



PLECS

*DEMO MODEL*

## Frequency Response of Passive Circuit

Last updated in PLECS 5.0.2

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# 1 Overview

This demonstration shows how to generate the frequency response of a non-switched network. In this example, a Bode plot is produced for a first-order RC network. For PLECS Standalone a Simulation Script is included where a parameter sweep can be executed for various values of the passive components.

## 2 Simulation

For PLECS Standalone and PLECS Blockset there are different simulation setups that can be used with this demo model. Since PLECS 5.0, PLECS Standalone offers a new **Frequency Response Analysis** which is not available in PLECS Blockset.

### 2.1 PLECS Blockset

To run the AC-Sweep double-click on the **AC Sweep Analysis** block to open the dialog and click on the **Start analysis** button. The progress of the analysis is displayed in the MATLAB Command Window. When the analysis has finished a new Bode plot will be displayed showing the corresponding transfer function.

### 2.2 PLECS Standalone

To run the scripted simulation demonstration select **Simulation scripts...** from the **Simulation** menu and run the “Sweep filter configuration with small-signal analysis” script. Note that an existing AC Sweep or Frequency Response Analysis are required to run the script and both have already been setup for this model. Additionally, the **Analysis Tools** window should be open prior to executing the script (select **Analysis Tools...** from the **Simulation** menu) in order to view the resulting plots. Also note that for the AC Sweep the “Operating point” analysis setting is set to “non-periodic (DC)” as the system contains no switches or discrete blocks. An alternative option is to use a “System period” of 0, which is equivalent to defining the system as non-periodic.

The variable ANALYSIS is used to choose with analysis is executed from the simulation script. The options are the name of the analyses defined in the **Analysis Tools** menu, which are Frequency Response or AC Sweep. The script requires a value for the resistance and a cutoff frequency for the filter network. The capacitance is then calculated for each combination and an analysis is performed. The frequency response result of each simulation is displayed as a new trace in the plot window.

```
% parameter definitions, create simStruct with field 'ModelVars'
mdlVars = struct('R', 1, 'C', 100e-6, 'fc', 10e3);
simStruct = struct('ModelVars', mdlVars);

ANALYSIS = 'Frequency Response'; % options are 'Frequency Response' or 'AC Sweep'
path = ['./Analyses/' ANALYSIS];
% clear all traces in frequency response plot window in the current model
plecs('scope', path, 'ClearTraces');
fcValues = [10e2, 10e3, 10e4]; % cutoff frequencies
for ix = 1:length(fcValues)
    fc = 10e3; % RC filter cutoff frequency
    simStruct.ModelVars.C = 1/(2*pi*simStruct.ModelVars.R*fcValues(ix)); % RC filter capacitance
    plecs('analyze', ANALYSIS, simStruct); % start AC Sweep analysis
    plecs('scope', path, 'HoldTrace', ...
        ['fc=' mat2str(fcValues(ix)/1000) 'kHz']); % hold and label trace
end
```

## Revision History:

PLECS 4.3.1	First release
PLECS 5.0.2	Frequency response analysis was added as option in the small-signal analyses

## How to Contact Plexim:

☎	+41 44 533 51 00	Phone
	+41 44 533 51 01	Fax
✉	Plexim GmbH Technoparkstrasse 1 8005 Zurich Switzerland	Mail
@	info@plexim.com	Email
	<a href="https://www.plexim.com">https://www.plexim.com</a>	Web

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