

# Activity 1

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## 1 AIM

- 1) At least 6 Lissajous figures should be plotted on the oscilloscope and justify the pattern you see on CRO with theory.
- 2) How do you capture one-time event on CRO - show with an example

## 2 APPARATUS REQUIRED

- 1) Oscilloscope (Digital with two channels)
- 2) Function Generator (with two channels)
- 3) Two probes
- 4) Two connection wires

## 3 THEORY

### 3.1 Lissajous figures

Lissajous curves are defined as a parametric curve given by,

$$x = A \sin(at + \delta), y = B \sin(bt) \quad (1)$$

which describe the superposition of two perpendicular oscillations in x and y directions of different angular frequency.

We can use an oscilloscope to project a Lissajous curve. We can send signal 1 to the top-bottom plates of the oscilloscope and signal 2 to the left-right plates. This achieves the given parametric equation.

## 4 PROCEDURE

### 4.1 Lissajous figures

- 1) Take a Function generator and an oscilloscope with 2 channels.
- 2) Connect channel 1 of function generator with channel 1 of the oscilloscope and channel 2 of function generator to channel 2 of oscilloscope.
- 3) Set channel 1 and channel 2 of the function generator to desired functions
- 4) Change the display mode of the oscilloscope to x-y mode
- 5) Observe the shapes produced by the oscilloscope

### 4.2 Capturing an event

- 1) Use the function generator to trigger a pulse signal on manual trigger
- 2) Set the trigger level in the CRO to an appropriate level (0.1V)
- 3) Set the Run control to single
- 4) Observe that it says WAIT on the top left of the CRO
- 5) Trigger the signal from the function generator
- 6) Observe the CRO output

## 5 OBSERVARION

### 5.1 Lissajous curves

1)

$$x = 5 \sin\left(\frac{2\pi}{3}t\right), y = 5 \sin\left(\frac{2\pi}{3}t\right)$$

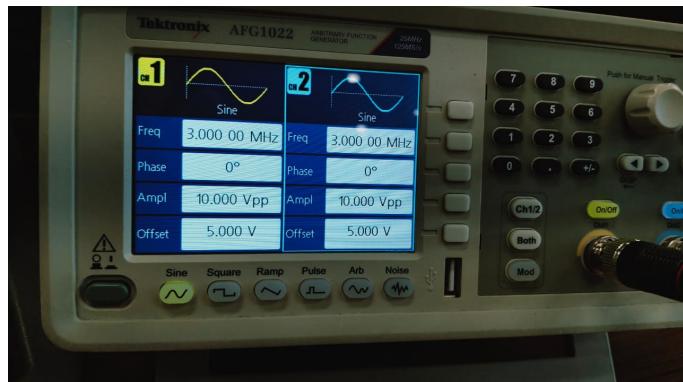


Fig. 1: Input from function generator

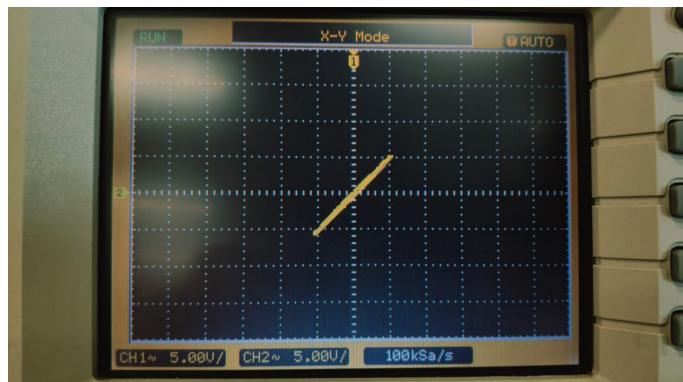


Fig. 2: Output on CRO

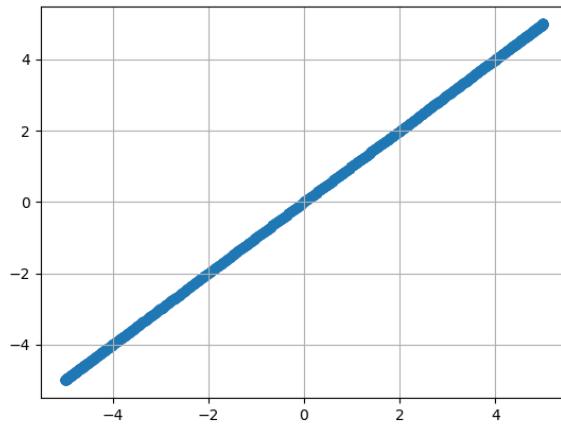


Fig. 3: Theoretical PPlot

2)

$$x = 5 \sin\left(\frac{2\pi}{3}t\right), y = 5 \sin\left(\frac{2\pi}{3}t + \frac{\pi}{2}\right)$$

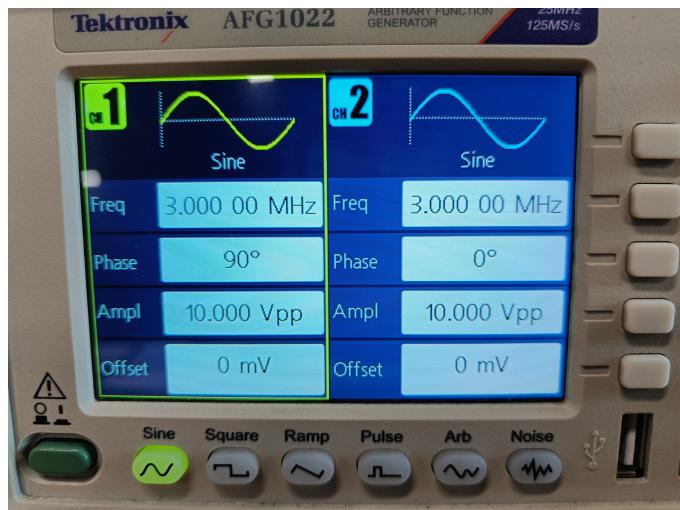


Fig. 4: Input from function generator

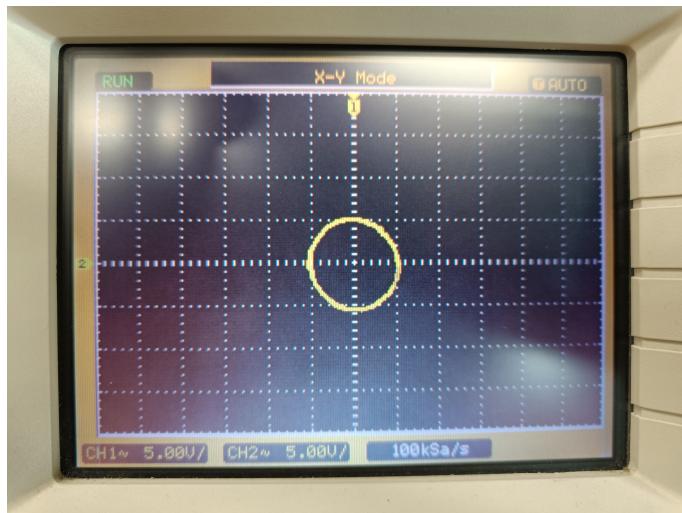


Fig. 5: Output on CRO

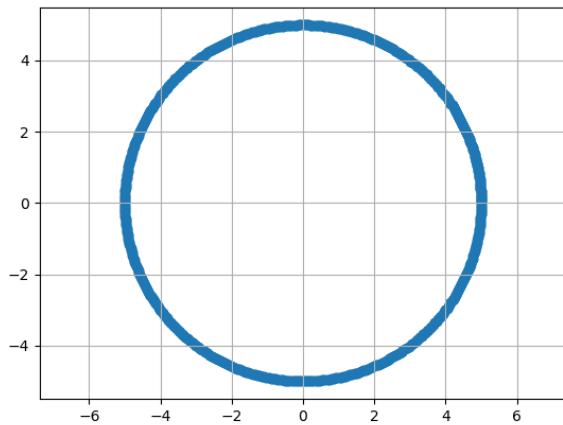


Fig. 6: Theoretical Plot

3)

$$x = 5 \sin\left(\frac{2\pi}{3}t + \frac{\pi}{2}\right), y = 5 \sin\left(\frac{2\pi}{6}t\right) \quad (2)$$



Fig. 7: Input from function generator

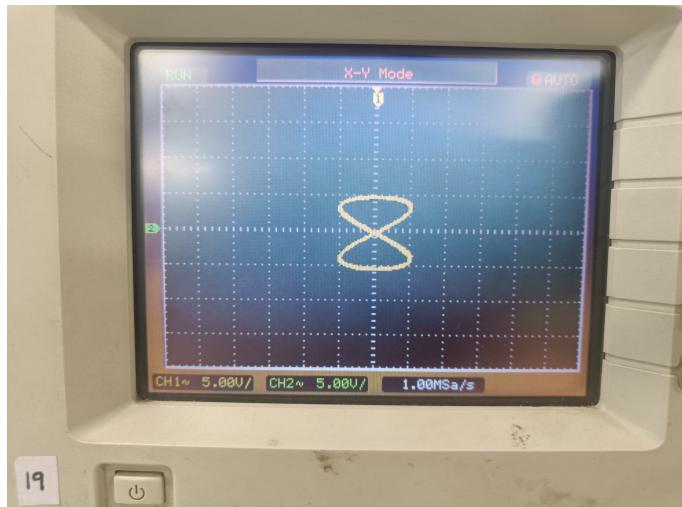


Fig. 8: Output on CRO

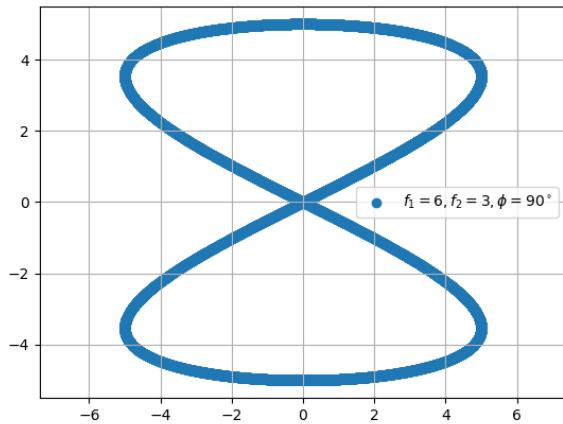


Fig. 9: Theoretical Plot

4)

$$x = 5 \sin\left(\frac{2\pi}{4}t + \frac{\pi}{4}\right), y = 5 \sin\left(\frac{2\pi}{3}t\right) \quad (3)$$

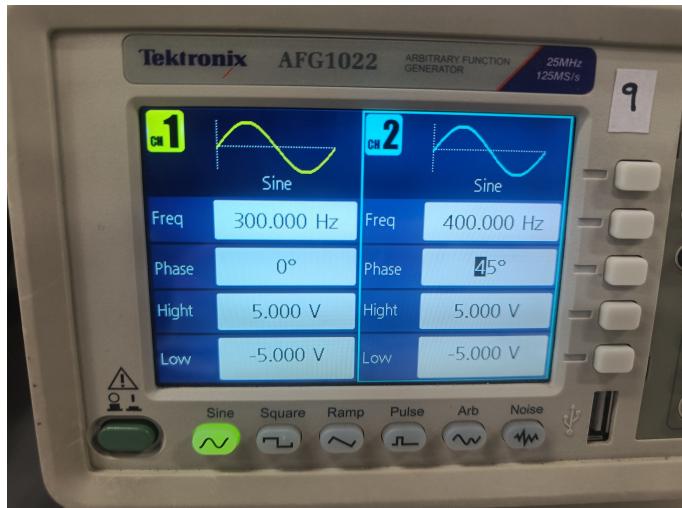


Fig. 10: Input from function generator

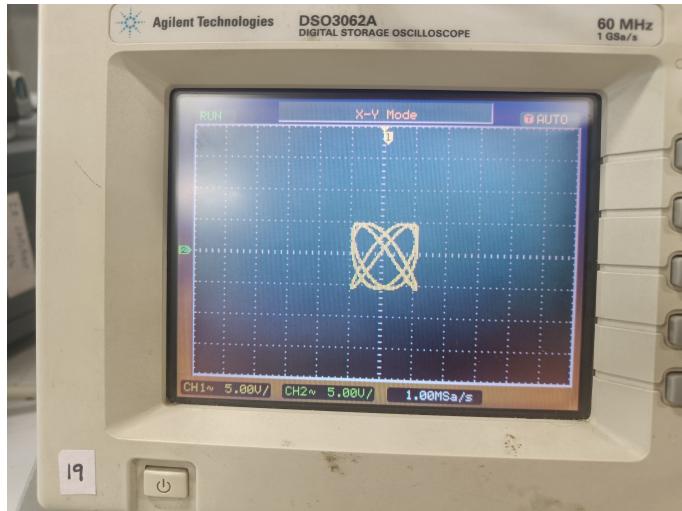


Fig. 11: Output on CRO

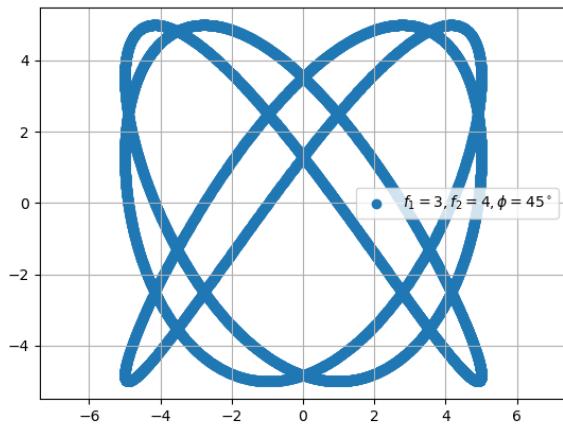


Fig. 12: Theoretical Plot

5)

$$x = 5 \sin\left(\frac{2\pi}{3}t\right), y = 5 \sin(2\pi t) \quad (4)$$



Fig. 13: Input from function generator

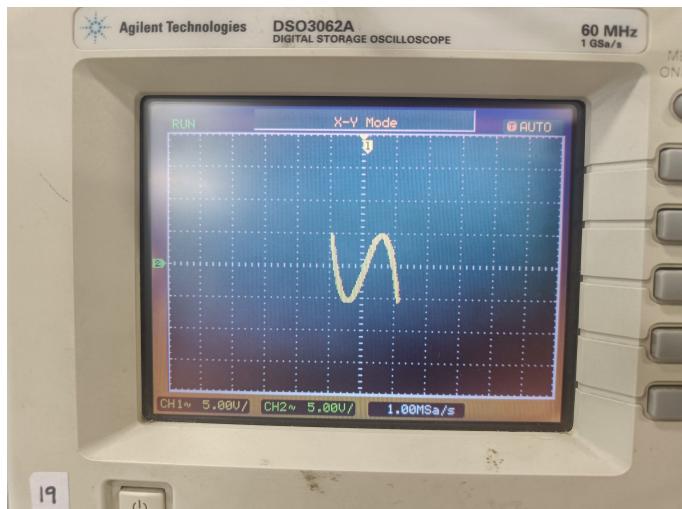


Fig. 14: Output on CRO

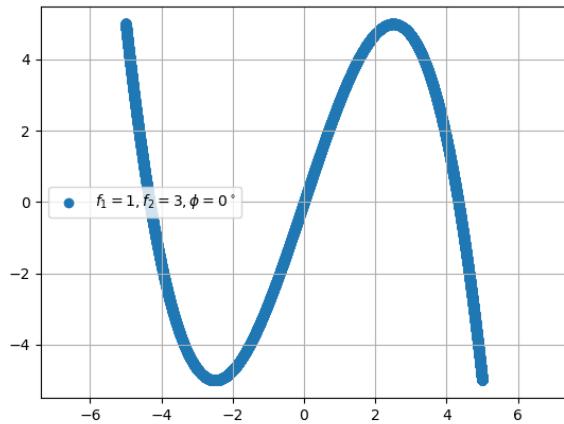


Fig. 15: Theoretical Plot

6)

$$x = 5 \sin\left(\frac{2\pi}{3}t + \frac{\pi}{2}\right), y = 5 \sin\left(\frac{2\pi}{2}t\right) \quad (5)$$



Fig. 16: Input from function generator



Fig. 17: Output on CRO

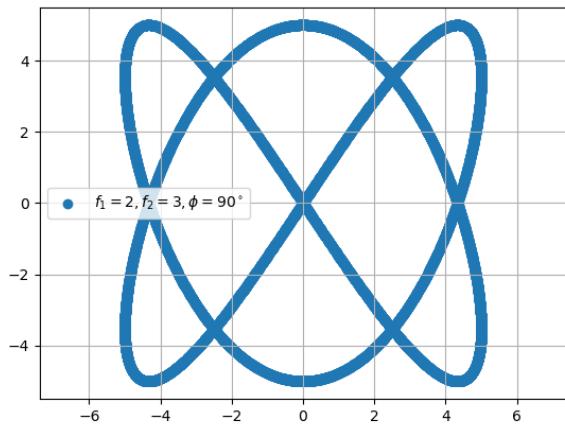


Fig. 18: Theoretical Plot

7)

$$x = 5 \sin\left(\frac{2\pi}{2}t + \frac{\pi}{2}\right), y = 5 \sin(2\pi t) \quad (6)$$

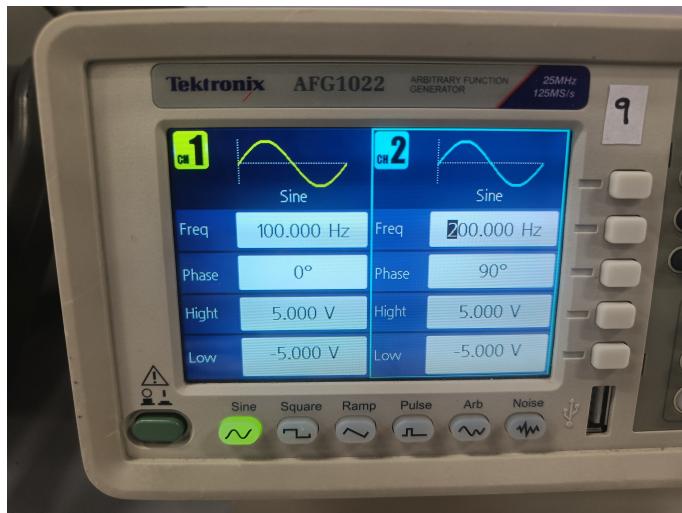


Fig. 19: Input from function generator

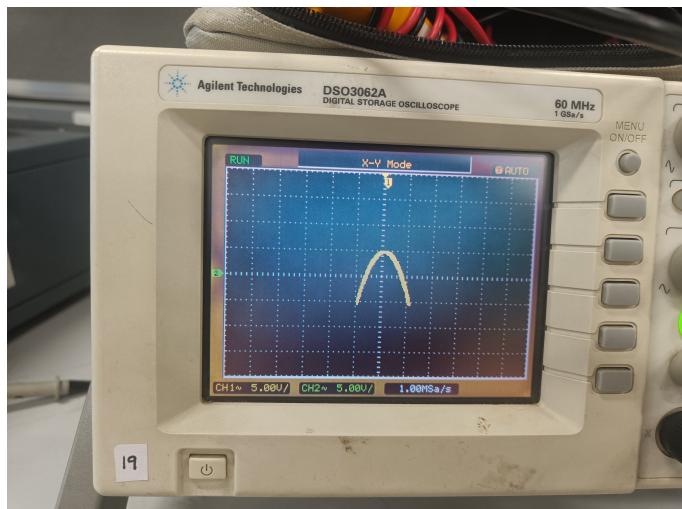


Fig. 20: Output on CRO

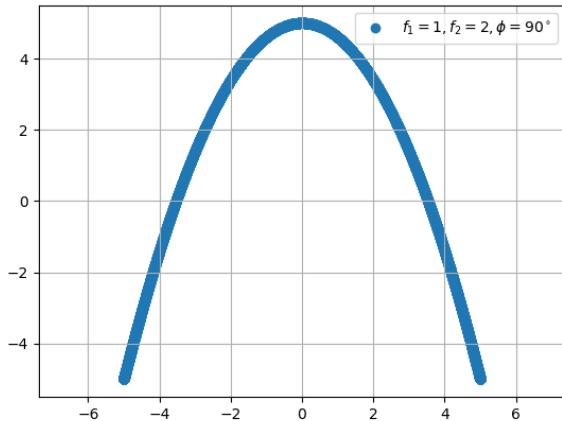


Fig. 21: Theoretical Plot

8)

$$x = 5 \sin\left(\frac{2\pi}{6}t\right), y = 5 \sin\left(\frac{2\pi}{5}t\right) \quad (7)$$



Fig. 22: Input from function generator

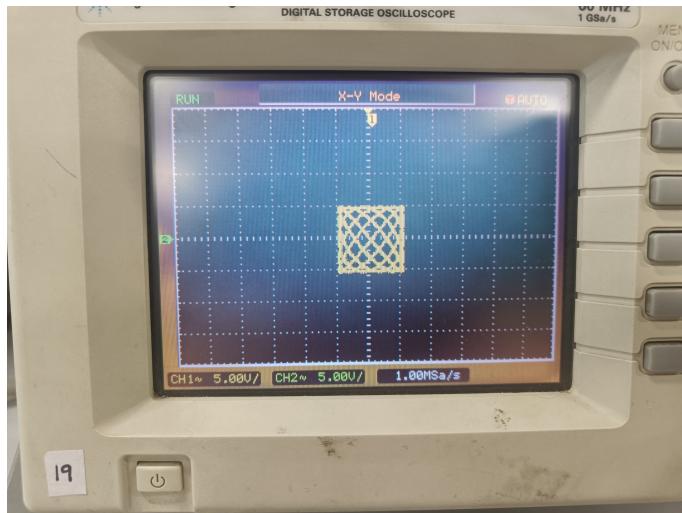


Fig. 23: Output on CRO

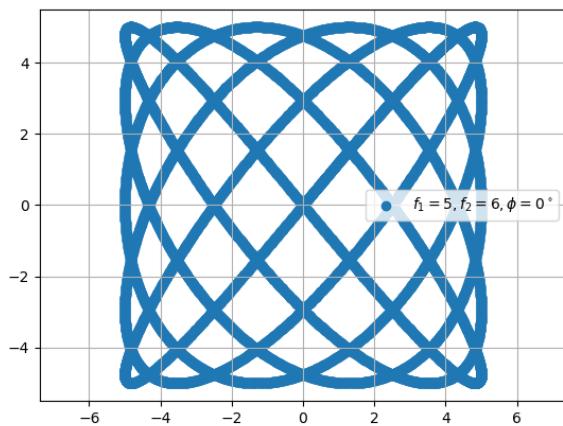


Fig. 24: Theoretical Plot

## 5.2 Capturing an event

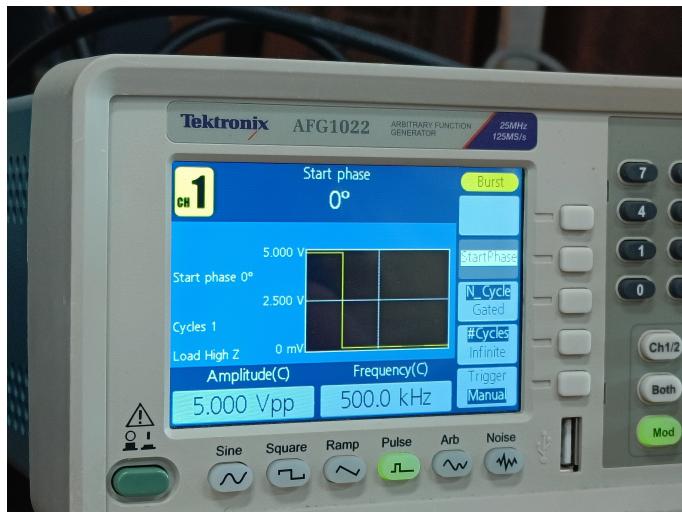


Fig. 25: Function Generator

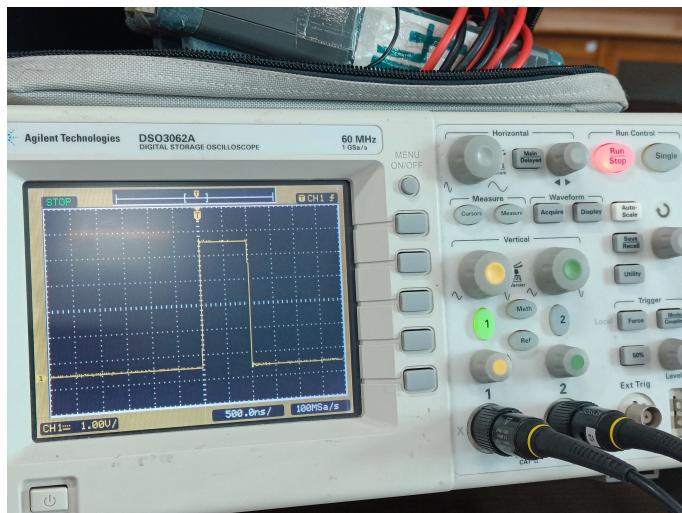


Fig. 26: Signal captured in CRO

## 6 PRECAUTIONS

- 1) Make sure the connections are proper
- 2) Join the grounds of the probe and the connector from the CRO and function generator.
- 3) Make sure to align phase each time to make changes in the function generator
- 4) Make sure the scaling of X and Y are set properly