

Glossary of Mixer and Detector Terminology

1 dB compression point. –The dynamic range of a mixer is the range of input RF power levels (in dBm) for which the mixer produces useful IF output power. Dynamic range is limited at the low end by the noise performance of the mixer devices. When the input power is such as to produce a discernable IF output signal a constant power ratio (equal to the conversion loss) is established between input RF power and output IF power. As input power is increased, a point is reached where this constant power ratio is no longer maintained and conversion loss begins to increase. When conversion loss has increased by 1 dB, the upper limit of the mixers dynamic range is deemed to have been reached and this “1 dB compression point” generally delineates the upper level of input power for which the mixer should be used

1 dB desensitization level – The RF input level of an interfering signal that causes a mixer’s small signal conversion loss to increase by 1 dB.

conversion loss (SSB) – The ratio of RF input power to the IF output power of one sideband (either $f_{LO} + f_{RF}$ or $f_{LO} - f_{RF}$ in the operating region of the mixer). If an IF amplifier is used, conversion gain may result.

DC polarity – The mixer IF voltage measured with only the LO operating and the RF port terminated in 50 ohms.

harmonic intermodulation products – Mixer output signals other than the desired $f_{LO} + \text{or} - f_{RF}$, which are harmonically related to either or both of the input signals. (Also termed NRF + or – MLO, NxM or “spurs.”)

isolation – The amount an input signal is attenuated when measured at another mixer port.

Noise Effective Power (NEP)

$$NEP = NV / R \text{ in Watt} / \sqrt{\text{Hz}}$$

where NV = noise voltage in Volt $\sqrt{\text{Hz}}$ and R = responsivity on Volt /Watt.

Noise floor = NEP • (modulation frequency)^{1/2} in Watts

noise figure (SSB) – The ratio of the signal-to-noise ratio at the mixer input divided by the signal-to-noise ratio of one of the sidebands at the output.

responsivity – The detector responsivity is the voltage produced at the output for a specific power input, usually expressed in millivolts per microwatt CW. The series DXP product description shows a typical plot. It is often incorrectly termed as “sensitivity,” but is not truly correlated to sensitivity.

sensitivity – The minimum input signal required to produce an output signal having a specified signal-to-noise ratio. Tangential sensitivity (TSS) typically assumes 8 dB signal-to-noise ratio.

spurious products – Undesired or spurious products are generated in addition to the desired signal sidebands as a result of diode non-linearities. These products increase the amount of signal power lost, in addition to providing “false” outputs.

two-tone intermodulation products – Undesired mixer output products caused by the simultaneous presence of two RF input signals (third order IM consists of $[2f_{RF1} + \text{or} - f_{RF2}] + \text{or} - (f_{LO})$ and $[(f_{RF1} + \text{or} - 2f_{RF2}) + \text{or} - (f_{LO})]$).

two-tone intermodulation products – The generation of spurious output frequencies in a mixer is the result of using non-linear switching elements. Even for the single input frequency the number of such products that is generated as discernible power levels is quite large.

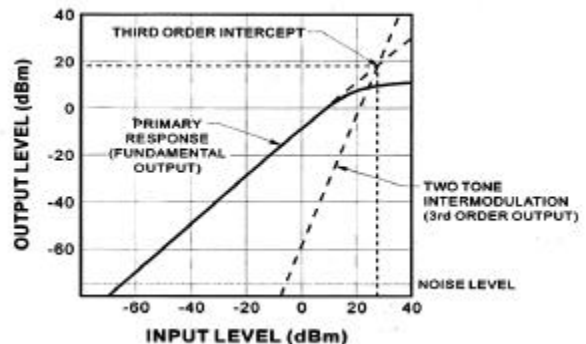


Figure 1. Two-Tone Order Intercept Point

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These products have even higher power when the input signal contains multitone components. A figure of merit indicative of the ability of a mixer to suppress such intermodulation products is the “two-tone third order intercept point” (usually measured in dBm). See **Figure 1** above. The hypothetical intercept point is arrived at by extrapolating measured data to suggest an input RF power level at which IF power and intermodulation products would be equal. Mixers with high intercept points generate low intermodulation distortion products.