# Design of a band stop filter with programmable gain

The following steps were made before: calculation of transfer function, topology identification of active components, simulations to verify operation. The gain selection is made by programming the AD5282 potentiometer, which is composed of 256 resistive sections.

Filter features:

- lower cut-off frequency in pass band : 1.8kHz
- upper cut-off frequency in pass band : 3.6kHz
- lower cut-off frequency in stop band : 2.2kHz
- upper cut-off frequency in stop band : 3kHz

For the design of the real filter, I chose the 741 operational amplifier, with differential power supply. The components with the values calculated using the ideal filter formulas are not on the market, so in order to reach values as close as possible to the ideal ones, I put in series or parallel components with values from the E6 series, and replaced the components as follows:

For the first biquad:

C3, instead of 2nF I put in parallel two capacitors with the value of 1nF;

R1, instead of 63kΩ I put in series 47kΩ with 15kΩ and with 1kΩ resulting in 63kΩ;

R2, instead of 90kΩ I put in series 68kΩ with 22kΩ;

R3, instead of 100. 6kΩ I used 100kΩ;

R4, instead of 60. 96kΩ I put in series 47kΩ with 15kΩ resulting in 62kΩ;

R5, instead of 30. 48kΩ I put 330kΩ in parallel with 33kΩ resulting in 30kΩ.

For the second biquad:

C11, instead of 602pF I put in parallel 330pF with 270pF, resulting in 600pF;

C12, instead of 398pF I put in parallel 330 pF with 68pF, resulting in 398 pF;

C15, instead of 2nF I put in parallel two capacitors of 1nF;

R11, instead of 62.97kΩ I put in series 47kΩ with 15kΩ and with 1kΩ resulting in 63kΩ;

R12, instead of 101.13kΩ I put in series 100kΩ with 1kΩ resulting in 101kΩ;

R13, instead of 50. 5 kΩ I put in series 47kΩ with 3.3kΩ resulting in 50. 3kΩ;

R14, instead of 166.88kΩ I put in series 100kΩ with two of 33kΩ resulting in 166kΩ.

The circuit is supplied with a differential voltage of ± 5V.