

Experiment procedure

The circuit in Figure 1 shows the setup of the digital multimeter BK Precision 2831E 4(1/2) (serial: U4-1999) to measure voltage and resistance. The ammeter used was the Data Precision 2831E" (serial: U-L0946) to determine the impedance of the system in combination with the voltage. The frequency generator was the BK Precision 4011A 5MHz Function Generator (serial: U4-2018U-L0946). To determine the capacitance of the capacitor the Wavetech CR50 multimeter was utilized.

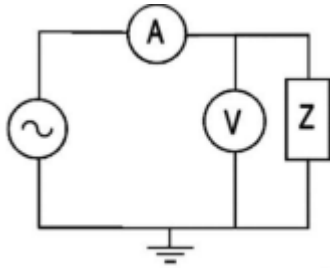


Figure 1: Measuring RMS current and voltage to determine impedance

To determine L , R_L and C the voltage was fixed, and the frequency of the generator was varied. First RMS voltage and current for the inductor was measured. The generator was set to 200Hz to start out and then the voltage was increased until the current read 100 mA but without going over. Readings were then taken in discrete steps at the following frequencies: $f = [200\ 490\ 663\ 800\ 916\ 1020\ 1114\ 1200]$ Hz.

The same was done with the capacitor measuring at the following frequencies: $f = [208\ 220\ 235\ 255\ 280\ 310\ 350\ 420\ 560\ 1200]$ Hz.

All data was written down exactly as seen on the devices to leave unit conversions for later during analysis. This reduces the chance of making an error which can't be rectified later on.

Afterwards, the R_L and C was directly measured to have a reference value.

Using 1201 Hz 12 data points were taken for RMS voltage and current with the circuit set up in parallel varying the source voltage this time.

Table 1: First set of 12 voltages used to measure current in parallel below shows the voltages and how they were varied. The last voltage corresponds to the maximum measured voltage from before.

Table 1: First set of 12 voltages used to measure current in parallel

Voltage [V]
0.5126
1.0142
1.5160
2.0072
2.604
2.991
3.508
4.016
4.509
5.016
5.503
5.826

14 data points at voltages in Table 2 were taken the same way as before for the circuit in series.

Table 2: Showing the voltage steps for 14 data points of corresponding current taken with the circuit in series

Voltage [V]
0.6172
1.0157
1.5258
2.0048
2.492
3.035
3.499
4.028
4.490
5.011
5.510
6.006
6.517
7.080

Once the maximum voltage of the table was reached the current through the capacitor and inductor was measured. Similarly for the series setup the voltage across the capacitor and inductor was measured once the last data point was taken. These measurements were to also have references for analysis later.