# Homodyne receivers

Homodyne Receivers The homodyne architecture once overwhelmed by the more complex heterodyne architecture came back to utility as the performance and functionality requirements for many newer applications were demanding such a design. A homodyne receiver is a particular architectural design of a wireless Radio Frequency (RF) receiver. This design is comparatively simple in its constitution and function as it is the most natural solution to detect information transmitted by a carrier in just one conversion stage.(Liapine, 2004). The functionality of homodyne receiver is other wise referred as Direct conversion reception or zero-Intermediate Frequency(IF) conversion.

The Construction

The architecture of homodyne receiver comprises the basic RF circuits which ensure the work flow of the equipment namely Band Select Filter (BSF), Low-noise amplifier (LNA), active mixer, oscillator and a Channel Select Filter (HFS, 2008). LNA is an amplifier which converts the received signal to acceptable levels while minimizing the noise. (Varma, Kunder, Daruwalla, 2003). The active mixers are responsible for frequency up conversion and down conversion functions (Beckwith, Schiltz, 2003) where as Oscillator generates a series of waves which is mixed with the RF signals (Fukatsu, 2005). Channel Select Filter converts preferred low power RF signal into significantly powerful ones.

The Principle of Operation

The primary principle of operation of a direct conversion receiver, is the down-conversion of incoming RF signal to base-band in one step by mixing with an oscillator output of the same frequency and hence the name ‘ homodyne receiver’. The resulting zero frequency signal is then filtered with

a low-pass filter to select the desired channel. (Ma, 2001). This process of operation has been illustrated in the following diagram.

Source: (Ma, 2008)

Advantages of Homodyne receiver

The simplicity in its constitution and function is the prime advantage of this type of receivers. With relevance to the changing performance and functionality requirement for the emerging technologies, the homodyne model becomes more practical to implement.

Disadvantages of Homodyne receiver

The major disadvantage of homodyne receiver is that the down-converted signal is extremely sensitive to DC voltage offsets due to current leakage from the local oscillator entering into the LNA and mixer. This demands high requirements on reverse isolation and low substrate coupling. Moreover because of the down-conversion of the RF signal to zero IF, the noise in the oscillator must be minimized and the distortion or linearity must be kept very low for the LNA and mixer. This causes power dissipation as well. (HFS, 2005).

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