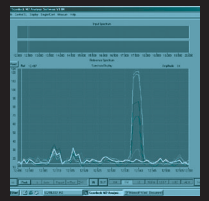
Harmonic Tuning



A simplified explanation of Harmonic Tuning

Before information can be transmitted via radio the information to be sent needs to be converted into an electrical signal, for example a microphone converts audio information into an electrical signal. The resulting information signal is superimposed onto a carrier radio signal generated by an oscillator in the radio transmitter, this process is called modulation. The resulting modulated radio signal is then amplified and transmitted via an aerial.

To recover information from a radio signal a radio receiver has to do the opposite.

The receiver aerial picks up the modulated signal which is then mixed with a radio signal produced by an oscillator in the receiver. To receive specific transmissions the frequency of this oscillator is tuned to the same frequency as the original transmitters carrier frequency. Mixing the incoming signal and oscillator signal effectively cancels out the carrier frequency leaving the original information signal which can then be converted back to its original form.

A conventional radio receiver like this works well provided you know the frequency of the incoming signal you wish to listen to. However, searching for covert transmitters usually means you don't know the frequency and you need to tune your receiver to all possibilities to find the signal you want. This can take a long time and since bugs usually transmit for short periods you may miss the bug all together.

A Harmonic receiver speeds up the process of searching through a wide band of frequencies by looking at several frequencies at the same time. This effectively compresses the frequency band width so a receiver can be tuned through a much narrower band of frequencies (reference frequencies) and still search the wider frequency range. There are two forms of compression, Swept compression and Fixed compression.

Swept compression works by mixing the incoming signal with a signal that has passed through a non linear junction. This has the effect of producing many different frequencies in multiples of the original signal frequency (harmonics). As the signal passing through the Non-linear junction is tuned all the harmonic frequencies also change. This produces a comb of different frequencies which are mixed with the incoming signal. When one of the harmonic frequencies combined with the incoming signal is the same as the carrier frequency the original information signal can be recovered. Since several different harmonics might match the original carrier frequency as a swept compression receiver is tuned the same incoming radio signal might be found several times (multiple responses).

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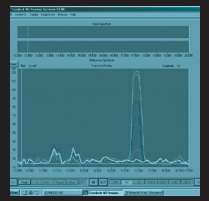

A Fixed Compression receiver uses a fixed frequency oscillator to generate the harmonic frequencies that are combined with the incoming signal. This compresses the possible frequencies of the incoming signal by superimposing all the different harmonic signals. The compressed frequency signal is mixed with a conventional oscillator signal. When the conventional oscillator is tuned to match the compressed carrier frequency the original information signal can be recovered. Since this method uses a conventional mixing of radio signals as the final stage of demodulation each incoming radio signal will only be detected at one particular frequency.

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