Lab2 Report

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Part One: Sinusoidal waveform

1. Turn on oscilloscope , perform the self-detection of both coax measurement probe and oscilloscope.
2. **Signal Generator:** There are two outputs on the front-panel of function generator. nitially set up the two outputs of signal generator with the following parameters respectively, and observe the waveforms on the Oscilloscope.

Sinusoidal waveform ①	Frequency: 1kHz; Amplitude: 1V; Offset: 0V
Sinusoidal waveform ②	Frequency: 2kHz; Amplitude: 0.5V ; Offset: 1V

3. Using a BNC-to-alligator cable, connect the oscilloscope probe(Set to 1X) tip to the red lead from the function generator and the probe's ground clip to the black lead.
4. Connect the coax measurement probe from Channel 1 of the **Osciloscope** to the Output 1 of the **Signal Generator**, connect the coax measurement probe from Channel 2 of the **Osciloscope** to the Output 2 of the **Signal Generator,** respectively.

5. Osciloscope

(1) Press "Autoset".

(2) Be sure the CH1 Coupling is DC, CH2 Coupling is DC, and do not change the other oscilloscope settings .

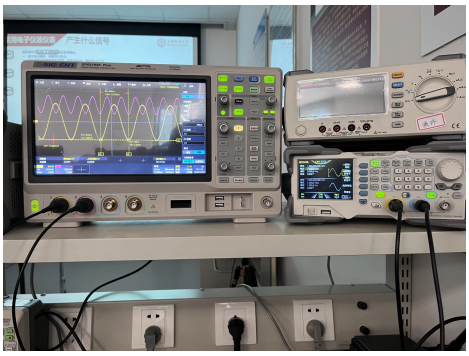
(3) Measure Sinusoidal waveform①. Adjust the oscilloscope until you see about 2~5 duty cycles of the sinusoidal waveform on the screen.

a) With the cursors, measure Vp (peak), Vpp (peak-to-peak) , Period and Frequency. Record these values. __/4pt

Period: 986 μs Frequency: 1.014 kHz

Vp (peak): 1.01V Vpp (peak-to-peak): 2.04V

b) Paste photos of experiment result below. The corresponding waveform parameters should be displayed. __/4pt



I use the cursors to measure the parameters above

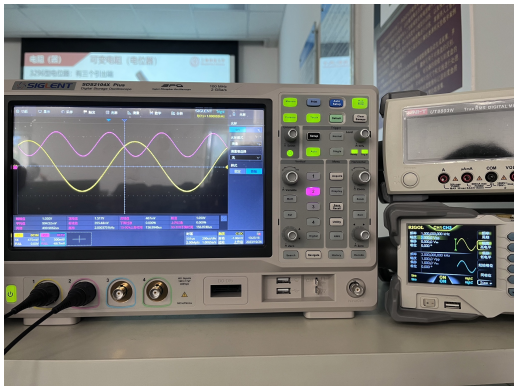
(4) Measure Sinusoidal waveform②. Adjust the oscilloscope until you see about 2~5 duty cycles of the sinusoidal waveform on the screen.

a) Use the Built-in function in the **measure** menu to measure Vp (peak), Vpp (peak-to-peak) , Period and Frequency. Record these values. __/4pt

Period: 500.1 μs Frequency: 1999 kHz

Vp (peak): 0.516 V Vpp (peak-to-peak): 1.033 V

b) Paste photos of experiment result below. The corresponding waveform parameters should be displayed. __/4pt



I just press the "measurement" button to measure the parameters above.

c) Press "Probe Setup", and toggle between "Set to 1X" and "Set to 10X". See what happens. __/4pt

The signal's amplitude declined to $\frac{1}{10}$ of the original

d) Be sure "Probe Setup" to be "1X". Change CH2 "Coupling-DC" to "AC", and see what happens. __/4pt

The offset of the signal disappeared (become zero while the other characteristic remains the same.

Part Two: Diode Characteristics

1. Measure the threshold voltage of the diodes with Digital Multimeter.

Warning! To avoid electrical shock or damage to the Meter when testing diodes in a circuit, make sure the power to the circuit is turned off and all capacitors are discharged.

(1) Turn the rotary switch to 

(2) Press the YELLOW function button once  to activate Diode Test.

(3) Connect the red test lead to the  terminal and the black test lead to the COM terminal.

(4) Connect the red probe to the **anode** side and the black test test lead to the **cathode** side of the diode being tested.

(5) Read the **forward bias voltage**/ threshold voltage value on the display. __/6pt

	threshold voltage
LED_Red	1.695 V
LED_Green	1.808V
LED_Yellow	1.791 V
1N4148	0.551V

(6) If the polarity of the test leads is reversed with diode polarity, the display reading shows ___OL___. __/2pt

(7) Are the threshold voltages of LEDs consistent across colors? __/2pt

No. LEDs with different colors have different threshold voltage.

(8) Summarize how to distinguish the anode and cathode sides of a diode. __/3pt

For general diodes the end with a white wire is cathode
and for LED, the longer lead is anode while the shorter lead is cathode

2. Consider the circuit of Figure 1. For any positive value of Vs, the diode should be forward biased. Once Vs exceeds the threshold voltage, the difference between the source and the threshold voltage drops across R. Thus, as Vs increases, so does the LED current and hence its brightness.

   Build the circuit of Figure 1 using R = 1 kΩ and the **LED- green**.

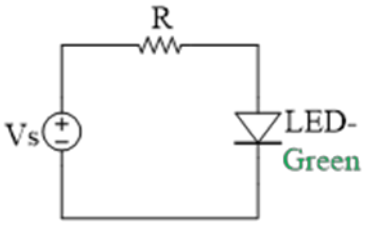


Figure1.

(1) How to get the current value flowing through the LED with a DMM whose current measure fuction is NOT ALLOWED TO BE USED? __/3pt

measure the resistence and the voltage of R
then use the Ohms Law $I=\frac{V}{R}$
since the LED and R are in series so the current of R is the same as LED

(2) Record the measured value of resistor R and construct the circuit in the figure. __/2pt

R (measured) = 1 kΩ

(3) Initially, set the supply voltage Vs to 0V, and measure both the LED voltage V_{LED} and and the voltage across the resistor V_R using DMM, and record the results in Table 1.

(4) Get the current value flowing through the LED without using an Ammeter.

(5) Repeat this process for the remaining source voltages listed.

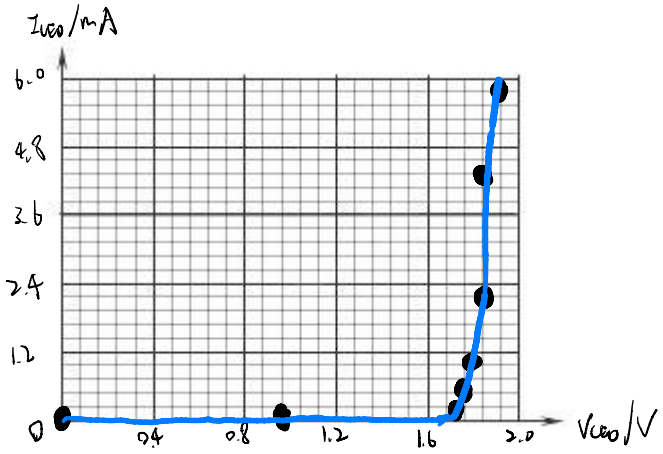
(6) Note the relative brightness level.

Table1 __/16+3pt

Vs	V_{LED}	V_R	I_{LED} (Not directly measured)	What can be said regarding LED brightnes?
0	0	0	0	as the voltage increases the LED brighted up gradually after getting its threshold voltage
1	0.991 V	0	0	
threshold voltage	1.746 V	0.049 V	0.049 mA	
2	1.800 V	0.185 V	0.186 mA	
3	1.872 V	1.105 V	1.105 mA	
4	1.898 V	2.070 V	2.070 mA	
6	1.933 V	4.011 V	4.011 mA	
8	1.954 V	5.97 V	5.97 m A	

1.808

(7) Using the data in table1 to sketch the I_{LED} vs.V_{LED} curve for LED-Green. __/6pt



Label the axis variables and units!

(8) Compare that the I_{LED} vs.V_{LED} curve measured in lab with the Simulated curve. __/6pt

The curve measured in lab and the simulated curve showed the same growth trend. with the current being nearly zero before reaching the threshold voltage, and after reaching the threshold voltage, both the current continue to increase and in lab the LED started to bright up.

3. As shown in Figure2, replace DC voltage source Vs in figure1with pulse waveform Vpulse descirbed in step1, build the circuit on the breadboard.

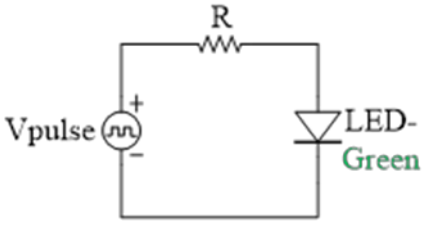


Figure2.

(1) **Signal Generator Setup:** Turn on the function generator and set the controls to create a pulse waveform with a 1 kHz frequency, 50 % duty cycle, 5 volt peak-to-peak amplitude and an offset of +2.5 volt such that the pulse waveform is zero volts during the low portions and +5 volts at the high portions. __/2pt

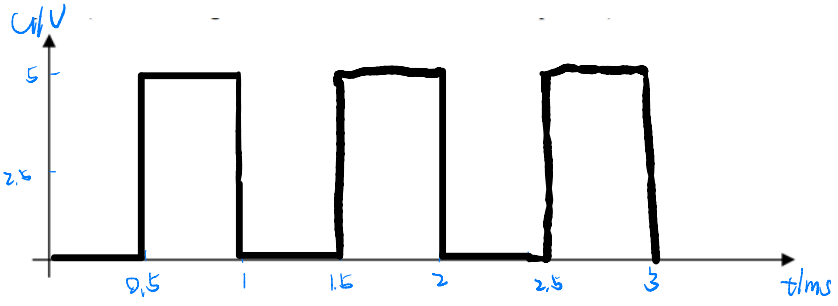
(2) **Oscilloscope :**

a) Connect the coax measurement probe from Channel 1 to the output of the Signal Generator

b) Press "Autoset" .

c) Press "CH1". To better demonstrate the DC offset in step(1), DC ("DC"or "AC") Coupling is set to observe the pulse waveform.

d) Carefully sketch the waveform (DC couple), *including the time and voltage details*. __/6pt



Duty cycle = 50 %

(3) construct the circuit below on your breadboard. The LED should be illuminated slightly. Decrease the frequency of the function generator until your eyes can just start to see the LED flickering on and off. What frequency is it? . __/6pt

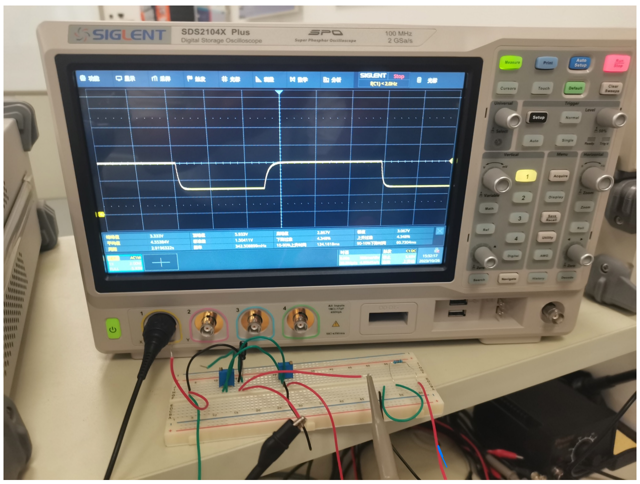
40Hz

Part Three: Capacitor Characteristics

1. Build the circuit in the schematic (Figure1 in Prelab2) on the breadboard. Two 500 Ω resistors are replaced by a W102 potentiometer.

2. Set the DC power supply for 6V output, use Oscilloscope to to observe the change of capacitor voltage. Take photographs of your results and paste it into the form.

Note: The waveform results should include change of capacitor voltage when the switch change from on–off –on (or off-on-off), and the corresponding voltage amplitude should be included in your results too. __/6.5pt



When the switch is on. the voltage is 2.867V.

When the switch is off. the voltage is 5.933V.

on:

off:

TA signature: