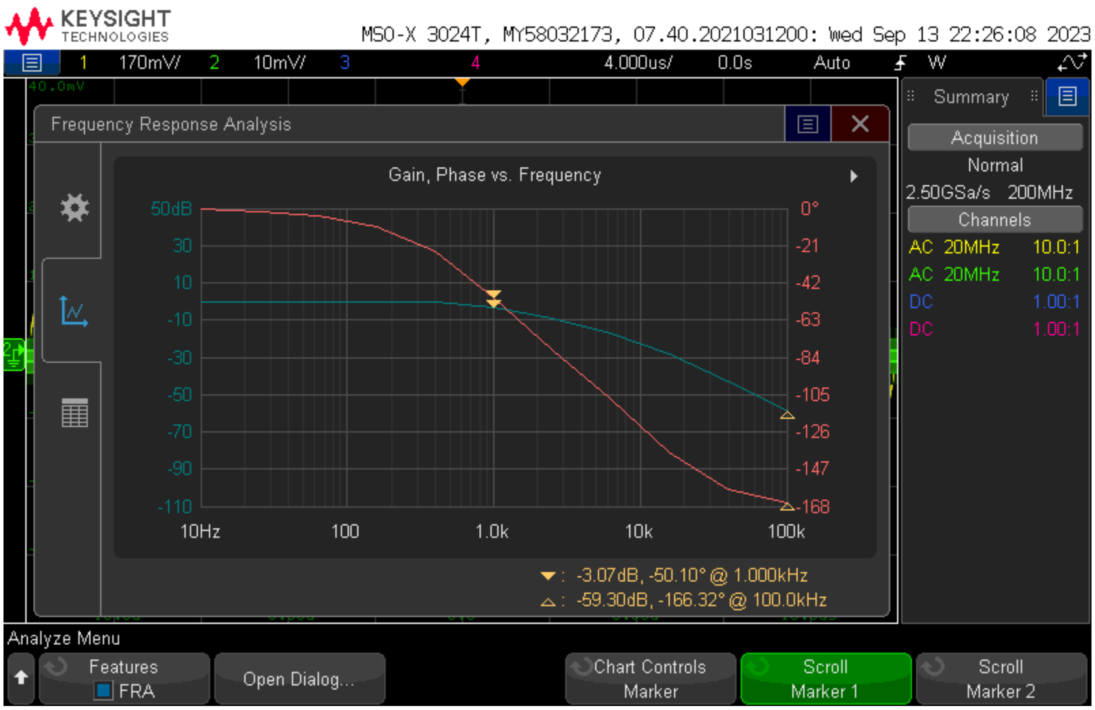
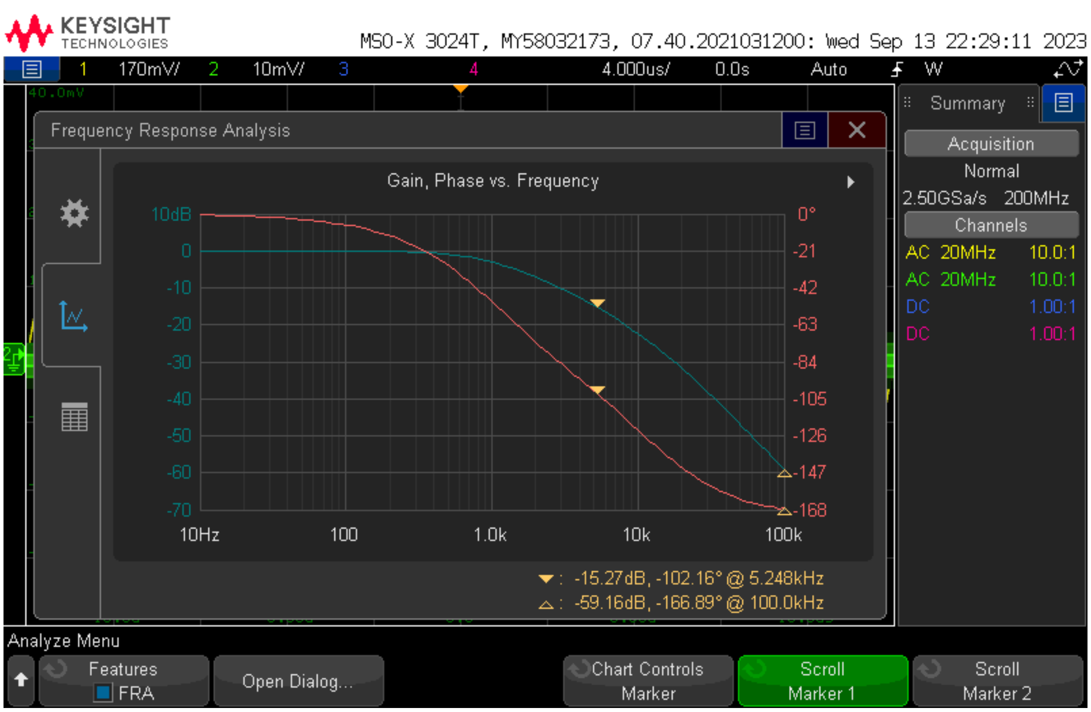
Dominic Treadwell | UIN:72004254 Date: 9/17/2023
Joaquin Salas | UIN:731000141 ECEN-325-512

ECEN 325 - Lab Report 2

1a) Low Pass @3dB



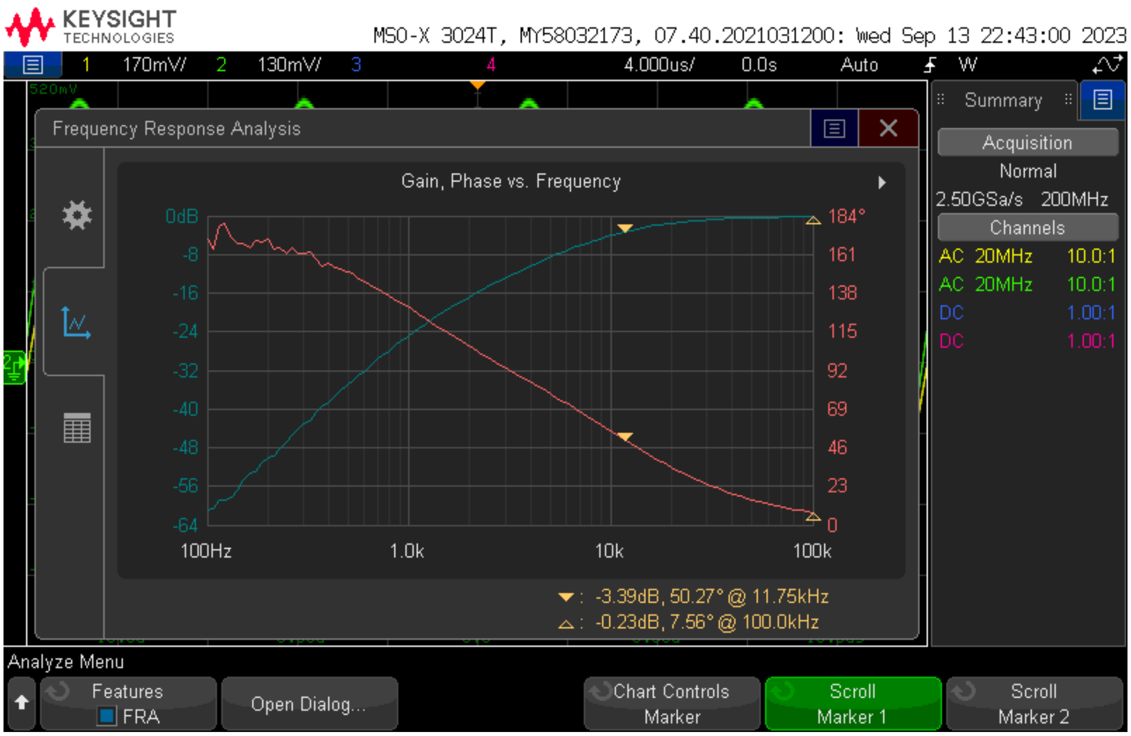
1b) Low Pass @5kHz



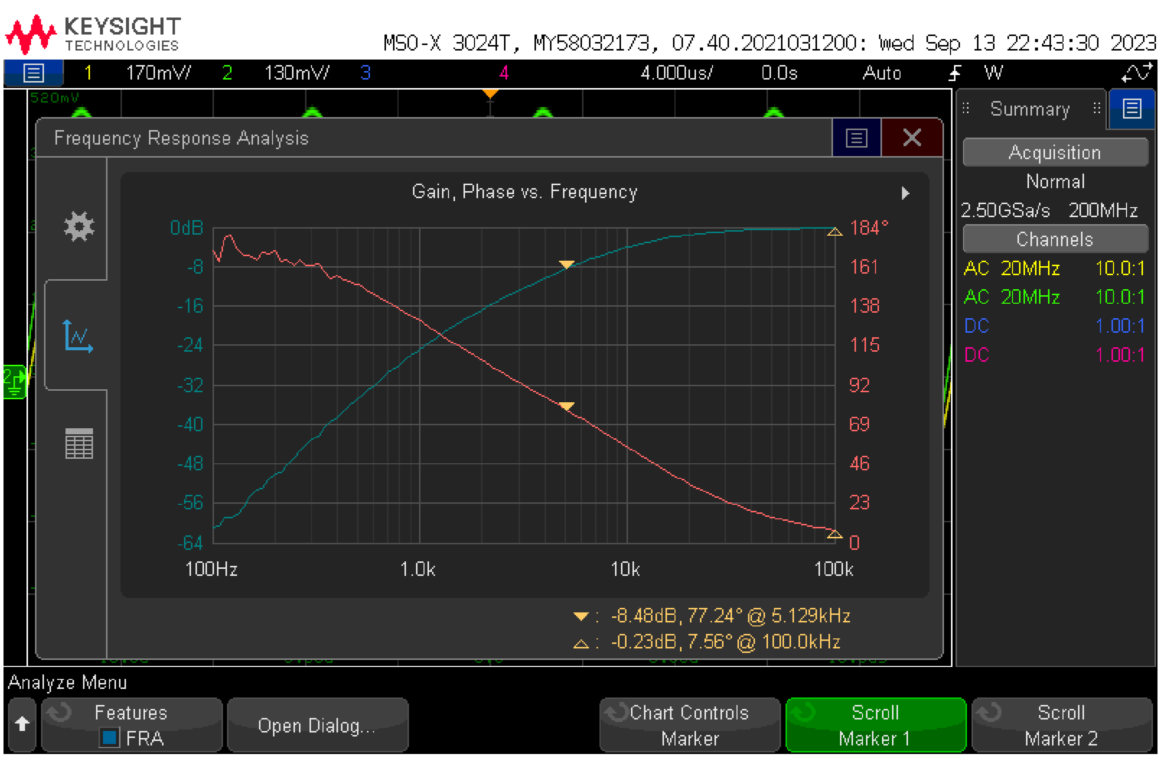
Dominic Treadwell | UIN:72004254
Joaquin Salas | UIN:731000141

Date: 9/17/2023
ECEN-325-512

1c) High Pass Bode Plot



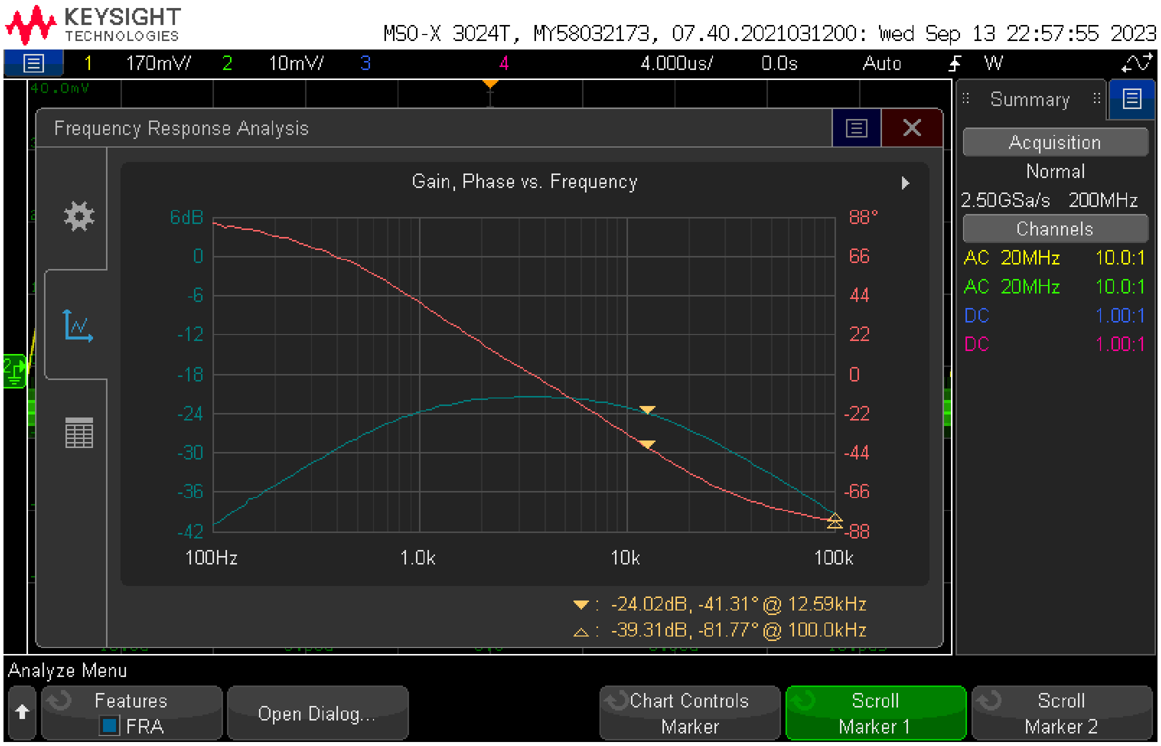
1d) High pass @5kHz



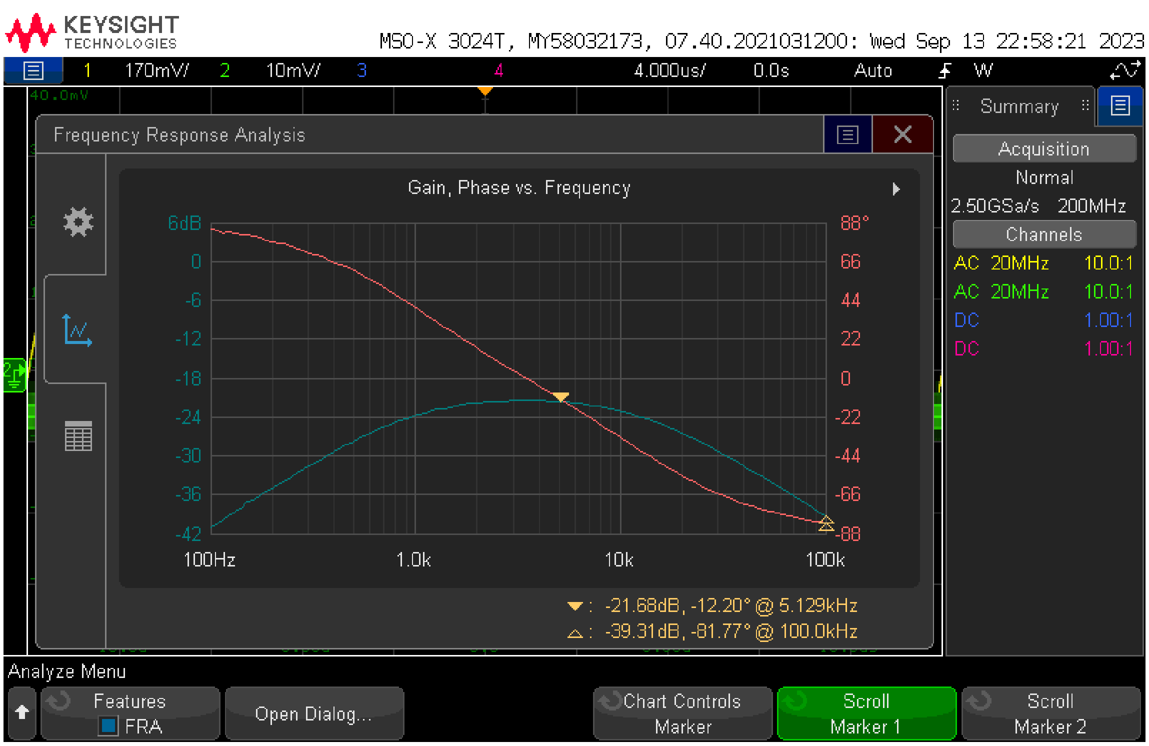
Dominic Treadwell | UIN:72004254
Joaquin Salas | UIN:731000141

Date: 9/17/2023
ECEN-325-512

1e) Bandpass 3dB



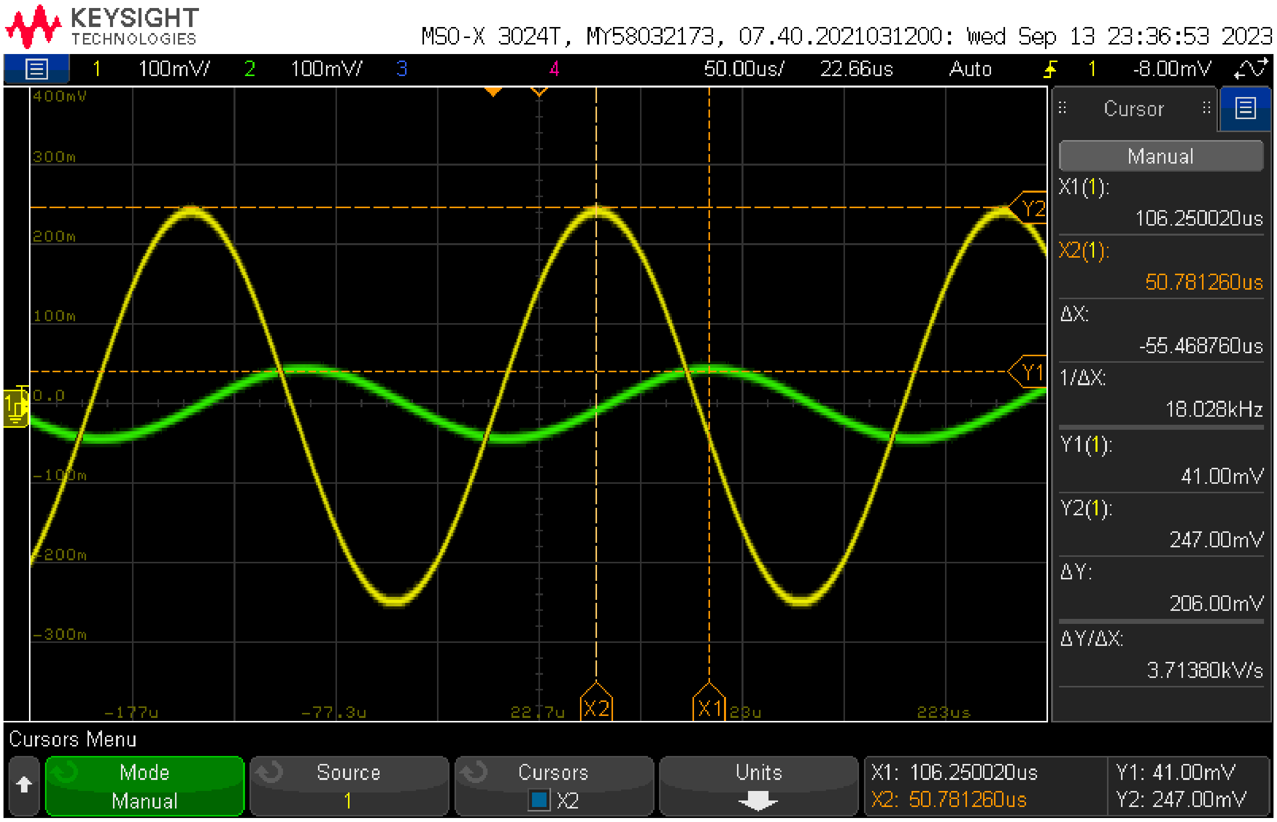
1f) Bandpass @5kHz



Dominic Treadwell | UIN:72004254
Joaquin Salas | UIN:731000141

Date: 9/17/2023
ECEN-325-512

2a) Low Pass time-domain waveforms for $V_i(t) = 0.5 sin(2\pi 5000t)$



$|H| = \frac{V_{out}}{V_{in}} = \frac{41mV}{247mV} = 0.166$

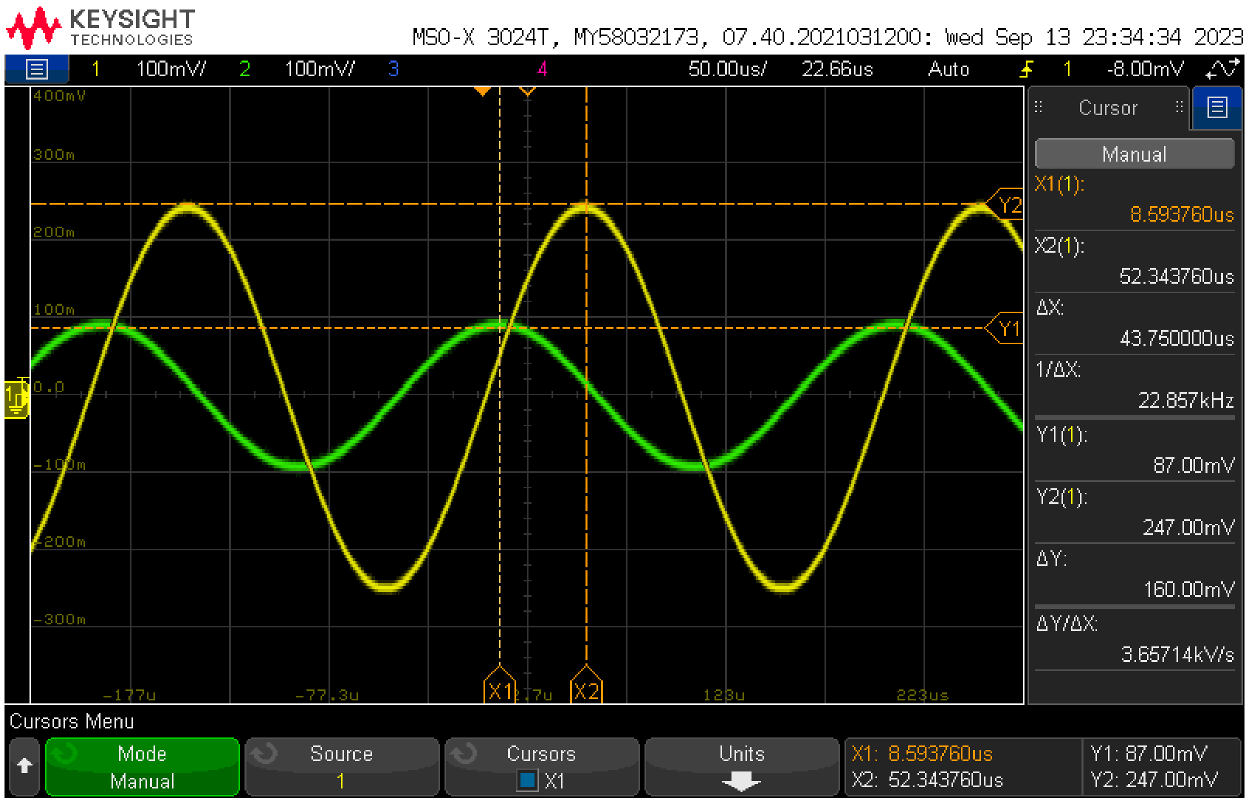
$\Delta t = (106.25\mu S - 50.78\mu S) = -55.47\mu S \Rightarrow T = \frac{1}{f} = \frac{1}{5000} = 200s,$

$\angle H = \frac{\Delta t}{T} \times 360^{\circ} = \frac{-55.47\mu S}{200\mu S} \times 360^{\circ} = -99.85^{\circ}$

Dominic Treadwell | UIN:72004254
Joaquin Salas | UIN:731000141

Date: 9/17/2023
ECEN-325-512

2b) High Pass time-domain waveforms for $V_i(t) = 0.5sin(2\pi 5000t)$



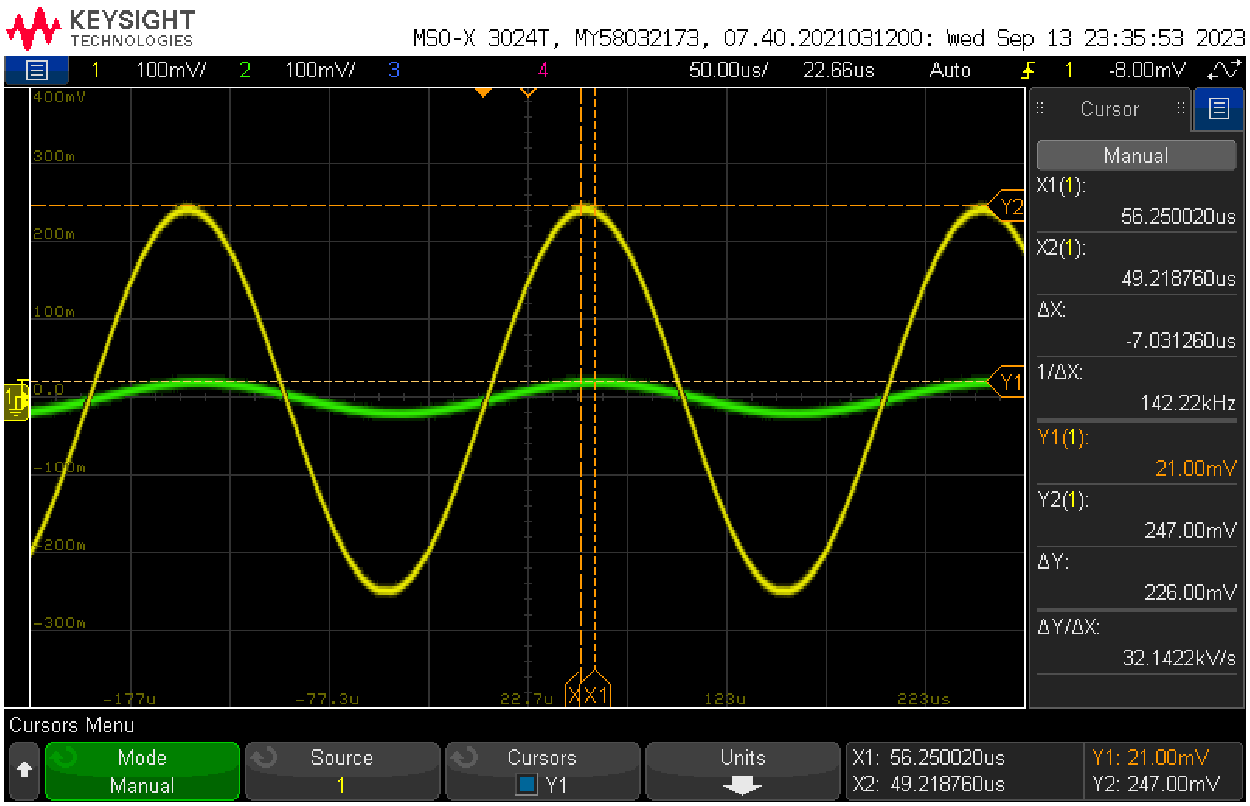
$$|H| = \frac{V_{out}}{V_{in}} = \frac{87mV}{247mV} = 0.352$$

$$\Delta t = (52.34\mu S - 8.59\mu S) = 43.75\mu S \Rightarrow T = \frac{1}{f} = \frac{1}{5000} = 200\mu S,$$

$$\angle H = \frac{\Delta t}{T} \times 360^\circ = \frac{43.75\mu S}{200\mu S} \times 360^\circ = 78.75^\circ$$

Dominic Treadwell | UIN:72004254
Joaquin Salas | UIN:731000141

2c) Band Pass time-domain waveforms for $V_i(t) = 0.5sin(2\pi 5000t)$



$$|H| = \frac{V_{out}}{V_{in}} = \frac{21mV}{247mV} = 0.085$$

$$\Delta t = (56.25\mu S - 49.22\mu S) = -7.03\mu S \Rightarrow T = \frac{1}{f} = \frac{1}{5000} = 200\mu S,$$

$$\angle H = \frac{\Delta t}{T} \times 360^\circ = \frac{-7.03\mu S}{200\mu S} \times 360^\circ = -12.65^\circ$$

Data Table:

The provided data table is a good way to organize and present our range of calculated, simulated, and measured values. It is divided into three distinct sections: Lowpass, High Pass, and Band Pass, which correspond to different stages and aspects of the experiment or analysis. This format simplifies the detection of inconsistencies, allows for easy comparison of results across different methods or frequency domains, and ensures transparency and data integrity. By structuring data in this manner, we can efficiently manage and reference our findings, enhancing the clarity and reliability of our work.

	Calculated	Simulated	Measured
Lowpass -3dB frequency	1kHz	0.88 kHz	1 kHz

Dominic Treadwell | UIN:72004254
Joaquin Salas | UIN:731000141

Date: 9/17/2023
ECEN-325-512

Lowpass Passband Gain	0 dB	0 dB	0 dB
Lowpass Phase @ 5kHz	-90○	-90○	-102.2○
Lowpass Magnitude @ 5kHz	-15 dB	-16.3 dB	-15.27 dB
Lowpass Input Voltage Vi(t) = 0.5 sin(2π5000t)	0.969 V	0.998 V	0.247 V
Lowpass Output Voltage Vi(t) = 0.5 sin(2π5000t)	0.484 V	0.182 V	0.041 V
Lowpass Phase Difference Vi(t) = 0.5 sin(2π5000t)	-100.2○	-115.2°	-99.85°
Highpass -3dB frequency	10 kHz	8.51 kHz	11.75 kHz
Highpass Passband Gain	0 dB	0 dB	0 dB
Highpass Phase @ 5kHz	75	60	77.24
Highpass Magnitude @ 5kHz	-6 dB	-6.12 dB	-8.48 dB
Highpass Input Voltage Vi(t) = 0.5 sin(2π5000t)	0.268 V	0.997 V	0.247 V
Highpass Output Voltage Vi(t) = 0.5 sin(2π5000t)	0.134 V	0.500 V	0.087 V
Highpass Phase Difference Vi(t) = 0.5 sin(2π5000t)	74.88°	57.6°	78.75°
Bandpass -3dB frequency	5 kHz	12 kHz	12.59 kHz
Bandpass Passband Gain	-20 dB	-20.5 dB	-21 dB
Bandpass Phase @ 5kHz	-12○	-12○	-12.20○
Bandpass Magnitude @ 5kHz	- 20 dB	-20.5 dB	-21 dB
Bandpass Input Voltage Vi(t) = 0.5 sin(2π5000t)	0.978 V	0.994 V	0.247 V
Bandpass Output Voltage Vi(t) = 0.5 sin(2π5000t)	0.489 V	0.793 V	0.021 V
Bandpass Phase Difference Vi(t) = 0.5 sin(2π5000t)	-8.44°	34.74°	-12.65°

Dominic Treadwell | UIN:72004254
Joaquin Salas | UIN:731000141

Date: 9/17/2023
ECEN-325-512

Results:

In this lab experiment, we conducted simulations on three distinct circuits: the Lowpass, Highpass, and Bandpass circuit configurations. The data table above shows a range of parameters obtained through calculations, simulations, and practical measurements. After examining the data, it becomes apparent that there are inconsistencies, potentially due to the selection of resistor values that may not have adequately accounted for loading effects. These variations underscore the significance of considering loading and impedance factors when designing and implementing electronic circuits.

We chose resistor and capacitor values with ease of use in mind for our circuit construction in the lab. Our intention was to match all the resistor values to simplify the assembly process. However, we inadvertently selected equal resistor values, which deviated from how we were supposed to choose. This decision ended up affecting the circuit's performance and led to discrepancies between our simulated results and our calculations.