Digital Communications Lab

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

Bachelor of Technology
in
Electronics and Communication Engineering

by

Kartikeya Acharya

21UEC072

Course Coordinator
Dr. Anirudh Agrawal/ Dr. Santosh Shah/ Dr. Soumitra Debnath

Department of Electronics and Communication Engineering
The LNM Institute of Information Technology, Jaipur

August 2023

Contents

Chapter *1*

Experiment - 2

1.1 AIM

1. Generation and study of Pseudo Random Binary Sequence (PRBS).
2. Generation and study of Various Line Codes i.e., NRZ, RZ, Manchester.

1.2 Apparatus Used

1. Opamp-741 IC
2. DC Power Supply
3. Resistors
4. Breadboard
5. Capacitors
6. Connecting Wires
7. Digital Storage Oscilloscope
8. Function Generator
9. 7408 (AND Gate)
10. 7486 (Ex-OR Gate)
11. 7404 (NOT Gate)

1.3 Observations

1.3.1 Calculation

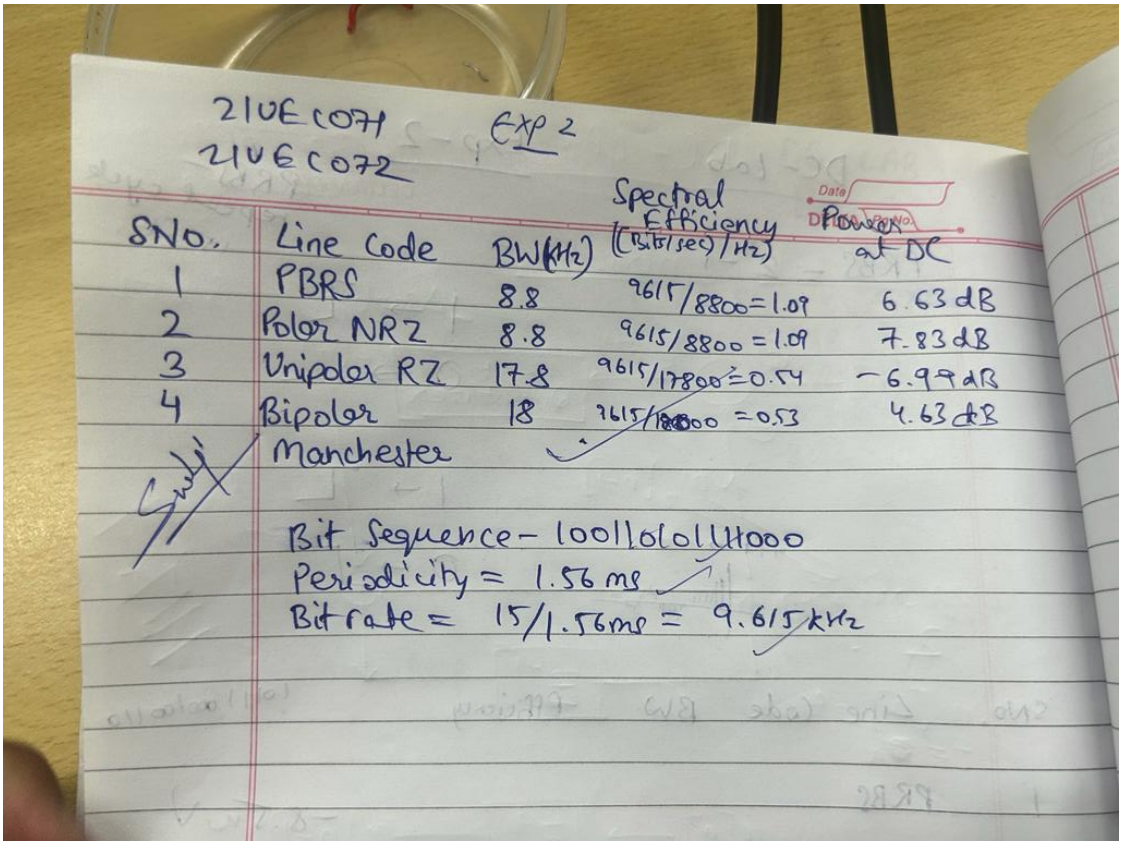

Figure 1.1: Calculation

1.4 Result Screenshots

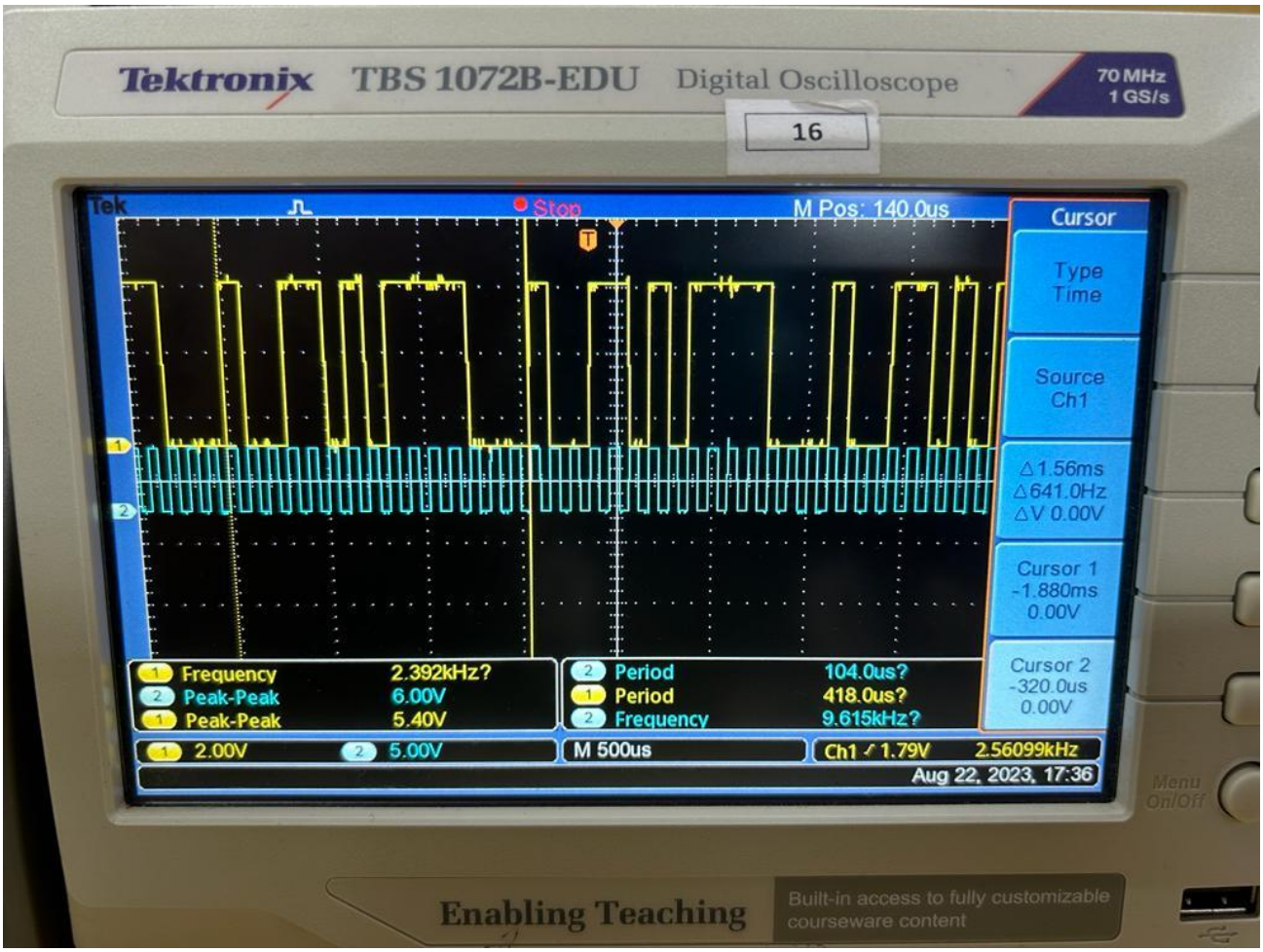

Figure 1.2: Output of PRBS

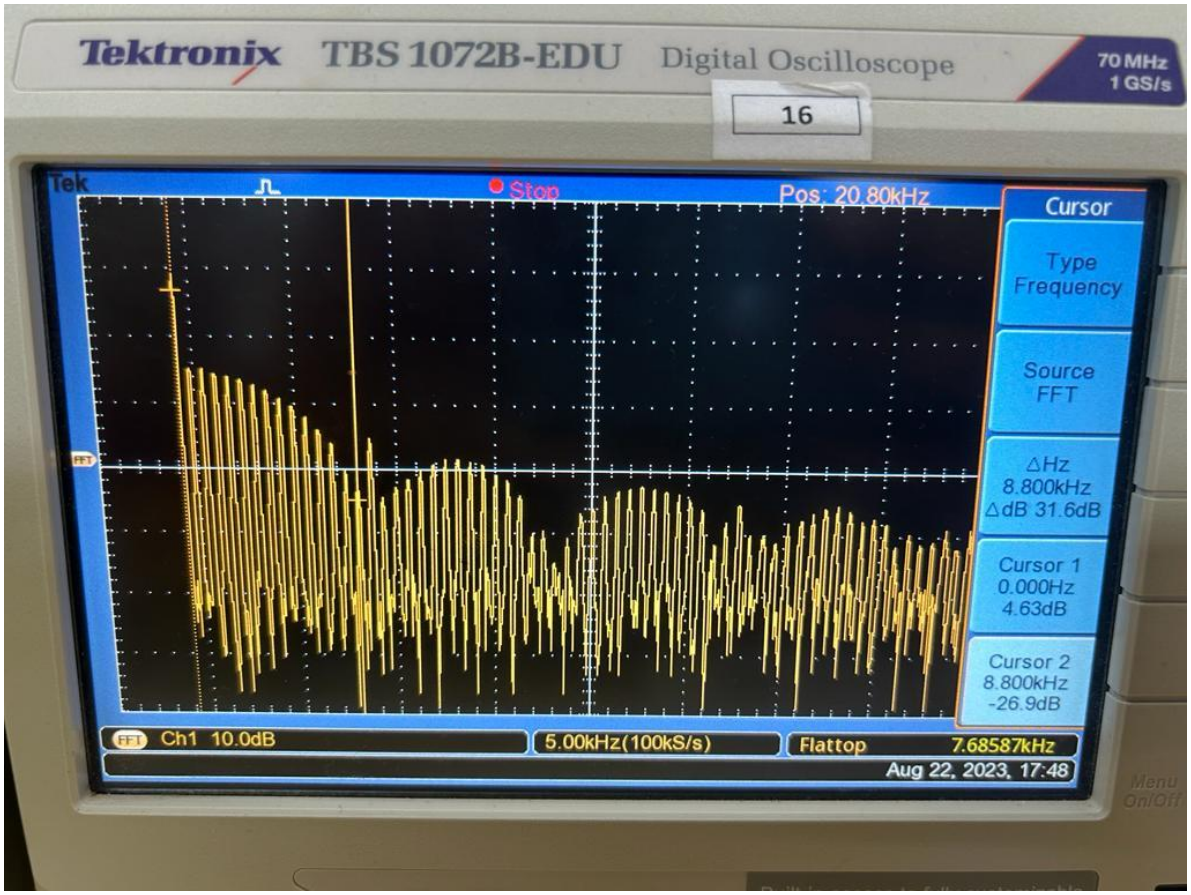

Figure 1.3: FFT of Output of PRBS

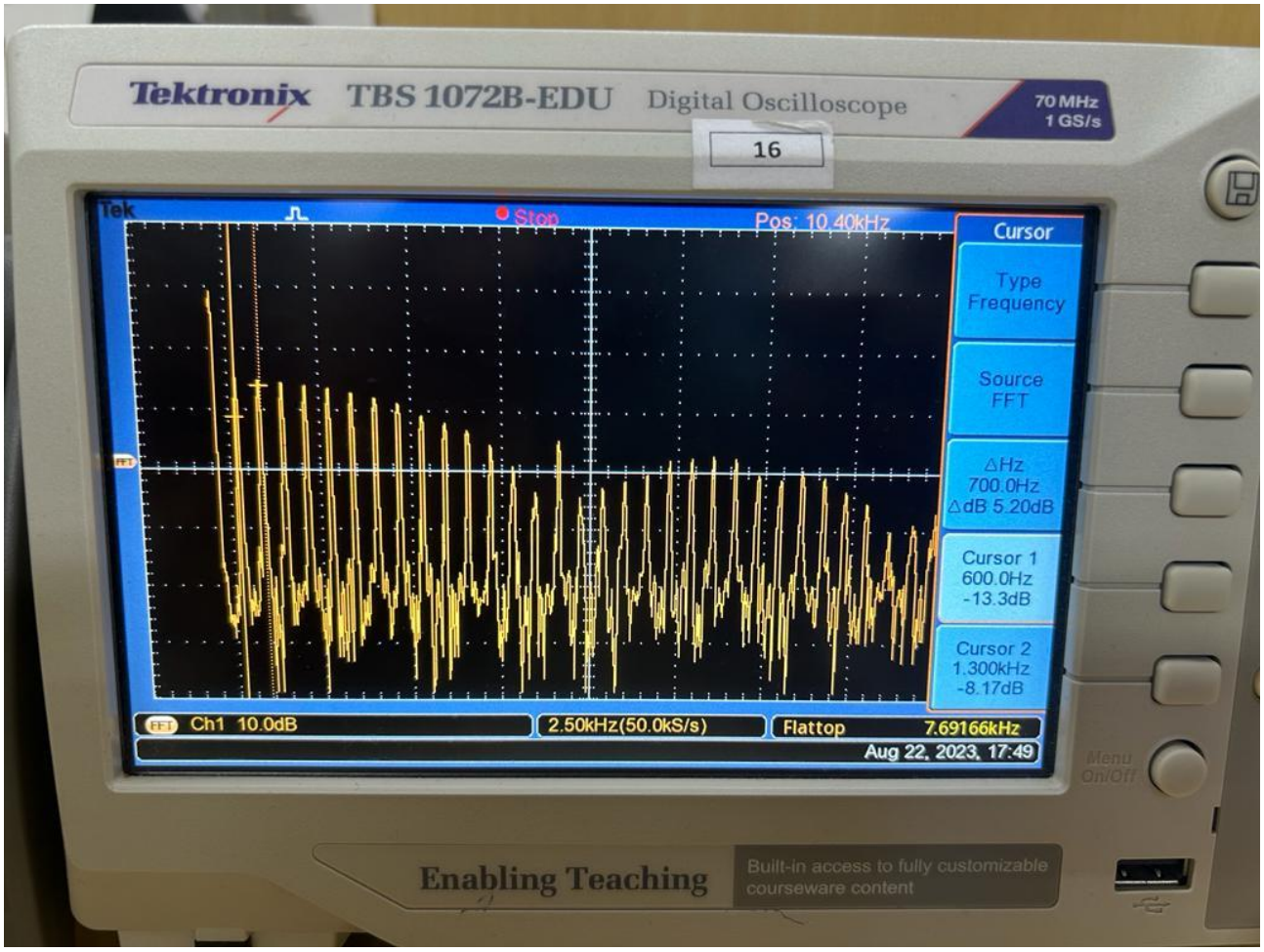
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
Pos: 10.40kHz
Cursor
Type
Frequency
Source
FFT
ΔHz
700.0Hz
ΔdB 5.20dB
Cursor 1
600.0Hz
-13.3dB
Cursor 2
1.300kHz
-8.17dB
Ch1 10.0dB
2.50kHz(50.0kS/s)
Flattop
7.69166kHz
Aug 22, 2023, 17:49
Menu
On/Off
Enabling Teaching
Built-in access to fully customizable
courseware content

Figure 1.4

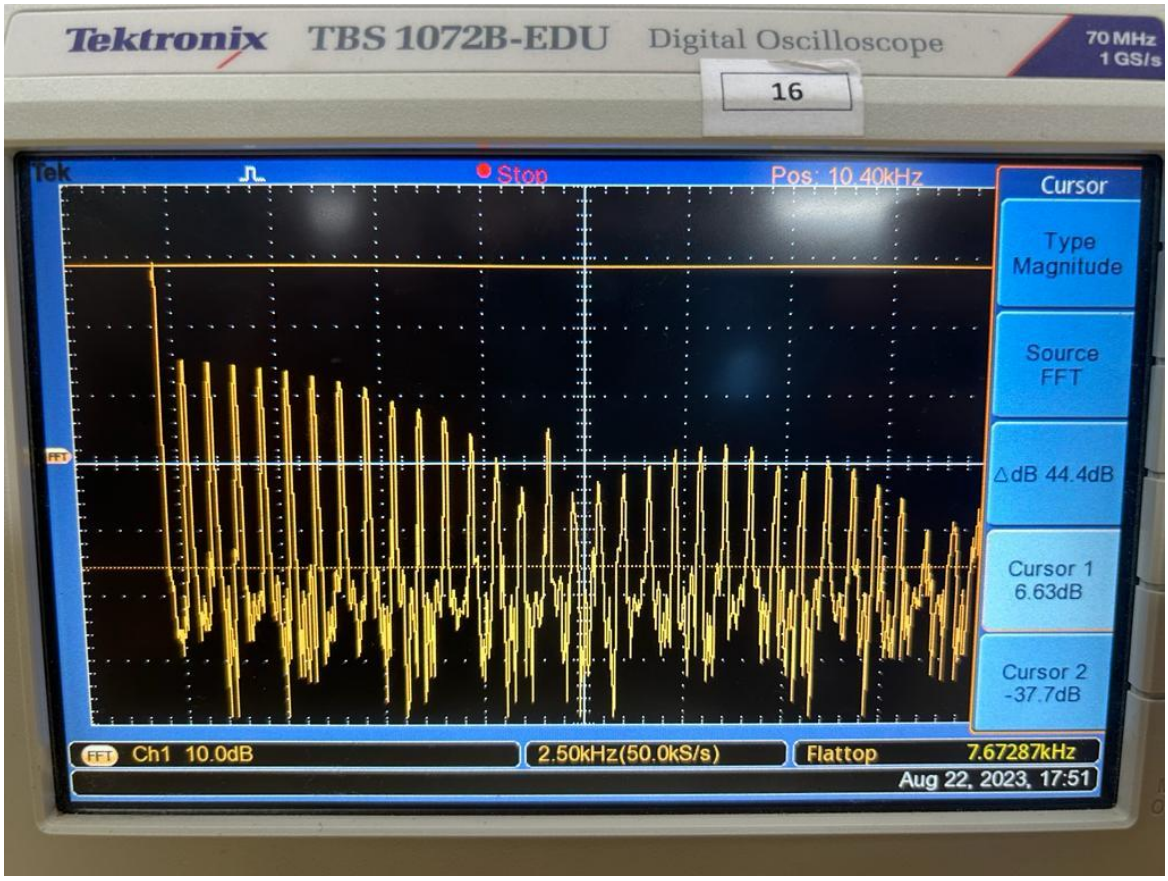
Tektronix
TBS 1072B-EDU
Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
Pos: 10.40kHz
Cursor
Type
Magnitude
Source
FFT
ΔdB 44.4dB
Cursor 1
6.63dB
Cursor 2
-37.7dB
FFT
Ch1 10.0dB
2.50kHz(50.0kS/s)
Flattop
7.67287kHz
Aug 22, 2023, 17:51

Figure 1.5

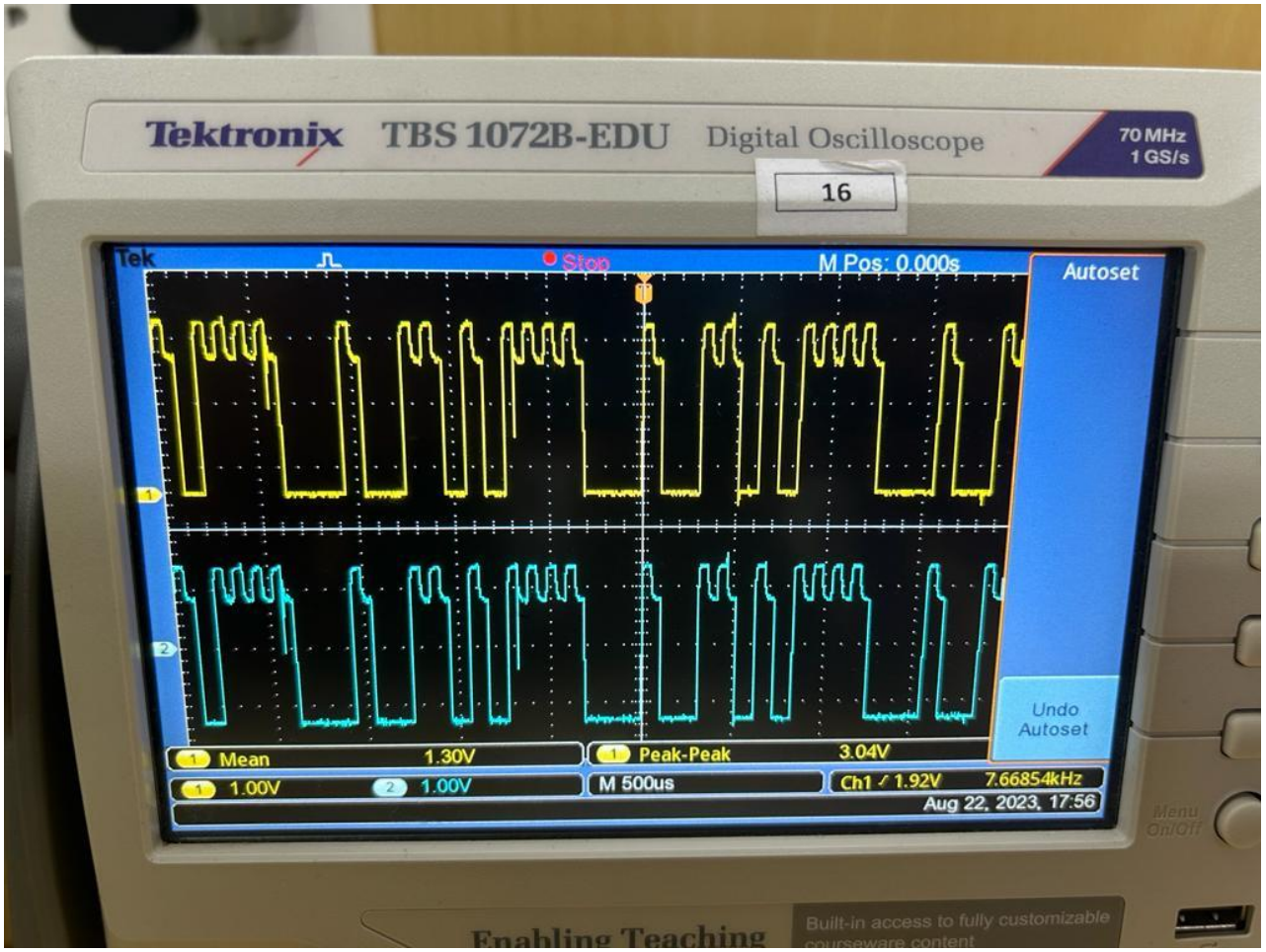
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
M Pos: 0.000s
Autoset
Undo
Autoset
Mean 1.30V
Peak-Peak 3.04V
1.00V
1.00V
M 500us
Ch1 1.92V
7.66854kHz
Aug 22, 2023, 17:56
Enabling Teaching
Built-in access to fully customizable

Figure 1.6

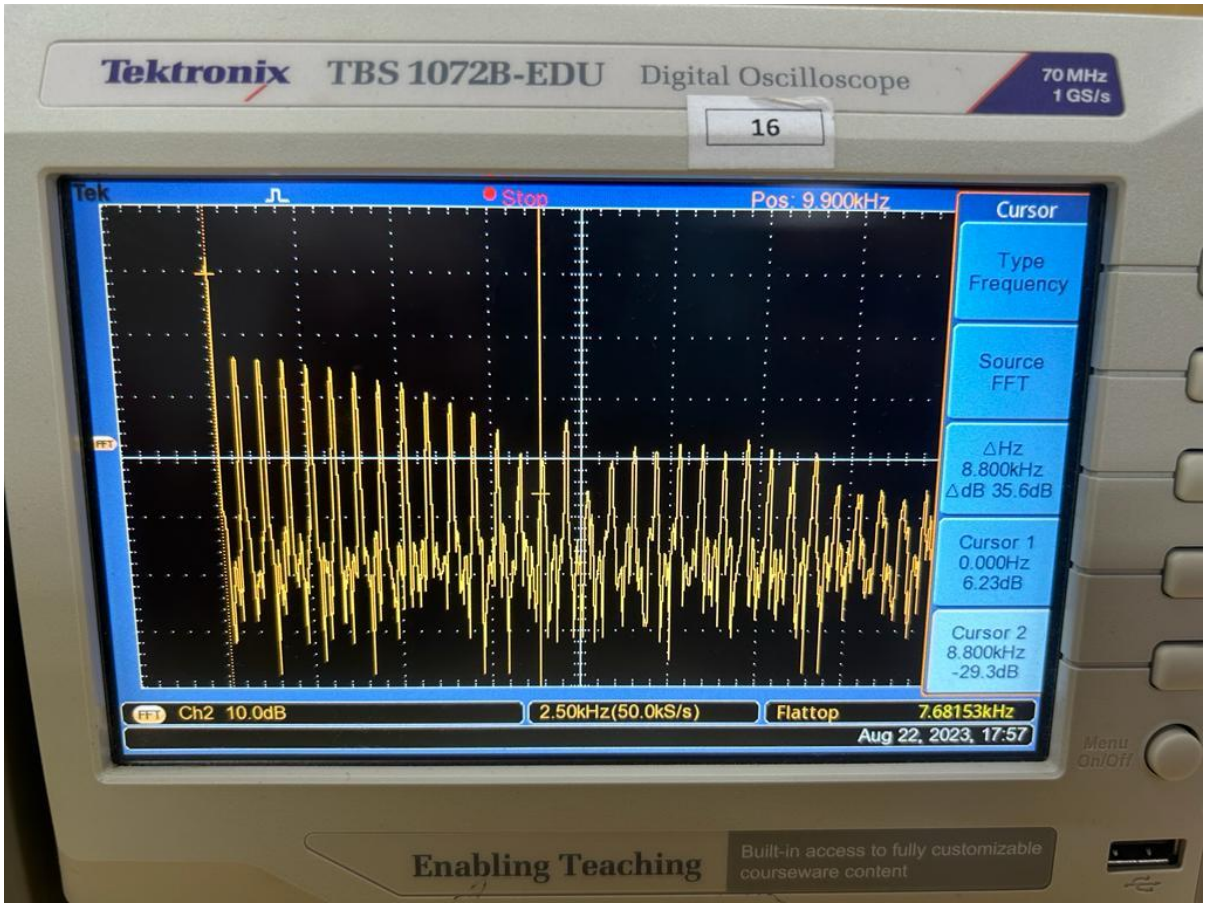
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
Pos: 9.900kHz
Cursor
Type
Frequency
Source
FFT
ΔHz
8.800kHz
ΔdB 35.6dB
Cursor 1
0.000Hz
6.23dB
Cursor 2
8.800kHz
-29.3dB
Ch2 10.0dB
2.50kHz(50.0kS/s)
Flattop
7.68153kHz
Aug 22, 2023, 17:57
Menu
On/Off
Enabling Teaching
Built-in access to fully customizable
courseware content

Figure 1.7

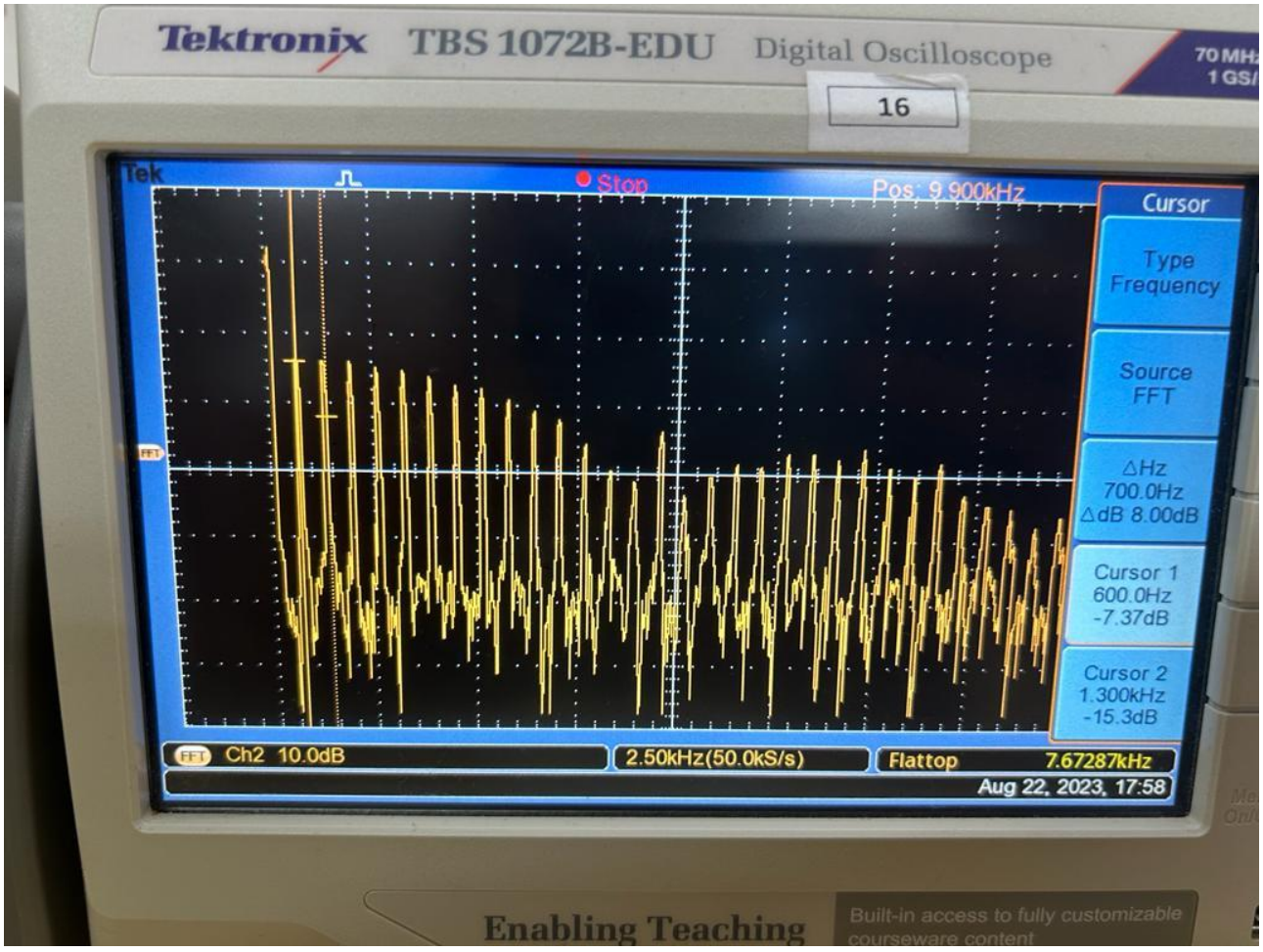
Tektronix TBS 1072B-EDU Digital Oscilloscope
16
Tek
Stop
Pos: 9.900kHz
Cursor
Type
Frequency
Source
FFT
ΔHz
700.0Hz
ΔdB 8.00dB
Cursor 1
600.0Hz
-7.37dB
Cursor 2
1.300kHz
-15.3dB
FFT Ch2 10.0dB
2.50kHz(50.0kS/s)
Flattop
7.67287kHz
Aug 22, 2023, 17:58
Enabling Teaching
Built-in access to fully customizable courseware content

Figure 1.8

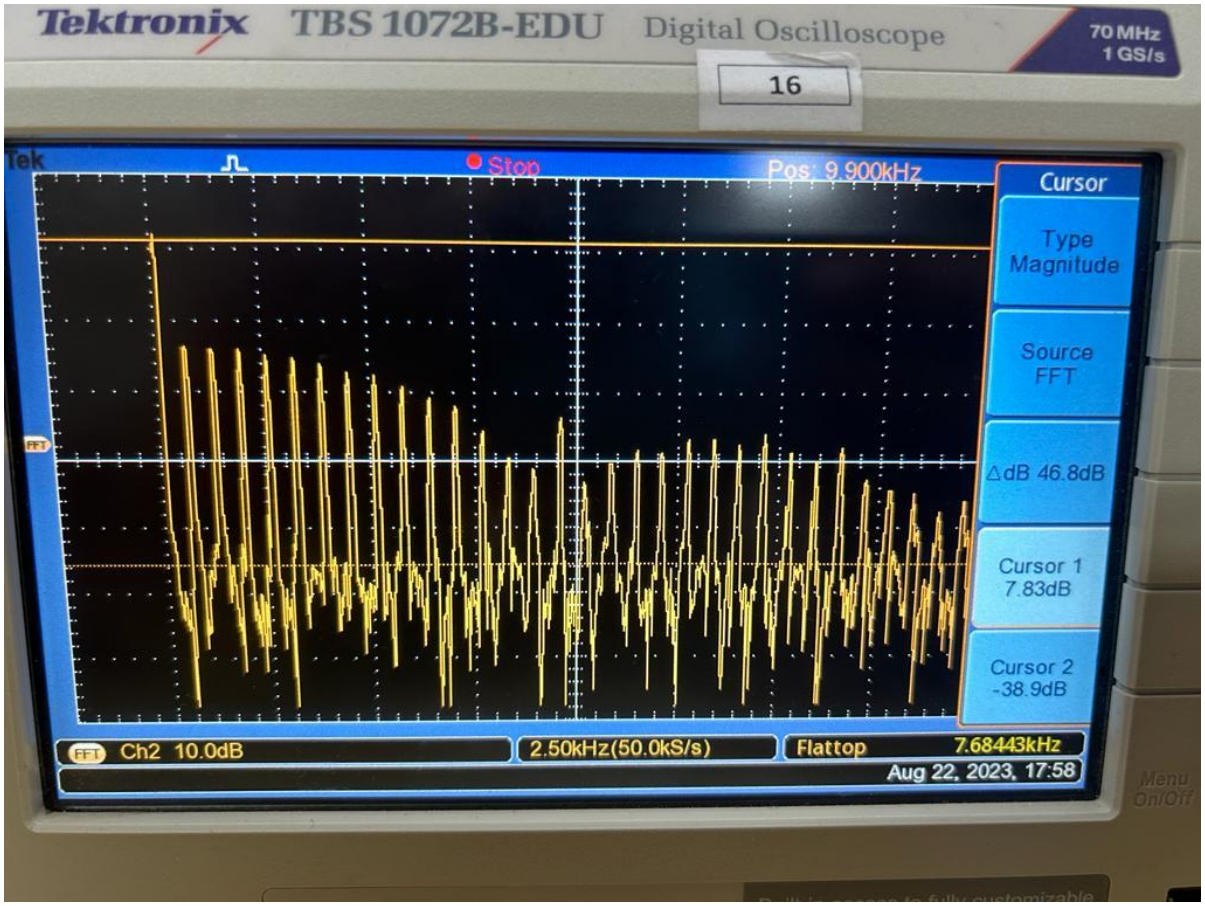
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz
1 GS/s
16
Stop
Pos: 9.900kHz
Cursor
Type
Magnitude
Source
FFT
ΔdB 46.8dB
Cursor 1
7.83dB
Cursor 2
-38.9dB
FFT Ch2 10.0dB
2.50kHz(50.0kS/s)
Flattop
7.68443kHz
Aug 22, 2023, 17:58

Figure 1.9

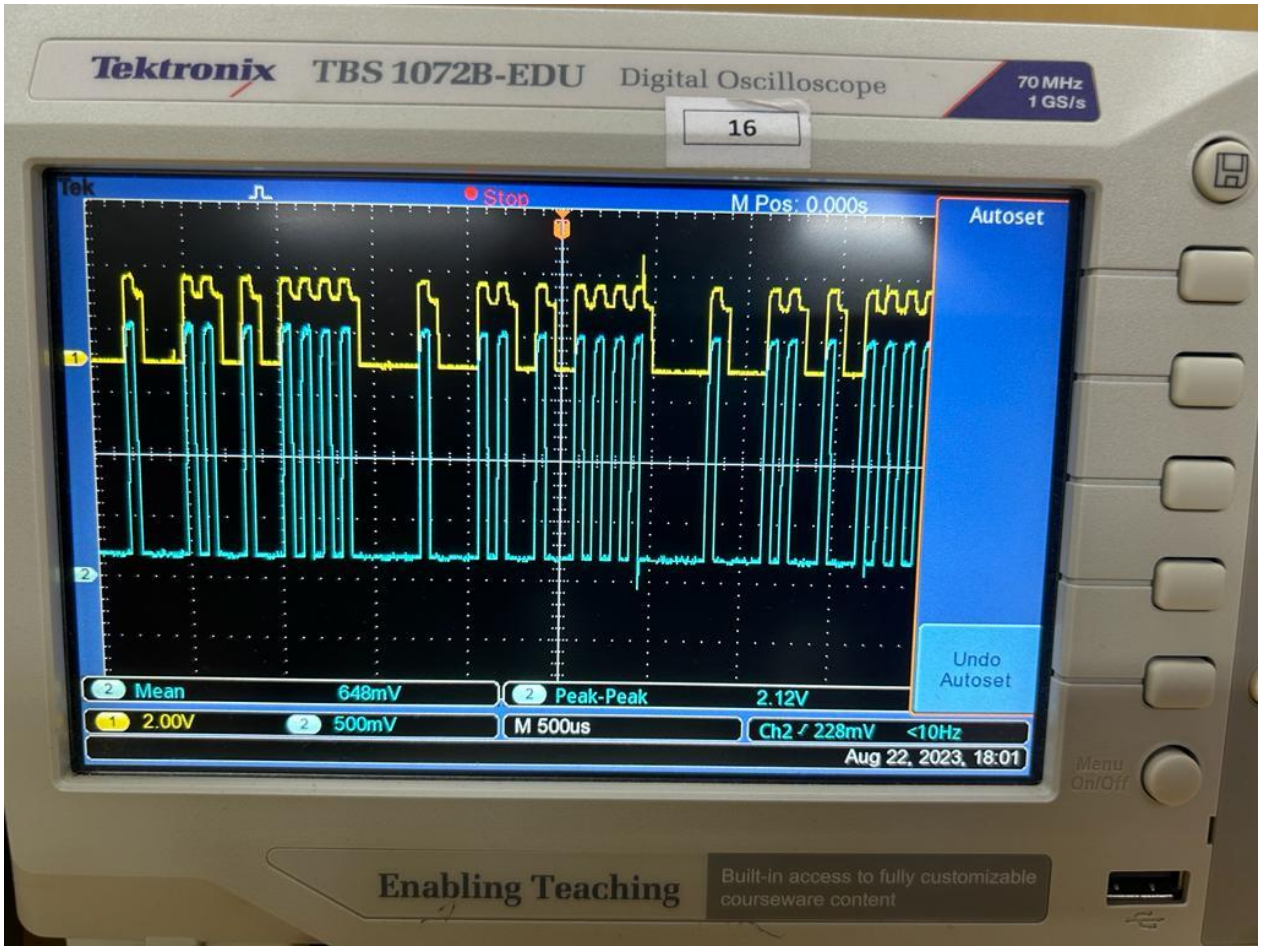
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
M Pos: 0.000s
Autoset
Undo
Autoset
Mean 648mV
Peak-Peak 2.12V
2.00V
500mV
M 500us
Ch2 228mV <10Hz
Aug 22, 2023, 18:01
Menu
On/Off
Enabling Teaching
Built-in access to fully customizable courseware content

Figure 1.10

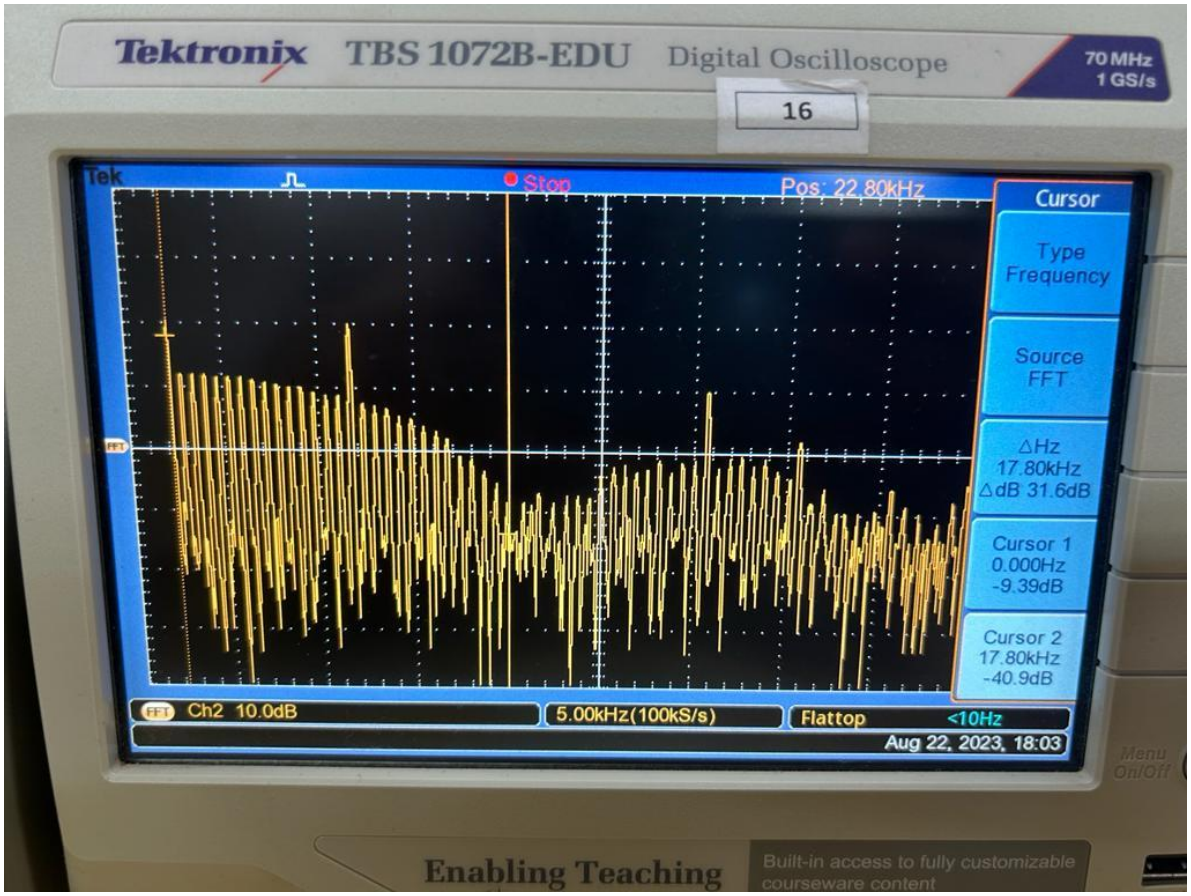
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
Pos: 22.80kHz
Cursor
Type
Frequency
Source
FFT
ΔHz
17.80kHz
ΔdB 31.6dB
Cursor 1
0.000Hz
-9.39dB
Cursor 2
17.80kHz
-40.9dB
Ch2 10.0dB
5.00kHz(100kS/s)
Flattop
<10Hz
Aug 22, 2023, 18:03
Menu
On/Off
Enabling Teaching
Built-in access to fully customizable
courseware content

Figure 1.11

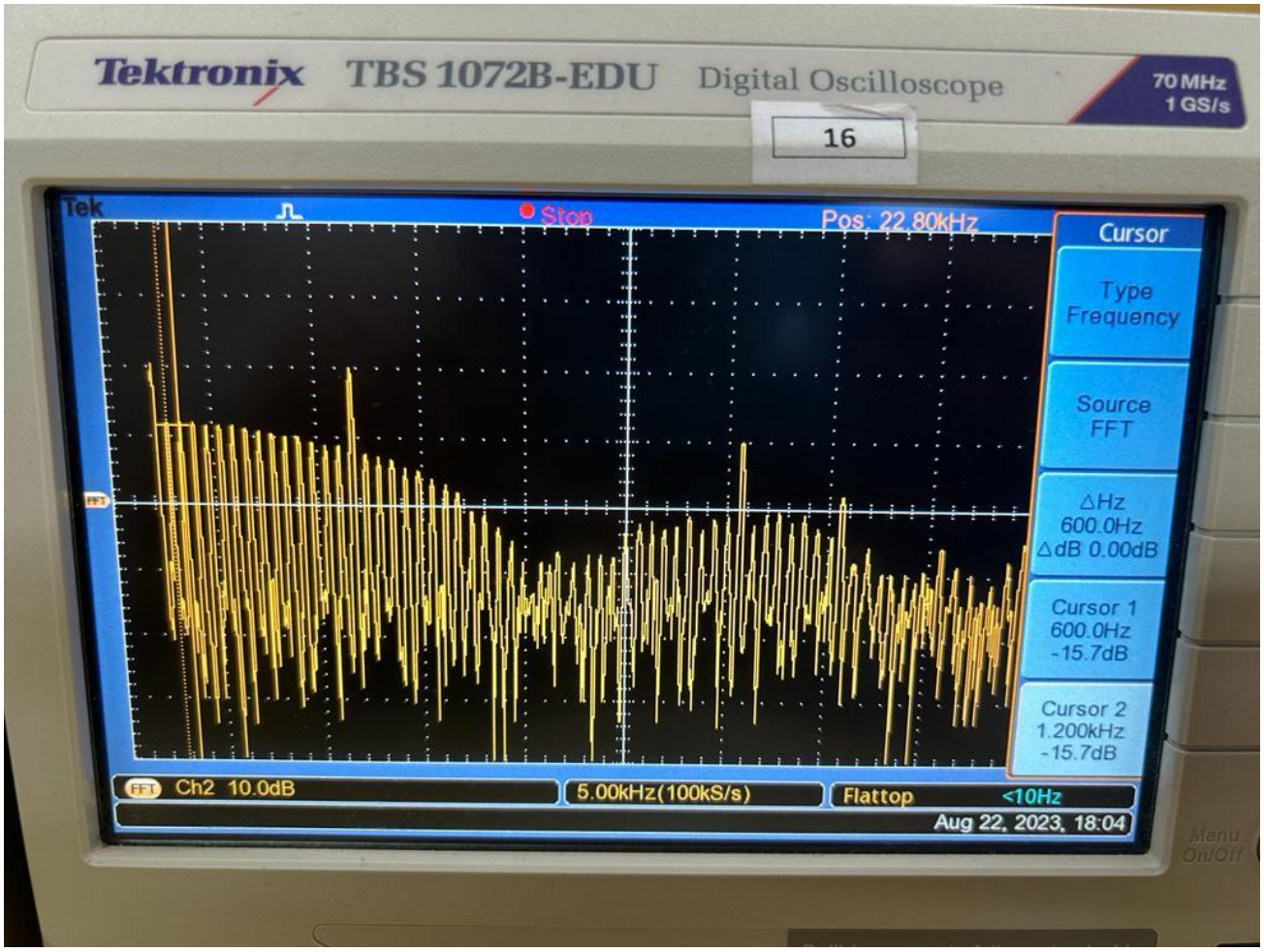
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
Pos: 22.80kHz
Cursor
Type
Frequency
Source
FFT
ΔHz
600.0Hz
ΔdB 0.00dB
Cursor 1
600.0Hz
-15.7dB
Cursor 2
1.200kHz
-15.7dB
FFT Ch2 10.0dB
5.00kHz(100kS/s)
Flattop
<10Hz
Aug 22, 2023, 18:04
Menu
On/Off

Figure 1.12

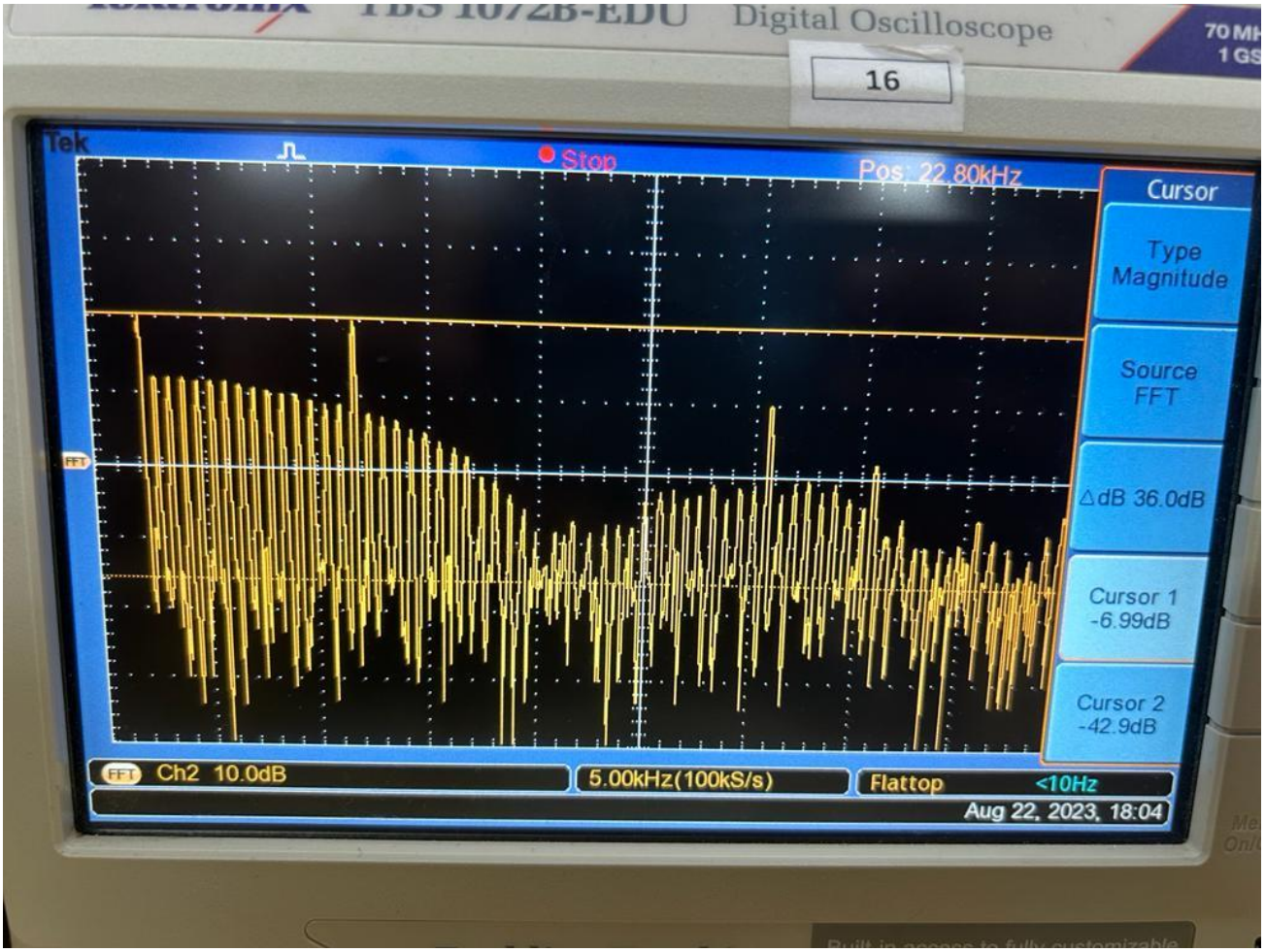
TBS 1072B-EDU Digital Oscilloscope
16
Tek
Stop
Pos: 22.80kHz
Cursor
Type
Magnitude
Source
FFT
ΔdB 36.0dB
Cursor 1
-6.99dB
Cursor 2
-42.9dB
FFT Ch2 10.0dB
5.00kHz(100kS/s)
Flattop
<10Hz
Aug 22, 2023, 18:04

Figure 1.13

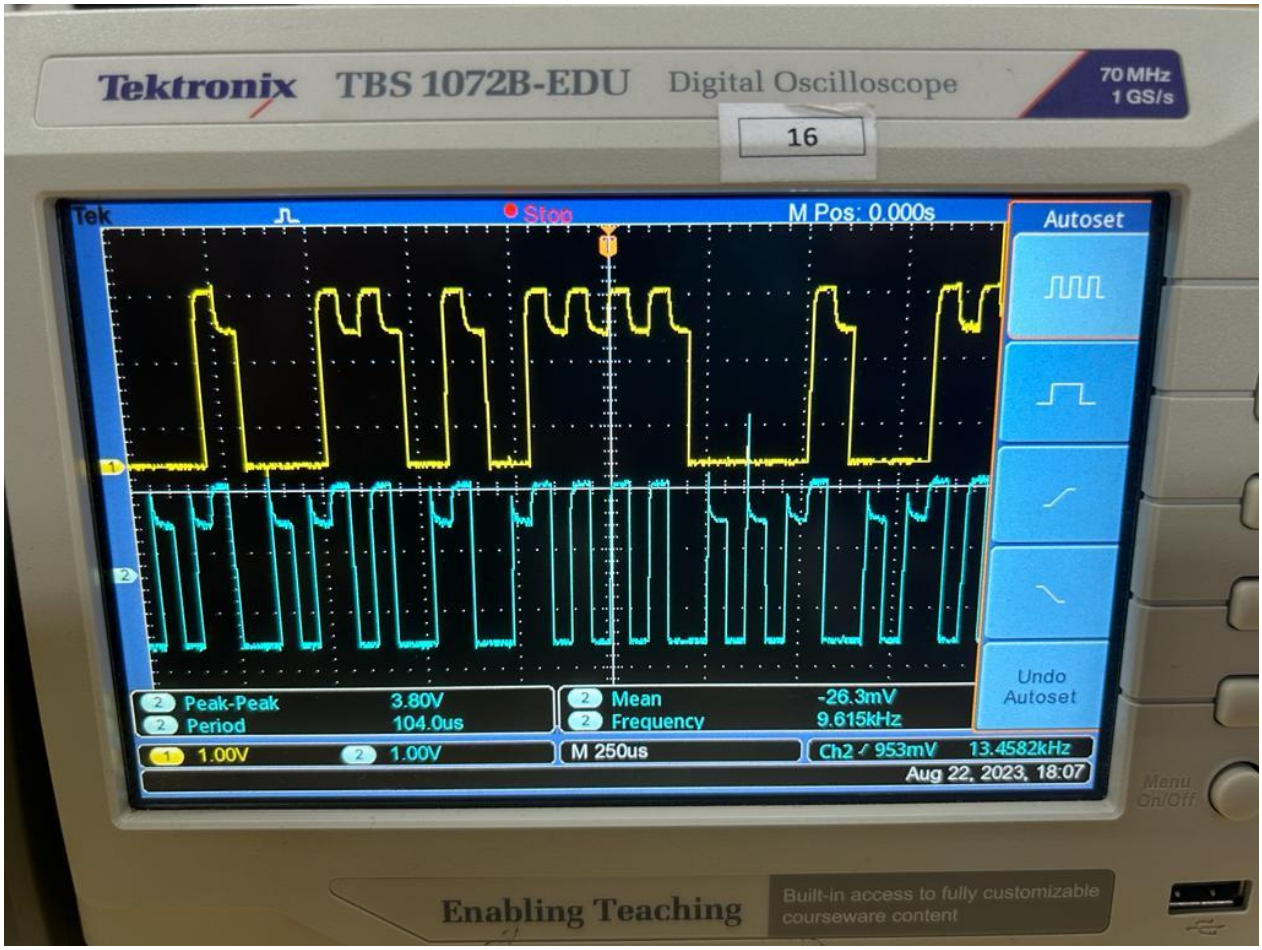
Tektronix
TBS 1072B-EDU
Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
M Pos: 0.000s
Autoset
Undo
Autoset
Peak-Peak
3.80V
Period
104.0us
Mean
-26.3mV
Frequency
9.615kHz
1.00V
1.00V
M 250us
Ch2 ∕ 953mV
13.4582kHz
Aug 22, 2023, 18:07
Menu
On/Off
Enabling Teaching
Built-in access to fully customizable
courseware content

Figure 1.14

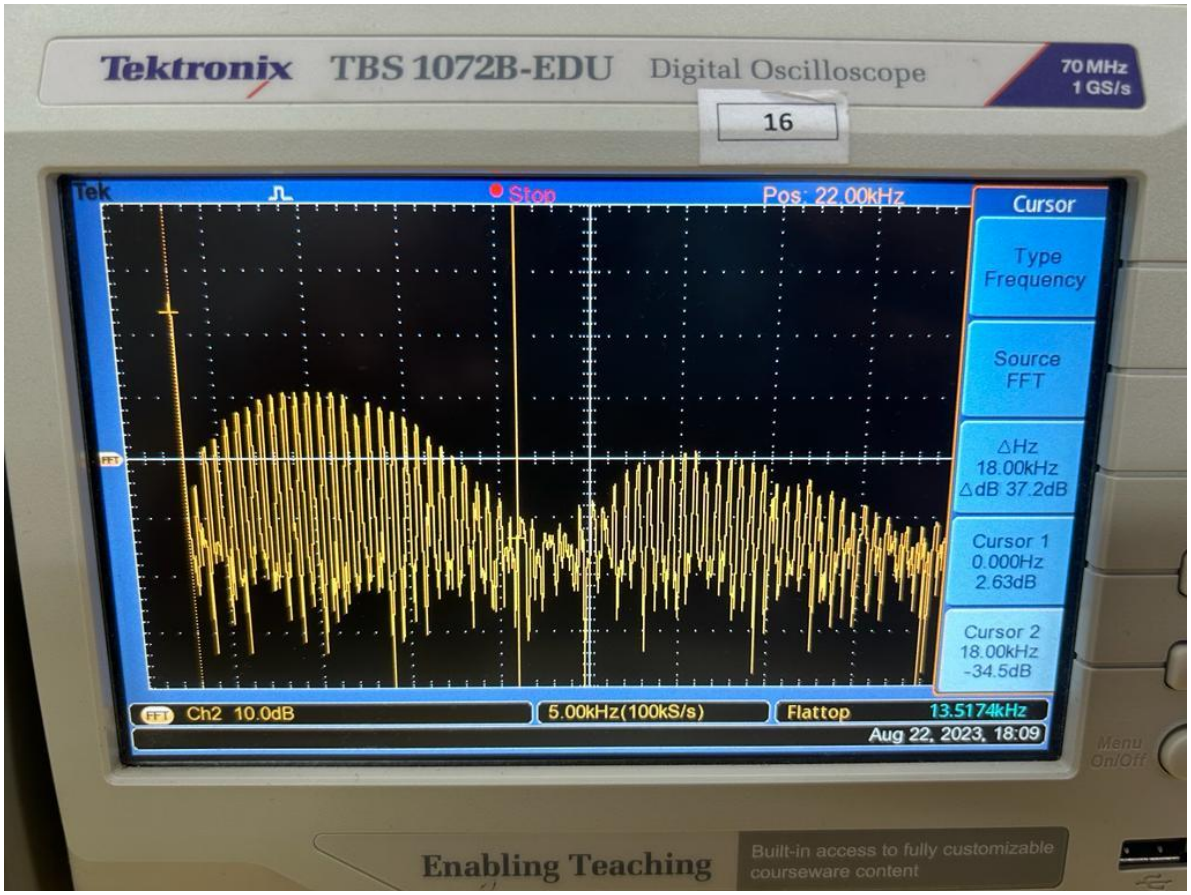
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
Pos: 22.00kHz
Cursor
Type
Frequency
Source
FFT
ΔHz
18.00kHz
ΔdB 37.2dB
Cursor 1
0.000Hz
2.63dB
Cursor 2
18.00kHz
-34.5dB
FFT Ch2 10.0dB
5.00kHz(100kS/s)
Flattop
13.5174kHz
Aug 22, 2023, 18:09
Menu
On/Off
Enabling Teaching
Built-in access to fully customizable
courseware content

Figure 1.15

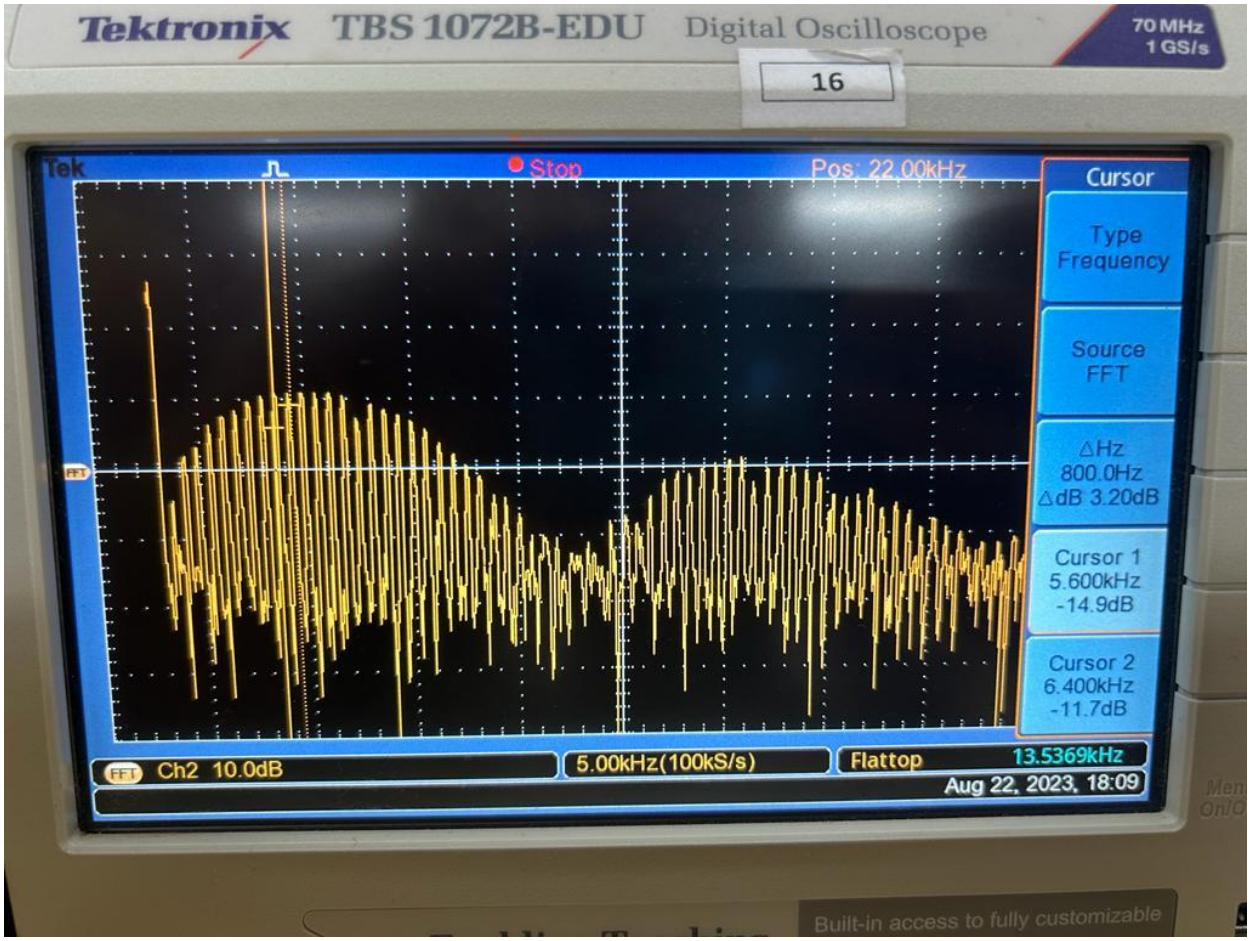
Tektronix TBS 1072B-EDU Digital Oscilloscope
70 MHz
1 GS/s
16
Tek
Stop
Pos: 22.00kHz
Cursor
Type
Frequency
Source
FFT
ΔHz
800.0Hz
ΔdB 3.20dB
Cursor 1
5.600kHz
-14.9dB
Cursor 2
6.400kHz
-11.7dB
FFT Ch2 10.0dB
5.00kHz(100kS/s)
Flattop
13.5369kHz
Aug 22, 2023, 18:09
Built-in access to fully customizable

Figure 1.16

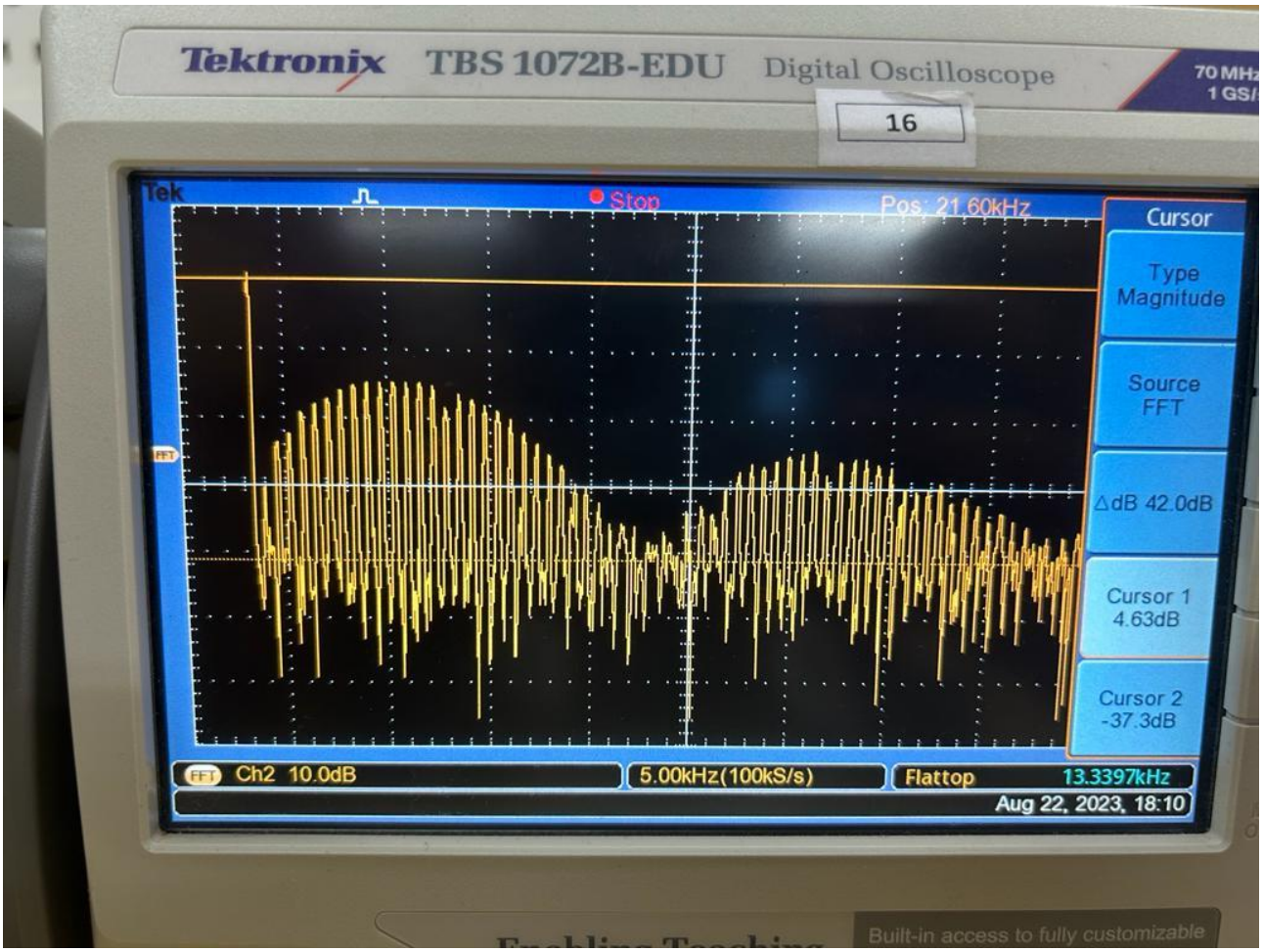
Tektronix TBS 1072B-EDU Digital Oscilloscope
16
Tek
Stop
Pos: 21.60kHz
Cursor
Type
Magnitude
Source
FFT
ΔdB 42.0dB
Cursor 1
4.63dB
Cursor 2
-37.3dB
FFT Ch2 10.0dB
5.00kHz(100kS/s)
Flattop
13.3397kHz
Aug 22, 2023, 18:10
Built-in access to fully customizable

Figure 1.17

1.5 Precautions

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