



## Experiment No.: 3

### Active Filter

#### 1- Objective

As time moves forward and the study on the filters has increased, active filters have been a matter of discussion. Active filters are a group of electronic filters that utilize active components like an amplifier for their functioning. Amplifiers are used in filters for designing to enhance predictability and performance.

#### 2. What is an active filter

The filter is an electric network in any circuit theory, that is used to change either phase or amplitude of signal characteristics with respect to its frequency. Ideally, this will not include any new frequency to the i/p nor it will alter the frequency component of that signal. An Active Filter utilizes **an operational amplifier** along with **various electronic components** like resistors, and capacitors for the filtering. Op-Amps are used to allow easily making of many types of active filters.

#### 3- Circuit elements

- Function generator
- Operational amplifier
- Resistors
- Capacitors
- VCC
- VEE
- Bode Plotter

#### 4- Procedure

This experiment will be in several types (low pass filter and high pass filter):

##### • **Part 1/ (Low pass filter)**

1- Insert Operational amplifier

From Place Analog → ANALOG\_VIRTUAL → OPAMP\_5T\_VIRTUAL.

2- Insert VCC (12V) and VEE (-12V).

3- Insert R1 (10K $\Omega$ ), R2 (50K $\Omega$ ), and R3 (1.2K $\Omega$ ).

- 4- Insert C1 (0.02μF).
- 5- Insert pade plotter.
- 6- Insert function generator.

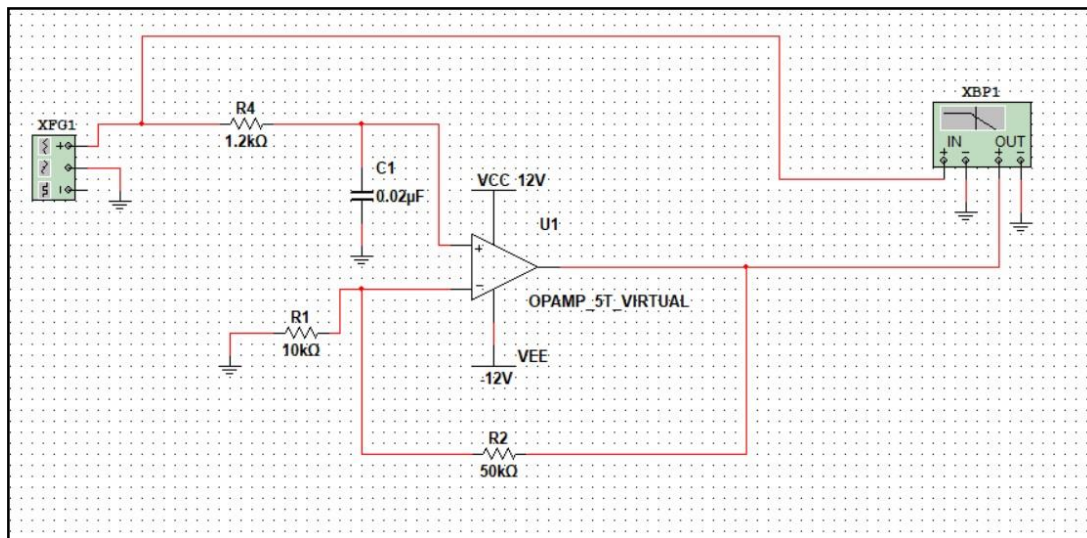


Figure 1: Active low pass filter circuit.

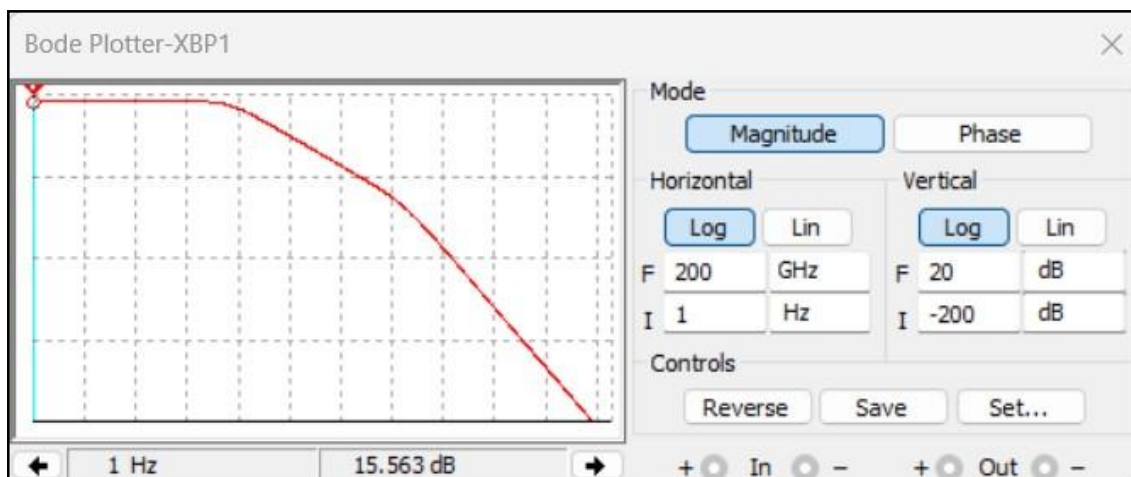


Figure 2: Low Pass Filter magnitude response (Gain) simulated in MULTI SIM.

$$\text{Gain} = AV = 1 + R_F / R_G$$

**• Part 2/ (High pass filter)**

- 1- Insert Operational amplifier
- From Place Analog → ANALOG\_VIRTUAL → OPAMP\_5T\_VIRTUAL.
- 2-Insert VCC (12V) and VEE (-12V).
- 3- Insert R1 (10KΩ), R2 (50KΩ), R3 (2.1KΩ), and R4 (2.1KΩ).
- 4- Insert C1 (0.05pF), and C2 (0.05pF).
- 5- Insert pde plotter.
- 6- Insert function generator.

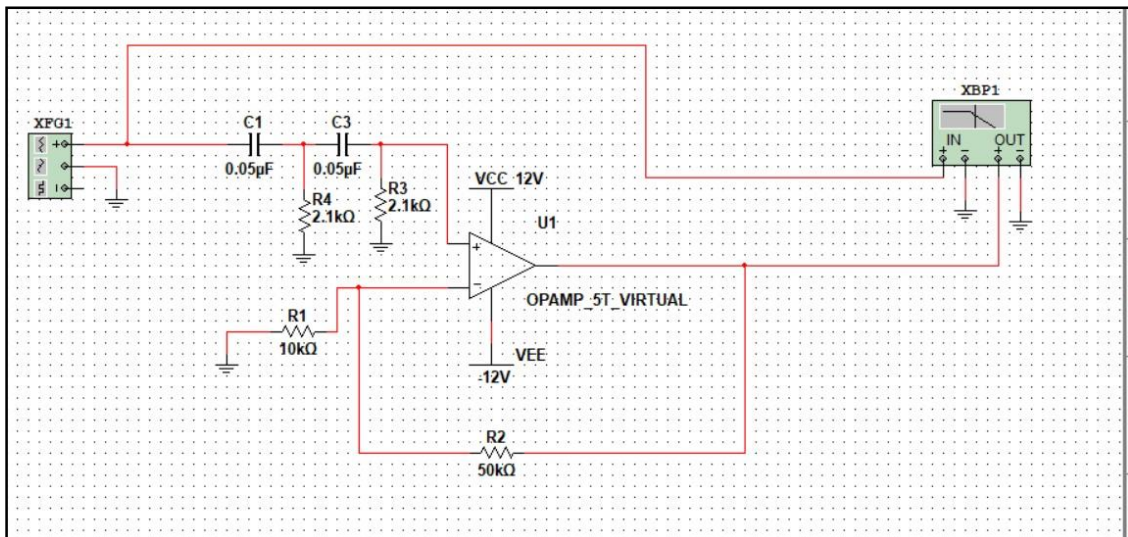


Figure 3: Active high pass filter circuit.

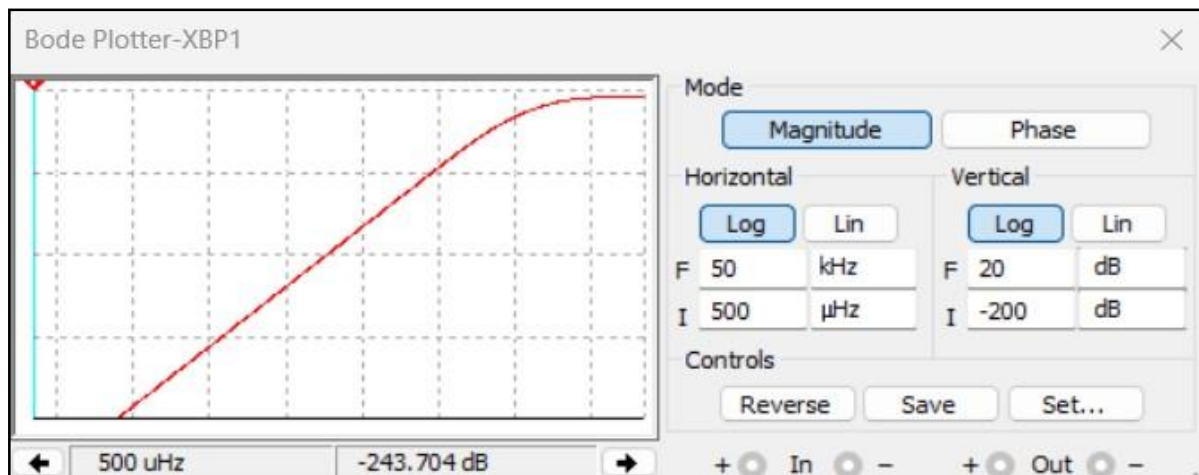


Figure 4: High Pass Filter magnitude response **Gain** simulated in MULTI SIM.

$$\text{Gain} = AV = 1 + R_F/R_G$$