

SPECTRUM ANALYZER TECHNOLOGY

- **AMPLITUDE MODULATION** – the carrier wave is impressed with intelligence by changing its amplitude or power level. Loudness is controlled by the amount of level change. The greater the level change the louder the sound coming from the radio. Frequency is controlled by the rate the level changes. A one kilohertz tone coming from the radio will be caused by the amplitude of the carrier wave changing its level at a rate of one kilohertz.
- **ADJACENT CHANNEL POWER** – Power generated in an adjacent channel. The channel does not have to be the next channel but may be 2 or more away from the channel of interest. It relates to the amount of interference that may be caused by the channel.
- **ATTENUATOR** – refers to the attenuator protecting the front end of a spectrum analyzer. It reduces the signal coming into the input of the analyzer to help prevent intermodulation in the input circuits. To look at low level signals make sure the input attenuator is reduced to zero.
- **BESSEL NULL** - When the modulation index is 2.4 the amplitude of the carrier is nulled, all the energy is in the sidebands.
- **CHANNEL POWER** -
- **CW** – Continuous Wave, a RF signal with no modulation.
- **DANL (Displayed Average Noise Level)** – refers to the noise floor seen on the screen. Generally is has specifications like 50 ohm load capping the input and a particular frequency, span and filter bandwidth (RBW).
- **dBc** – decibels related to the carrier. A signal –30 dBc means a signal that is 30 dB down from the carrier
- **DELTA MARKER** – will show a difference in level and frequency from the main/active marker.
- **DEMODULATION** – decodes the intelligence of the transmitted signal. In AM, FM, and PM the signal is in an analog signal and can be heard (understood) by a simple detection method. Our spectrum analyzers pride themselves in this capability. Digital signals are more difficult to decode and require a vocoder to decipher the demodulated digital message.
- **DISPLAY LINEARITY** – any level other than the top line is affected by nonlinearly of circuits. This problem is generally defined as +/- 1.5 dB over 10 Divisions.

- **DYNAMIC RANGE** – refers to possible the actual range seen on the screen and nothing more. If there are 10 vertical divisions on the screen and the scale is 10 dB/div then the dynamic range is 100 dB. Generally it refers to spurious free dynamic range. This deals with the compression of the front end of the spectrum analyzer and is generally given in the terms like -10 dBm minimum for 1 dB compression 100 KHz to 2.9 GHz at 0 dB attenuation. The higher the level the better the analyzer. You don't want the spectrum analyzer to be displaying erroneous results due to overdriving its front end with too much power.
- **FFT** – Fast Fourier Transform, a mathematical evaluation of a signal in time that reads out like a spectrum analyzer, frequency vs. amplitude. A convoluted signal on an oscilloscope containing a signal with its second harmonic will be transformed into a spectrum analyzer display showing two blips, one at the fundamental signal and the other at 2 times its frequency.
- **FREQUENCY MODULATION** - the carrier wave is impressed with intelligence by changing its frequency. Loudness is controlled by the amount of frequency change. The greater the frequency change or deviation from its center the louder the sound coming from the radio. Frequency is controlled by the rate the frequency changes. A 1 KHz tone coming from the radio will be caused by the carrier wave changing its frequency at a rate of one kilohertz.
- **FREQUENCY RESPONSE** - refers to the flatness of the trace from one frequency to another. ± 1.5 dB from 10 MHz to 2.9 GHz.
- **FREQUENCY STANDARD** – refers to the frequency standard in the spectrum analyzer. The standard relates to the accuracy of the center frequency setting and internal counter accuracy. Generally there are optional standards with better accuracy.
- **HARMONIC DISTORTION** – refers to the harmonics generated by the input spectrum analyzer's mixer. If the harmonics generated by the S/A's mixer is -60 dB then when evaluating a signal one can only evaluate harmonic levels down 60 dB from the wanted signals. Evaluating harmonics of the wanted signal any lower than 60 dBc will be distorted with the addition of the harmonic caused by the spectrum analyzer's mixer.
- **IEEE-488** – Is an instrument control buss. It is quite fast and capable of controlling up to 36 instruments. It is not simple and requires an IEEE-488 card at the PC and is even more complicated when using a modem for remote operation.
- **MARKERS** – refers to the markers that are settable on the screen of the display. Markers will generally have a digital frequency and level value on the screen.
- **MARKER TO REFERENCE LEVEL** – moves marker position to top line.

- **MARKER TO CENTER** – moves marker to center.
- **MARKER TO PEAK** – moves marker to peak signal on trace.
- **MARKER TRACK** – marker will track signal as it moves in frequency or level.
- **MARKER DELTA** – gives the difference between two markers. Generally used to find relationships between two signals harmonics, intermodulation, e.g.
- **MARKER SETS** – marker sets start, stop, span, etc. Used for easily setting parameters.
- **MODULATION INDEX.** - $\text{Mod Index} = \text{Mod Deviation} / \text{Mod Frequency}$
- **OCCUPIED BANDWIDTH** -
- **RBW (Resolution Band Width)** – refers to the filter bandwidths found in the spectrum analyzer. The narrowest filter allows user to see close in noise, power line hum, etc. Wide filters allow user to evaluate wide band channels and high speed data.
- **REFERENCE LEVEL** – refers to the top line of the spectrum analyzer. It is the most accurate level on the screen and every other level on the screen has a linearity factor that relates to the top line on the screen.
- **RS-232 INTERFACE** – refers to a control interface buss. RS-232 is an older format that is limited in speed and number of instruments controlled. It is a simple method of control since all computers have an RS-232 port it does not take anything other than a cable from the PC to the instrument to control it. RS-232 instrument control remotely only requires a modem at instrument end since the PC will most likely have an internal modem.
- **RX-** Transmitter, “R” stands for Receiver, “X” stands for what is missing.
- **SINGLE SIDEBAND MODULATION**
- **SINGLE SIDEBAND PHASE NOISE**
- **SPECTRAL PURITY** – refers to the SSB (Single Sideband Phase Noise) of the LO (Local Oscillator). Spec generally reads as -90 dBc at 10 KHz .
- **SPURIOUS** – unwanted signal that do not relate to any particular thing such as harmonics. A typical example would be a third harmonic of the first mixer, mixing with the second harmonic of the second harmonic of the second LO finding its way through the system. Generally they are low level and short ranged (they zip into and out of view quickly. May increase or decrease as the signal is increasing, of vice-versa.

- **SSB** – All the transmitted power is in one of the sidebands. The carrier and other sideband are depressed. It is a very efficient means of transmitting intelligence.
- **TX**- Transmitter, “T” stands for Transmitter, “X” stands for what is missing.
- **VGA** – refers to the ability to send the screen display to a VGA monitor for a larger view. It is a must for training and helps when more people want to evaluate the trace on the screen.
- **VDC**- Volts DC (Direct Current, like a battery)
- **XdB DOWN** – When looking at the pass band of a filter or amplifier the XdB down feature will place markers at specific points down from the peak showing the bandwidth at a specific dB down point e.g. 3 dB Down.