Pseudo-coherent Radar

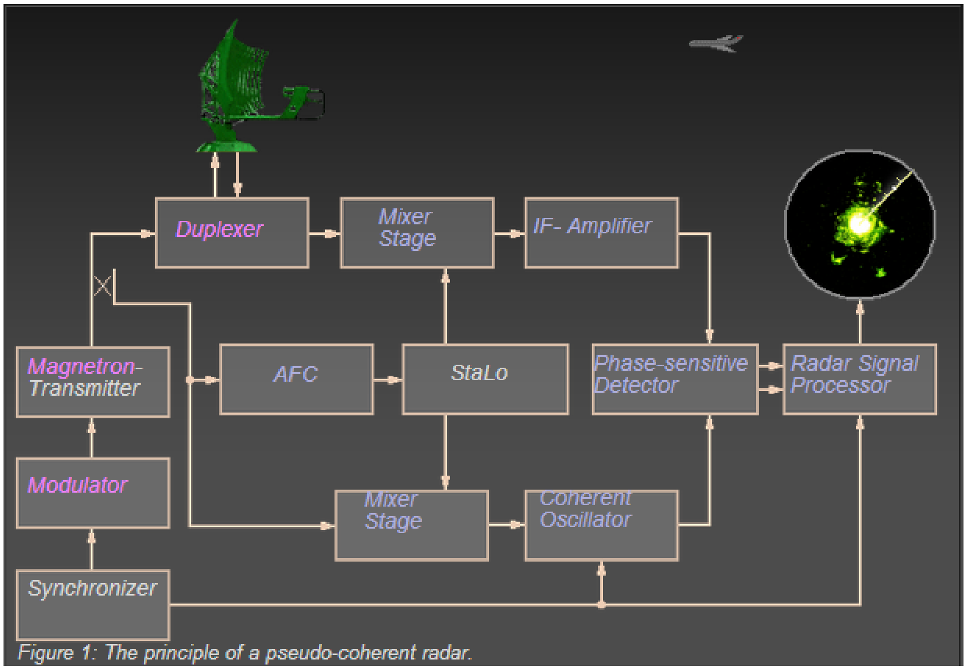

Figure 1: The principle of a pseudo-coherent radar.

A requirement for any Doppler radar is coherence; that is, some definite phase relationship must exist between the transmitted frequency and the reference frequency, which is used to detect the Doppler shift of the receiver signal. Moving objects are detected by the phase difference between the target signal and background clutter and noise components. Phase detection of this type relies on coherence between the transmitter frequency and the receiver reference frequency.

If the transmitter output stage is a self oscillating device, the pulse to pulse phase is random on transmission. In coherent detection, a stable cw reference oscillator signal, which is locked in phase with the transmitter during each transmitted pulse, is mixed with the echo signal to produce a beat or difference signal. Since the reference oscillator and the transmitter are locked in phase, the echoes are effectively compared with the transmitter in frequency and phase. This phase reference must be maintained from the transmitted pulse to the return pulse picked up by the receiver.

Pseudo-coherent Radar sets are sometimes called: “coherent-on-receive”.

Disadvantages of the pseudo-coherent radar

- The pseudo-coherent radar is a retired one today, but some older (or low-cost) radar sets are still operational. The disadvantages of the pseudo-coherent radar can be summarised as follows:
- The phase locking process is not as accurate as a fully coherent system, which reduces the MTI Improvement factor.
- This technique cannot be applied to frequency agile radar. Frequency change in a magnetron relies on the mechanical tuning of a cavity and it is essentially a narrow band device.
- It is not flexible and cannot easily accommodate changes in the PRF, pulsewidth or other parameters of the transmitted signal. Such changes are straightforward in fully coherent radar because they can be performed at low level. It is also impossible to perform FM modulation (which is mandatory for a pulse compression radar) with this type of system.
- Second time around echoes are returns from large fixed clutter areas located a long distance from the radar. Because they originate from a large distance, such echoes are returned after a second magnetron pulse has been transmitted. However, they pertain to the first pulse transmitted by the magnetron. Such echoes are range ambiguous but, in addition, second time around clutter will not cancel. This is due to the fact that the phase locking of the COHO applies only to the last transmitted pulse.

Source: http://www.radartutorial.eu/08.transmitters/Pseudo-coherent%20Radar.en.html