INTRODUCTION TO RADAR SYSTEMS

UNIT-IV

Lecture-6

Logarithmic Detector

- If the output of the receiver is proportional to the logarithm of the input envelope, it is called a logarithmic receiver.
- It finds application where a large dynamic range is required. For example, it might be used to prevent receiver saturation or to reduce the effects of unwanted clutter targets in certain types of non-MTI radar receivers. The particular set of parameters for which these curves apply is described in the legend.

Contd.

- The solid curves represent the logarithmic detector, while the dashed curves apply to the square-law detector as computed by Marcum.
- In both cases it is assumed that the n pulses are equally spaced between the half-power points of a Gaussian-shaped antenna pattern. The beam-shape loss is included in these curves.

Contd.

- For one pulse (no integration) there is no loss.
- The loss (in decibels) is roughly proportional to the logarithm of the number of pulses integrated, at least over the range of parameters for which computations were made ($0.01 < P_D < 0.99$;

  $10^5 < P_u < 10^{10}$;

  $1 < n < 100$).

Zero-crossings Detector

- The information contained in the zero crossings of the received waveform can be used for detecting the presence of signals in noise.
- The particular parameter of interest is the distance between the crossings of the waveform along the zero voltage axis.
- This distance is related to the instantaneous period or frequency of the waveform.

Contd.

- For 10 pulses integrated, the loss with the logarithmic receiver is about 0.5 db, while for 100 pulses integrated, the loss is about 1 .0 db.
- The variations in this distance will depend on whether signal-plus-noise is present or noise alone is present.
- If the sine wave were perturbed by noise, the average number of zero crossings might be increased.

Contd.

- In general, the smaller the signal-to-noise ratio, the greater will be the average number of zero crossings.
- If a suitable device is used to measure the average number of zero crossings in a unit interval of time, a target signal is said to be present if this number is less than a predetermined value and absent if this number is exceeded.