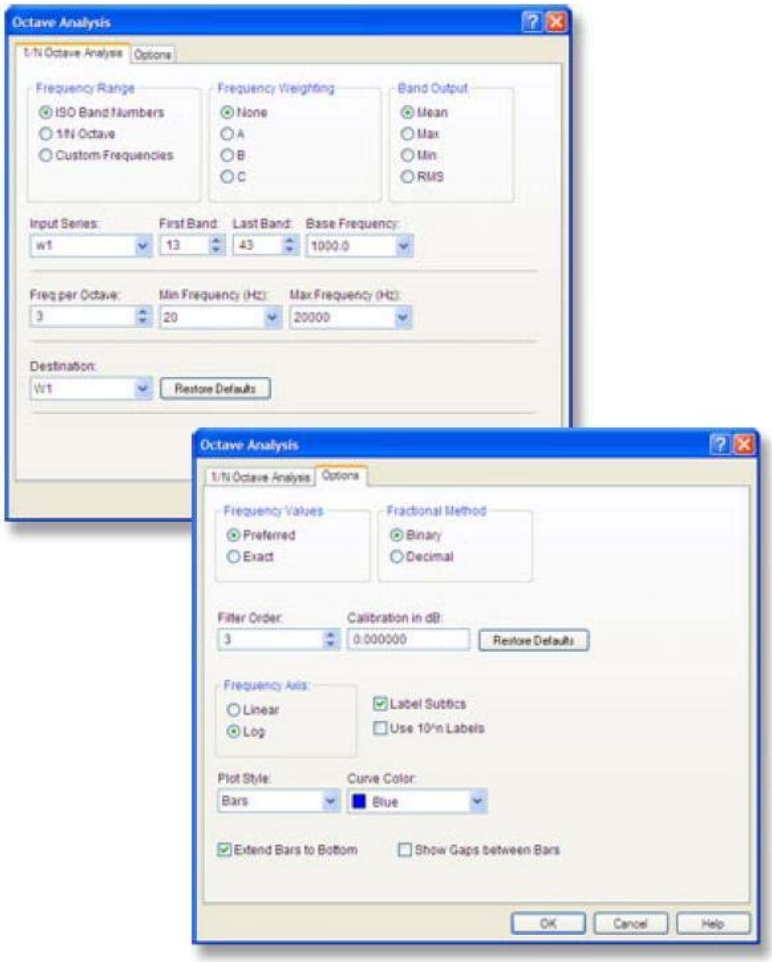
Digital Bandpass Filter Method

DADiSP/Octave provides 1/N octave analysis using true IIR digital filters that conform to ANSI S1.11 and IEC 1260 specifications. Each band filter is designed in accordance to ANSI S1.11 and IEC 1260 specifications by transforming the original analog transfer function to the digital domain by means of the bilinear transform. The filter order can be specified and the frequency ratio can be calculated using the binary or decimal system.



Standard or Custom Center Frequencies

Center frequencies can be specified as a range of ISO band numbers for standardized octave analysis. User defined center frequencies as a range or list of values are supported to facilitate custom applications.

Input and Output Options

A, B, and C weighting filters can be applied to the input data. Output results include mean power, max power, min power and un-weighted RMS values. The output can be normalized with a calibration value. The results can be plotted on log or linear axes and exact or preferred frequency values are supported. The output can be displayed in a variety of plot styles including bar, step and line plots.

Requirements

DADiSP/Octave requires DADiSP 6.0 B17 or higher. Contact us for information about updating your current version of DADiSP.

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Octave Functions

DADiSP/Octave includes several simple stand-alone functions to perform 1/N fractional Octave analysis.

Octave Functions

octnband	1/N octave analysis by specifying standard ISO bands
octnbank	1/N octave analysis by specifying a frequency range
octfbank	1/N octave analysis by specifying a specific list of frequencies
adsgn	design an A-weighting filter
aweight	Process data with an A-weighting filter
bdsgn	design a B-weighting filter
bweight	Process data with a B-weighting filter
cdsgn	design a C-weighting filter
cweight	Process data with a C-weighting filter
octndsgn	design a 1/N octave bandpass filter
octnfilt	1/N octave filtering given a series of frequencies