

UNIT - III

MTI & Pulsed Doppler Radar

MTI & Pulsed Doppler are used to identify the moving targets from stationary target.

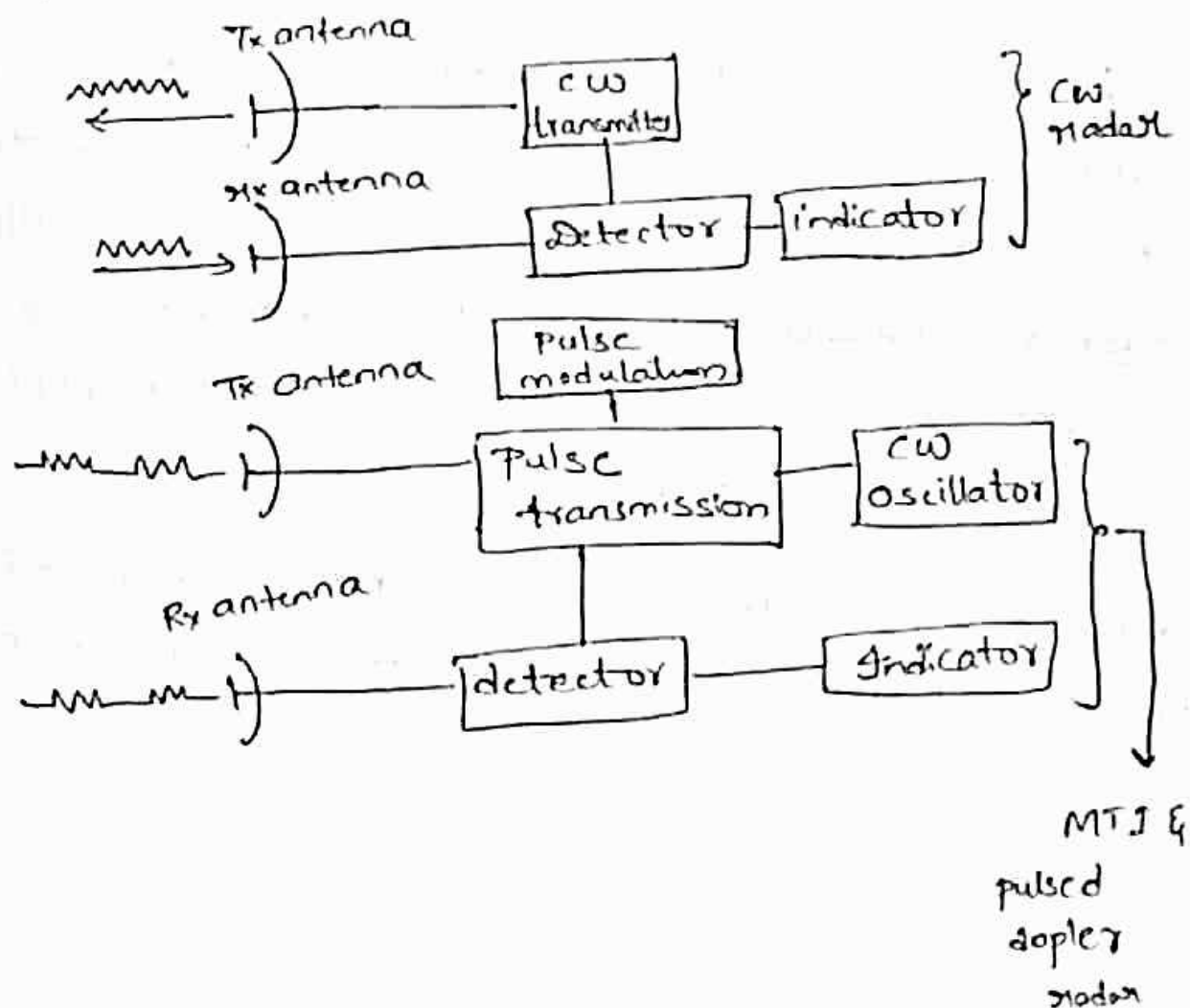
→ MTI is also called as moving target indicator.

→ MTI & Pulsed Doppler Radar are similar in design & differ in operation.

→ MTI Radar uses phase shift whereas Pulsed Doppler Radar uses frequency shift.

→ In MTI & Pulsed Doppler Radar the signal is transmitted in form of pulses.

→ General Blockdiagram of CW & MTI Radar



→ By comparing CW radar & MTI radar pulse modulator & pulse transmitter are present in MTI radar.

→ The pulse modulation & pulse transmitter is used to transmit the signal in form of pulses.

→ Let us consider signal S_1 which is transmitted by MTI radar & it is given by

$$S_1 = \sin(2\pi f t)$$

Echo signal received by MTI radar given by

$$S_2 = \sin\left(2\pi(f_t \pm f_d)t - \frac{4\pi f_0 R_0}{c}\right)$$

By comparing the transmitted signal & echo signal

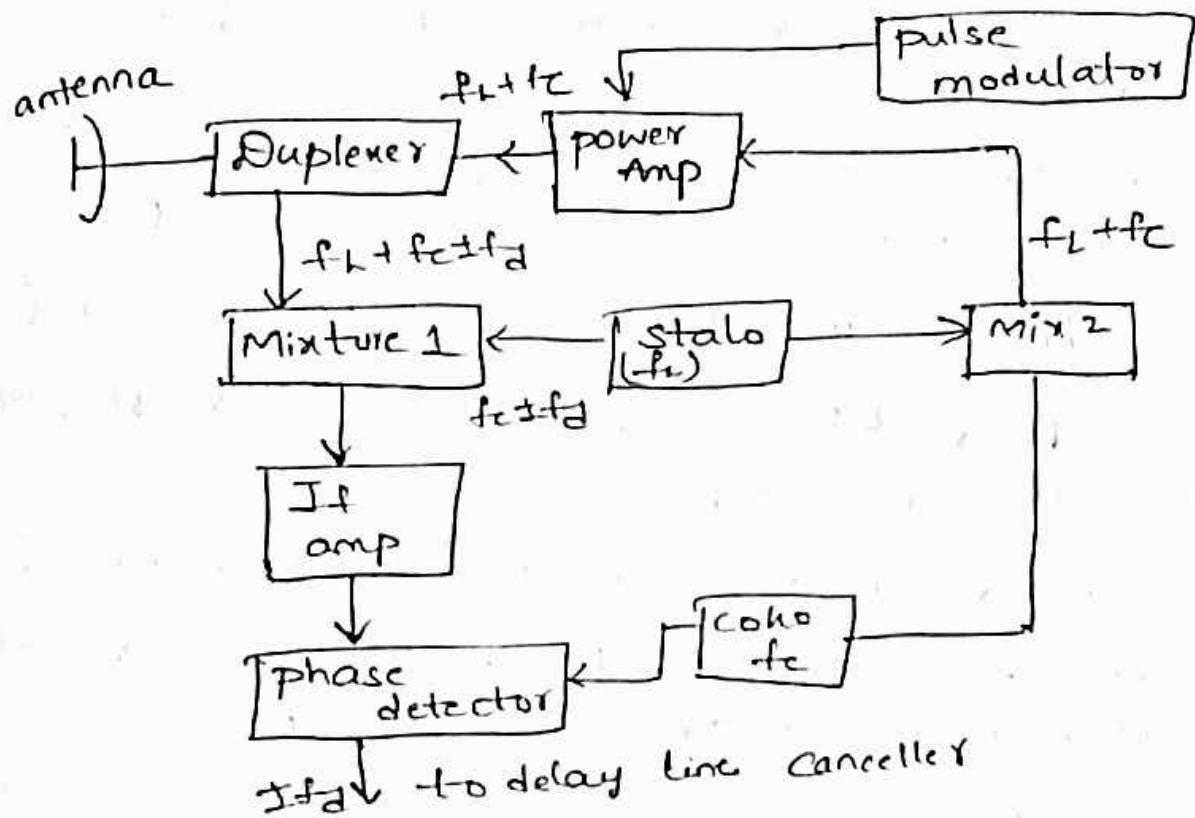
$$S_3 = \sin\left(2\pi(f_t \pm f_d)t - \frac{4\pi f_0 R_0}{c}\right)$$

from above equⁿ the phase change depends on doppler frequency & time taken to travel towards the target & return back.

→ For a stationary target the doppler frequency will be zero for moving target the doppler frequency will be non zero value.

→ Based on above conclusion MTI radar classify the target has stationary moving together.

MPI radar with power amplifier:



Stalo \rightarrow Stationary local oscillator
 Coho \rightarrow coherent oscillator

\rightarrow It consists of stationary local oscillator & coherent oscillator which are used to generate the frequency which is used to transmit.

\rightarrow power amplifiers are used to provide power to transmitted signal.

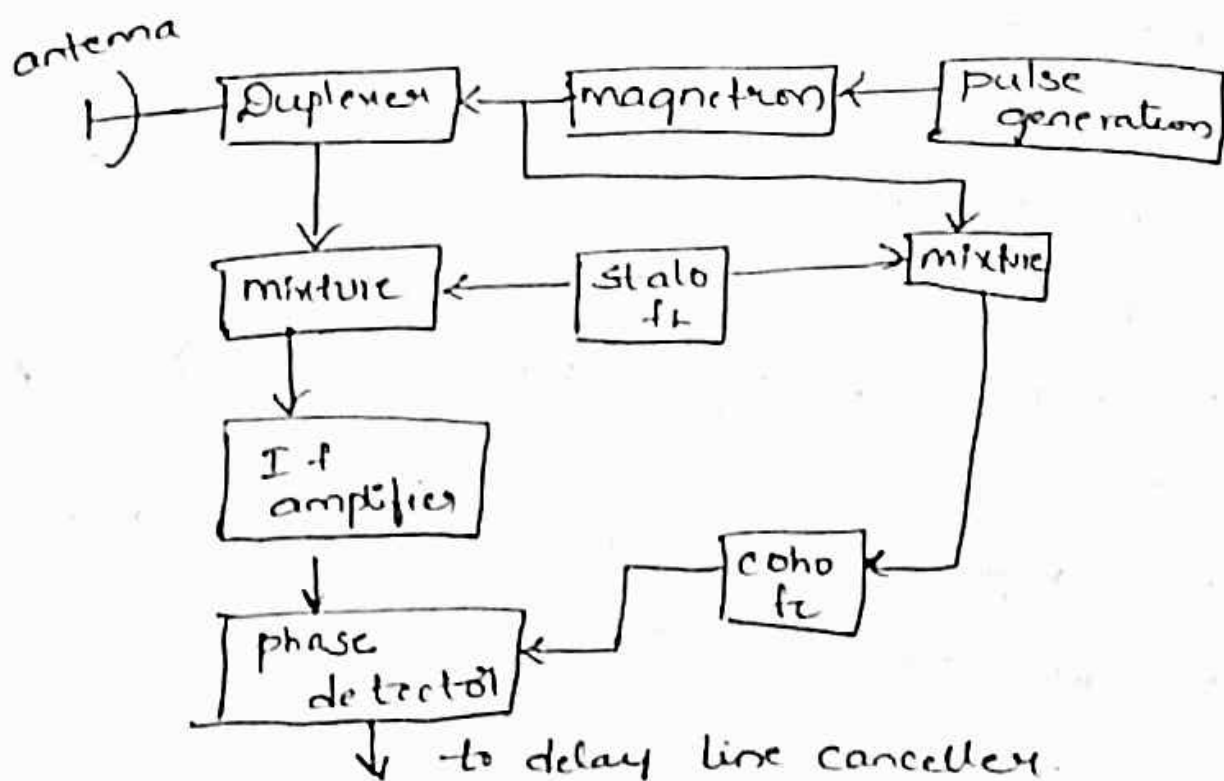
\rightarrow pulse modulator is used to control the power amplifier in order to produce the pulse waveform.

\rightarrow The transmitted signal has frequency given by $f_L + f_c$

\rightarrow The duplexer is used to connect the antenna to transmitter (or) receiver.

- The received signal is given to receiver, the receiver consist of mixture, IF amplifier is phase detect.
- The mixture is used to separate the similar frequencies and allows the different frequencies
- The o/p of mixture is given to IF amplifier
- The o/p of IF amplifier consist of frequency components given by $f_c \pm f_d$
- The o/p of IF amplifier is given to phase detector
- The phase detector compare the phase of coherent oscillator with o/p of IF amplifier & generates phase difference.
- The o/p of phase detector is given delay time canceller.
- The power amplifier like klystron, tetrodes, triode & travelling wave tubes.

MTI Radar with power oscillator:



→ The pulse generator & magnetron are used to generate train of pulse which are used to transmit towards the target

→ The stationery local oscillator & mixture will provide phase of transmitted signal to coherent oscillator in order to lock the coherent oscillator with transmitted signal.

→ The phase of recieved signal is given to phase detector with help of IF amplifier.

→ The phase phase detector compares the phase of recieved signal with phase of coherent oscillator & generates the phase difference which is given to delay line canceller.