Digital Communication Lab

Laboratory report submitted for the partial fulfillment
of the requirements for the degree of

Bachelor of Technology
in
Electronics and Communication Engineering

by

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21UEC072

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Contents

Chapter *1*

Experiment - 1

1.1 AIM

1. To generate Delta modulated and Demodulated signal.

2. Determine the conditions for slope overloading and step size.

1.2 Apparatus Used

1. LM393 (Comparator)	2. LM741	3. 74LS74 (D Flip Flop)	4. Resistance
5. Capacitor	6.Connecting wires	7.Breadboard	8.DC Power Supply
9.DSO Probe	10.Function Generator	11.Digital Storage Oscilloscope	

1.3 Theory

Delta Modulation (DM) is a simplified PCM. In some type of signals, the neighboring samples are closely correlated with each other. Therefore, once a sample value is known this enables the determination of the following sample values most probably. Thus, instead of sending the real value of each sample at each time, differences (variances) between adjacent samples are sent in DM.
In DM, two-level quantizer and one-bit coding is used. Transmitted code pulses do not carry the data related to the message signal itself; instead they carry data regarding the differentials of the message function. The output of a delta modulator is a bit stream of samples at a relatively high rate, the value of each bit being determined according to whether the input message sample amplitude has increased or decreased relative to the previous sample.

1.3.1 Block Diagram of Delta Modulation and Demodulation

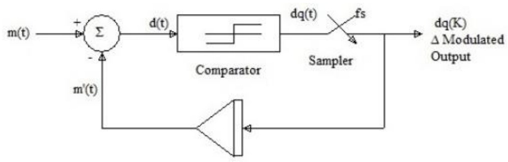


Figure: Delta Modulator

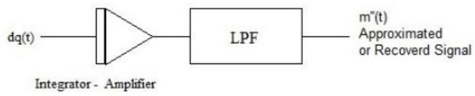


Figure: Delta Demodulator

Condition to avoid Slope overloading

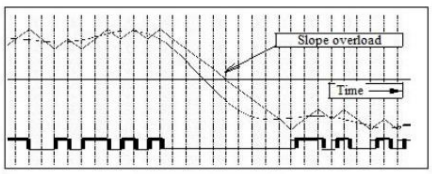


Figure: (a) Slope overload

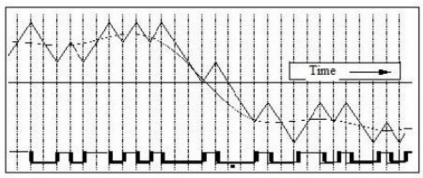


Figure: (b)Increased step size to reduce slope overload

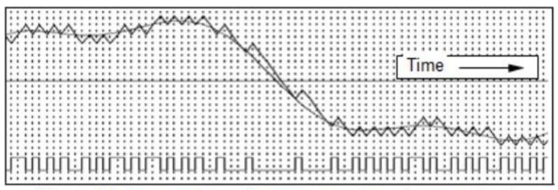


Figure: (c) increased sampling rate to reduce slope overload

This occurs when the sawtooth approximation cannot keep up with the rate-of-change of the input signal in the regions of greatest slope. The step size is reasonable for those sections of the sampled waveform of small slope, but the approximation is poor elsewhere. This is ‘slope overload’, due to too small a step. Slope overload is illustrated in Figure (a).

• To reduce the possibility of slope overload the step size can be increased (for the same sampling rate).This is illustrated in Figure (b). The sawtooth is better able to match the message in the regions of steep slope.

• An alternative method of slope overload reduction is to increase the sampling rate. This is illustrated in Figure (c), where the rate has been increased by a factor of 2.4 times, but the step is the same size as in Figure (a).

Figure/Connection Diagram:

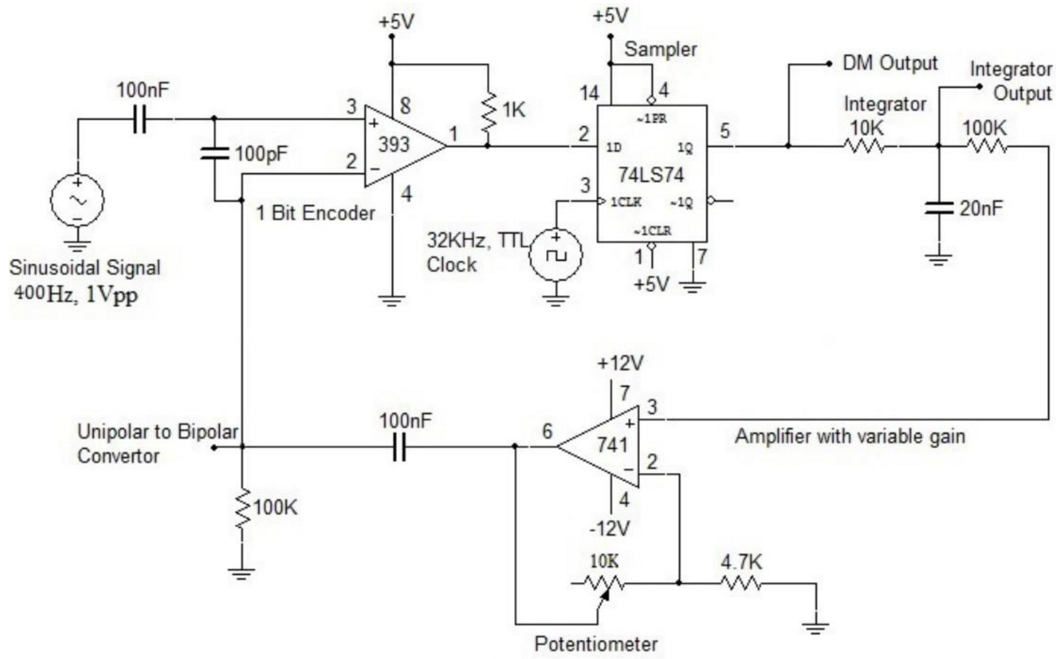


Figure 1.1: Delta Modulation

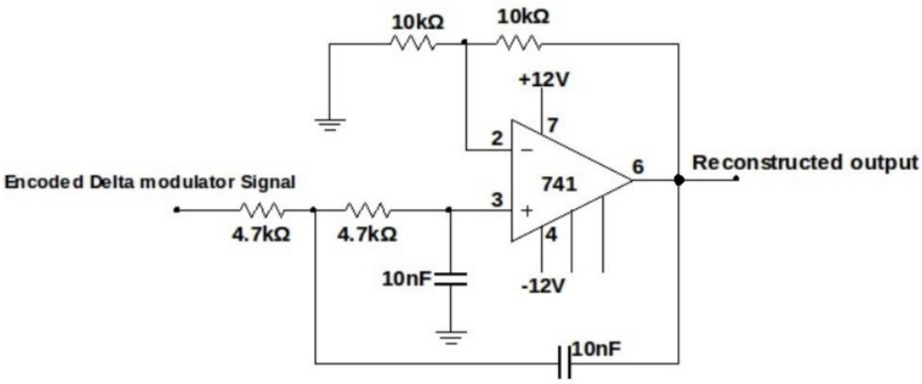


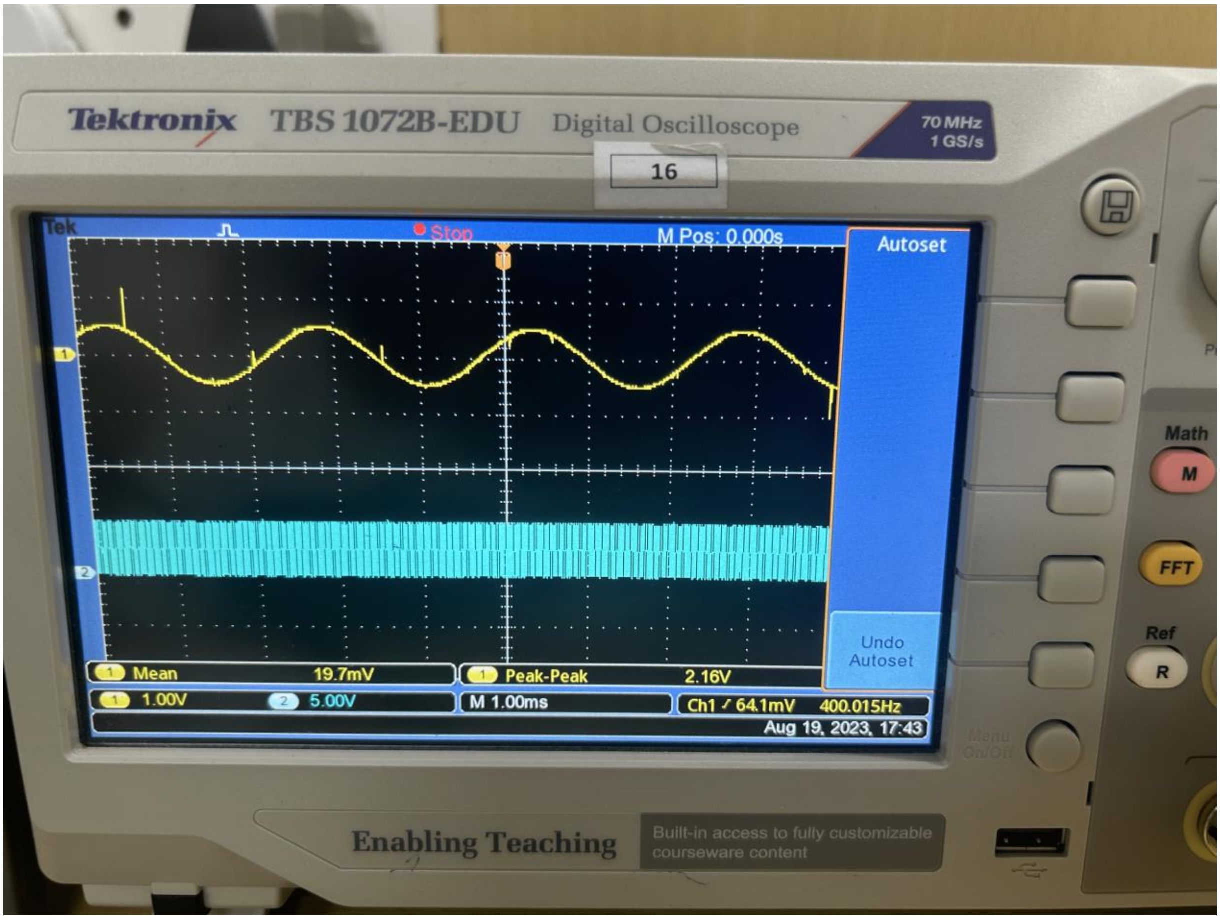
Figure 2: Delta Demodulation

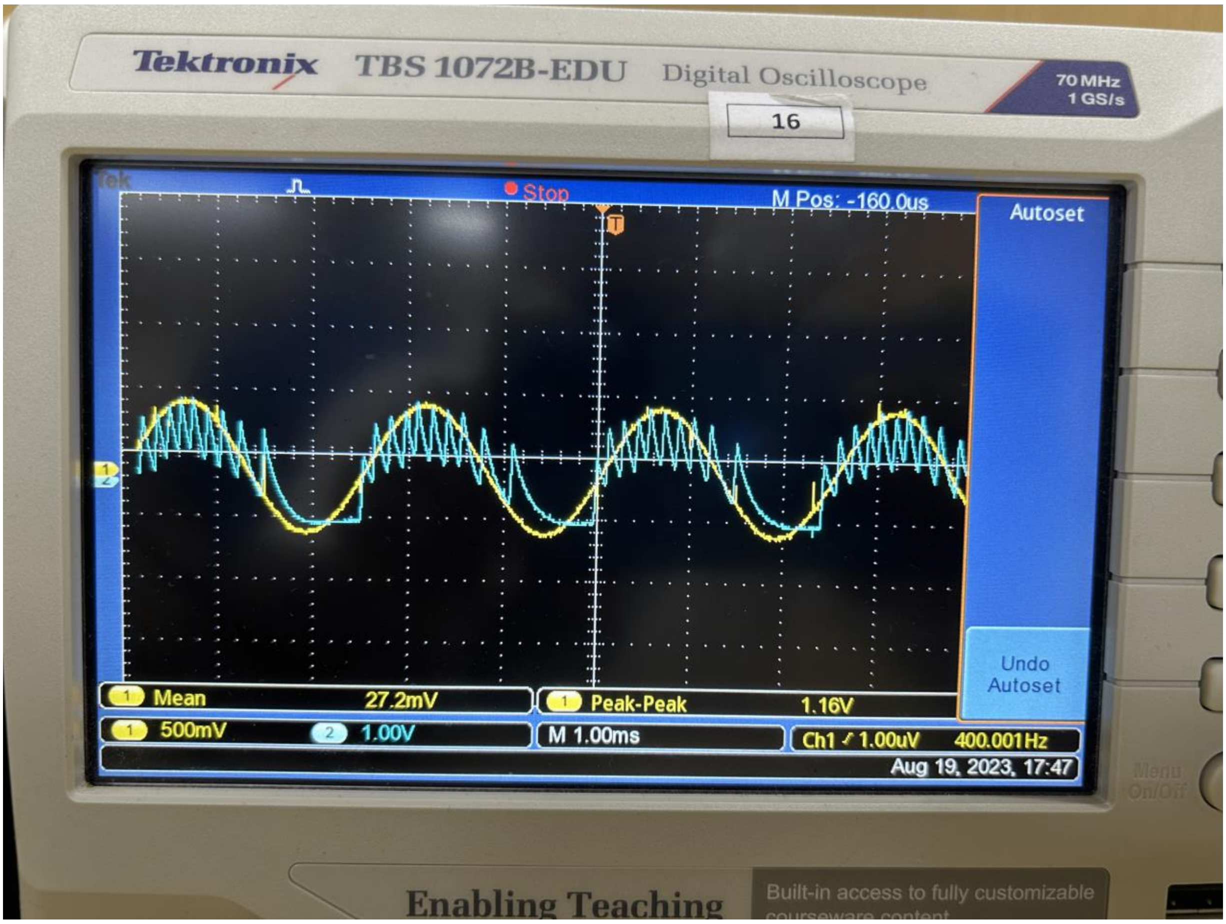
Figure 1.2: Delta Demodulation

1.3.2 Observation Table

S. No.	Sampling Frequency)	Step Size(Volt)
1	32 KHz	0.68
2	16 KHz	1.24
3	8 KHz	2.08
4	4 KHz	3.16

1.4 Result Screenshots

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TBS 1072B-EDU
Digital Oscilloscope
70 MHz
1 GS/s
16
Stop
M Pos: -160.0us
Autoset
Undo Autoset
Mean 27.2mV
Peak-Peak 1.16V
500mV
1.00V
M 1.00ms
Ch1 1.00uV 400.001Hz
Aug 19, 2023, 17:47
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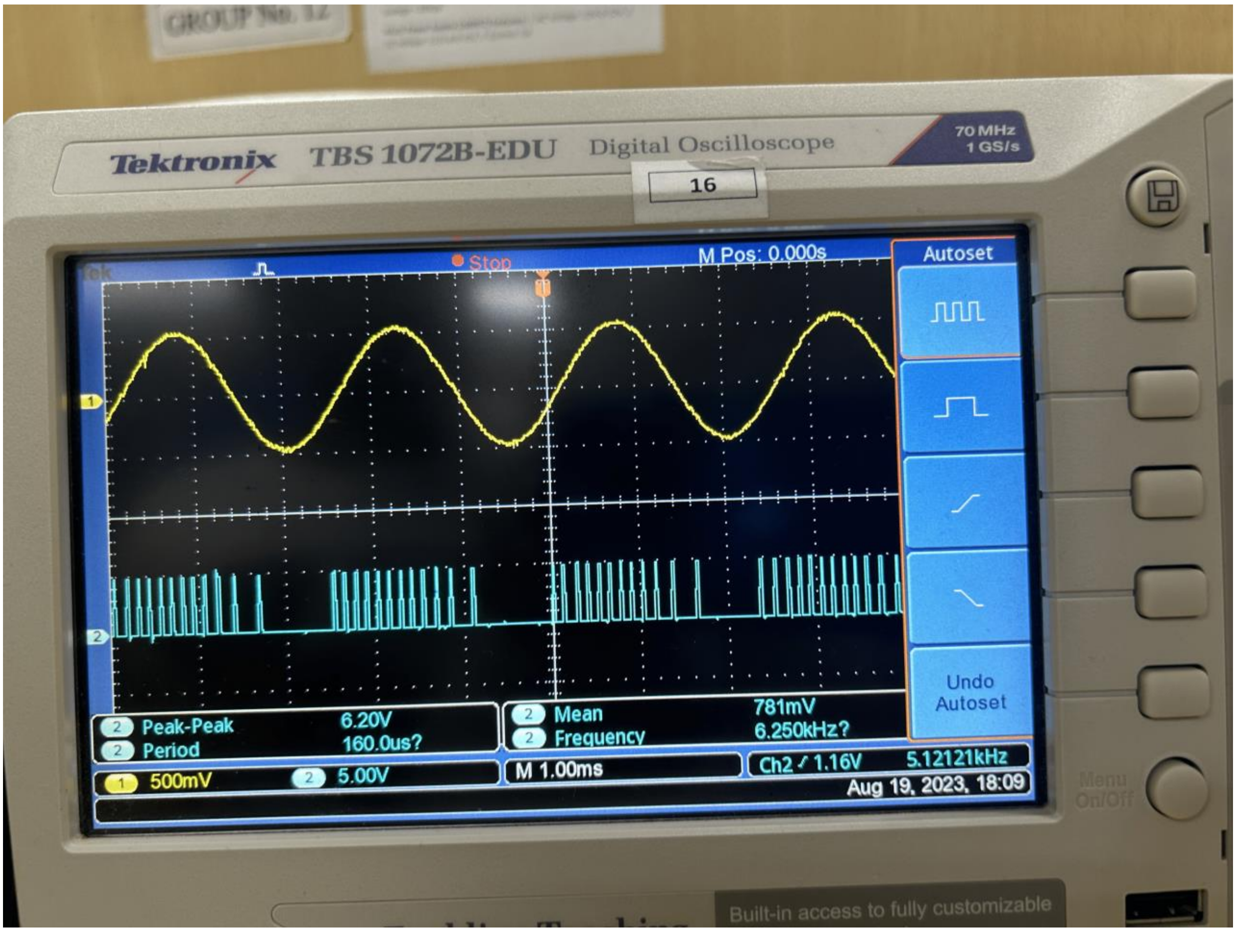
Built-in access to fully customizable


Tektronix
TBS 1072B-EDU
Digital Oscilloscope
70 MHz
1 GS/s
16
Stop
M Pos: 0.000s
Autoset
Undo Autoset
Peak-Peak 6.20V
Period 160.0us?
Mean 781mV
Frequency 6.250kHz?
500mV
5.00V
M 1.00ms
Ch2 1.16V 5.12121kHz
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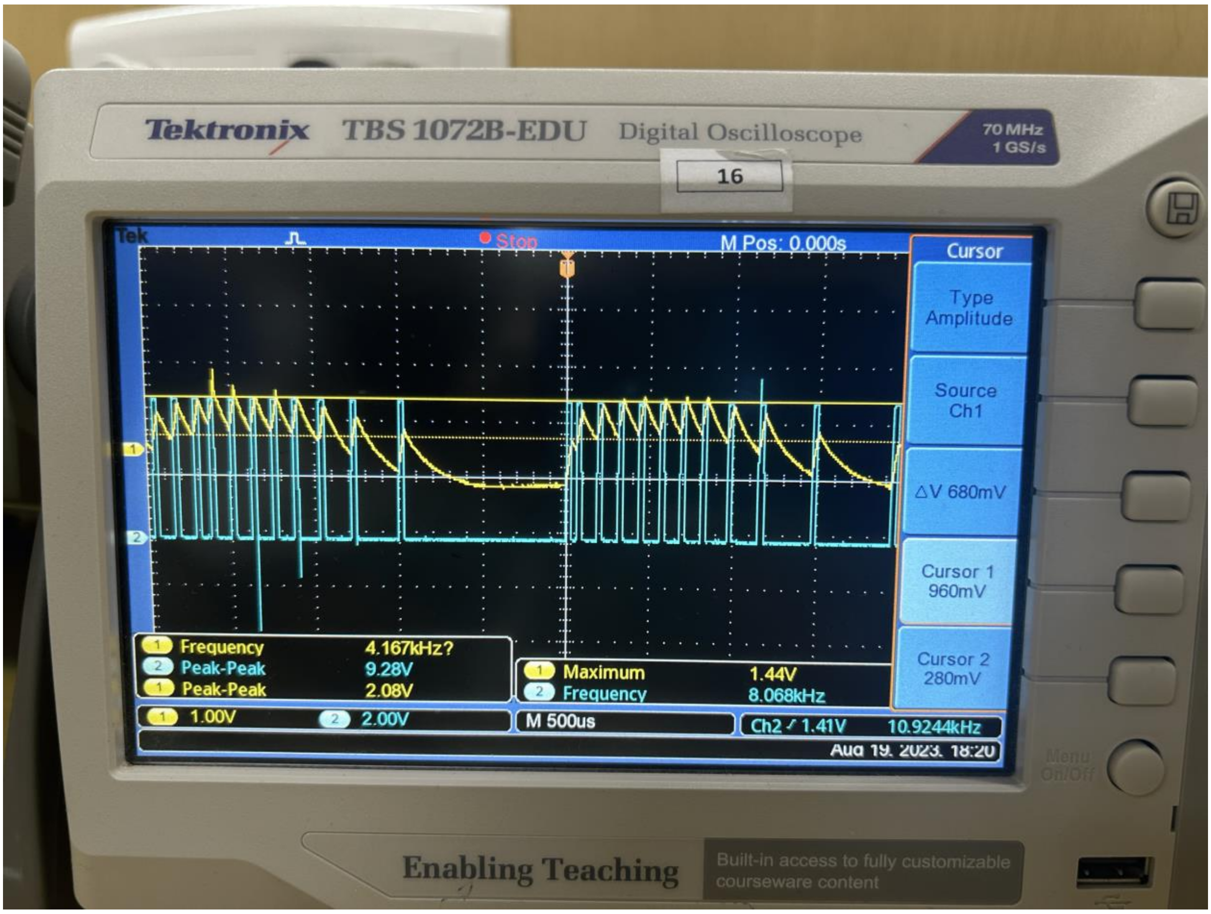
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz 1 GS/s
16
Tek
Stop
M Pos: 0.000s
Cursor
Type Amplitude
Source Ch1
ΔV 680mV
Cursor 1 960mV
Cursor 2 280mV
Frequency 4.167kHz?
Peak-Peak 9.28V
Peak-Peak 2.08V
Maximum 1.44V
Frequency 8.068kHz
1.00V
2.00V
M 500us
Ch2 ⁄ 1.41V 10.9244kHz
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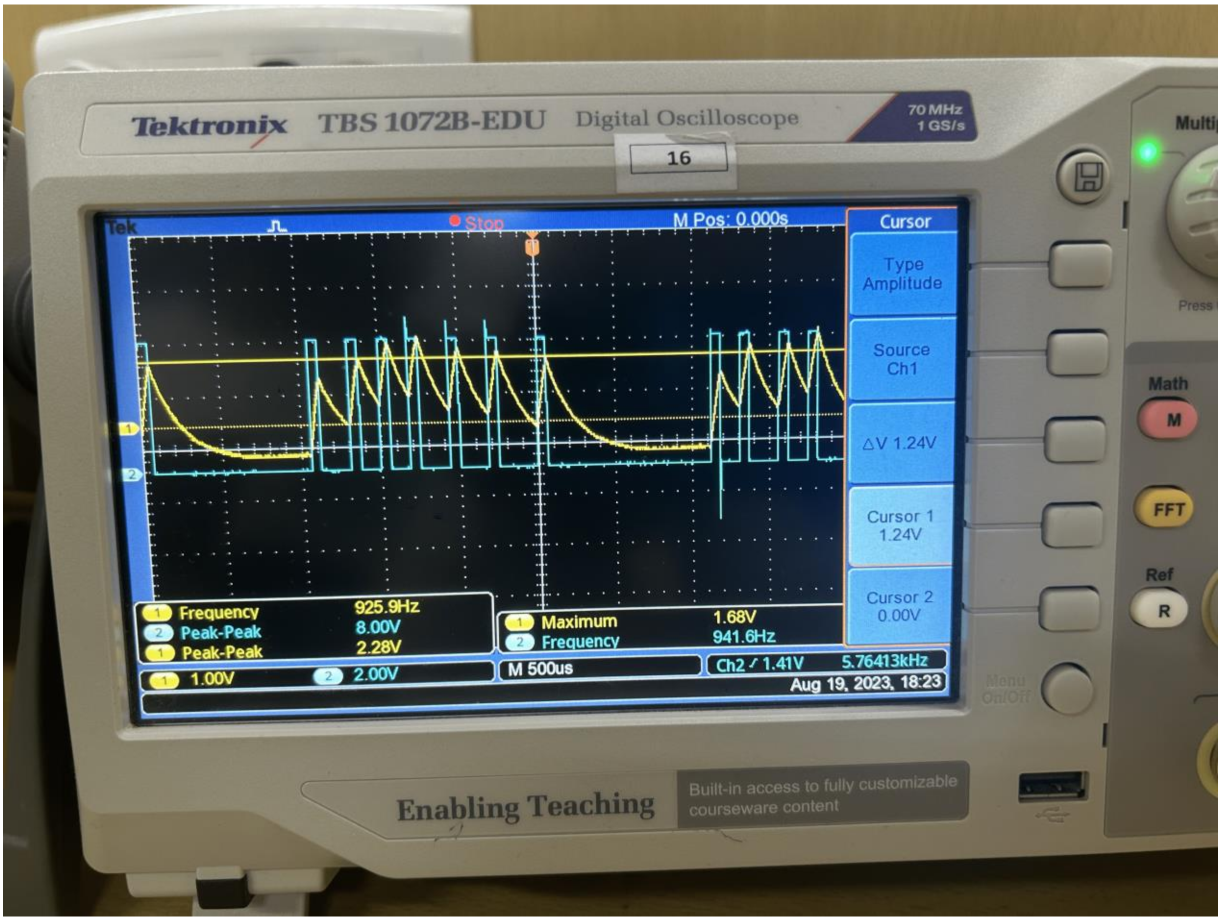
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz 1 GS/s
16
Tek
Stop
M Pos: 0.000s
Cursor
Type Amplitude
Source Ch1
ΔV 1.24V
Cursor 1 1.24V
Cursor 2 0.00V
Frequency 925.9Hz
Peak-Peak 8.00V
Peak-Peak 2.28V
Maximum 1.68V
Frequency 941.6Hz
1.00V
2.00V
M 500us
Ch2 ⁄ 1.41V 5.76413kHz
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Math
M
FFT
Ref
R
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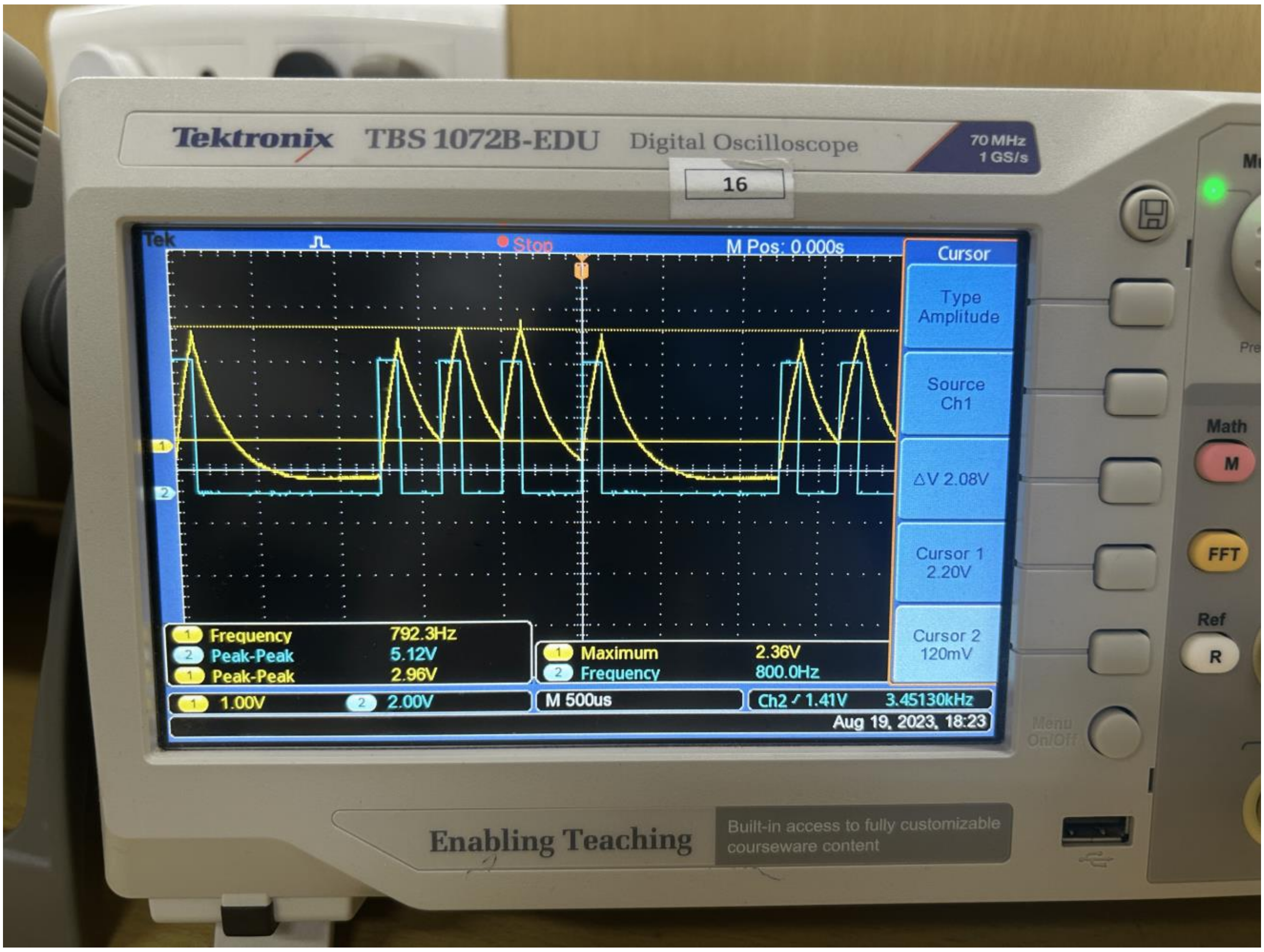
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz 1 GS/s
16
Tek
Stop
M Pos: 0.000s
Cursor
Type Amplitude
Source Ch1
ΔV 2.08V
Cursor 1 2.20V
Cursor 2 120mV
Frequency 792.3Hz
Peak-Peak 5.12V
Peak-Peak 2.96V
Maximum 2.36V
Frequency 800.0Hz
1.00V
2.00V
M 500us
Ch2 1.41V 3.45130kHz
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Math
FFT
Ref
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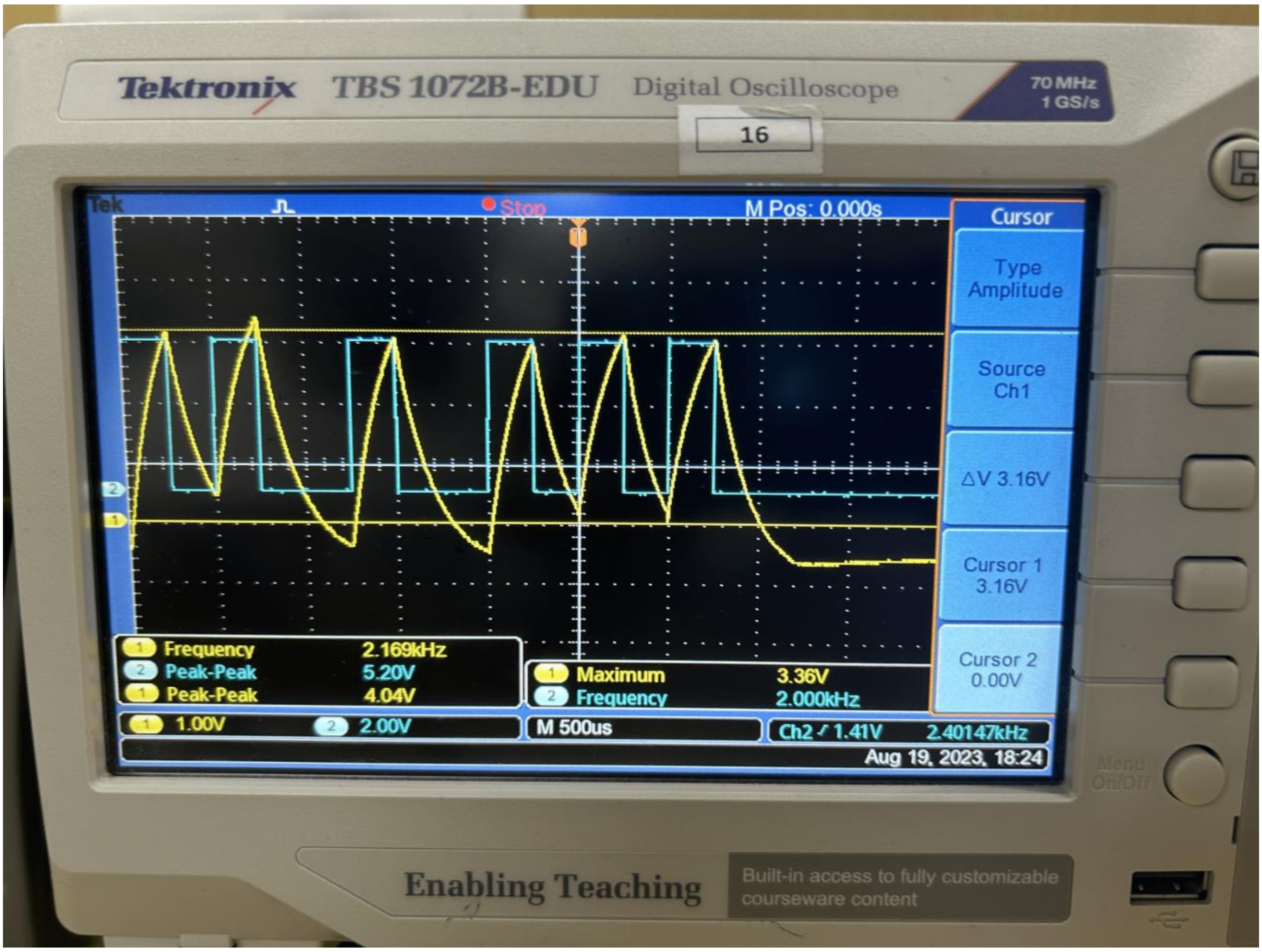
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz 1 GS/s
16
Tek
Stop
M Pos: 0.000s
Cursor
Type Amplitude
Source Ch1
ΔV 3.16V
Cursor 1 3.16V
Cursor 2 0.00V
Frequency 2.169kHz
Peak-Peak 5.20V
Peak-Peak 4.04V
Maximum 3.36V
Frequency 2.000kHz
1.00V
2.00V
M 500us
Ch2 1.41V 2.40147kHz
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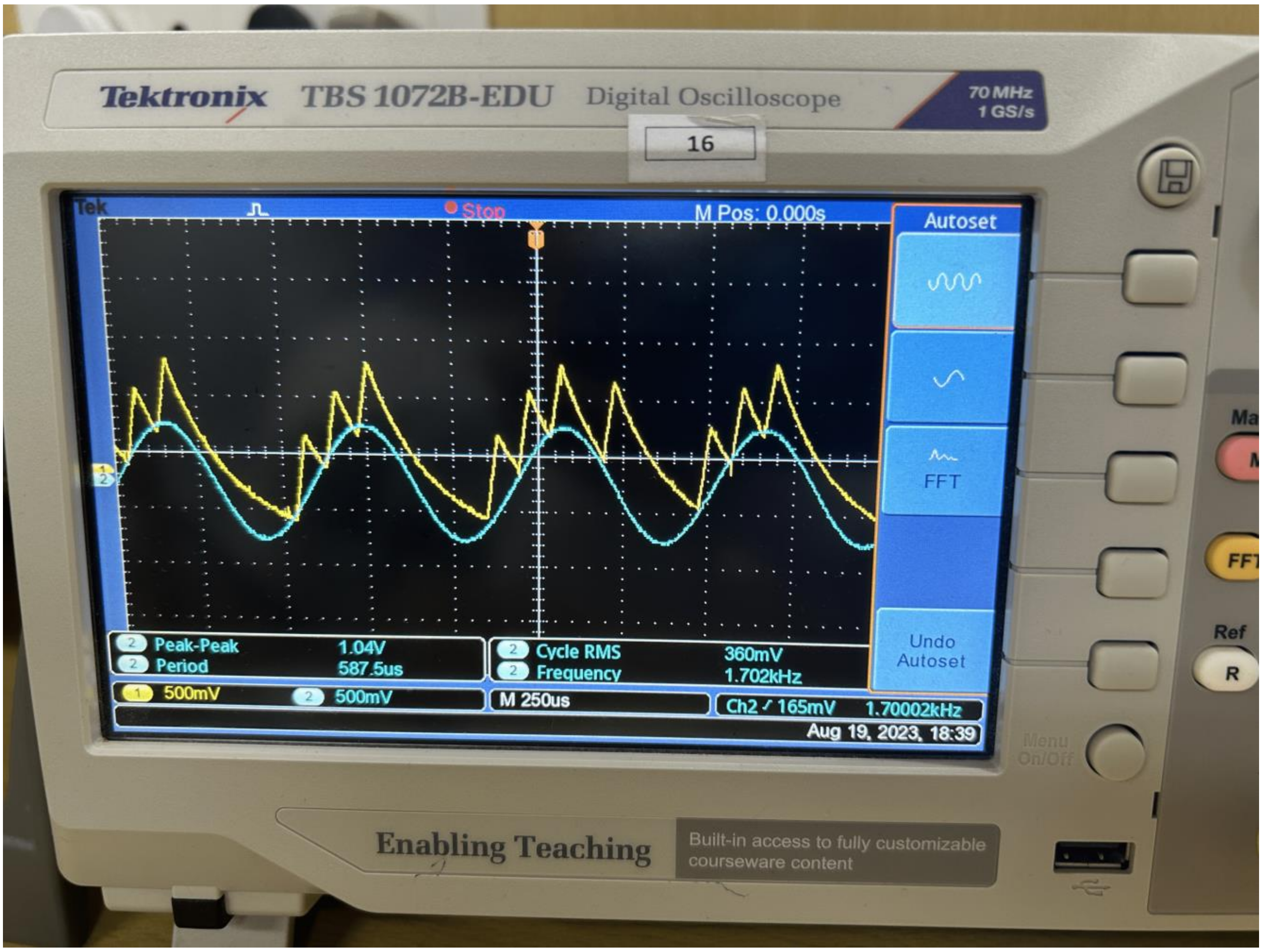
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
M Pos: 0.000s
Autoset
FFT
Undo Autoset
Peak-Peak 1.04V
Period 587.5us
Cycle RMS 360mV
Frequency 1.702kHz
500mV
500mV
M 250us
Ch2 ⁄ 165mV 1.70002kHz
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R
Menu On/Off
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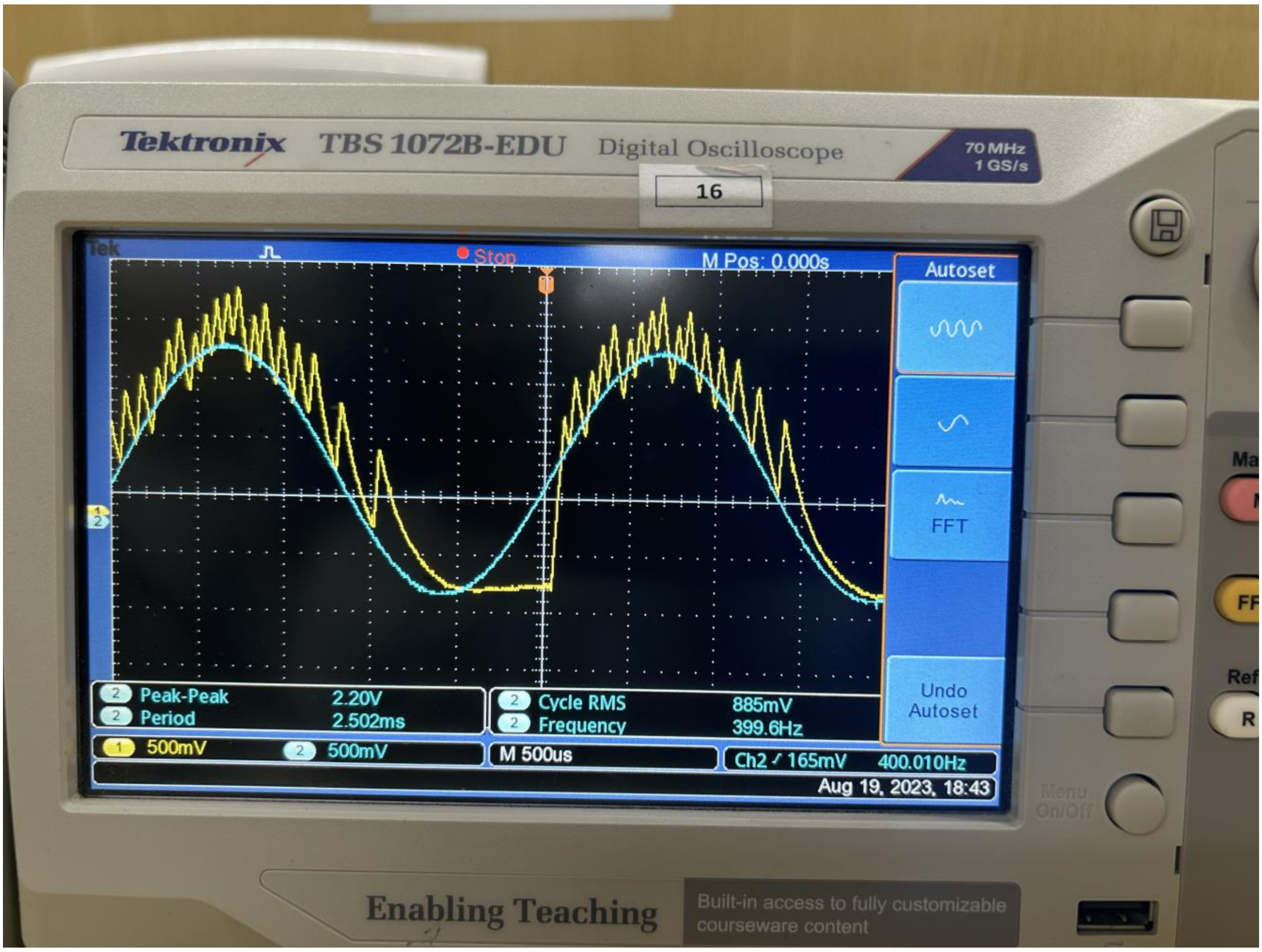
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
M Pos: 0.000s
Autoset
FFT
Undo Autoset
Peak-Peak 2.20V
Period 2.502ms
Cycle RMS 885mV
Frequency 399.6Hz
500mV
500mV
M 500us
Ch2 ⁄ 165mV 400.010Hz
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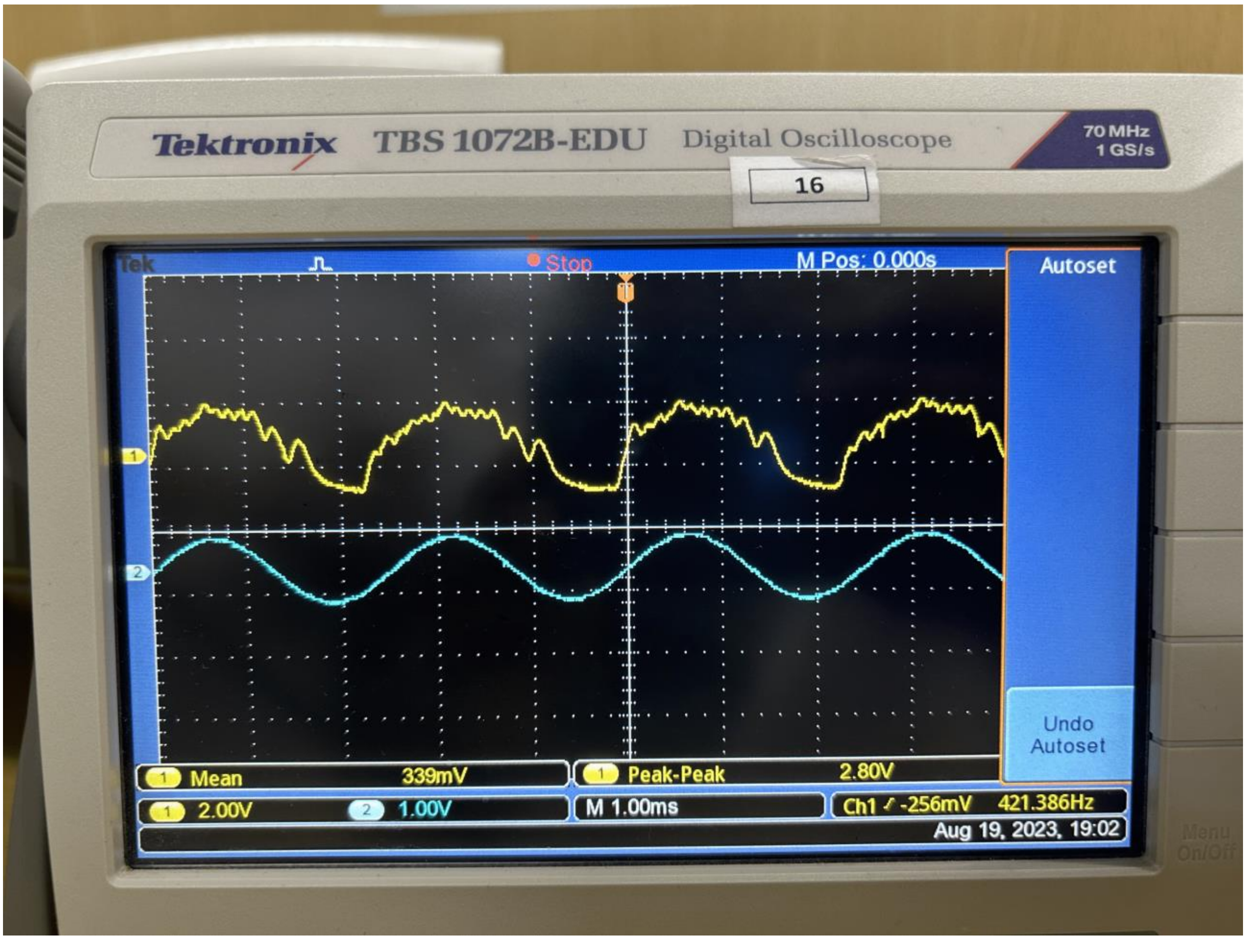
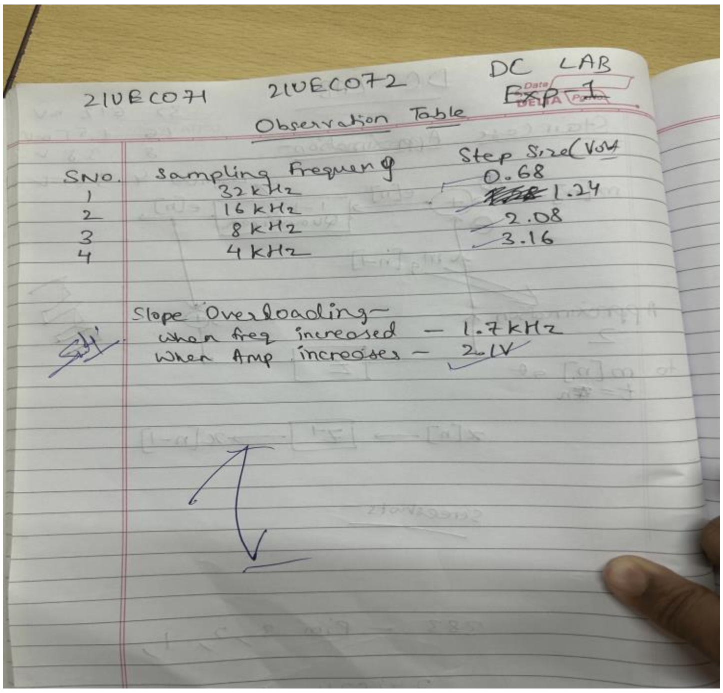


1.5 Conclusions



1.6 Precautions

1. Check the connections before switching on the kit.
2. Connections should be done properly.
3. Observation should be taken properly.