Parametric Equalizer (PEQ)

Overview

The Parametric Equalizer (PEQ) is a cascade of configurable EQ filters.

Description

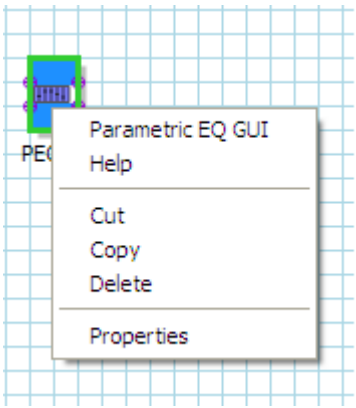
This component can work both for mono and stereo channels.

For stereo operation, the same set of filters is applied to both the channels.

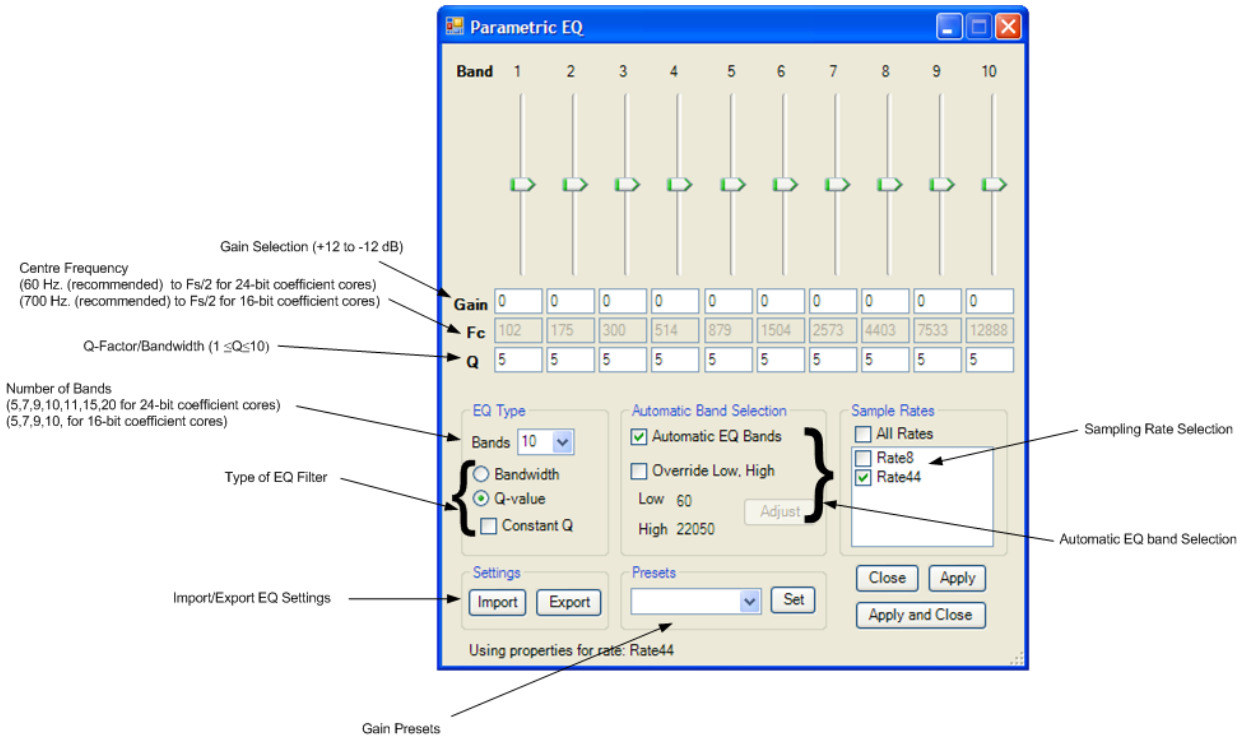
The EQ filters can be configured through a GUI.

Configuration GUI

To invoke the GUI, drag the Parametric EQ component on the diagram window, right click and select Parametric EQ GUI on the right click menu.



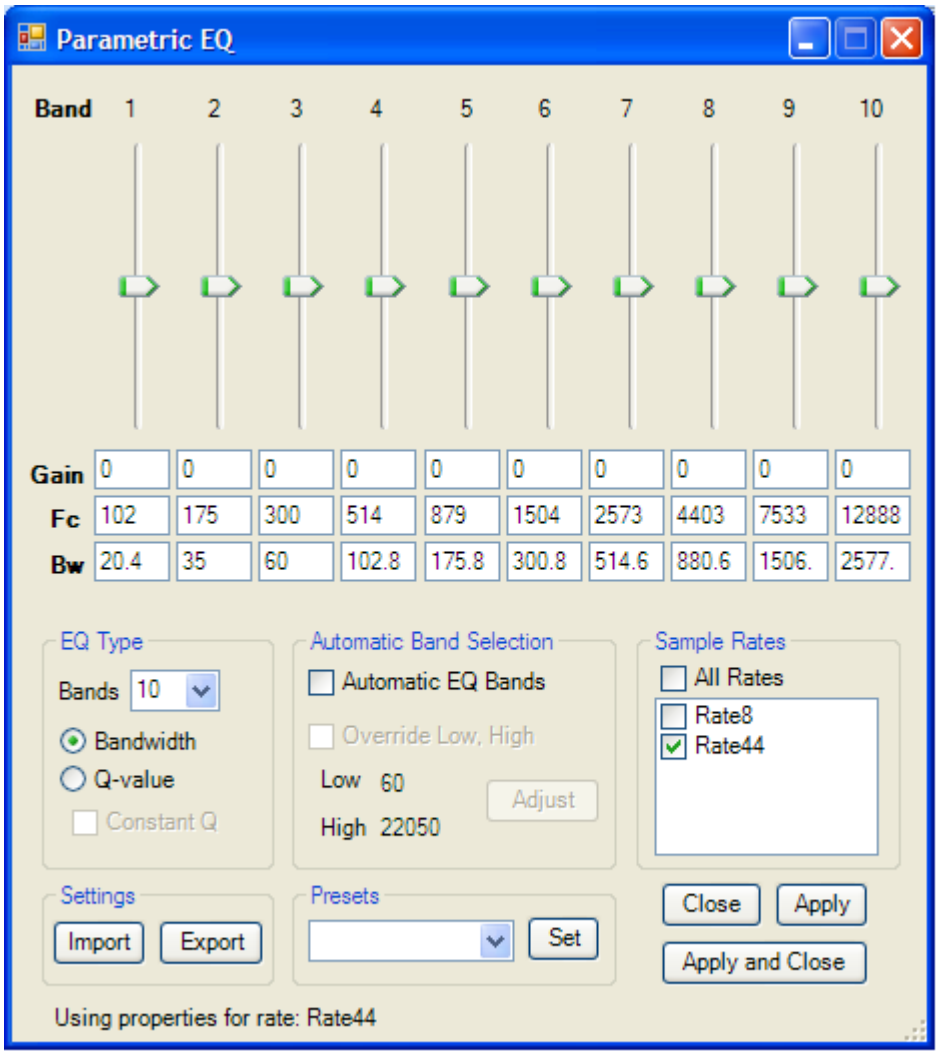
At this point the Parametric EQ GUI will appear.



EQ Type

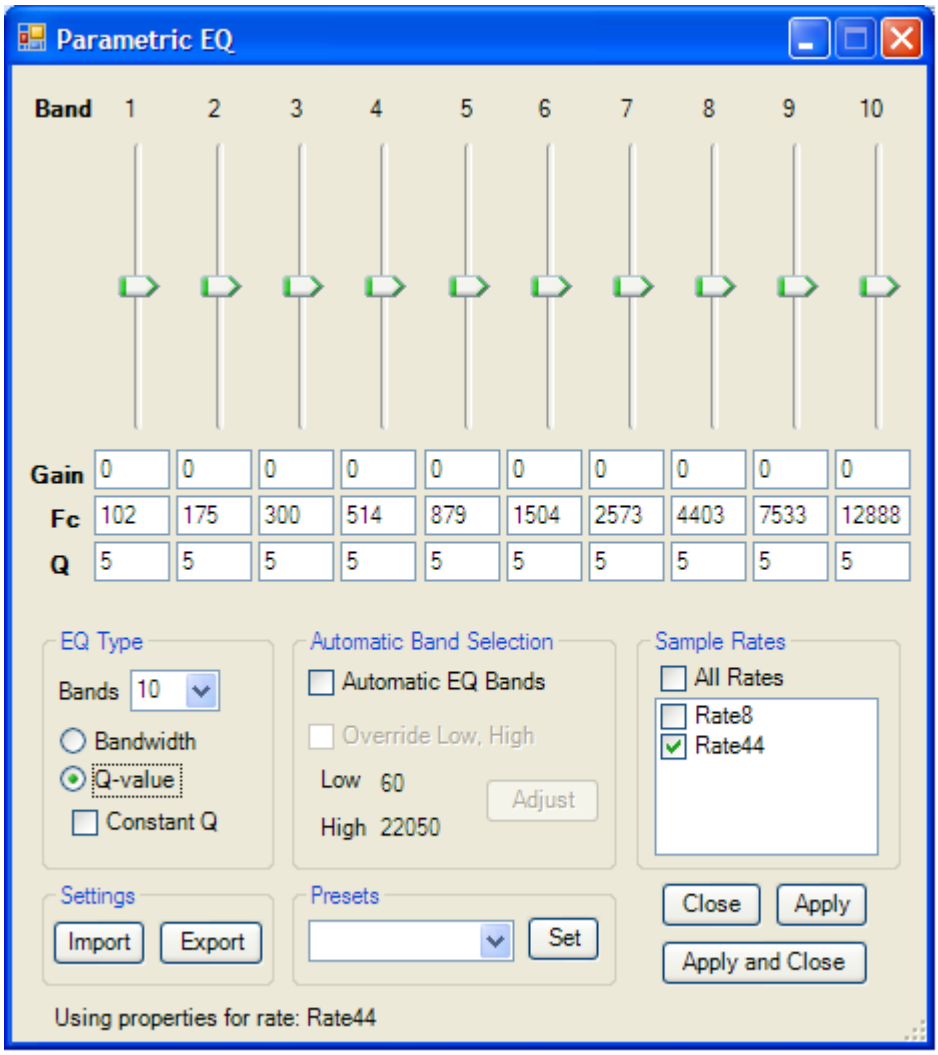
The EQ Type has the option of selecting either Bandwidth or the Q-factor for each filter.

a) Bandwidth



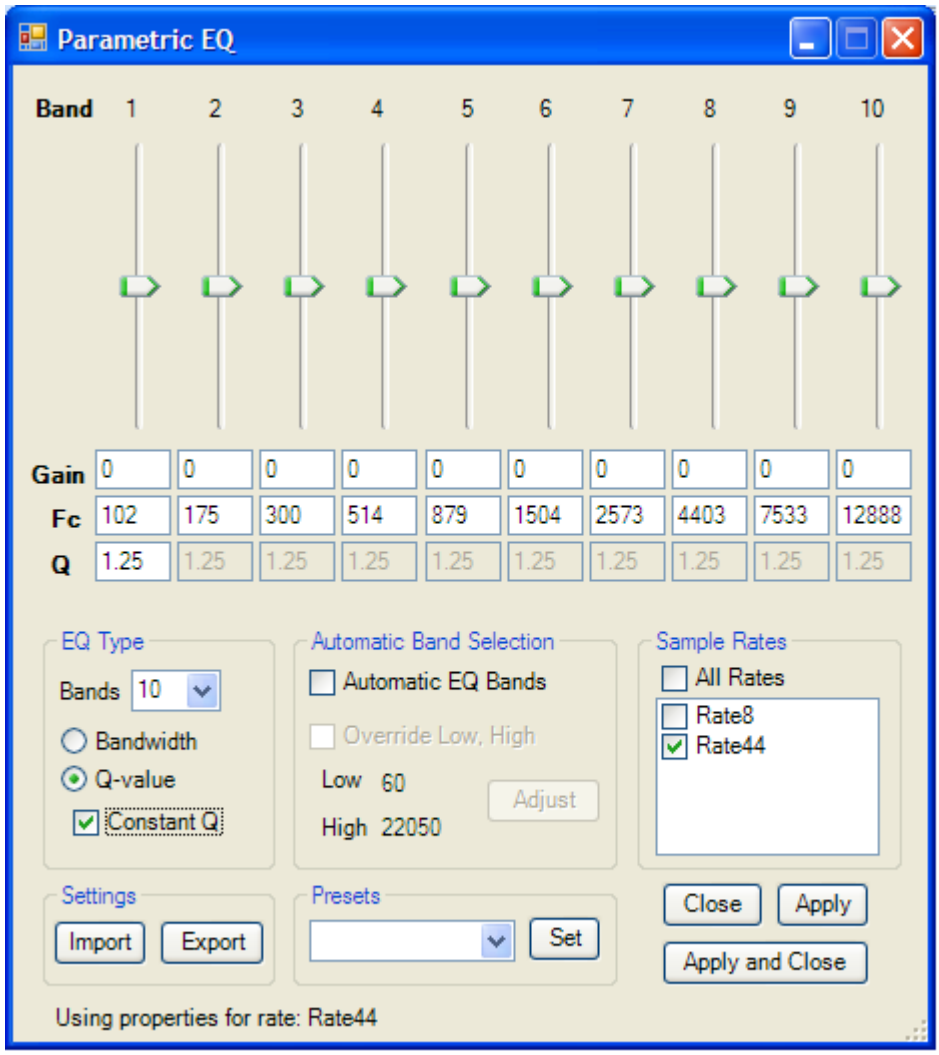
In this case, “Bw” appears in the Q/Bandwidth selection panel and individual Bandwidth can be entered for each EQ filter. The Bandwidth has to be such that $1 \leq Q \leq 10$ ($Q = Fc/Bw$)

b) Q-value



In this case, “Q” appears in the Q/Bandwidth selection panel and individual Q-value can be entered for each EQ filter. $1 \leq Q \leq 10$

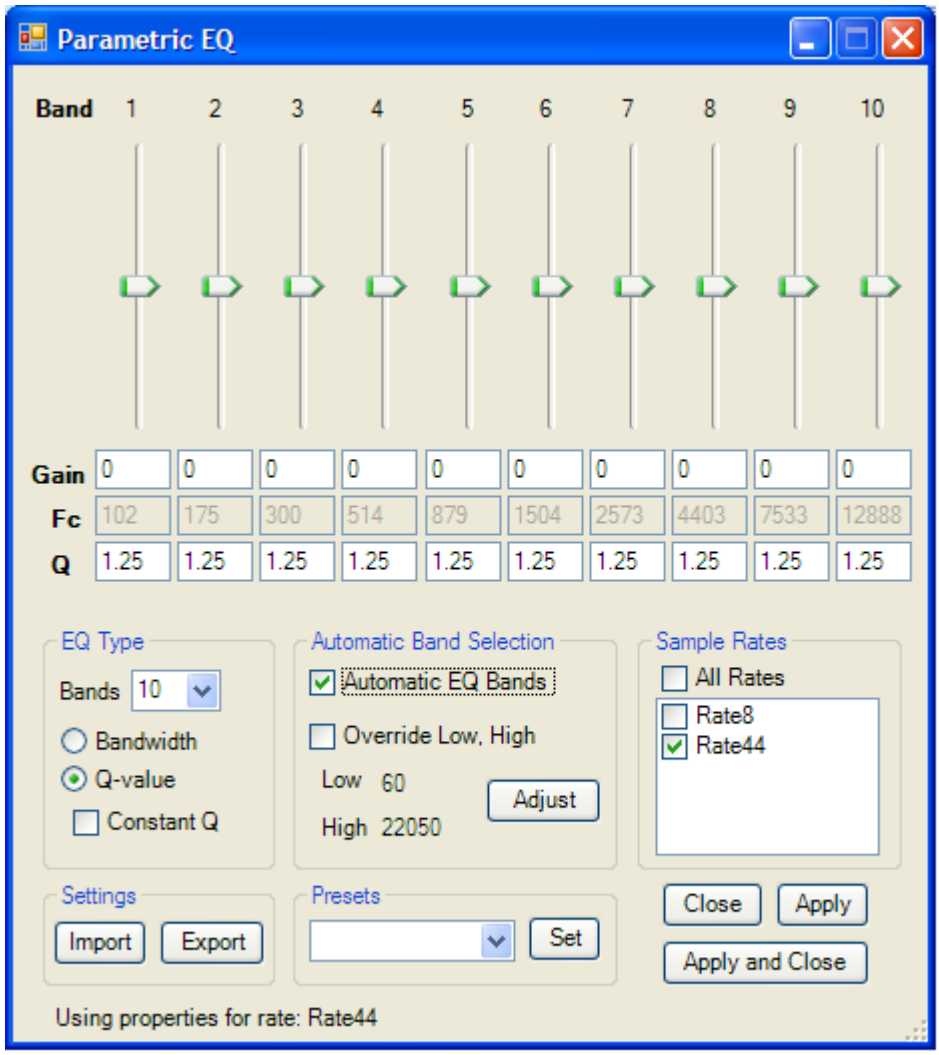
c) Constant Q



In this case the Q-value for all the bands are constant and the value entered for the first band will be used for all the remaining bands

Automatic Band Selection

If “Automatic EQ Bands” is selected under Automatic Band Selection, then the centre frequencies are automatically computed using an octave scale.



Each centre frequency is constrained to lie between a Low value and a High value, where

Low = 60 Hz. (24-bit coefficient miniDSP cores), 700 Hz. (16-bit coefficient miniDSP cores)

High = Fs/2 (Fs is the active sampling frequency)

The Low value is recommended to prevent instability/inaccuracy of the filter response at high-gain high-Q operating points.

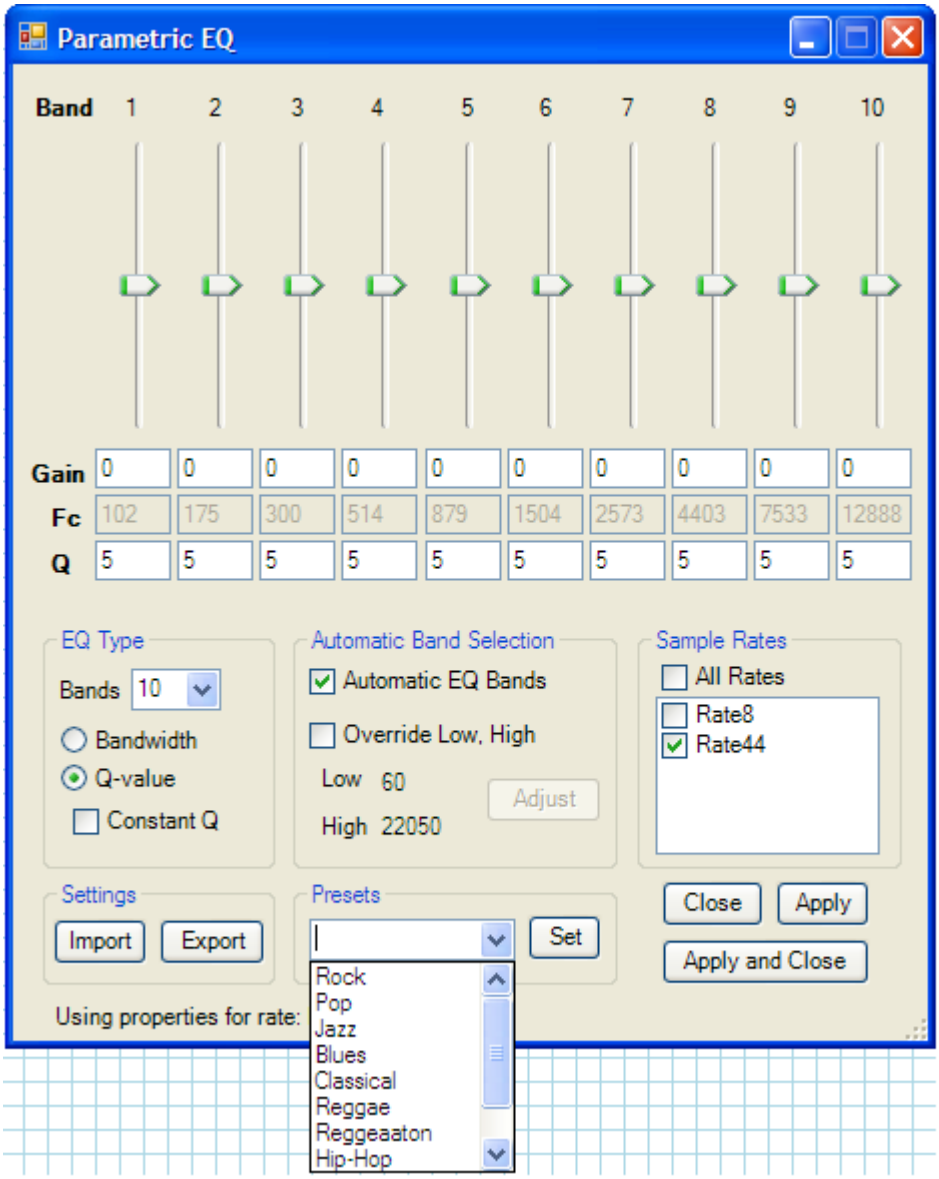
Import/Export

The EQ filter settings can be saved in an xml file by clicking “Export”

Previously save EQ filter settings can be reloaded in the GUI by clicking “Import”

Presets

Gain presets can be applied to each filter band by selecting the “Presets” dropdown menu and then clicking “Set”



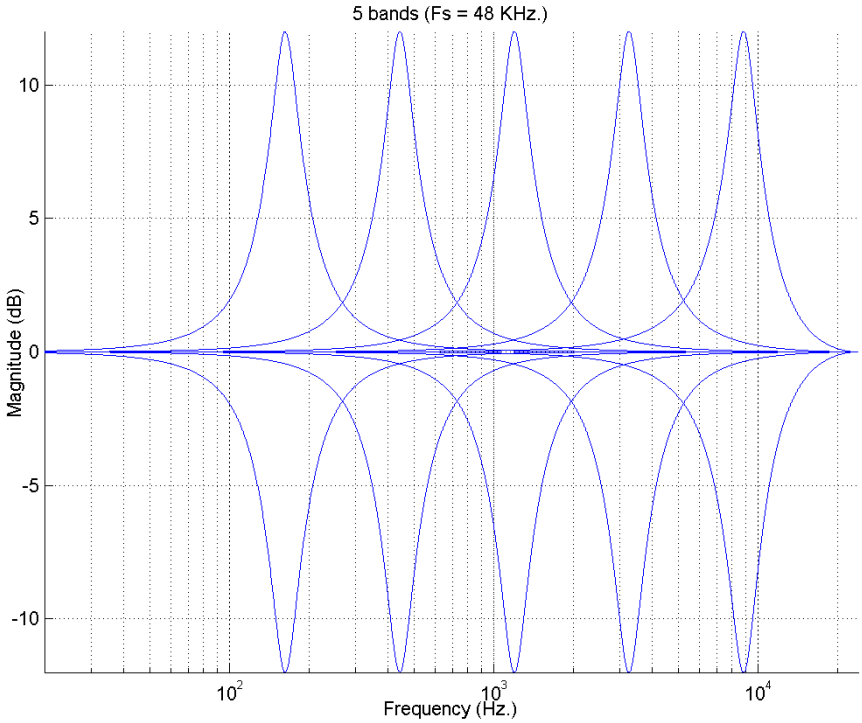
Sample Rates

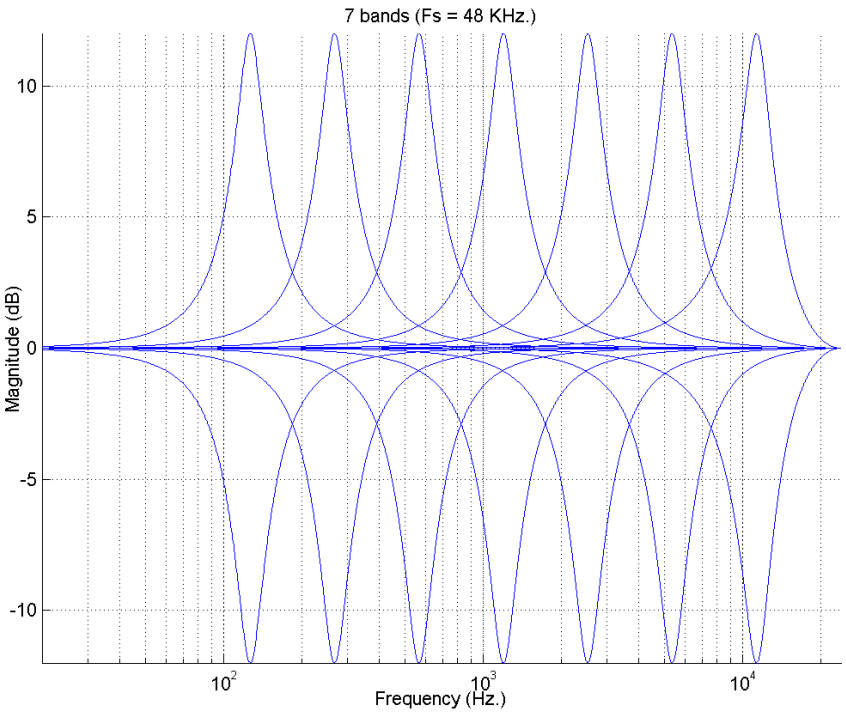
It is possible to operate the EQ filters on individual sampling rates by unchecking the “All Rates” check-box under Sample Rates. In this case, each Sampling Rate can have different EQ filter settings. It is also possible to apply the same EQ filter settings on all Sampling Rates by checking the “All Rates” check-box. However, in this case, the Centre Frequencies of each band should be less than Fs/2 where Fs is the lowest of all the active Sampling Rates.

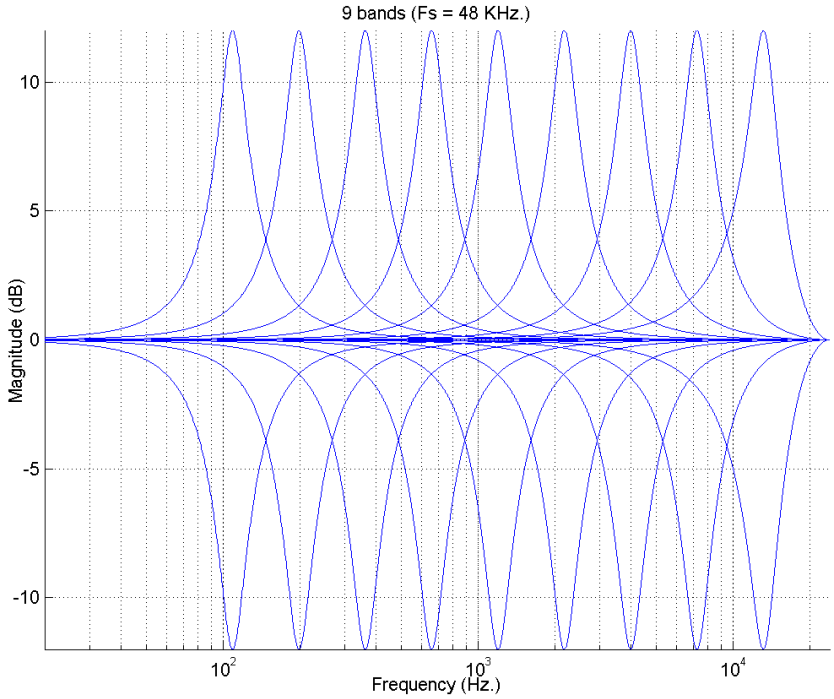
Configurable Properties

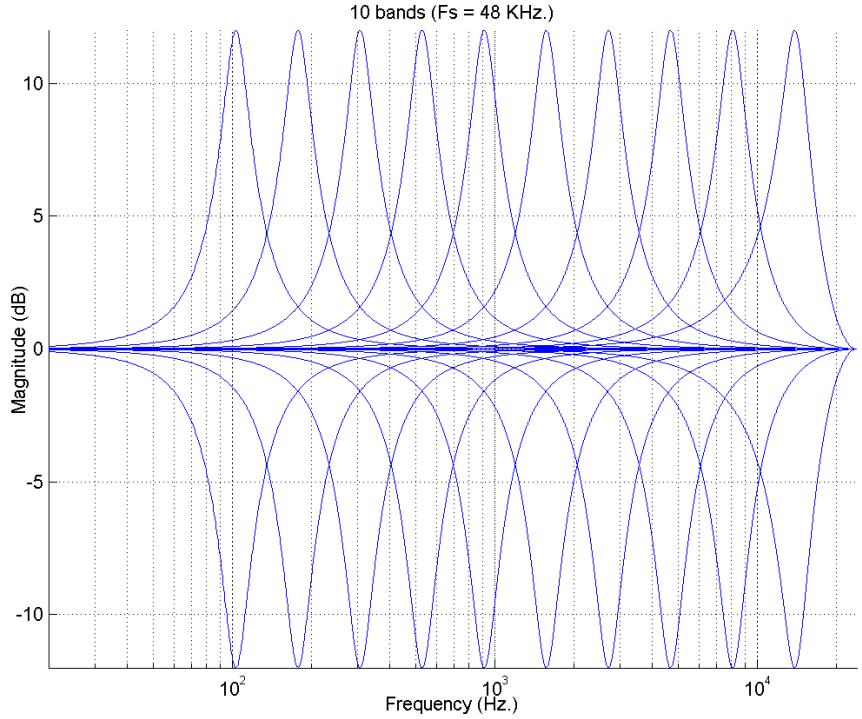
All Design Time and Run Time configurable properties are controlled by the Parametric EQ GUI.

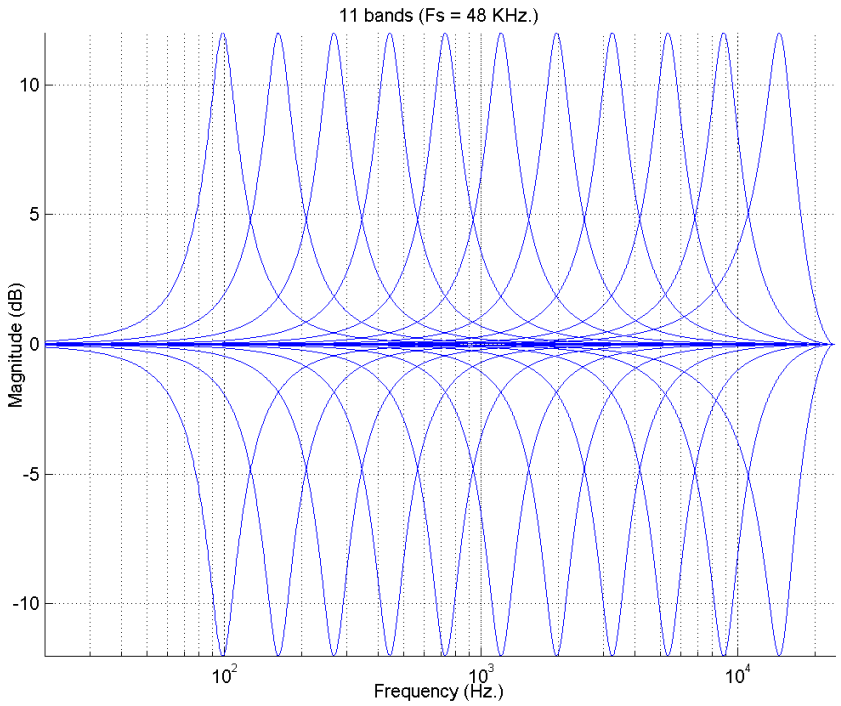
The figures below show +12 and -12 dB frequency plots for 5-,7-,9-,10-,11-,15- and 20-bands PEQ filters at 48 KHz. for 24-bit miniDSPs with the default settings.

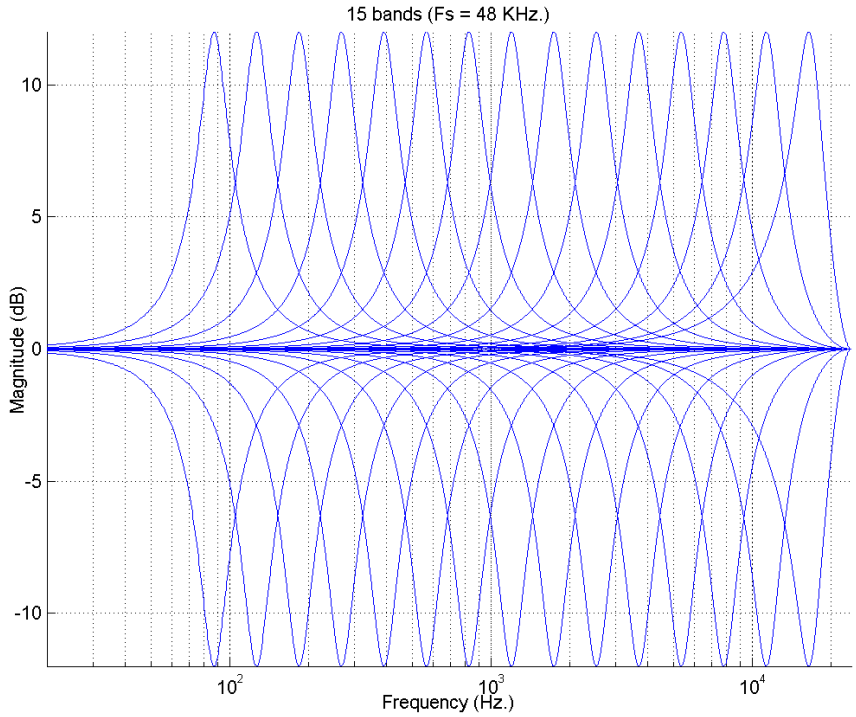


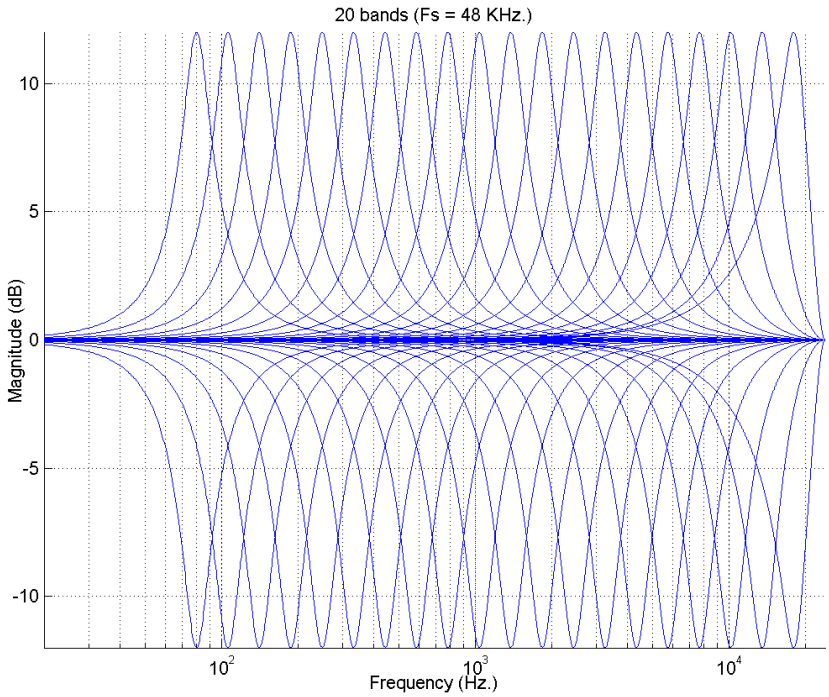



9 bands (Fs = 48 KHz.)
10
5
0
-5
-10
Magnitude (dB)
10^2
10^3
10^4
Frequency (Hz.)

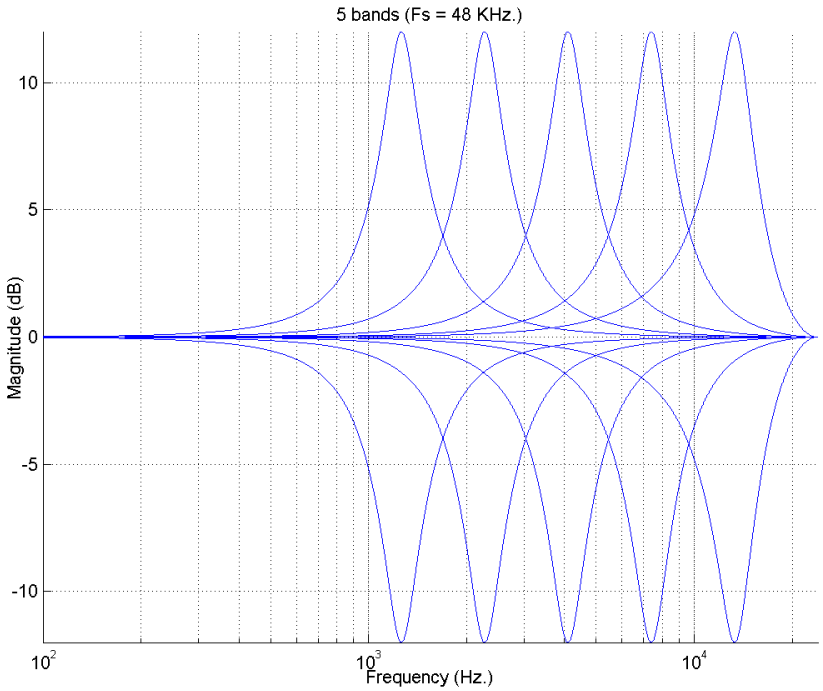

10 bands (Fs = 48 KHz.)
10
5
0
-5
-10
Magnitude (dB)
10^2
10^3
10^4
Frequency (Hz.)

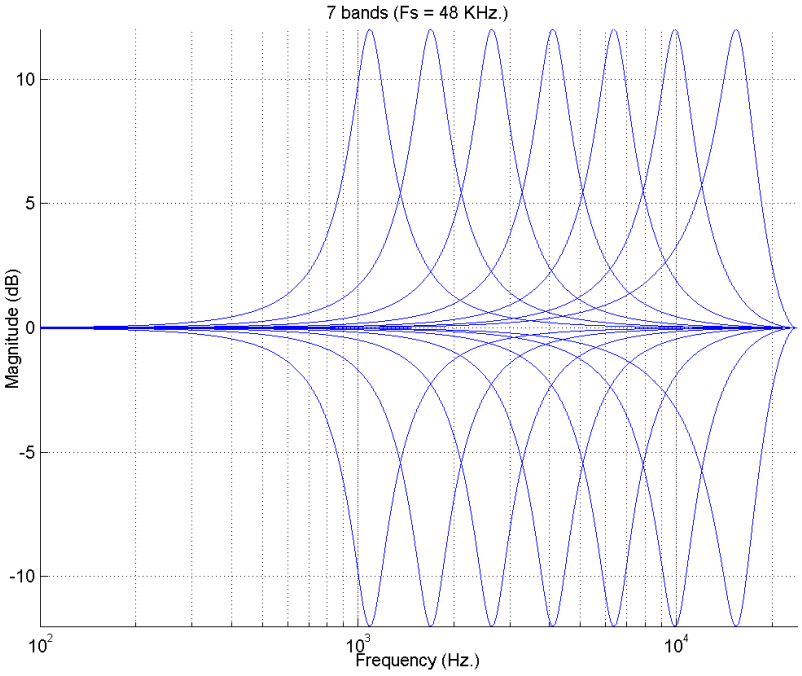

11 bands (Fs = 48 KHz.)
10
5
0
-5
-10
Magnitude (dB)
10^2
10^3
10^4
Frequency (Hz.)

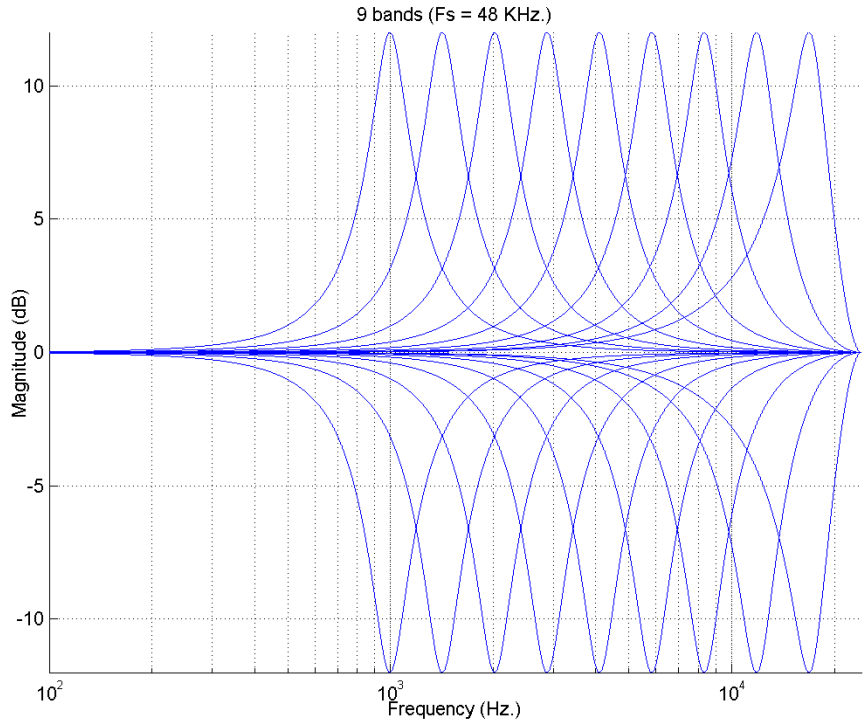

15 bands (Fs = 48 KHz.)
10
5
0
-5
-10
Magnitude (dB)
10^2
10^3
10^4
Frequency (Hz.)

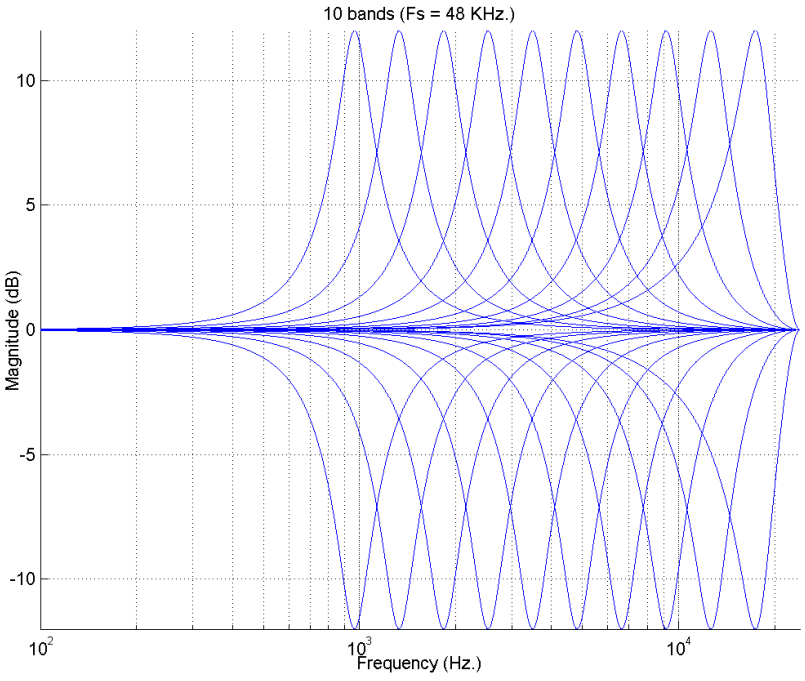


The figures below show +12 and -12 dB frequency plots for 5-,7-,9- and 10-bands PEQ filters at 48 KHz. for 16-bit miniDSPs with the default settings.


5 bands (Fs = 48 KHz.)
10
5
0
-5
-10
Magnitude (dB)
10^2
10^3
10^4
Frequency (Hz.)


7 bands (Fs = 48 KHz.)
10
5
0
-5
-10
Magnitude (dB)
10^2
10^3
10^4
Frequency (Hz.)


9 bands (Fs = 48 KHz.)
10
5
0
-5
-10
Magnitude (dB)
10^2
10^3
10^4
Frequency (Hz.)


10 bands (Fs = 48 KHz.)
10
5
0
-5
-10
Magnitude (dB)
10^2
10^3
10^4
Frequency (Hz.)