INTRODUCTION TO RADAR SYSTEMS

UNIT-IV

Lecture-7

Coherent Detector

- The coherent detector consists of a reference oscillator feeding a balanced mixer.
- The input to the mixer is a signal of known frequency and known phase plus its accompanying noise.
- The reference-oscillator signal is assumed to have the same frequency and phase as the input signal to be detected.

Contd.

- It does not extract the modulation envelope and is a truly linear detector, whereas the "linear" envelope detector was not linear in the same sense.

Contd.

- The output of the mixer is followed by a low-pass filter which allows only the d-c and the low-frequency modulation components to pass while rejecting the higher frequencies in the vicinity of the carrier.
- The coherent detector provides a translation of the carrier frequency to direct current.

Contd.

- Therefore the coherent detector will be a more efficient detector, especially when signal-to-noise ratios are low.
- The coherent detector does not destroy phase information as does the envelope detector, nor does it destroy amplitude information as does the zero-crossings detector.
- Since it utilizes more information than either the envelope or the zero-crossings detector,

Contd.

it is not surprising that the signal-to-noise ratio from the coherent detector is better than from the other two.

- The improvement in the signal-to-noise ratio might vary from 1 to 3 db or more, over the range of signal-to-noise ratios of interest in most radar applications.
- A comparison of the detection probabilities when the signal parameters are known completely and when the signal is known except for phase.

Contd.

- The coherent detector is similar to the cross-correlation receiver discussed previously.
- It is also similar to the phase-sensitive detector used in coherent MTI radars and in monopulse tracking radars.
- The chief difference between the coherent detector and the phase-sensitive detector is that the reference signal in the phase-sensitive detector need not necessarily be of the same phase as the input signal.