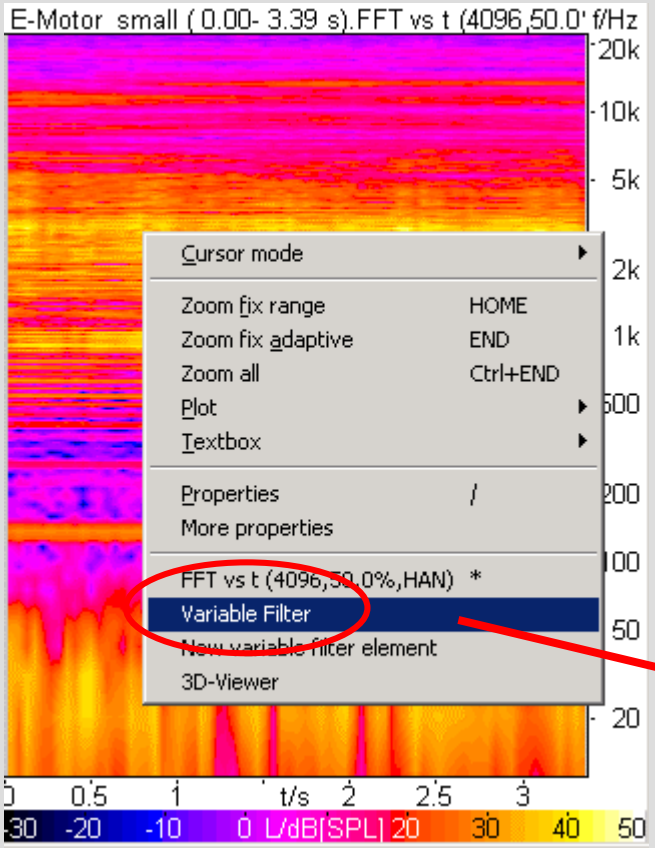
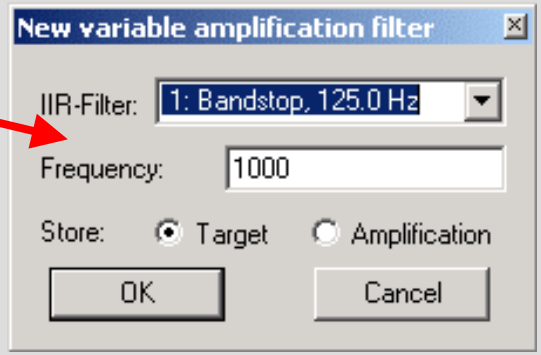
How to use “Variable Filters” in ArtemiS

Step by Step



- Select a file in the Source Pool and calculate e.g. a *1/3-octave vs. Time* or *Order Spectrum vs. RPM* analysis in a Mark Analyzer.
- Click with the right mouse button in the diagram.
- Select “Variable Filter”.
- ArtemiS automatically opens the Filter Editor and the following window appears:

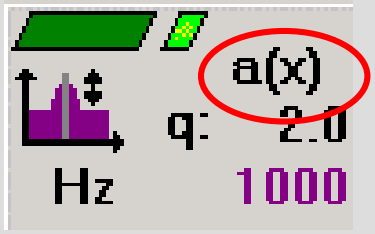


Target <-> Amplification

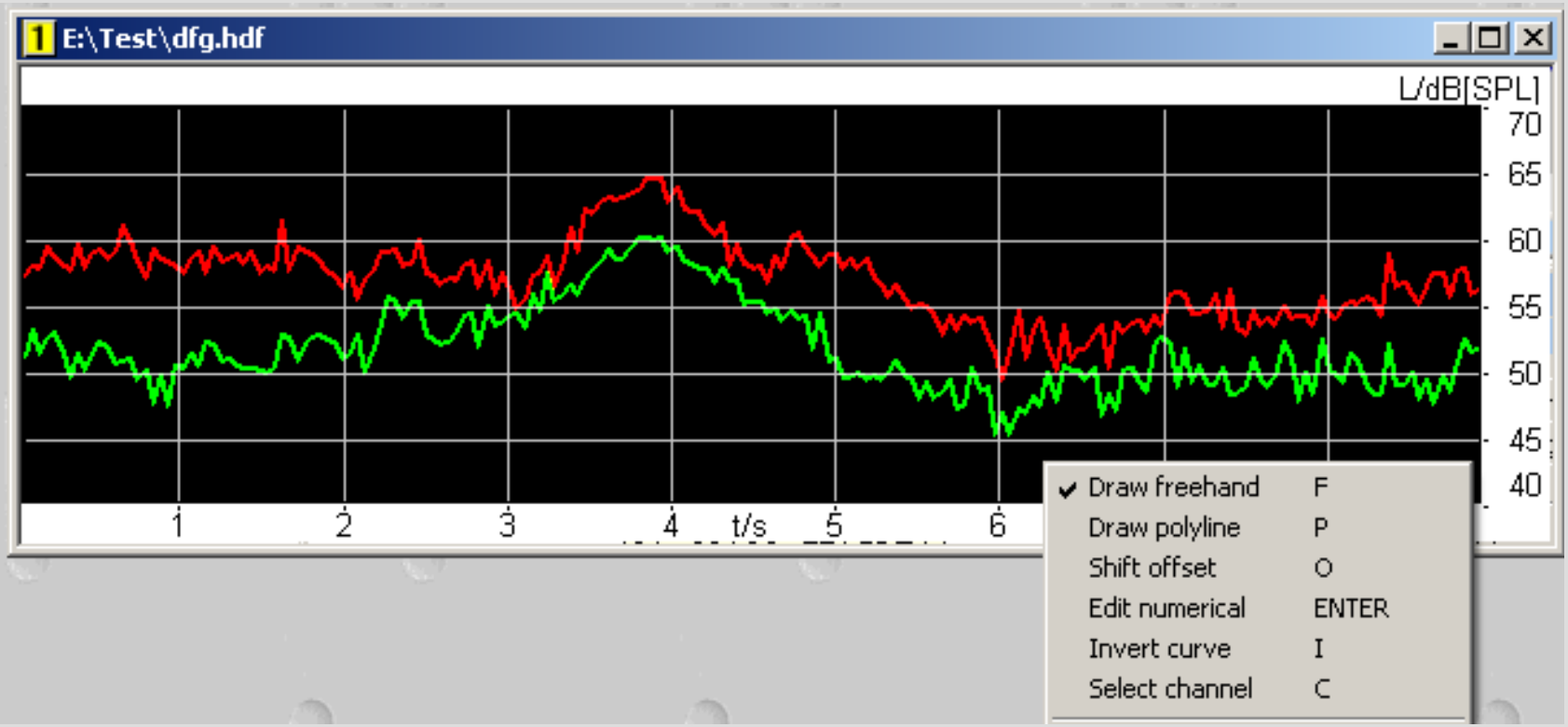
- ***Target*:** The curve you are going to edit will be stored. The amplification of the parametric filter will be calculated in an online mode by comparing the current output level of a bandpass filter at the same frequency with the desired output level that is stored in the *.hdf file. The edited target level curve continues to be available for further modification.
- ***Amplification*:** The difference between the edited curve and the original curve will be stored. These differences (saved as a *.hdf file) will be used for the parametric filter as amplification values. If you edit this *.hdf file later, the amplification may still be changed, but the target curve you originally edited will be lost.

Step by Step

- Select the filter kind you need and the frequency of which you want to edit the level curve.
- Confirm with “OK”.
- Type in a name for the new filter in the file select box showing up after the confirmation.
- Then a diagram is shown displaying the level vs. time of the selected frequency. In this diagram you can create the desired filter curve using the mouse or numeric input.
- The corresponding filter button now shows an a(x). By clicking on this a(x) you can re-open the editing window and edit the filter again.



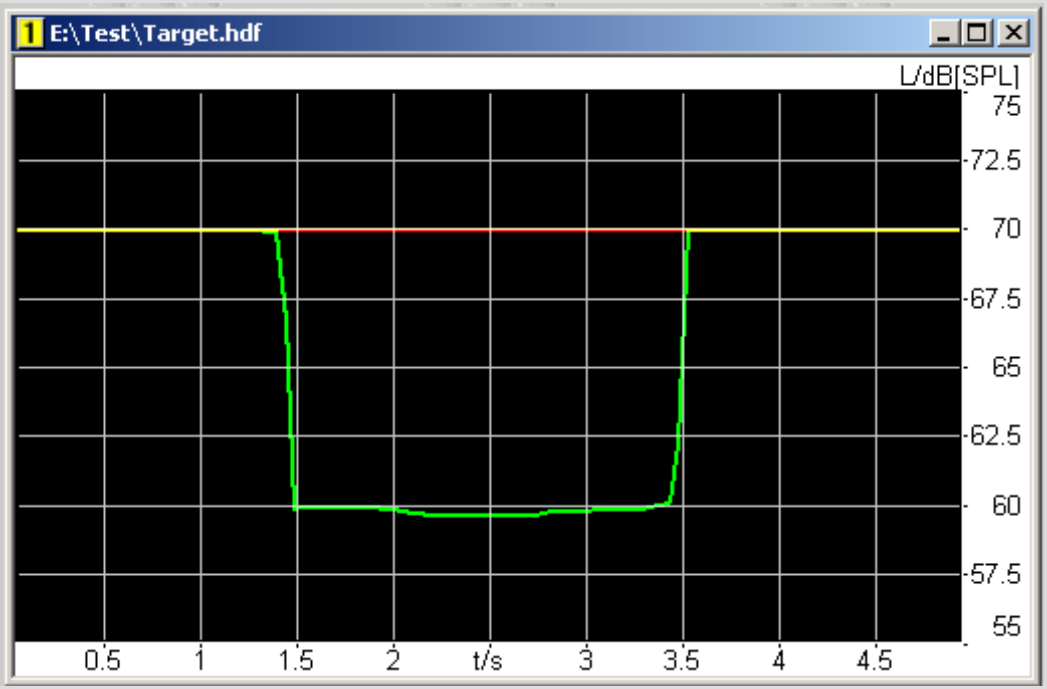
Editing the Filter Curve



- With a right mouse click in the diagram you get a list for selecting the editing mode (e.g. “Draw freehand” or “Edit numerical”).

Creating a “Target Filter”

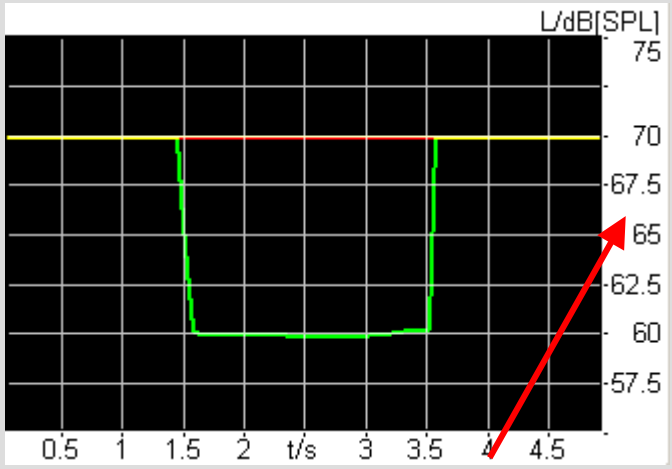
- As mentioned earlier, with a target filter you determine the level for the filtered signal.
- In the editing diagram you create a curve with the level you want to have for the filtered signal.
- In the shown example the level will be 70 dB for the first and the last 1.5 seconds, in the middle of the signal the level will be 60 dB.



- In order to save the filter curve close the window and confirm the saving dialog.

Creating an “Amplification Filter”

- If you select the amplification filter option the same editing window opens as for the target filter.
- Please note that only the difference between the newly created and the original curve is saved. The differences will be used as amplification values for the filter. If you reload the filter by clicking on the a(x) of the filter button, you will get the amplification curve.
- You can save the filter by closing the window and confirm the saving dialog.

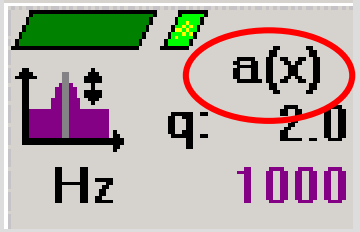


Drawn curve (absolute level)

Saved curve (amplification level)

Using the Variable Filter

- After creating a variable filter you can check it online by activating it and listen to the effect. (You can activate the filter in the same way as non-variable filters.)
- You can use only parametric filters for variable filtering. Variable filtering is possible with a parametric bandpass as well as a parametric highpass and parametric lowpass. You can change the frequency or the order of the filter according to your needs (not only the frequency/order with which you created the filter curve is possible to select).
- As mentioned before: By clicking on the a(x) you can re-open the editing window and edit the filter again.

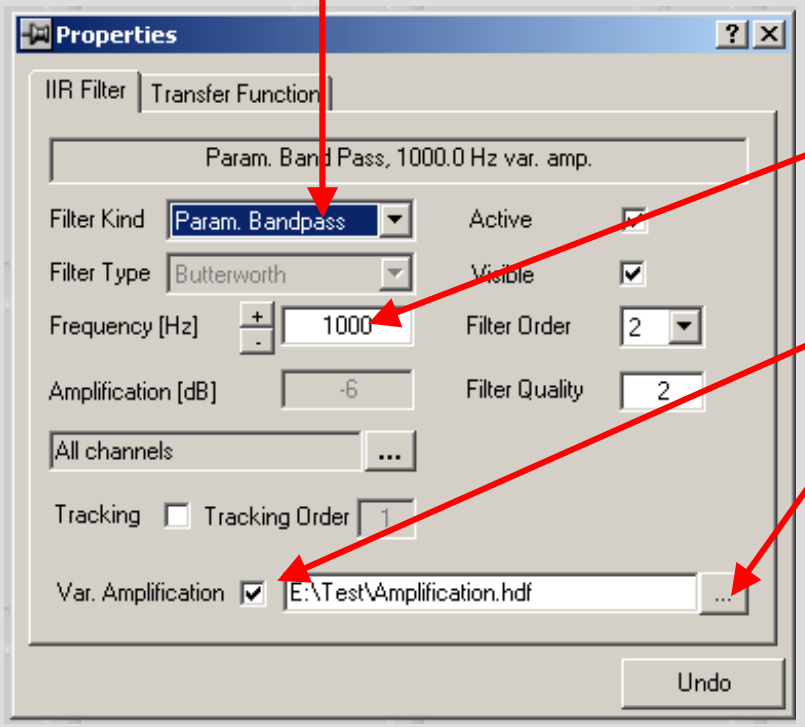


Using the Variable Filter

- **Please note:** The filter morphing function is **not** available for variable filters.
- If you do not only want to listen to the effect of the variable filters, but see an analysis of the filtered signal the following procedure can be used:
  - Right mouse click on the corresponding filter button
  - Select “Copy”
  - Open the Filter Pool of your ArtemiS project
  - Right mouse click in the project
  - Select “Paste”
  - Now the variable filter is available in the Filter Pool and can be activated for the next calculation.

Load an Existing Variable Filter

- Open the Property Page of a filter (right mouse click on a filter button or on a filter in the Filter Pool).
- Select a parametric filter (variable filters are only available with parametric filters).



- Select the frequency range you want to filter.
- Activate the Var. Amplification mode and select filter file from your hard disk.

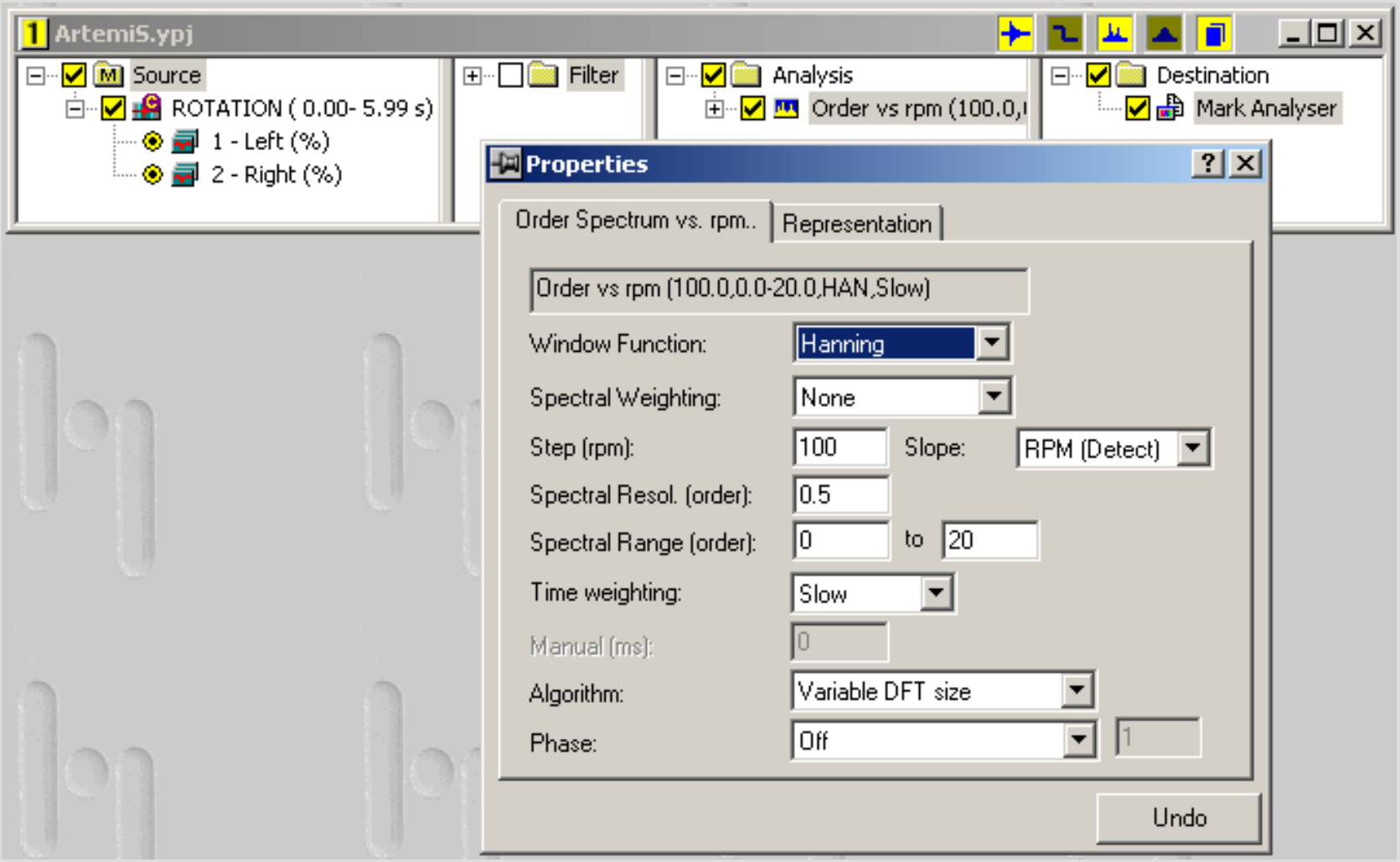
RPM Related Variable Filters

- In addition to time related variable filters, you can use an RPM related variable filter.
- The approach is nearly the same as creating a time related filter.
- You start the procedure by calculating an *Order vs. RPM* analysis.
- After clicking on “Variable filter” you can select the order you want to modify and a *Level vs. RPM* diagram appears in which you can create an RPM related filter curve.

Application Example

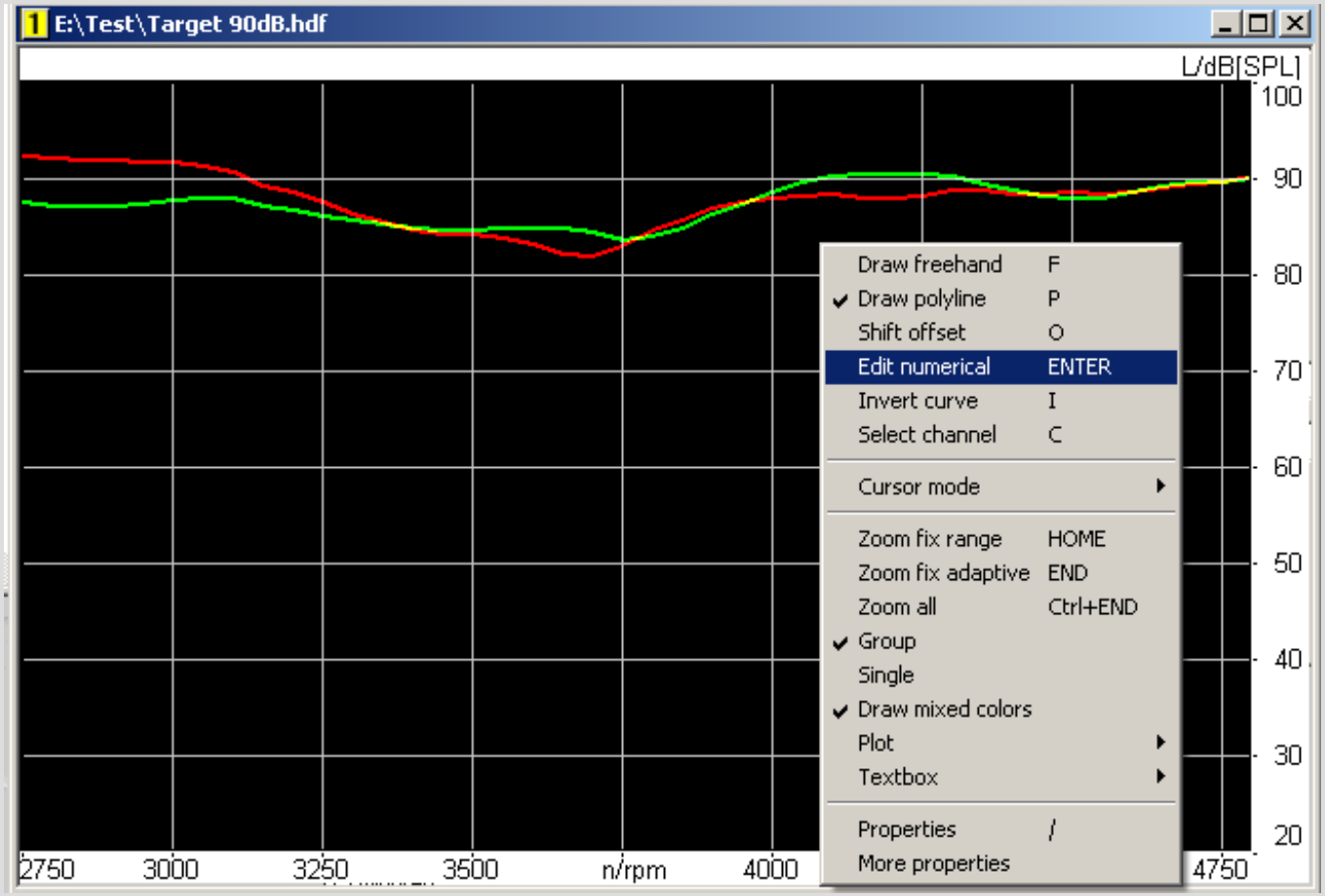
- In the following example the second order of a run up will be set to 90 dB for the whole signal.
- Therefore a soundfile with RPM information will be selected and an *Order Spectrum vs. RPM* calculated. As we are only interested in the second order, we will activate the cut function of the analysis, i.e. only the second order of this analysis will be shown in the diagram.
- The next slide shows the settings of the property page of the *Order Spectrum vs. RPM* analysis used for this application example.

Property Page – Settings –



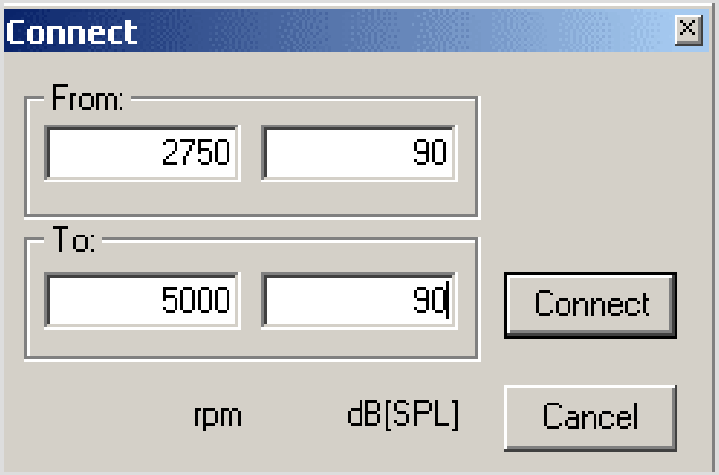
Edit the Filter Curve

- Start the *“Variable Filter”* procedure
- Select the default settings for the filter: second order, Target



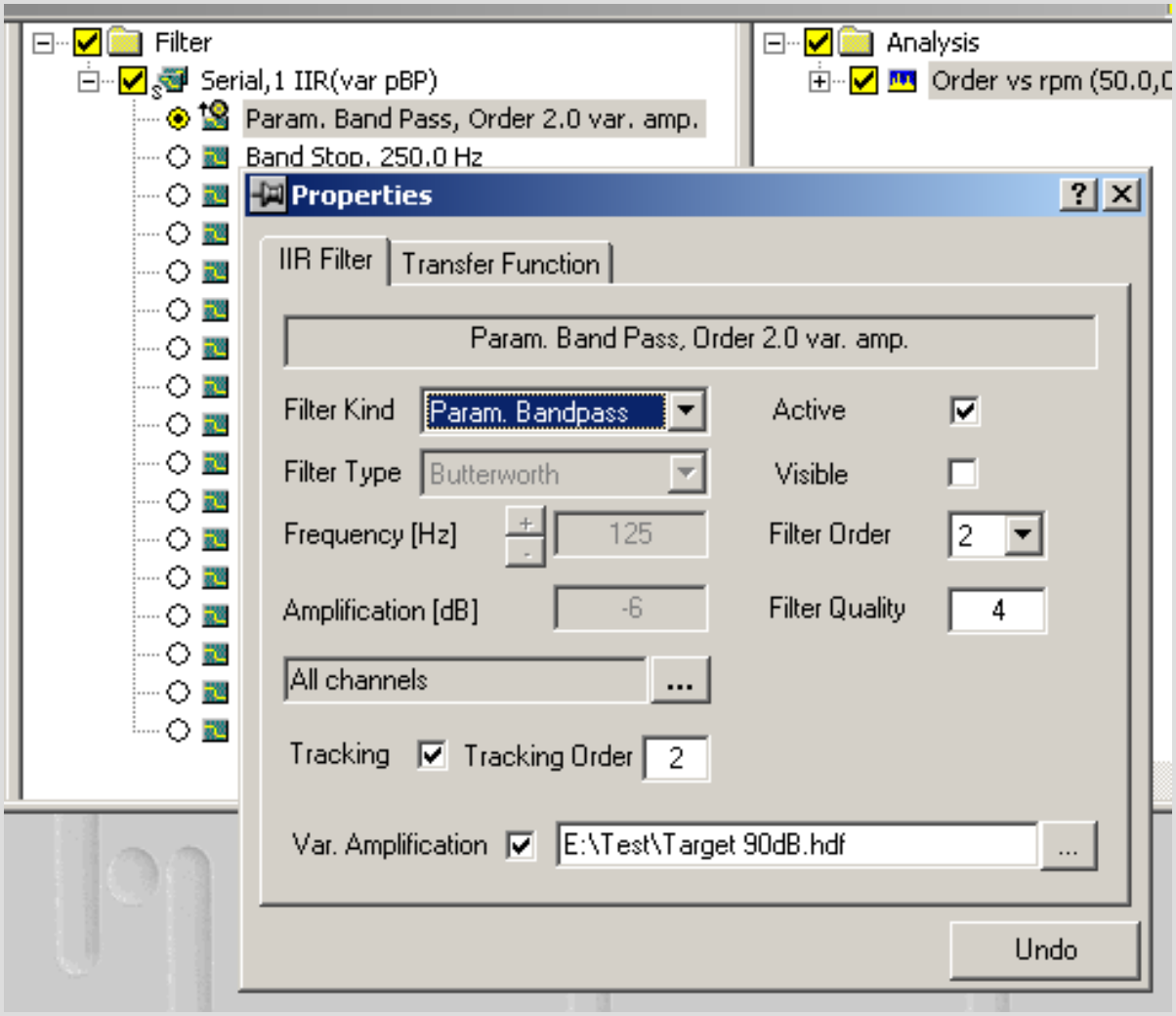
- Enter a path and name for the filter
- Select “Edit Numerical” by clicking the right mouse button in the filter diagram

Numerical Input



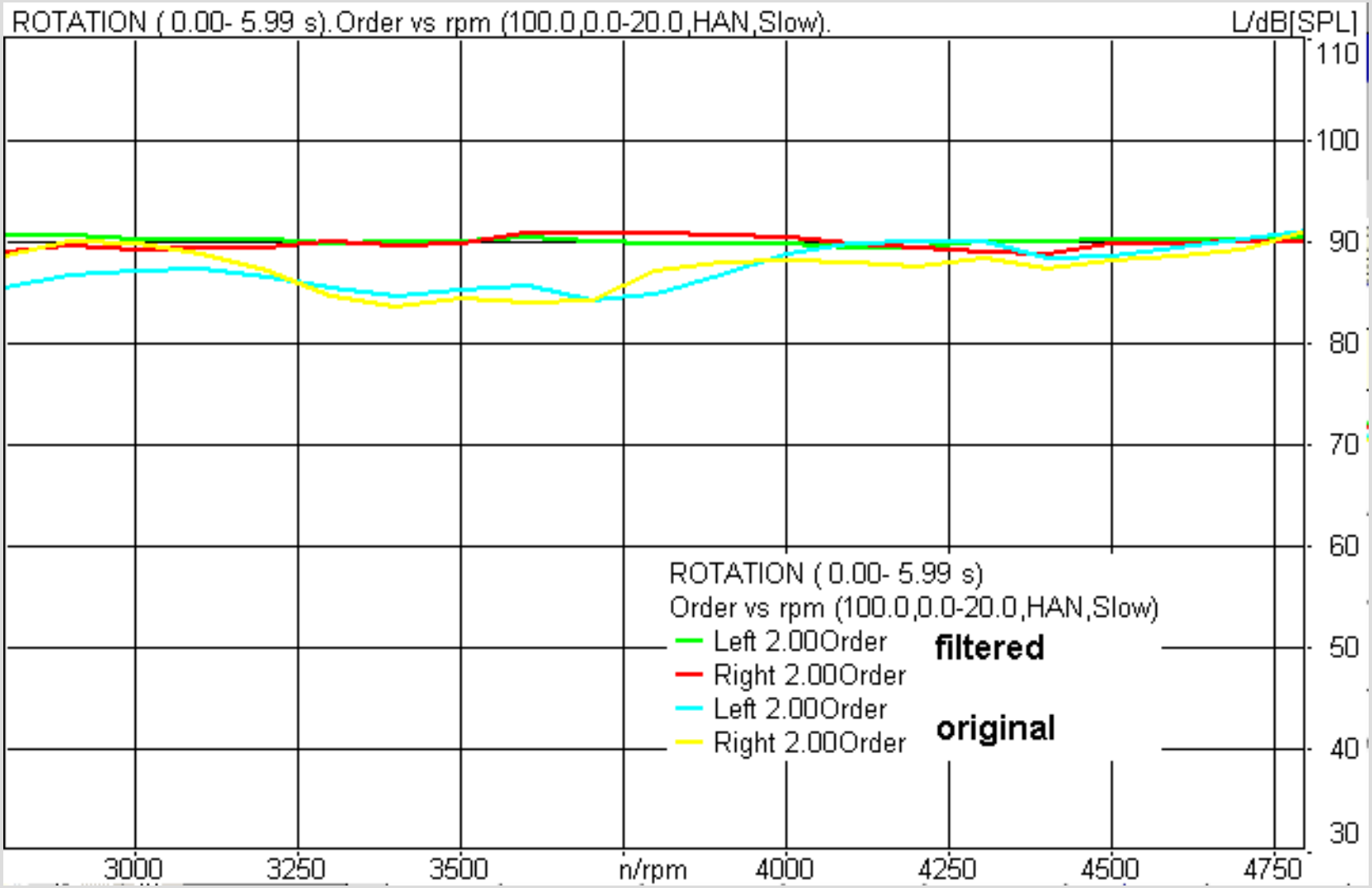
- Enter the filter curve as shown in the picture
- Click “Connect”
- Select the second channel (click with the right mouse in the diagram and then click on *“Select channel”*)
- Enter the same filter curve as for the first channel
- Close the diagram window and save the filter

Display the Filtered Signal



- Click with the right mouse button on the corresponding filter button
- Select “Copy”
- Click with the right mouse button in the Filter Pool
- Select “Paste”
- Activate the filter and start the calculation

Result


ROTATION (0.00- 5.99 s).Order vs rpm (100.0,0.0-20.0,HAN,Slow).
L/dB[SPL]
110
100
90
80
70
60
50
40
30
3000
3250
3500
n/rpm
4000
4250
4500
4750
ROTATION (0.00- 5.99 s)
Order vs rpm (100.0,0.0-20.0,HAN,Slow)
Left 2.00Order
Right 2.00Order
filtered
Left 2.00Order
Right 2.00Order
original

Additional Information

- If you try to create filter curves of your own, please note that the slew rate of an FIR filter's transfer function is limited due to principle laws of communications engineering. This applies to both the frequency and the time domains.
- The maximum amplification level is about 40 dB, but if a signal has a very low level, this value may not be possible.
- As the filter curve is created based on an analysis the analysis settings influence the final filter curve as well, especially in the amplification mode.
- Therefore the user should check very carefully what is possible in his special case and try out several settings for the analysis and filter properties.