UM–SJTU Joint Institute

Electronic Circuits
(VE311)

Laboratory Report

Lab 1

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Contents

1 Objectives

- Test the behavior that the resistance has to temperature, humidity, high current and voltage.
- Understand what happened when a series of capacitors behave at different conditions.
- Analyze the behavior of a simple array of resistors.

2 Experiment procedures

2.1 Resistor behavior

We are going to test the behavior that the resistance has to temperature, humidity, high current and voltage. By using a resistor of 220 Ω, 10 kΩ and the closest to 1 Ω, perform the follow set of tests.

- By using a wave generator and an oscilloscope, measure the resistor response for a voltage of 1, 5, 10 and 15 V by sweeping the frequency from 10 Hz up to 50 MHz in each case.
- In each case heat or warm the resistance and see if there is any change in the oscilloscope signal.
- "Carefully" reduce the temperature of the resistance and see what happen to the signal.

2.2 Capacitors

The second part considers the use of capacitors. In here, we are going to use a series of capacitors and to understand what happened when they behave at different conditions.

- Use the capacitors: 3.3 μF, 0.082 μF and 5 pF. Each one of the capacitors is to be in series with a 10 kΩ resistor. By applying 1 V_{pp} you're going to sweep the frequency ranging from 50 MHz or the highest to 60 Hz.
- Invert the order of the devices and perform the same test.

2.3 Array of resistors

Finally, with an inductor, we are going to perform a set of experiments. By using a simple array of a 10 kΩ resistor in series with an inductor, we're going to analyze the behavior of the array. By using the wave generator, we are sweeping a range of frequencies from 50 MHz up to 1 Hz with a 1 V_{pp} .

3 Experimental results and discussion

3.1 Resistor behavior

We use the 10 kΩ resistor, which has the most apparent behavior. The voltage figure for the origin resistor was shown in Figure 1.

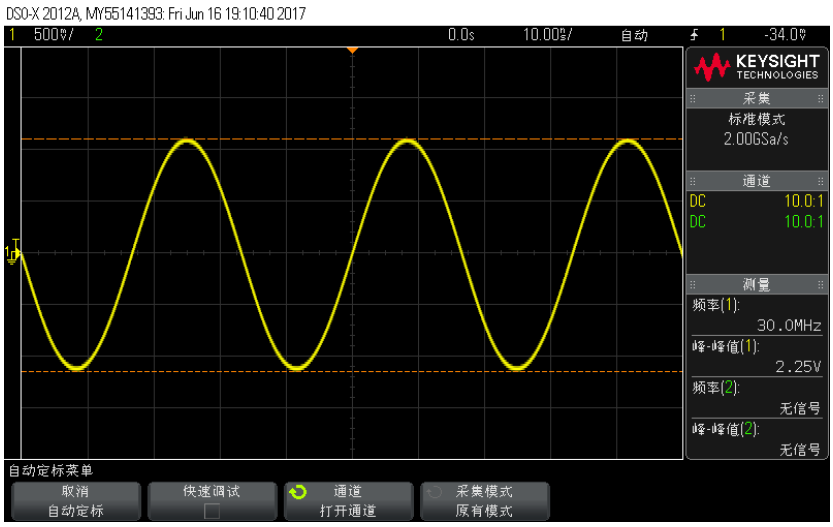
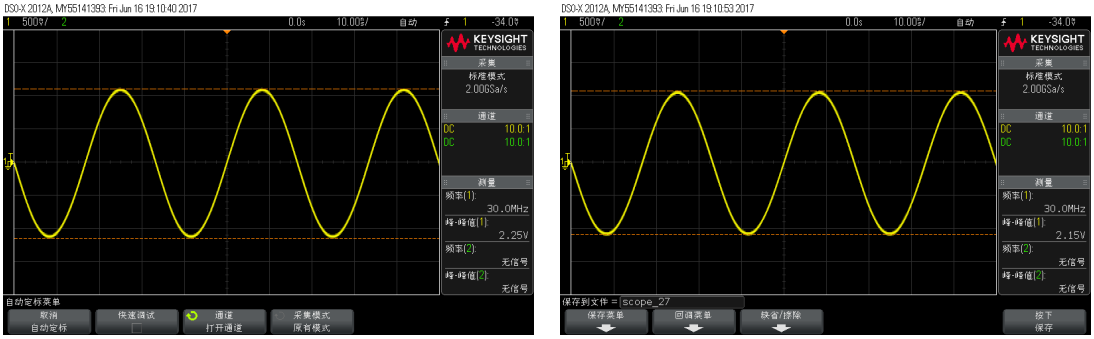


Figure 1: Origin voltage figure of $R = 10\,\mathrm{k\Omega}$

When the temperature was raised, the comparison of the origin figure and the new figure was shown in Figure 2.



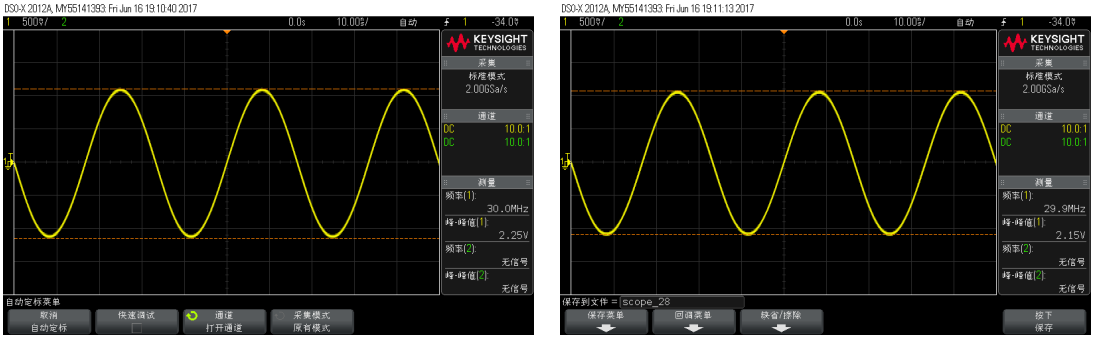
(a) origin

(b) higher temperature

Figure 2: Comparison between origin figure and higher temperature

We can find that when the temperature rises, the voltage on the source become slightly higher, which means that the resistance becomes higher.

When the humidity was raised, the comparison of the origin figure and the new figure was shown in Figure 3.



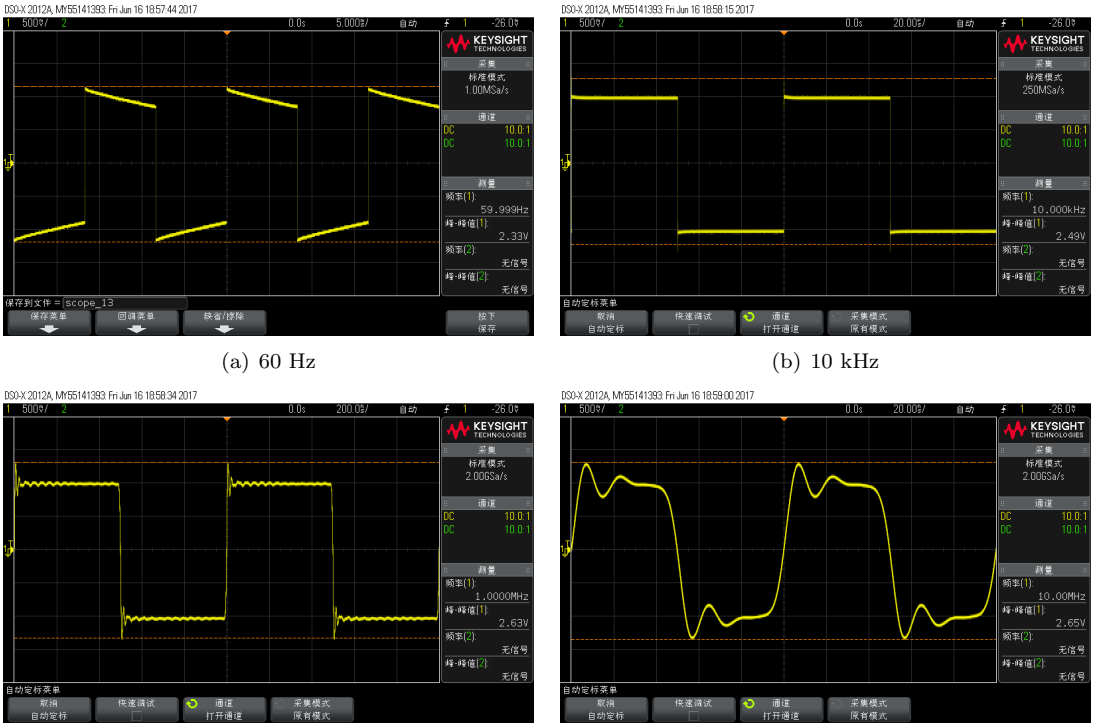
(a) origin (b) higher humidity

Figure 3: Comparison between origin figure and higher humidity

We can find that when the humidity rises, the voltage on the source become slightly higher, which means that the resistance becomes higher.

3.2 Capacitors

We choose two capacitors, 3.3 μF and 0.082 μF.
For the 3.3 μF capacitor, the figure was shown in Figure 4.

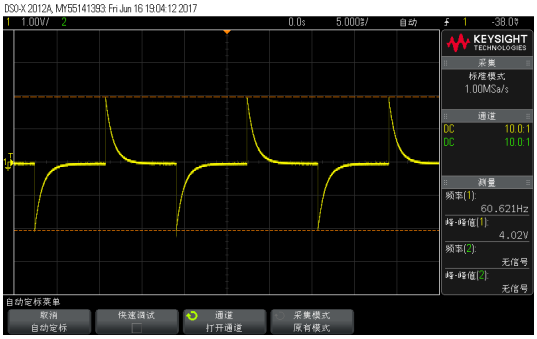


(a) 60 Hz (b) 10 kHz

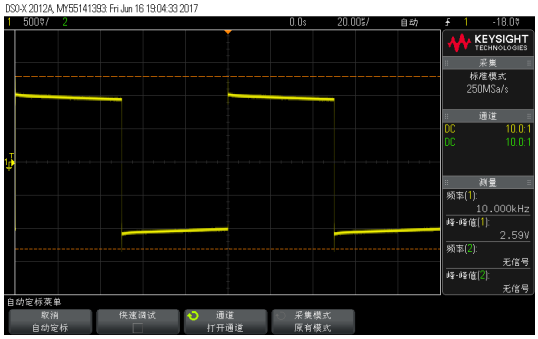
(c) 1 MHz (d) 10 MHz

Figure 4: 3.3 μF capacitor

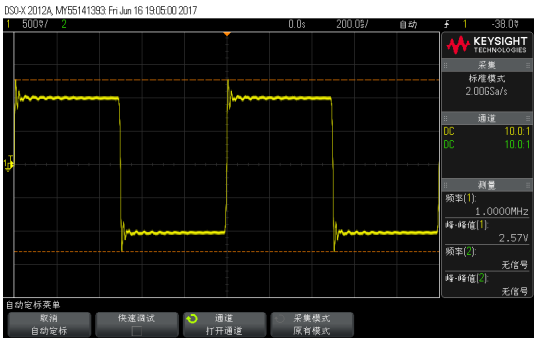
For the 0.082 μF capacitor, the figure was shown in Figure 5.



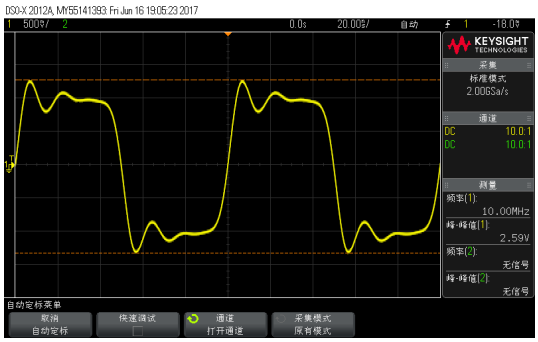
(a) 60 Hz



(b) 10 kHz



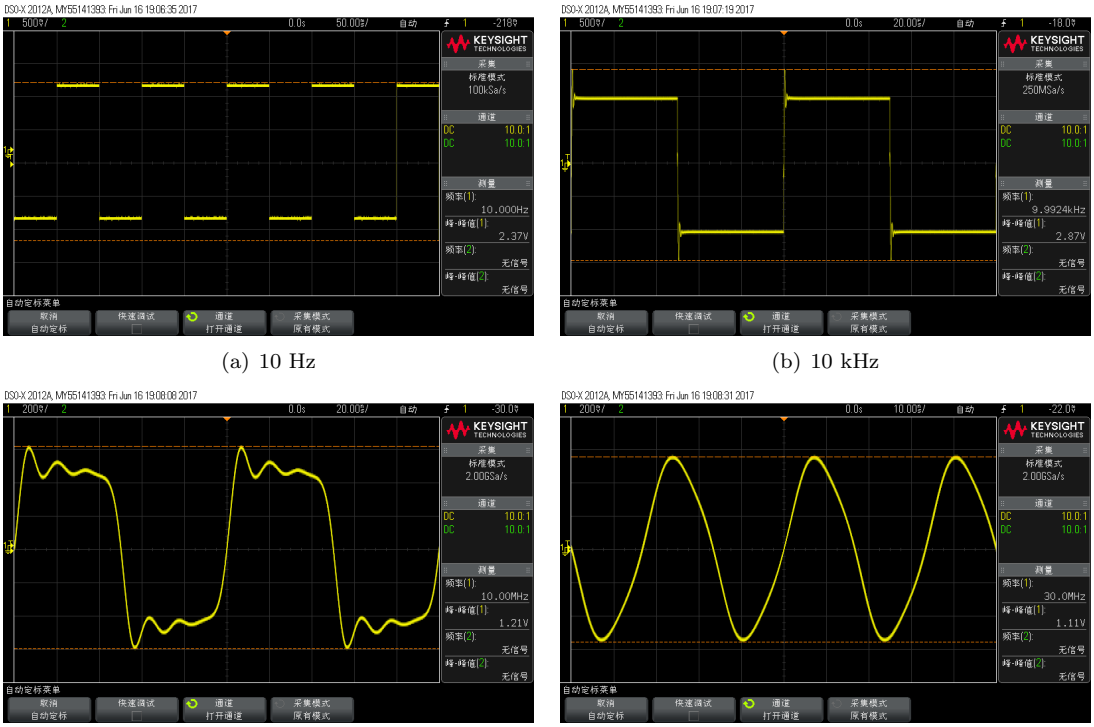
(c) 1 MHz



(d) 10 MHz

Figure 5: 0.082 μF capacitor

3.3 Array of resistors



(a) 10 Hz

(b) 10 kHz

(c) 10 MHz

(d) 30 MHz

Figure 6: $0.082\,\mu$F capacitor

4 Reference

4.1 References

1. Lab1 Manual