

Lab nr 03

RC and RLC Filters

Goals

To study the input-output transfer characteristic of simple, passive RC filters; To study the overvoltage or overcurrent in RLC circuits; To broaden oscilloscope skills. Learn how to solder. Application of complex numbers and functions.

1 Experiment

1.0 The TA will demonstrate proper soldering techniques.

1.1 Built the measuring system shown in Fig. 1 and measure the transfer function for the filters shown in Fig. 2 (Solder the circuits shown in Fig. 2):

- a) low-pass filter
- b) high-pass filter
- c) band-pass filter
- d) band-stop filter

1.2 Replace the voltmeters VL1 and VL2 by an oscilloscope and measure the phase shift as a function of frequency for a chosen filter. Compare the result with the calculated frequency dependence of phase shift.

1.3 Set up the series RLC circuit and perform measurements showing the generation of higher voltages than the applied (input) voltage.

2 Background

2.1 Inductance, capacitance and resistance in AC circuits.

2.2 Resonance circuits, complex numbers and functions.

2.3 Phase and frequency response of the RC circuits, passive and active filters.

Literature

[1] L.P. Huelsman; Basic circuit theory.

[2] P. Horowitz, W. Hill; The Art of Electronics.

[3] Internet.

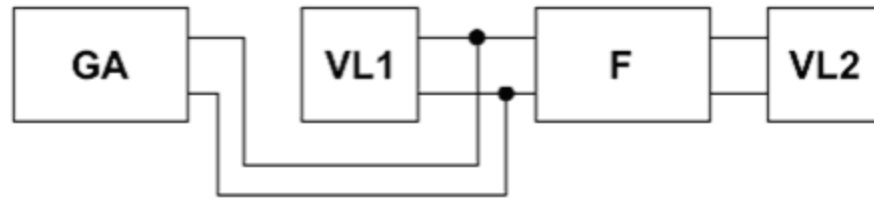


Fig.1. Block scheme of the measurement setup.

- GA - acoustic generator.
- VL - wide-band voltmeter.
- F - filter under test.

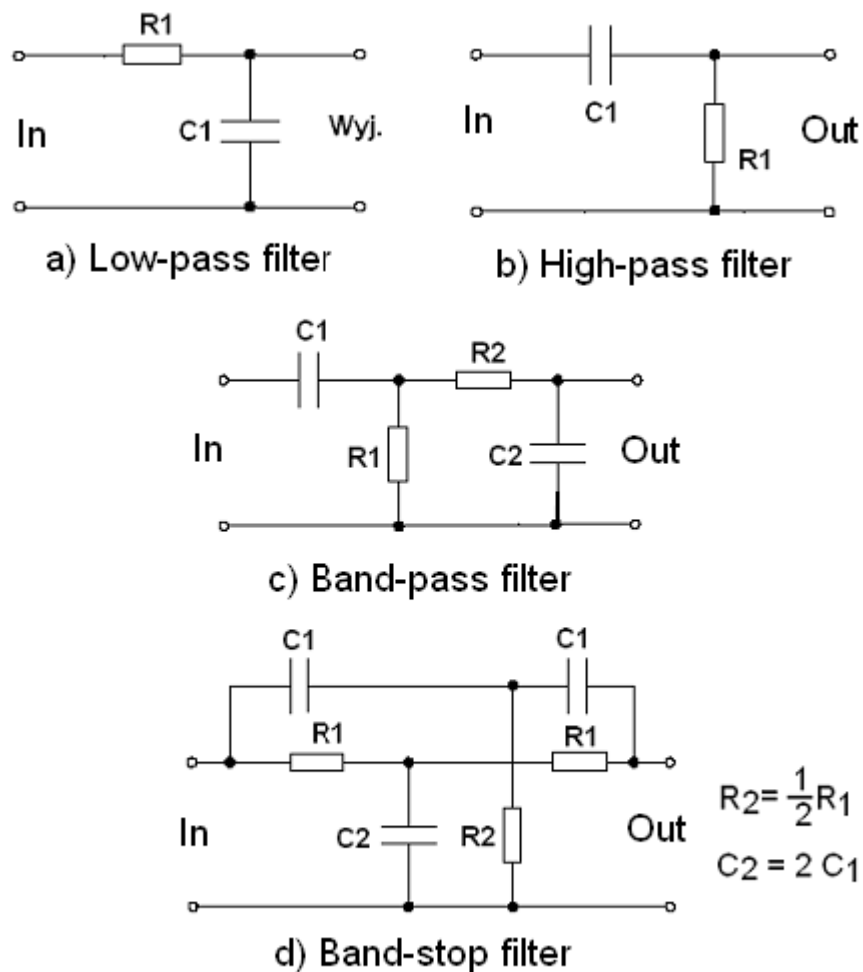


Fig. 2. Passive filters to be tested.

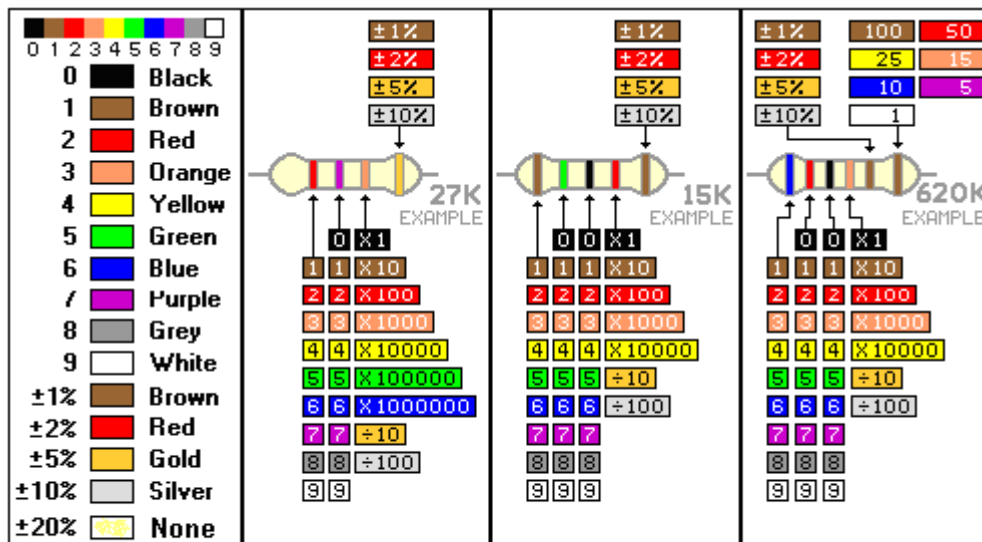


Table 1. Resistor color codes.