SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution

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DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

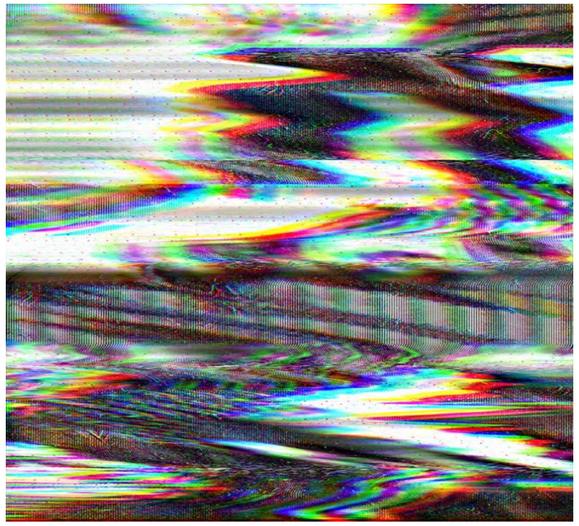
19ECT302 – TRANSMISSION LINES AND WAVE GUIDES

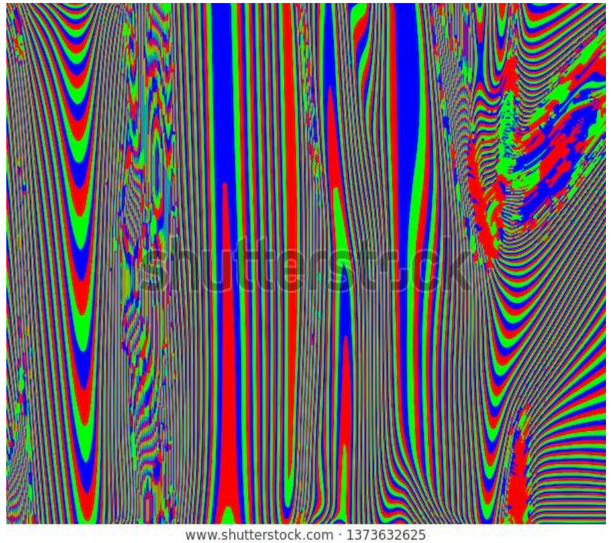
III YEAR/ V SEMESTER

UNIT 1 – TRANSMISSION LINE THEORY

TOPIC 6 – WAVEFORM DISTORTION AND DISTORTIONLESS LINE

GUESS WHAT THE IMAGES INDICATE ?





DISTORTION

- Signal transmitted over lines are normally complex and consists of many frequency components.

- For ideal transmission, the waveform at the line-receiving end must be the same as the waveform of the original input signal.

DISTORTION

- Requires that all frequencies have the same attenuation and the same delay caused by a finite phase velocity or velocity of propagation.

- When these conditions are not satisfied, distortion exists. The distortions occurring in the transmission line are called waveform distortion or line distortion.

TYPES

1. Frequency Distortion

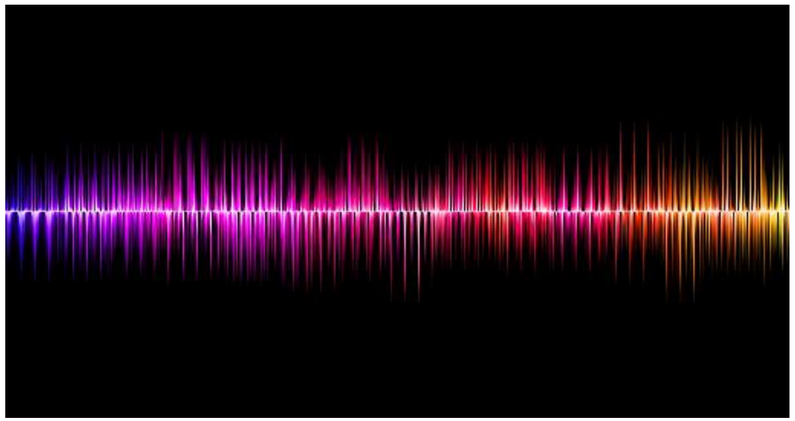
2. Phase or Delay Distortion

FREQUENCY DISTORTION

- When a signal having many frequency components are transmitted along the line, all the frequencies will not have equal attenuation

EX

- Voice signal is a complex waveform consists of many frequencies



FREQUENCY DISTORTION

- Hence the received end waveform will not be identical with the input waveform at the sending end because each frequency is having different attenuation.

- This is called Frequency distortion

METHODS TO AVOID

- When the attenuation constant is not a function of frequency, frequency distortion does not exist on transmission lines.

In order to reduce frequency distortion occurring in the line,

a) The attenuation constant should be made independent of frequency.

b) By using equalizers at the line terminals which minimize the frequency distortion.

ACTIVITY

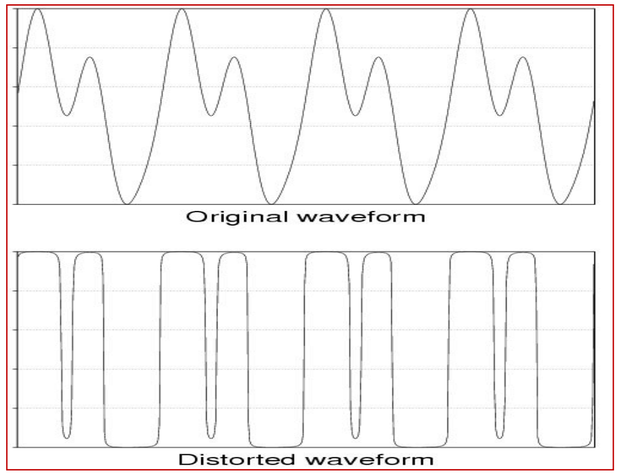
A man is looking at a photograph of someone. His friend asks who it is. The man replies, “Brothers and sisters, I have none. But that man’s father is my father’s son.” Who was in the photograph?

ANS : His son.

PHASE DISTORTION

- When a signal having many frequency components are transmitted along the line, all the frequencies will not have same time of transmission,

- some frequencies being delayed more than others.



PHASE DISTORTION

- So the received end waveform will not be identical with the input waveform at the sending end because some frequency components will be delayed more than those of other frequencies.

- This type of distortion is called phase or delay distortion

METHODS TO AVOID

When velocity is independent of frequency, delay distortion does not exist on the lines

a)The phase constant β should be made dependent of frequency.

b)The velocity of propagation is independent of frequency.

DISTORTIONLESS TRANSMISSION LINE

➢**A transmission line** is said to be distortionless when attenuation constant ‘α’ is frequency independent and the phase shift constant ‘β’ is linearly dependent on the frequency.

➢**Condition for line to be distortionless**

$$R/L=G/C$$

ASSESSMENT

A transmission line is distortion less if

(a) $RL=1RC$ (b) $R/L=G/C$

(c) $RL=RC$ (d) $RL=LC$

2. The distortionless line is one in which the attenuation constant and phase constant are independent of the frequency. State true/false.

Answer : ----------

3. Which two parameters given below are zero in the lossless line?

a) L, C b) C, G

c) G, α d) R, L

Answer: ----------

REFERENCES

- J.D.Ryder “Networks, Lines and Fields”, PHI, New Delhi, 2003
- Raju, “Electromagnetic Field Theory and Transmission Lines”, Pearson Education, 2005

THANK YOU