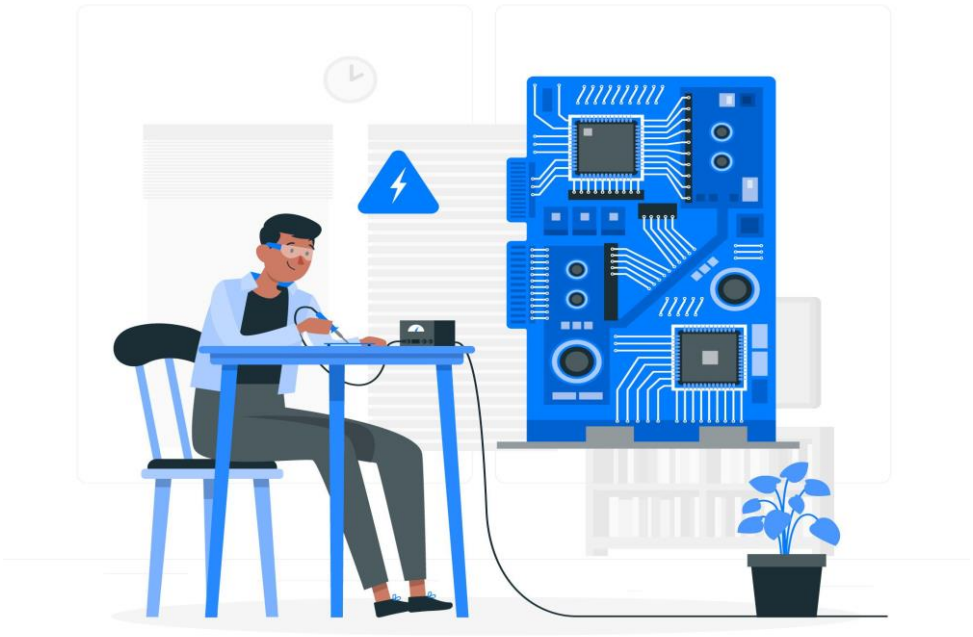


Lab 6

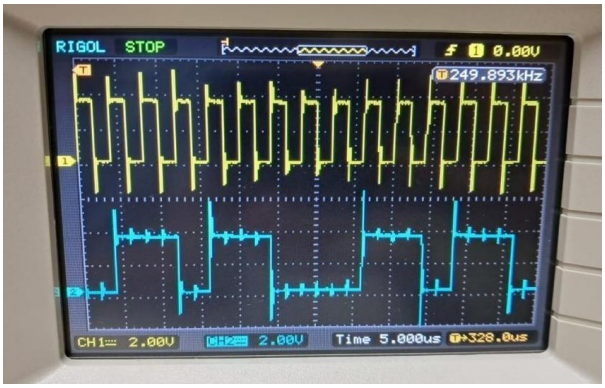
Akshar Panchani 202101522

CT303 Digital Communication

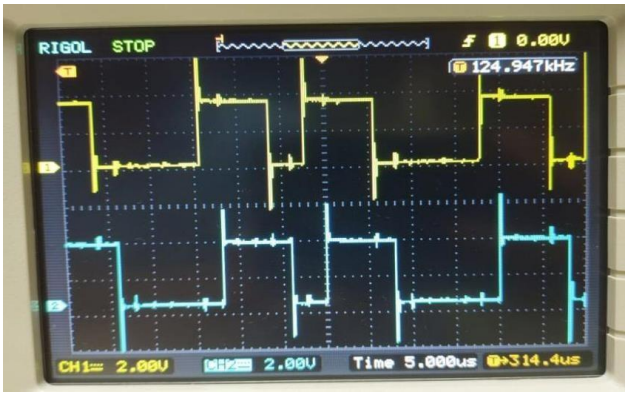
11/13/23

Experiment -1

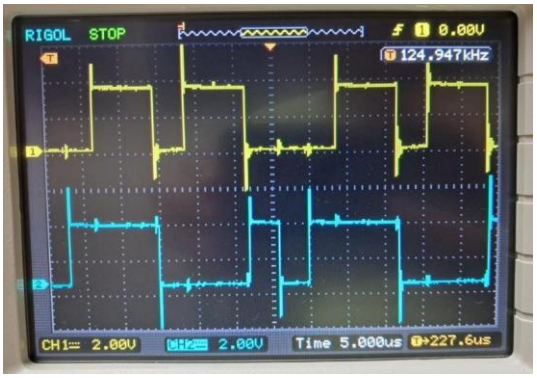
CH 1: DATA CLK (266 KHz) & CH 2: SERIAL DATA (00011011)



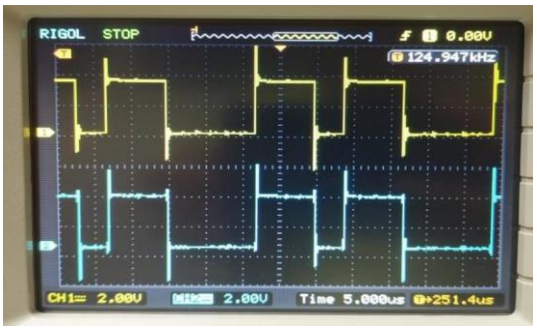
CH 1:DATA IN& CH 2:NRZ-L & CH 2: NRZ-M

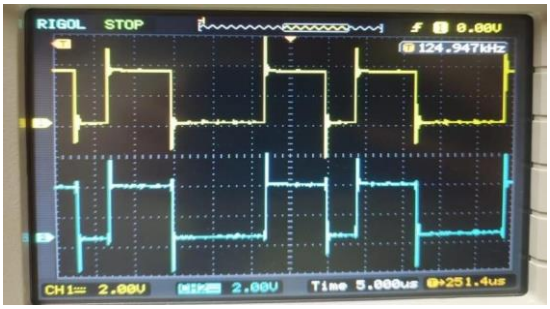


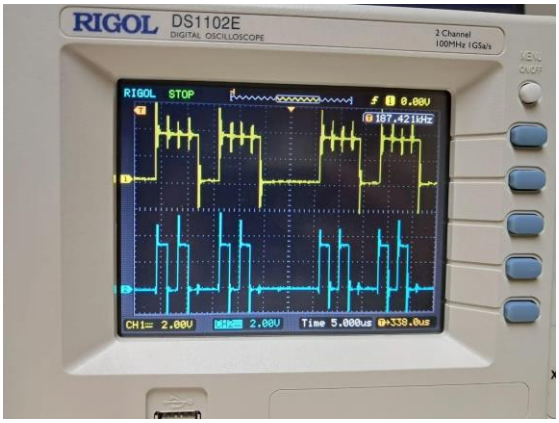
CH 1: DATA IN& CH 2: NRZ-S

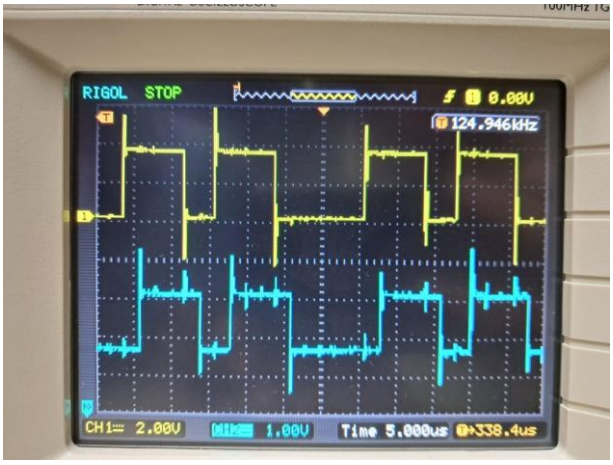


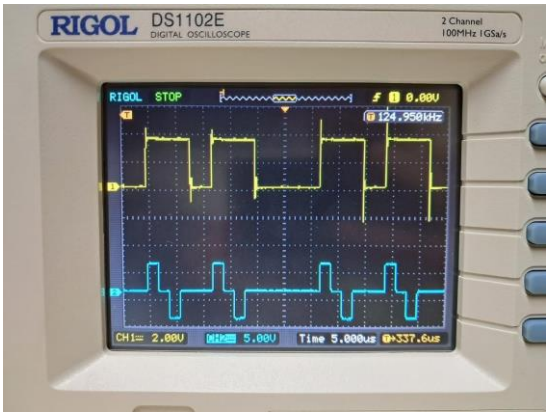
CH 1:DATA IN& CH 2: OUT1 & CH 2: OUT2

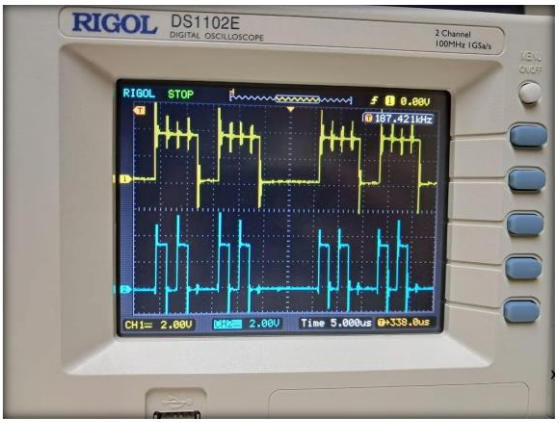


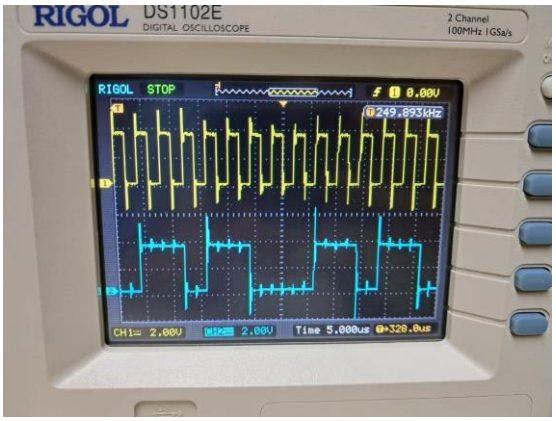


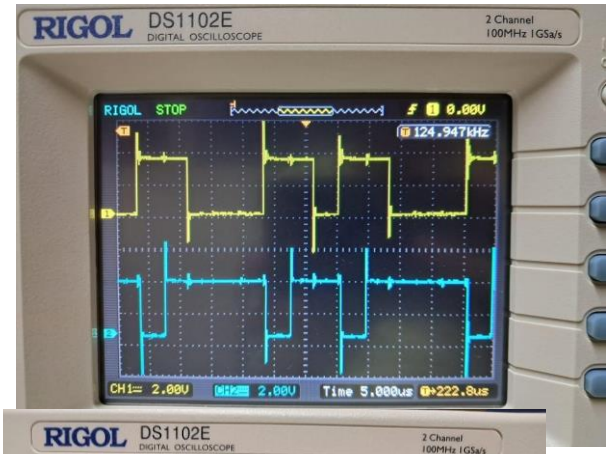


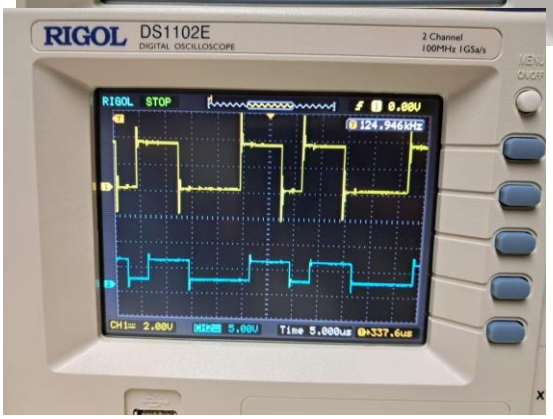

RIGOL STOP
0.00V
124.946kHz
CH1 2.00V
1.00V
Time 5.000us +338.4us

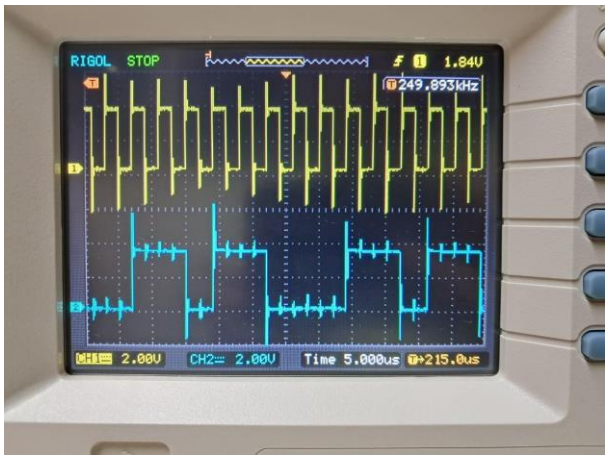

RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
0.00V
124.950kHz
CH1 2.00V
5.00V
Time 5.000us +337.6us

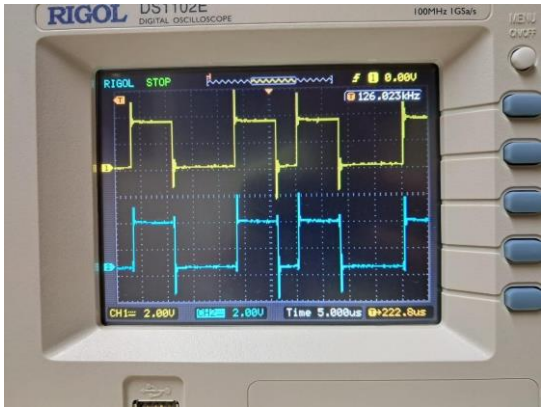

RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
0.00V
187.421kHz
CH1 2.00V
2.00V
Time 5.000us +338.0us

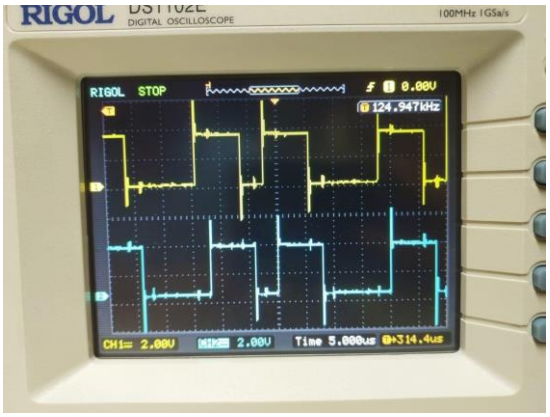

RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
0.00V
249.893kHz
CH1 2.00V
2.00V
Time 5.000us
328.0us

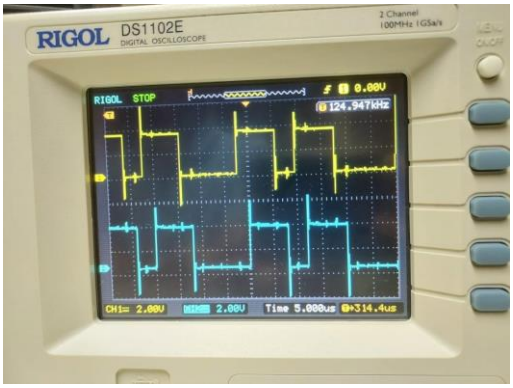

RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
0.00V
124.947kHz
CH1 2.00V
2.00V
Time 5.000us
222.8us

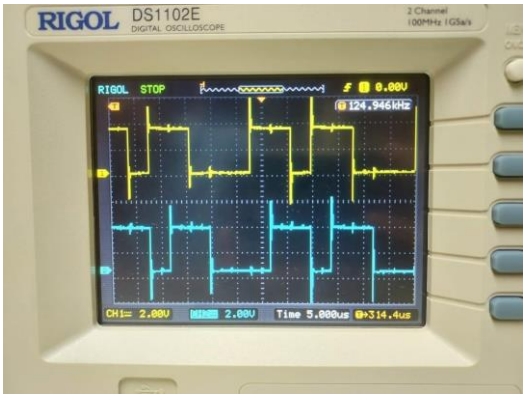

RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
0.00V
124.946kHz
CH1 2.00V
5.00V
Time 5.000us
337.6us

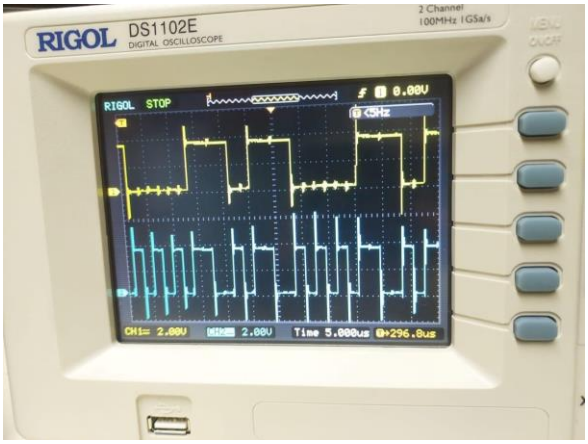

RIGOL STOP
1.84V
249.893kHz
2.00V
CH2 2.00V
Time 5.000us
215.0us

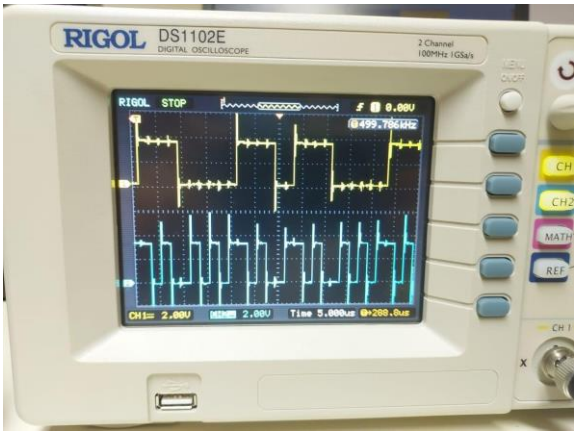

RIGOL DS1102E
DIGITAL OSCILLOSCOPE
100MHz 1GSa/s
RIGOL STOP
0.00V
126.023kHz
CH1 2.00V
MINUS 2.00V
Time 5.000us 0+222.0us

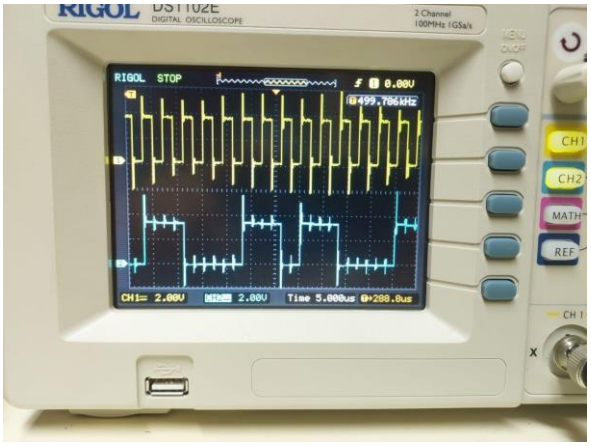

RIGOL
DIGITAL OSCILLOSCOPE
100MHz 1GSa/s
RIGOL STOP
0.00V
124.947kHz
CH1 2.00V
MINUS 2.00V
Time 5.000us 0+314.4us

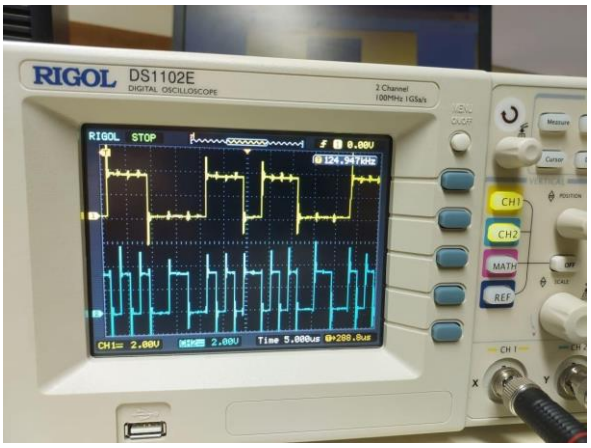

RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
0.00V
124.947kHz
CH1 2.00V
MINUS 2.00V
Time 5.000us 0+314.4us

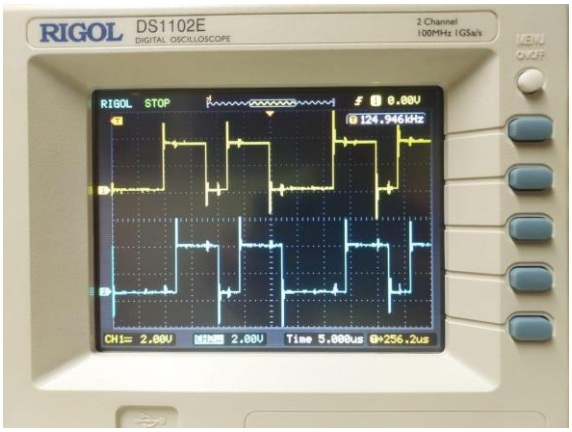

RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
0.00V
124.946kHz
CH1 2.00V
MINUS 2.00V
Time 5.000us 0+314.4us

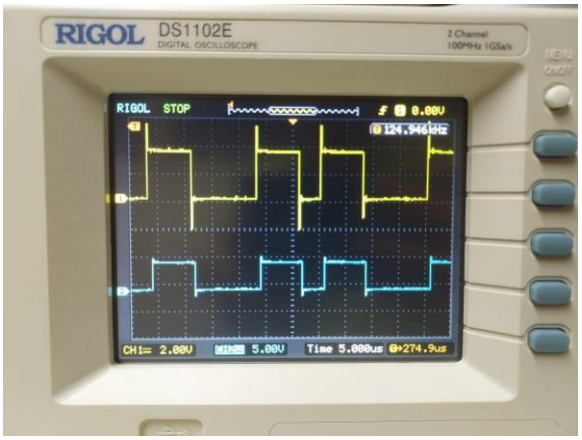

RIGOL
DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
0.00V
0Hz
CH1= 2.00V
2.00V
Time 5.000us
+296.0us

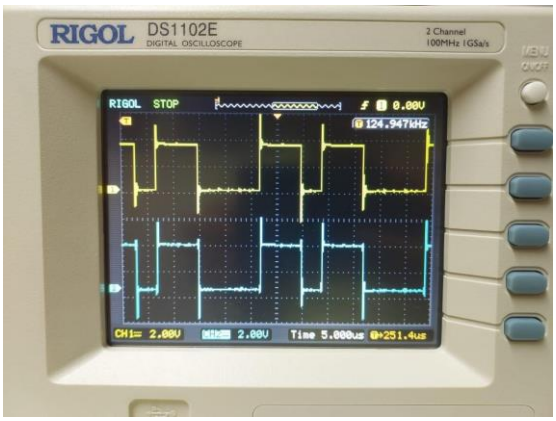

RIGOL
DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
0.00V
499.786kHz
CH1= 2.00V
2.00V
Time 5.000us
+288.0us
CH1
CH2
MATH
REF

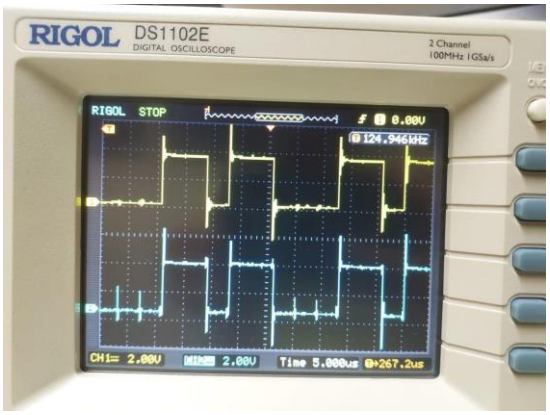

RIGOL
DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
0.00V
499.786kHz
CH1= 2.00V
2.00V
Time 5.000us
+288.0us
CH1
CH2
MATH
REF

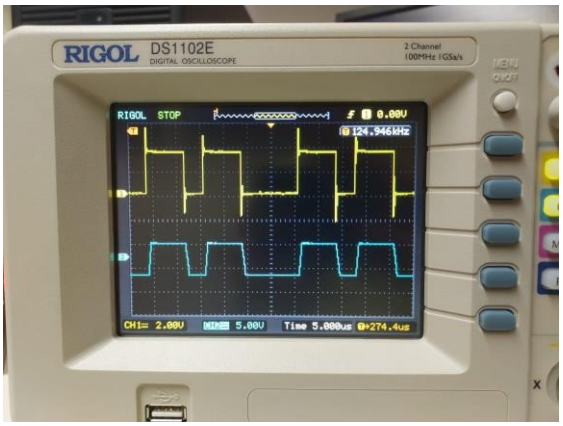

RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
124.947kHz
CH1
CH2
MATH
REF
CH1= 2.00V
2.00V
Time 5.000us
288.8us

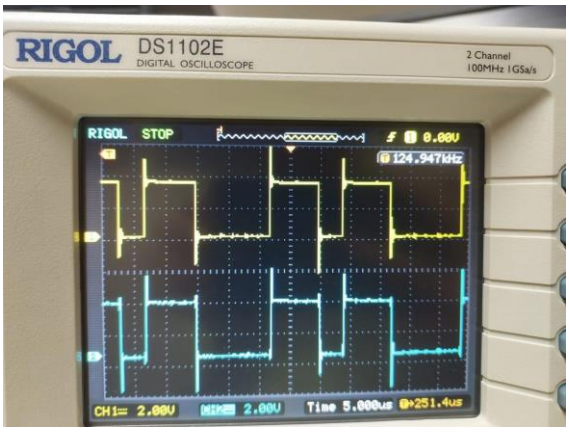

RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
124.946kHz
CH1= 2.00V
2.00V
Time 5.000us
256.2us


RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
124.946kHz
CH1= 2.00V
5.00V
Time 5.000us
274.9us


RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
124.947kHz
CH1= 2.00V
2.00V
Time 5.000us
251.4us


RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
124.946kHz
CH1= 2.00V
2.00V
Time 5.000us
267.2us


RIGOL DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
124.946kHz
CH1= 2.00V
5.00V
Time 5.000us
274.4us


RIGOL
DS1102E
DIGITAL OSCILLOSCOPE
2 Channel
100MHz 1GSa/s
RIGOL STOP
0.00V
124.947kHz
CH1= 2.00V
2.00V
Time 5.000us @>251.4us

Question 6.8:

```
N = 10000; % Number of bits
data = 2*randi([0,1], 1, N) - 1; % Generating random data: +1 or -1
h = [0.5, 0.5]; % This is an assumption.
% Variance values
sig_values = [0, 0.1, 0.2, 0.5, 1.0];
for sigma =sig_values
    received_data = filter(h,1,data);
noisy_received_data = received_data + sigma * randn(1, N);
% Decision Making: Assuming zero threshold. This might need to change based on your actual
channel.
decoded_data = sign(noisy_received_data);
% Calculating error
error = sum(data ~= decoded_data);
err_rate = error/N;
fprintf('Rate of the error in sigma = %f is: %.4f\n', sigma, err_rate);
end;
```

```
Rate of the error in sigma = 0.000000 is: 0.5061
Rate of the error in sigma = 0.100000 is: 0.2571
Rate of the error in sigma = 0.200000 is: 0.2497
Rate of the error in sigma = 0.500000 is: 0.2702
Rate of the error in sigma = 1.000000 is: 0.3357
```

Question 6.9

```
h_new = [1, 0.25];
% Using the same data and sigma values from 6.8:
for sig = sigma_values
    received_data_new = filter(h_new, 1, data);
    noisy_data_new = received_data_new + sig * randn(1, N);
decoded_data_new = sign(noisy_data_new);
err_new = sum(data ~= decoded_data_new);
err_rate_new = err_new/N;
fprintf('Rate of Error in sigma = %.4f for new channel = %.4f\n', sig, err_rate_new);


end
```

```
Rate of Error in sigma = 0.0000 for new channel = 0.0000
Rate of Error in sigma = 0.1000 for new channel = 0.0000
Rate of Error in sigma = 0.2000 for new channel = 0.0000
Rate of Error in sigma = 0.5000 for new channel = 0.0382
Rate of Error in sigma = 1.0000 for new channel = 0.1657
```