Bilkent University EEE102

Lab 01 Report:

Introduction to Digital Oscilloscopes

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Purpose:

The aim of this lab was to learn how to work oscilloscopes and breadboard. So that we can use them later.

Methodology:

In this lab, we are wanted to use oscilloscope and generate some signals. For that, before the lab, we made some researches about oscilloscope and breadboard.

-In first step; we are wanted to use compensation signal of the oscilloscope and compensate our probes.

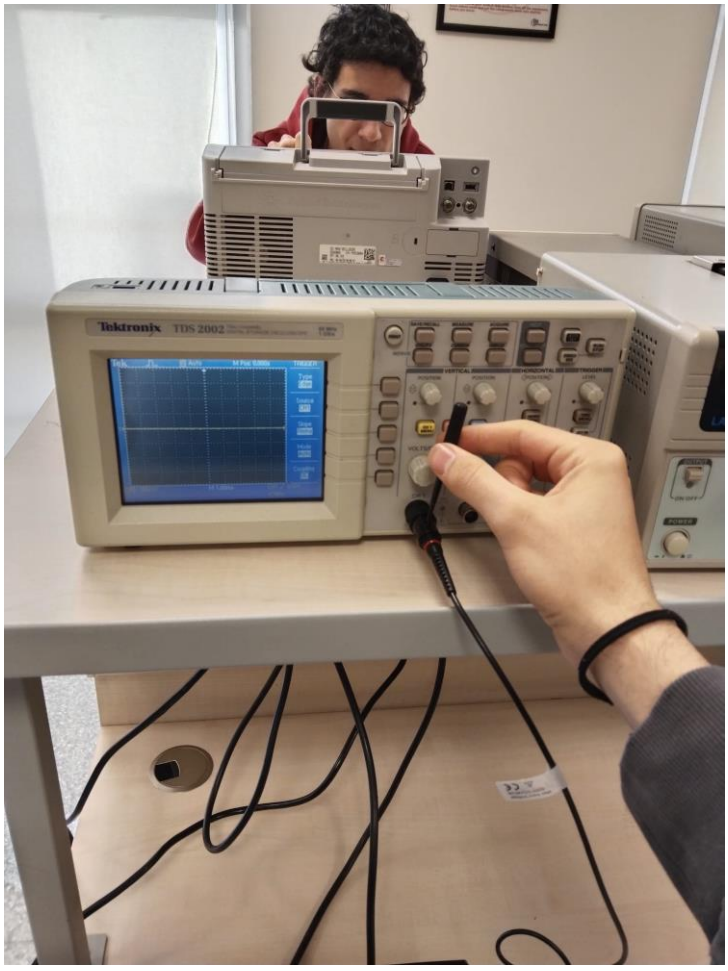

Figure 1: Compensating probe

-In second step, we are wanted to use signal generator and apply 5 Vpp sinusoidal signal with frequency 1 kHz and use the positive and negative edges.

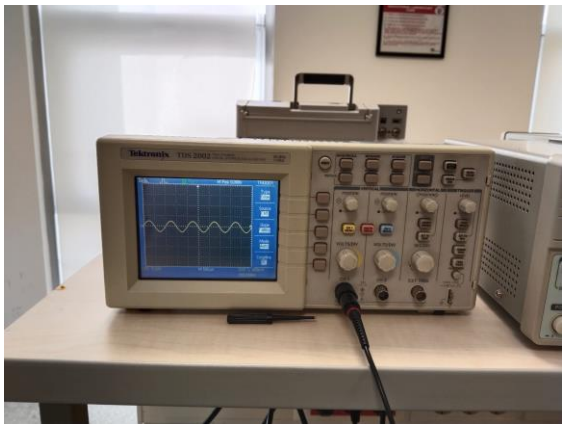

Figure 2: Negative edge triggering

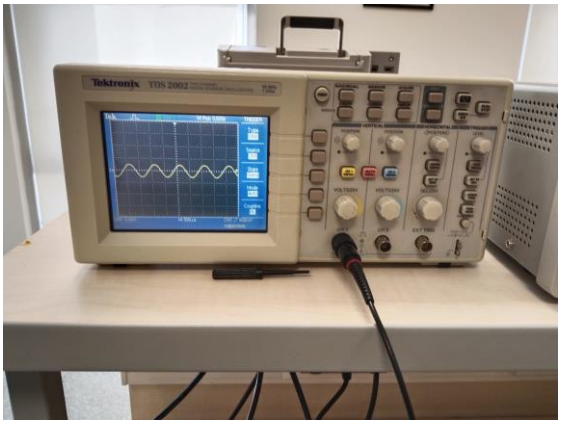

Figure 3: Positive edge triggering

-In the third step, we are wanted to apply 1 Vpp triangular wave with 2 kHz frequency and observe the trigger knob's effect. So I experimented effect of trigger knob. The trigger function made the waveforms less steady.

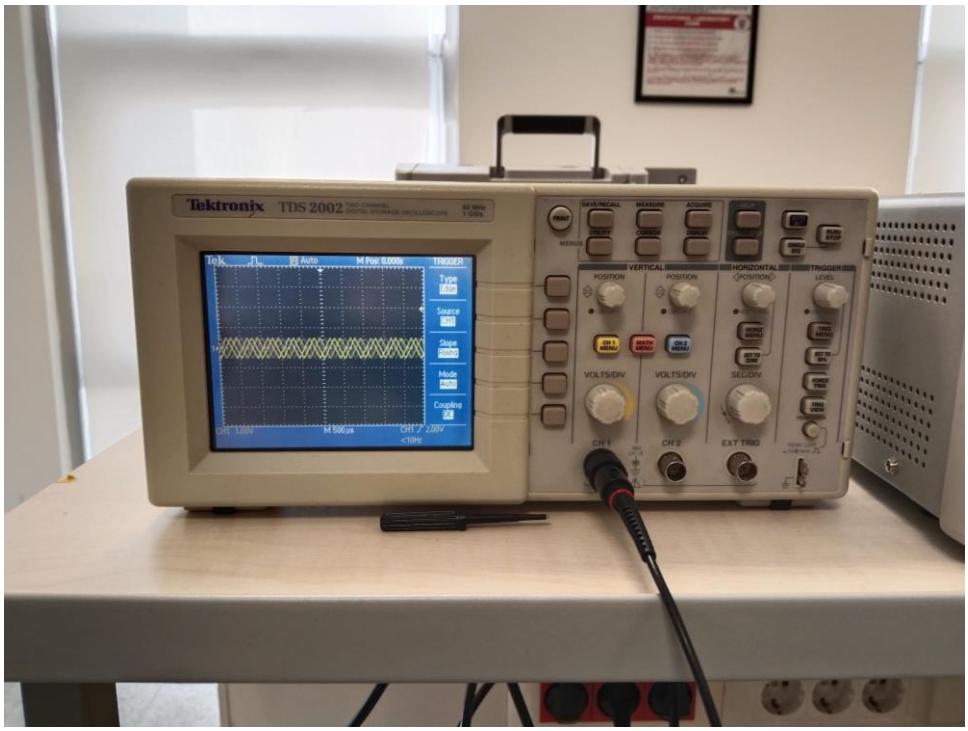

Figure 4. Effect of trigger knob

-At the fourth step, we are asked some questions and then apply 1 Vpp square wave with 5 kHz frequency and try all the acquisiton modes.

Q1. What is digital to analog converter (DAC)?

Answer: It is a system that converts a digital signal to analog signal.

Q2. What is analog to digital converter (ADC)?

Answer: It is a system that converts a analog signal to digital signal.

Q3. What are they used for?

Answer: There is a lot of usable areas. For example DACs can be used in televisions and phones for converting digital video data into analog video signals.

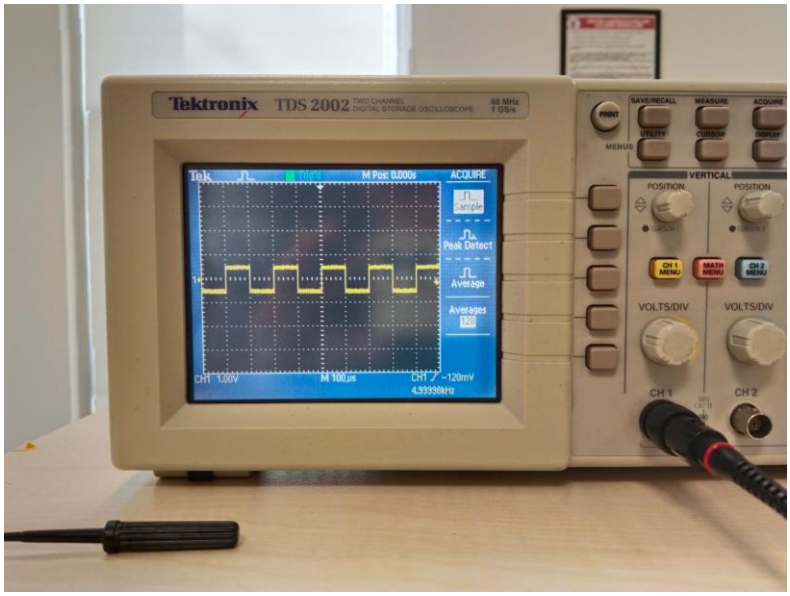

Figure 5. Sample acquisition

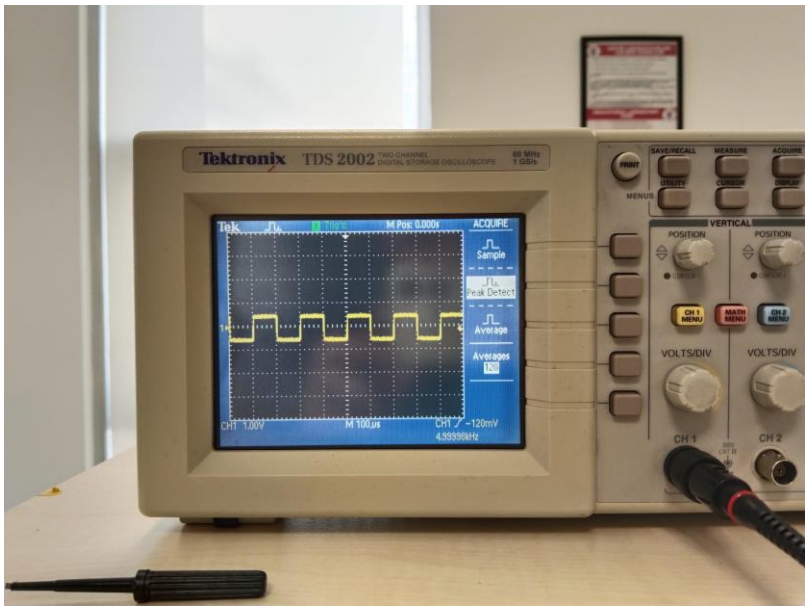

Figure 6. Peak detect acquisiton

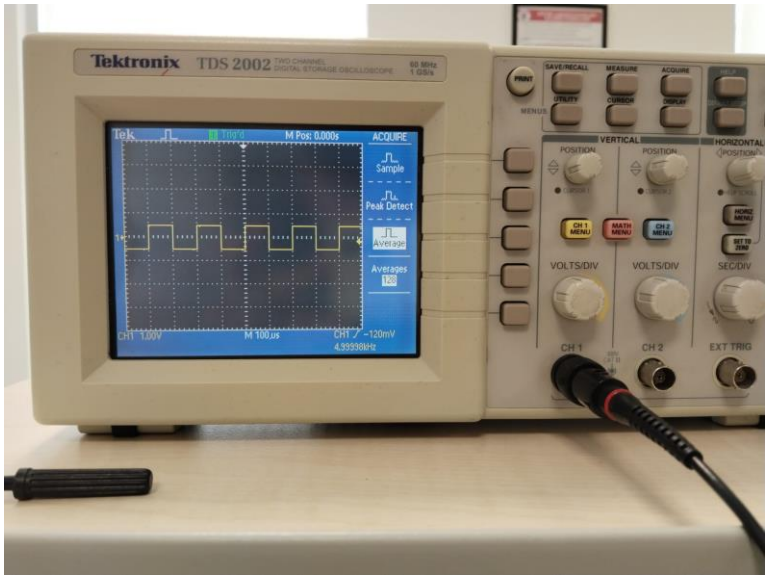

Figure 7. Average acquisiton

-In fifth step, we are wanted to generate a sinusiodal with 2 Vpp amplitude and 1 kHz frequence and also apply a DC offset of 1V. Then we are wanted to use DC and AC couplings.

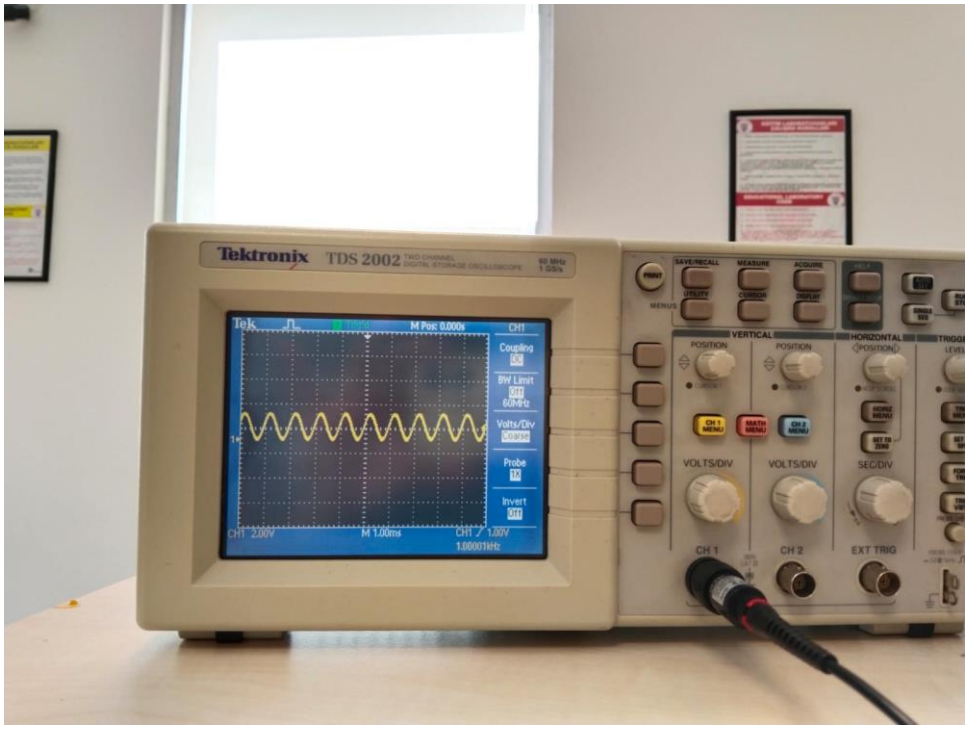

Figure 8. DC coupling

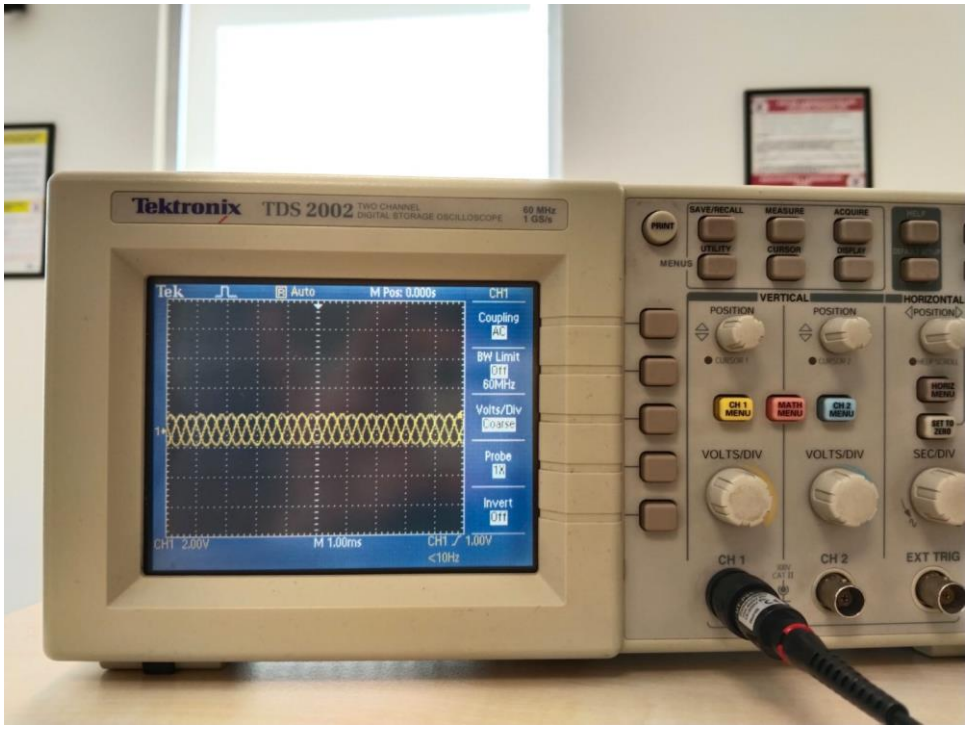

Figure 9. AC coupling

As we can see from the Figure 8 and 9, AC coupling removes the DC off set.

-In the sixth and last step, we are wanted to use breadboard and set up the following circuit; then measure phase differences between X and Y.

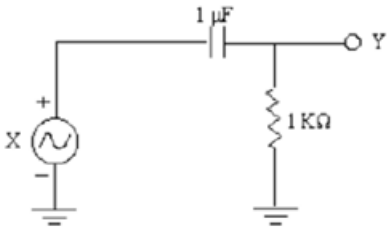

Figure 10. Circuit

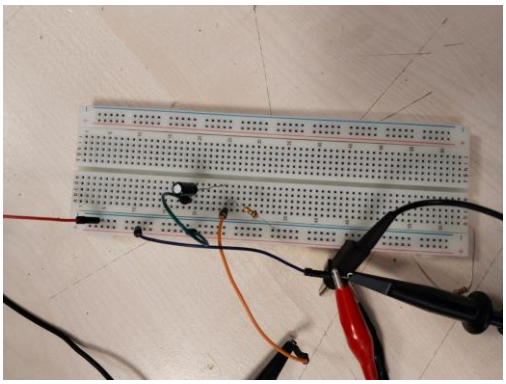

Figure 11. Circuit on breadboard

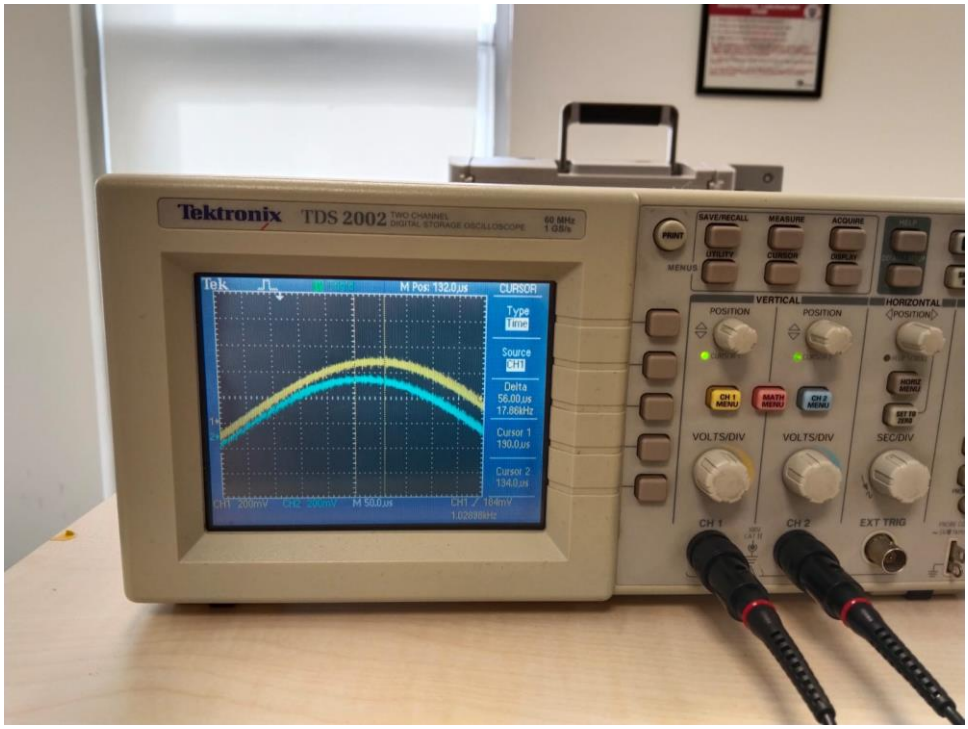

Figure 12. Phase difference of 2 Vpp-1kHz circuit (56 nanosecond)

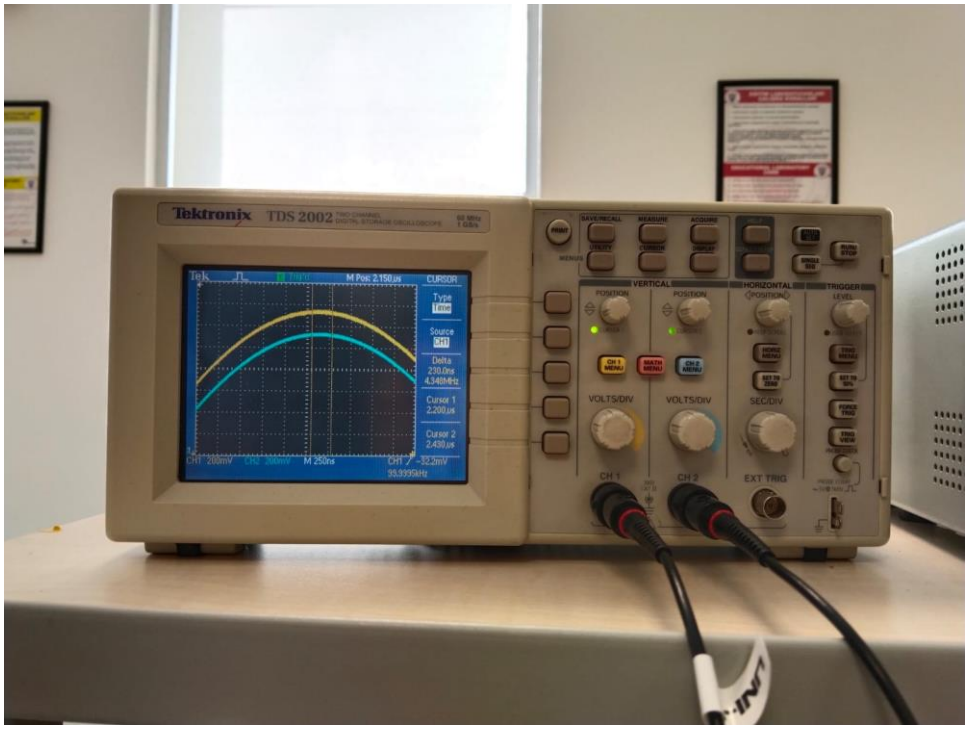

Figure 13. Phase difference of 2 Vpp-100kHz circuit (230 nanosecond)

CONCLUSION:

As a result of this experiment I learned how to use oscilloscopes and breadboards. Also I learned that what is phase difference, how can we calculate it and what is the differences of AC/DC couplings. So it was a successfull lab.