MIT-WPU
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MIT WORLD PEACE UNIVERSITY | PUNE
TECHNOLOGY, RESEARCH, SOCIAL INNOVATION & PARTNERSHIPS

DEMONSTRATING LINE CODING & EYE DIAGRAM USING MATLAB GUI

-Tanmay Kapil (PC47)
-Jay Srivastava (PC46)
-Atul Kumar (PC44)

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BASICS OF AN EYE DIAGRAM

An eye diagram is a common indicator of the quality of signals in high-speed digital transmissions.

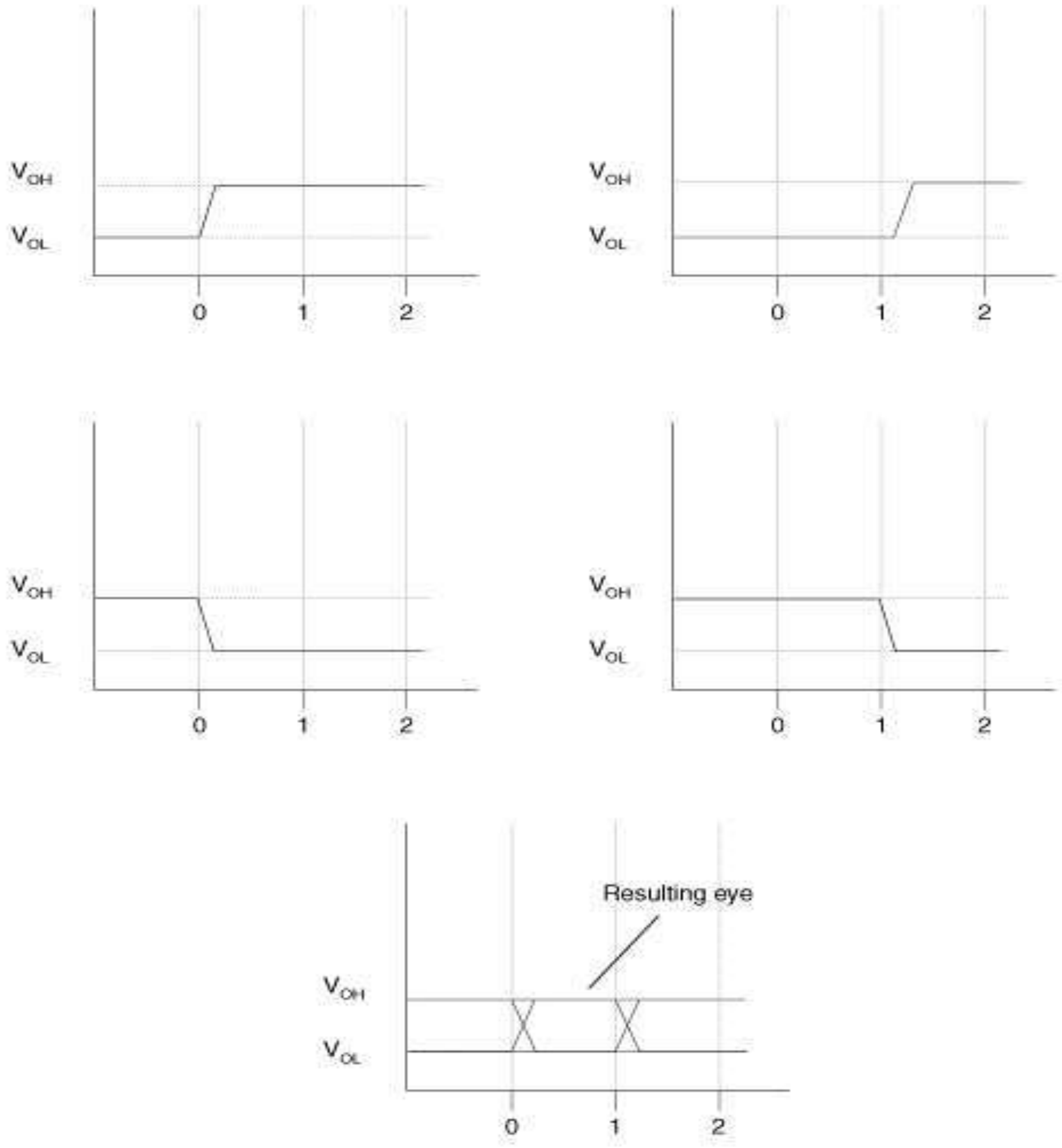
An eye diagram is used in electronic engineering to get a good idea of signal quality in the digital domain.

The eye diagram takes its name from the fact that it has the appearance of a human eye.

The eye diagram is used primarily to look at digital signals for the purpose of recognizing the effects of distortion and finding its source

INTERPRETING AN EYE DIAGRAM

- A properly constructed eye should contain every possible bit sequence from simple alternate 1’s and 0’s to isolated 1’s after long runs of 0’s, and all other patterns that may show up weaknesses in the design.
- In the figure shown, the bit sequences 011, 001, 100, and 110 are superimposed over one another to obtain the final eye diagram.



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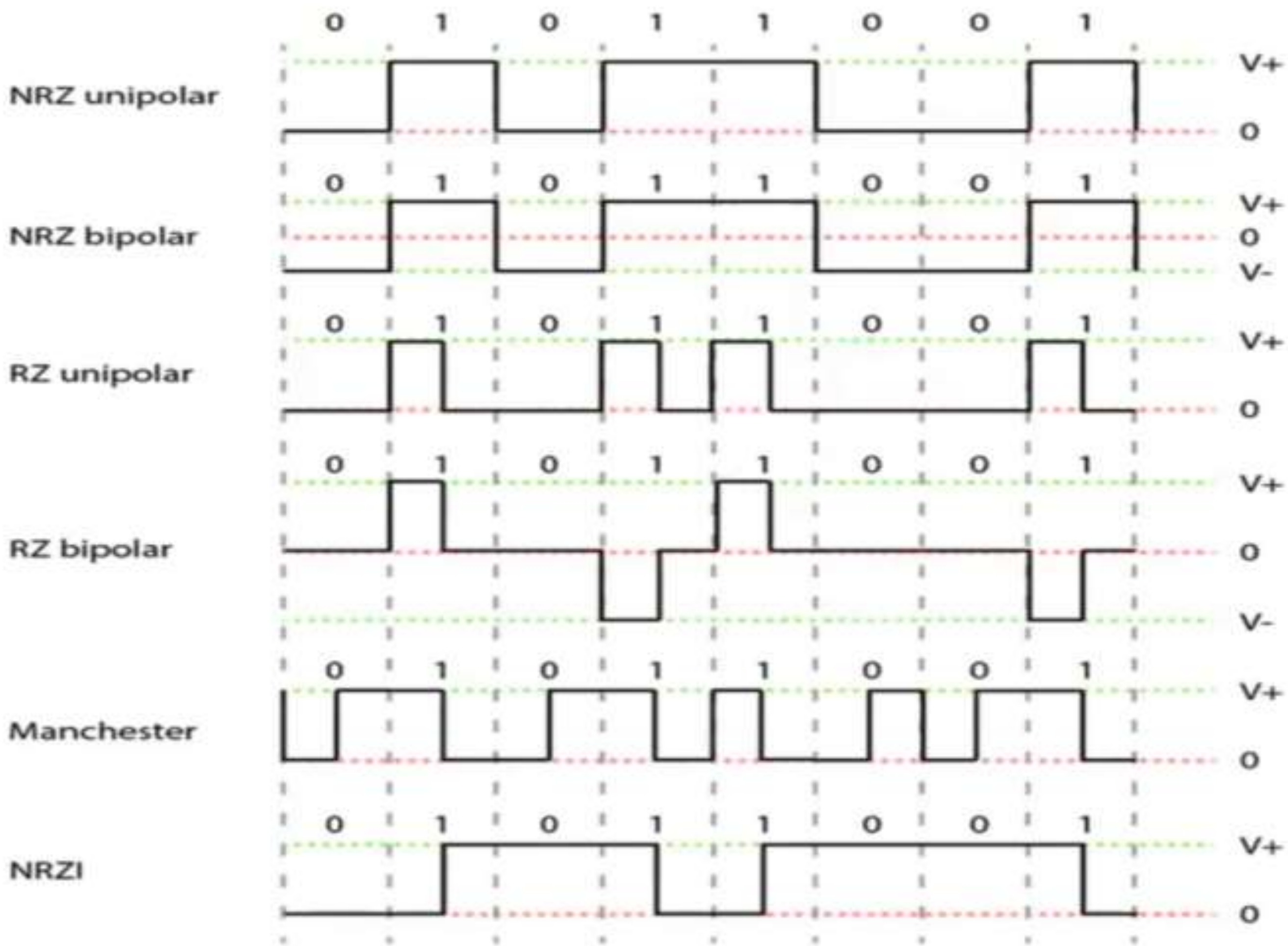
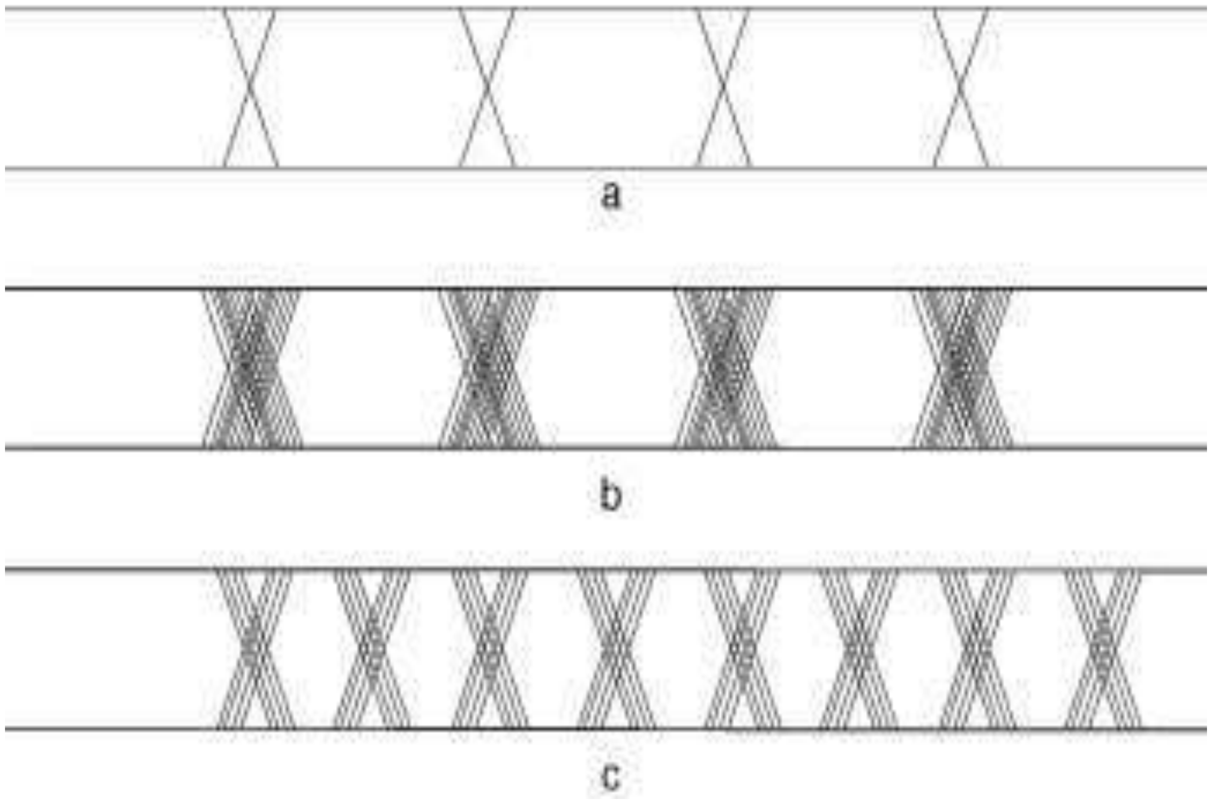
LINE CODING



WHAT IS JITTER?

- Although in theory eye diagrams should look like rectangular boxes, the finite rise and fall times of signals and oscilloscopes cause eye diagrams to actually look more like the image in **Figure (a)**.
- When high-speed digital signals are transmitted, the impairments introduced at various stages lead to timing errors. One such timing error is “jitter,” which results from the misalignment of rise and fall times (**Figure b**).



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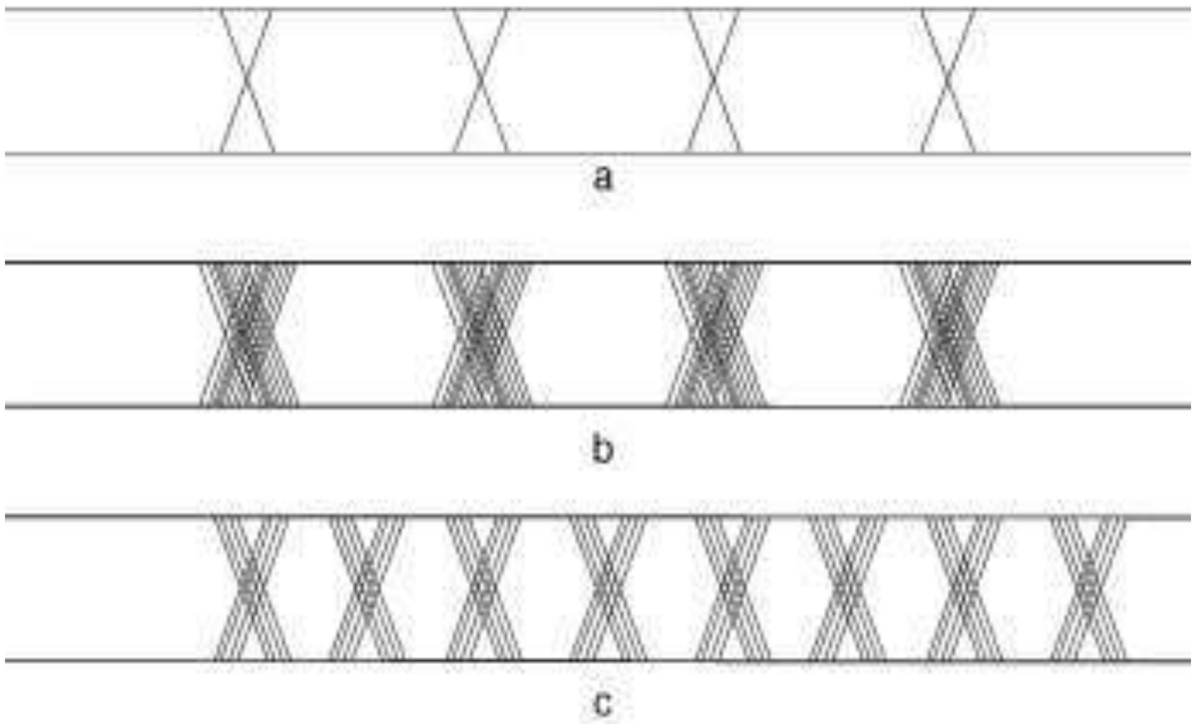
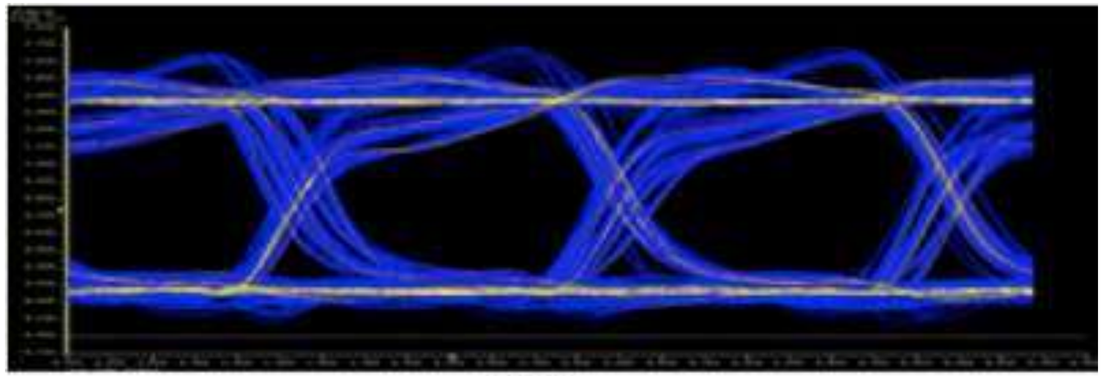
JITTER IN DETAIL

- Jitter occurs when a riding or falling edges occur at times that differ from the ideal time. Some edges occur early, some occur late.
- In **Figure (c),** the absolute timing error or jitter margin is less than that in **Figure (b)** , but the eye opening in **Figure (c)** is smaller because of the higher bit rate.
- With the increase in bit rate, the absolute time error represents an increasing portion of the cycle, thus reducing the size of the eye opening. This may increase the potential for data errors.



JITTER IN DETAIL

- The effect of termination is clearly visible in the eye diagrams generated. With improper termination, the eye looks constrained or stressed (**Figure (a**)), and with improved termination schemes, the eye becomes more relaxed (**Figure (b)**).
- A poorly terminated signal line suffers from multiple reflections. The reflected waves are of significant amplitude, which may severely constrict the eye.
- Typically, this is the worst-case operating condition for the receiver, and if the receiver can operate error-free in the presence of such interference, then it meets specifications.



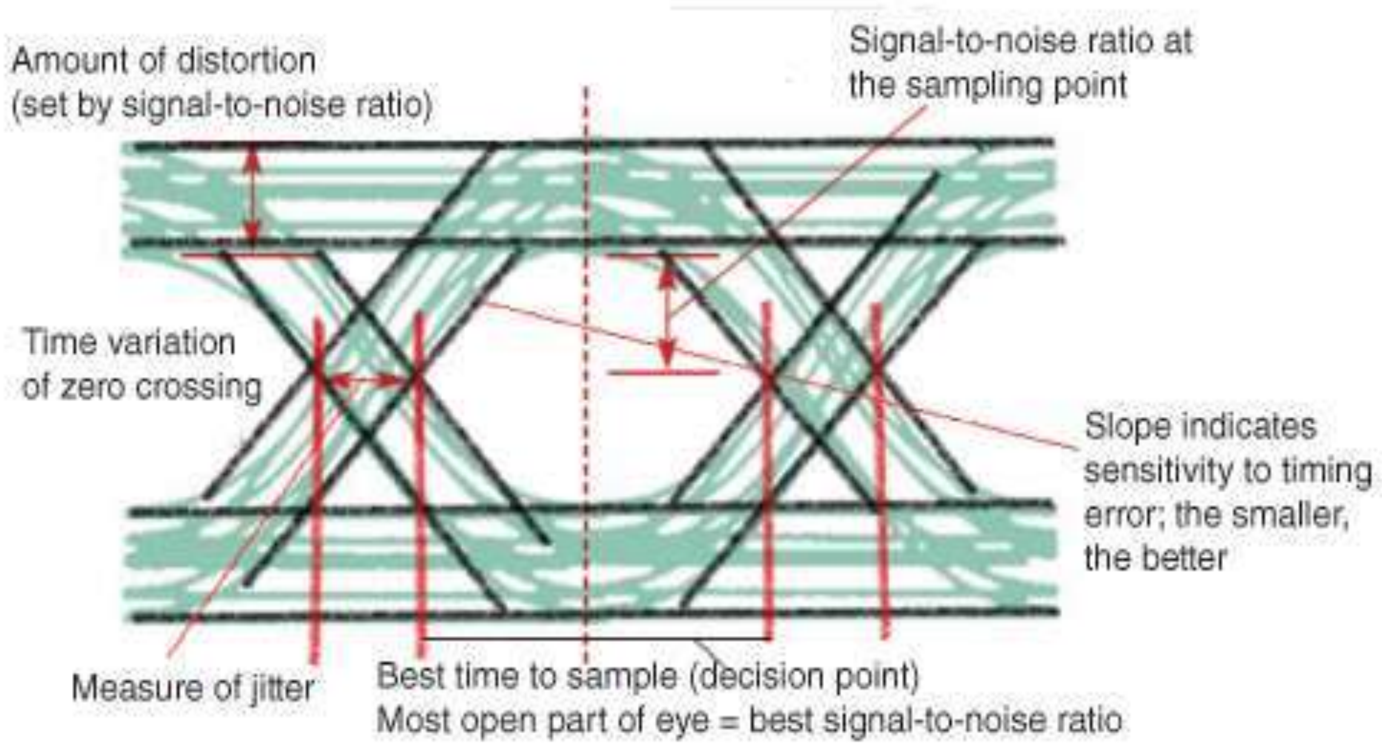
(a)

(b)

IMPORTANCE OF AN EYE DIAGRAM

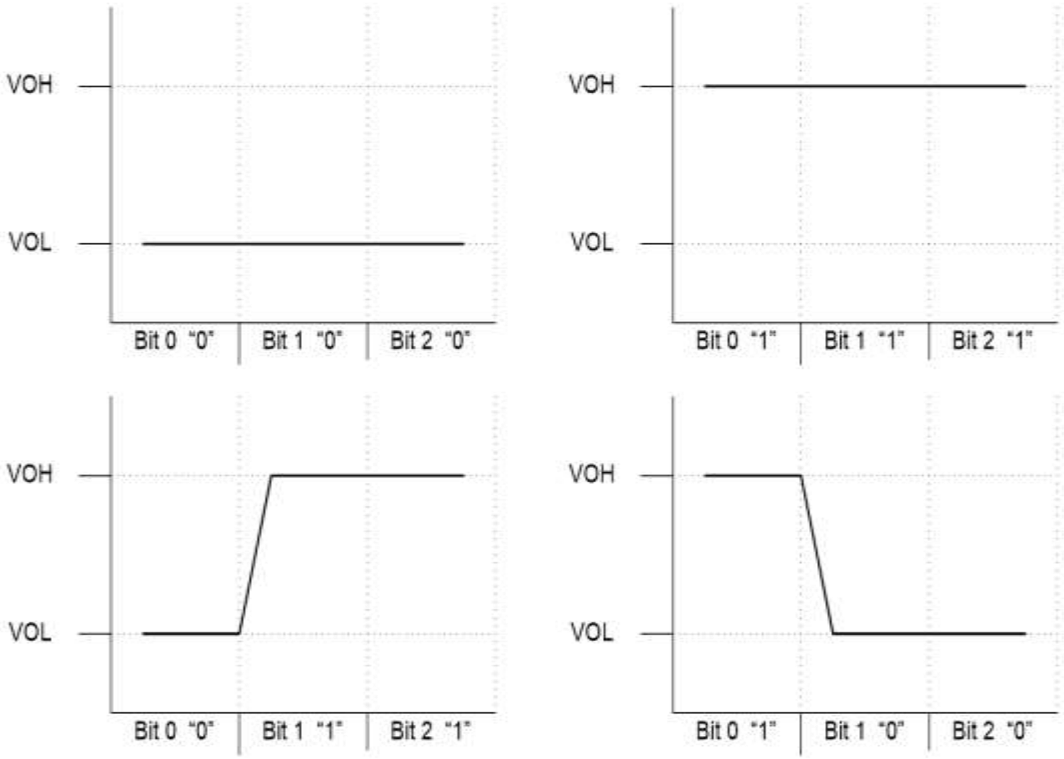
An eye pattern provides the following information about a particular system.

- Actual eye patterns are used to estimate the bit error rate and the signal-to-noise ratio.
- The width of the eye opening defines the time interval over which the received wave can be sampled without error.
- The instant of time when the eye opening is wide, will be the preferred time for sampling.
- The rate of the closure of the eye, according to the sampling time, determines how sensitive the system is to the timing error.
- The height of the eye opening, at a specified sampling time, defines the margin over noise



OBTAINING THE EYE DIAGRAM

- A Sampling Oscilloscope is used to create an Eye Diagram.
- It is used for displaying and overlaying the results of a continuous sampling of the signal.
- This is done at a resolution of a single Unit Interval (UI) of a one data bit to allow for all combinations of low-to-high and high-low transitions to occur.



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PROJECT CONTENT

Demonstrating Line Coding and Eye Diagram using MATLAB GUI

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MATLAB CODE & OUTPUT

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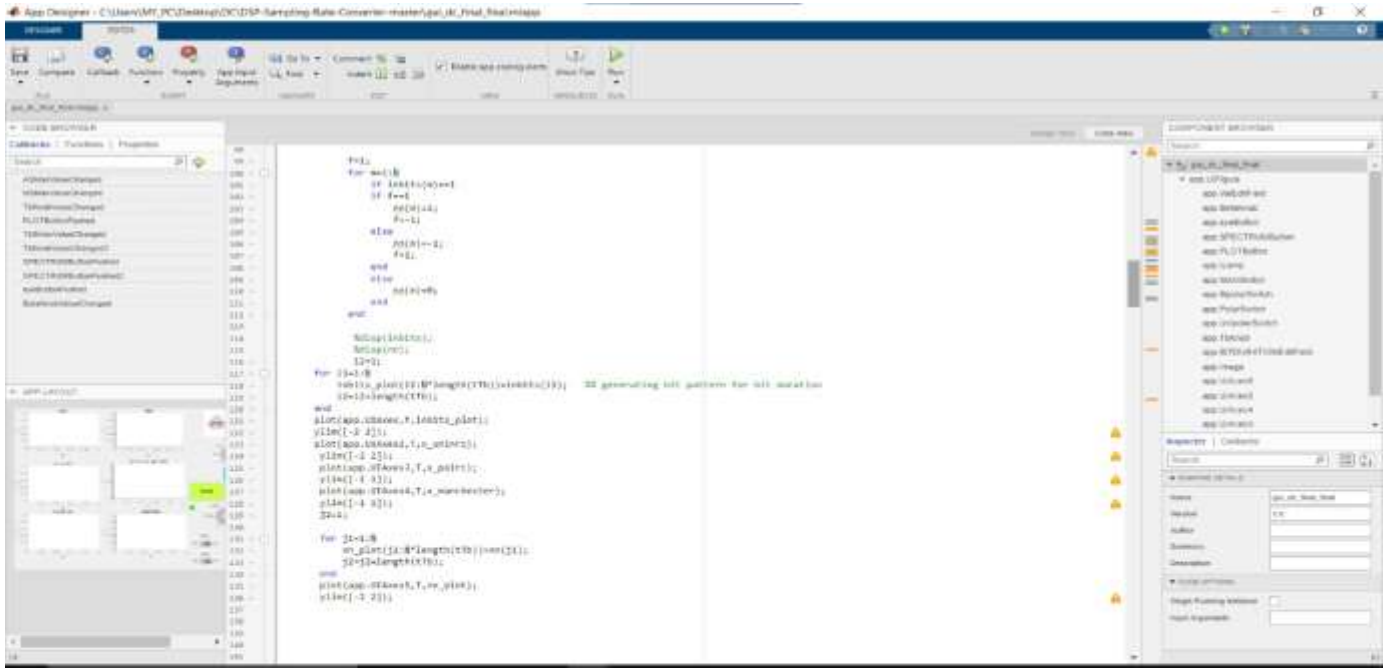
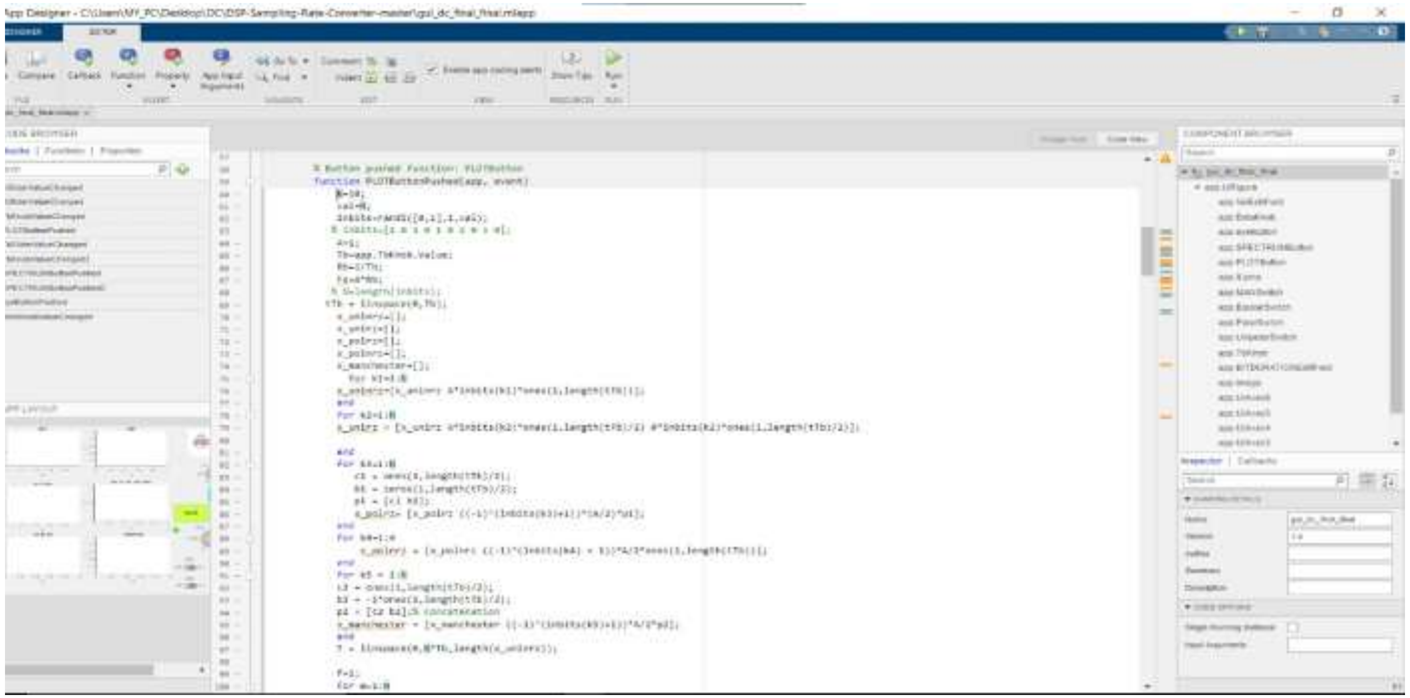
CODE FOR PLOT BUTTON





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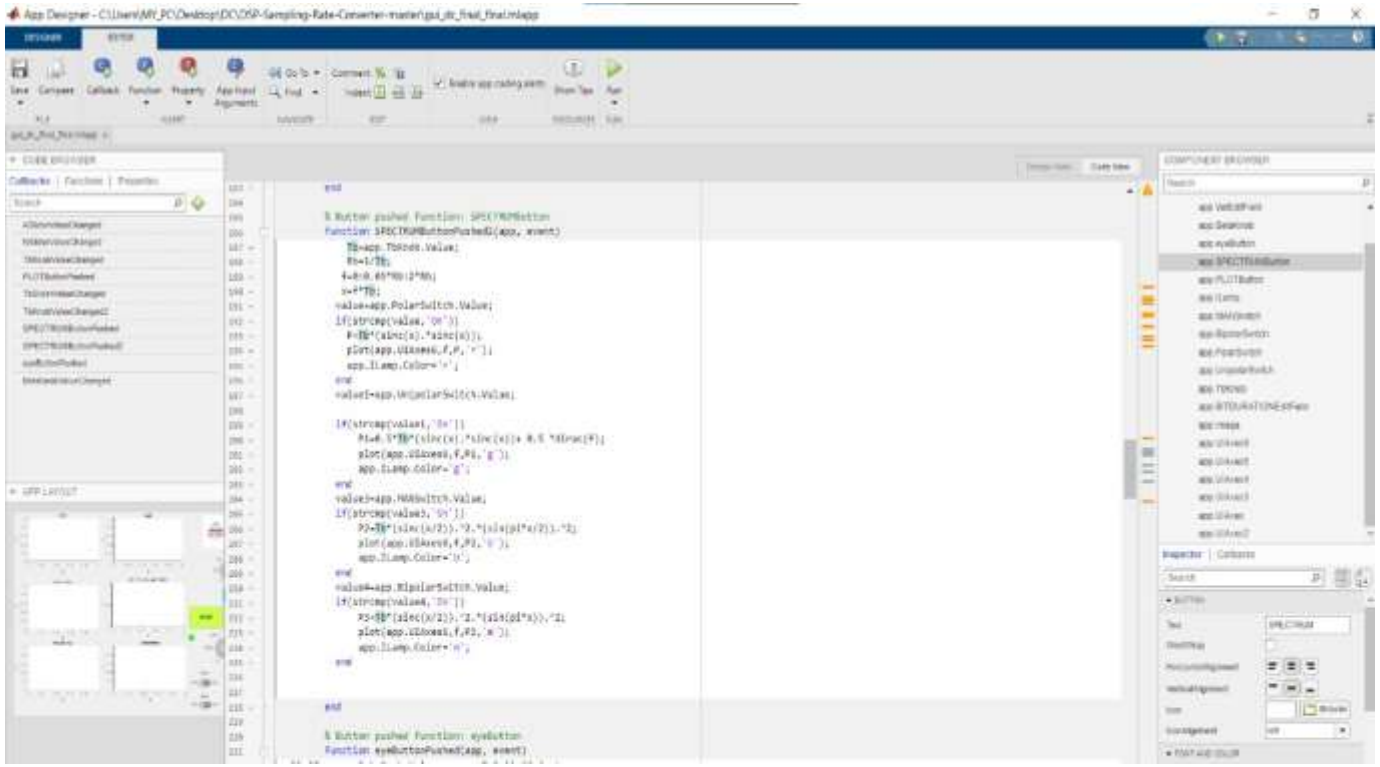
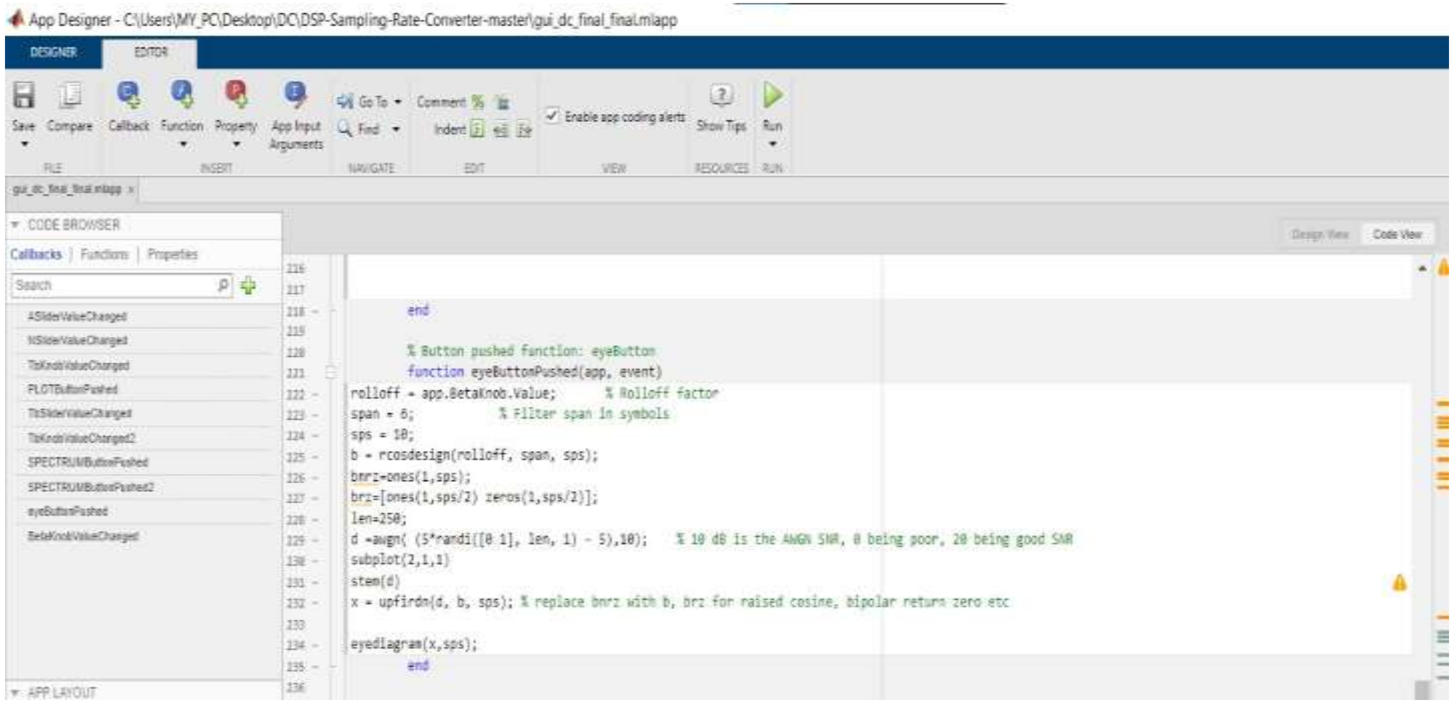
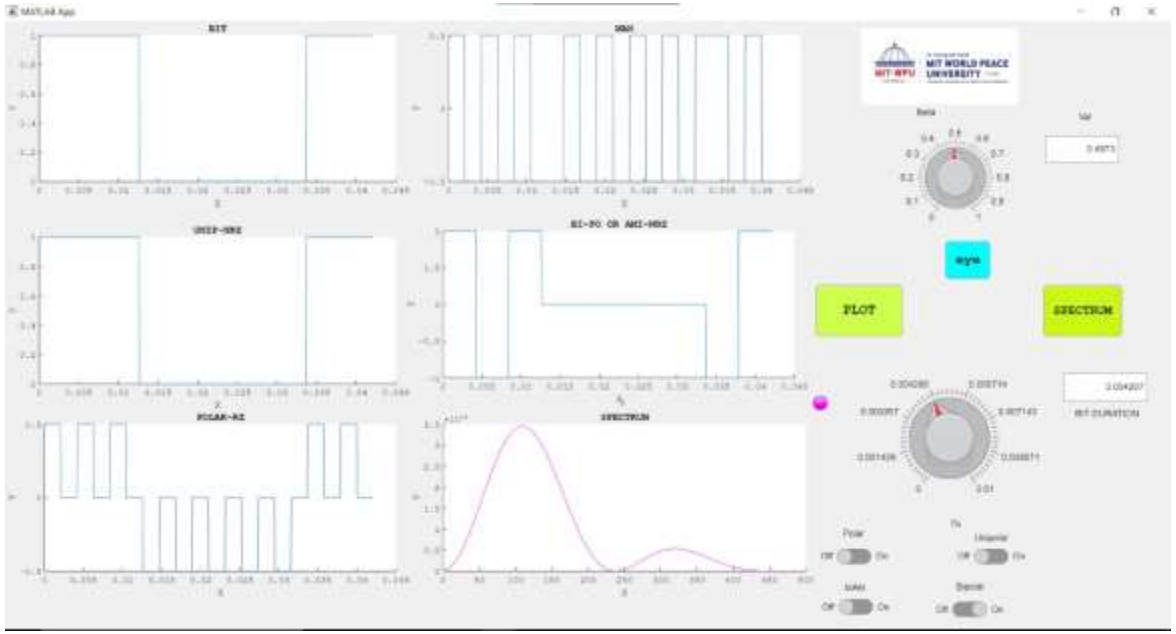
CODE FOR SPECTRUM

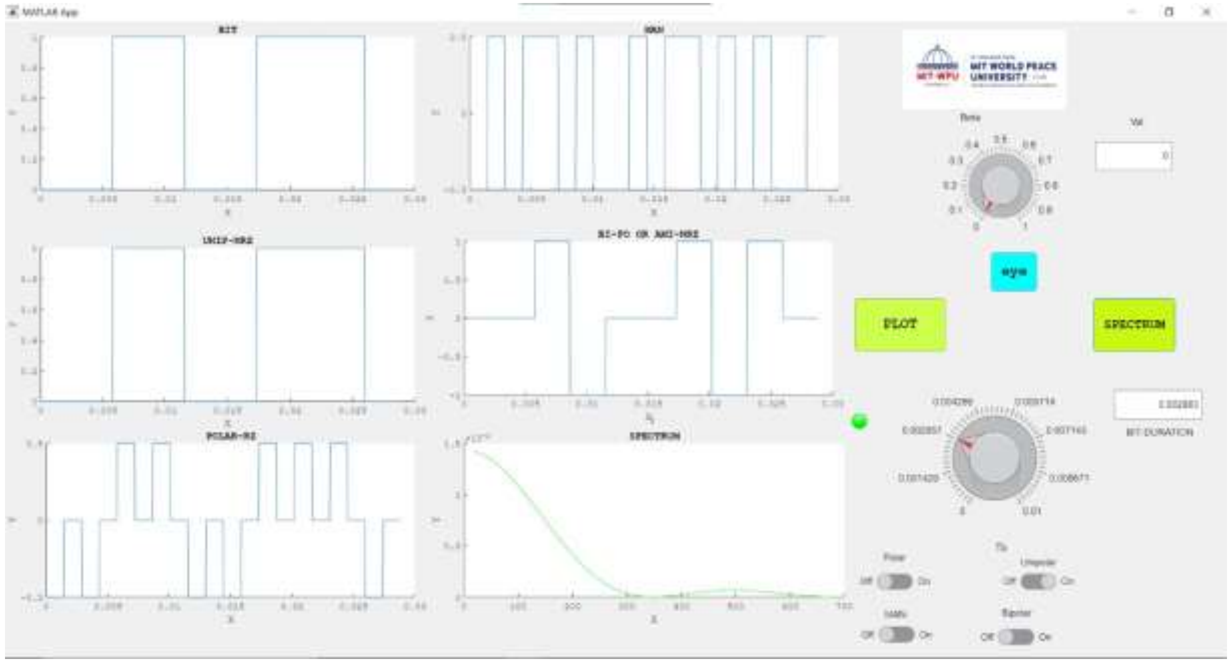


CODE FOR EYE DIAGRAM

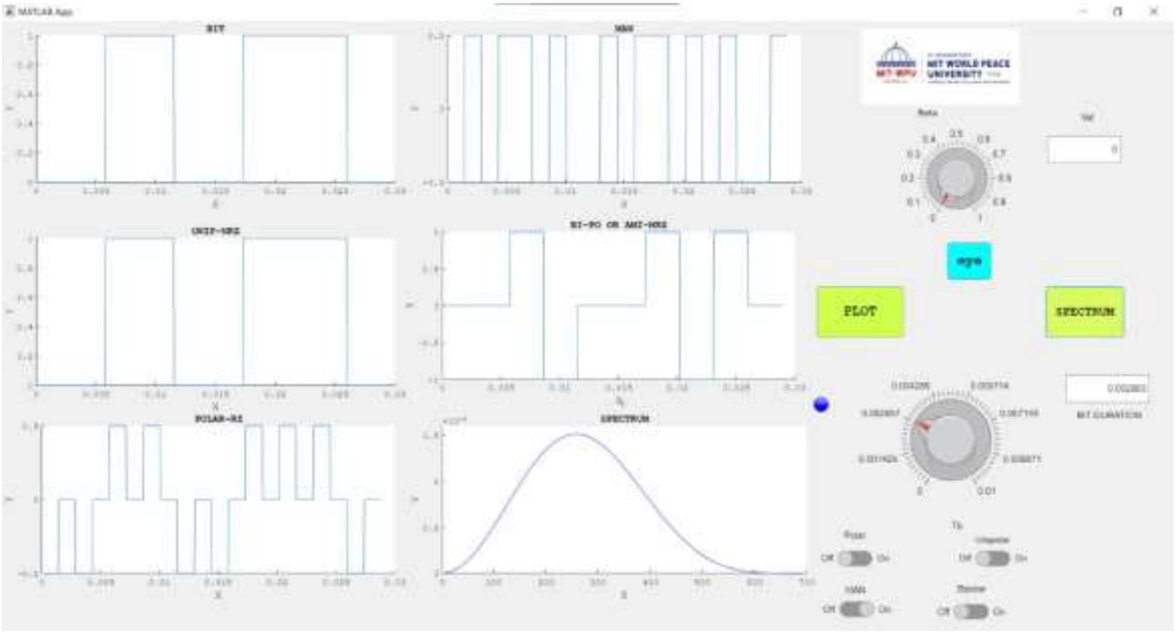


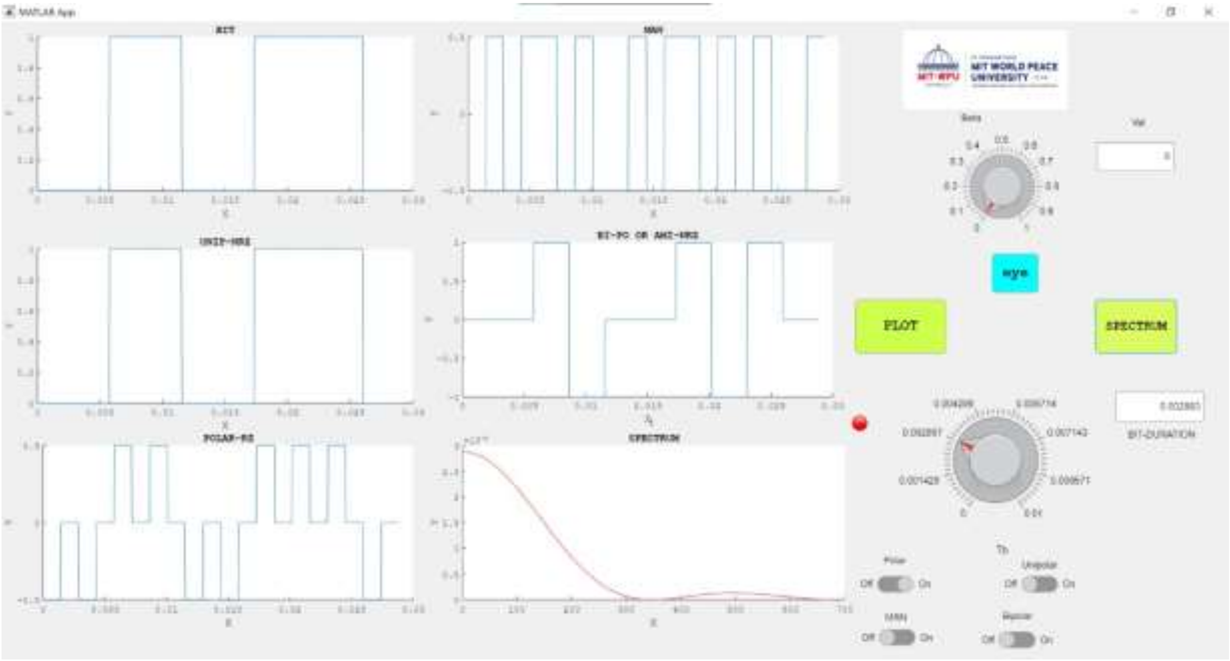
OUTPUT



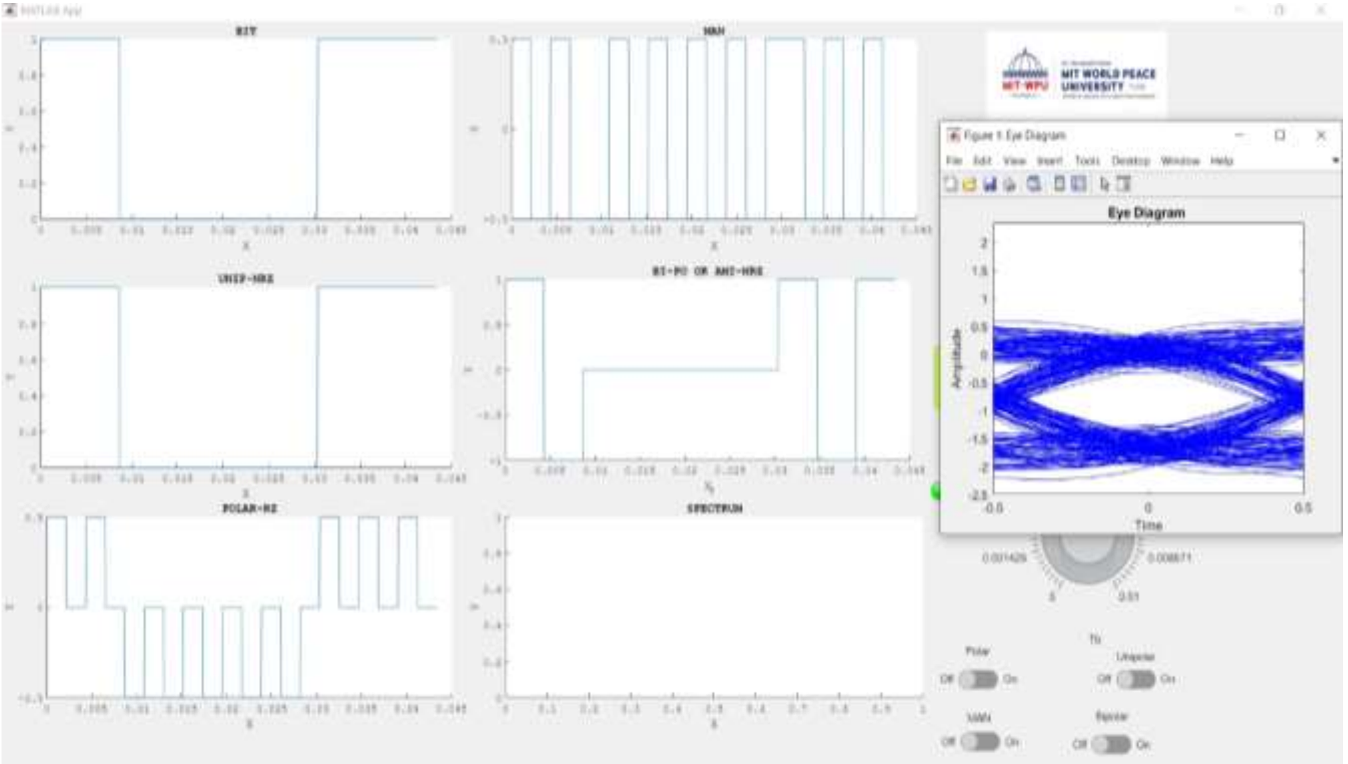


OUTPUT





EYE DIAGRAM


BIT
UNIP-NRZ
POLAR-NRZ
SPECTRUM
Figure 1: Eye Diagram
File Edit View Insert Tools Desktop Window Help
Eye Diagram
Amplitude
Time

REFERENCES

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THANK YOU

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