



Dynamic Sciences International, Inc.

Application Note

DSI-600 EMI TEST MEASUREMENT RECEIVER SYSTEM

Subject: Third Order Intercept Point Versus Sensitivity

Application Note No. 1.01

Third Order Intercept Point Versus Sensitivity

When comparing receivers, spectrum analyzers and RF amplifiers, the third order intercept point, which is a measure of the linearity, is an important factor, but so is the sensitivity.

Figure 1 describes the two parameters:

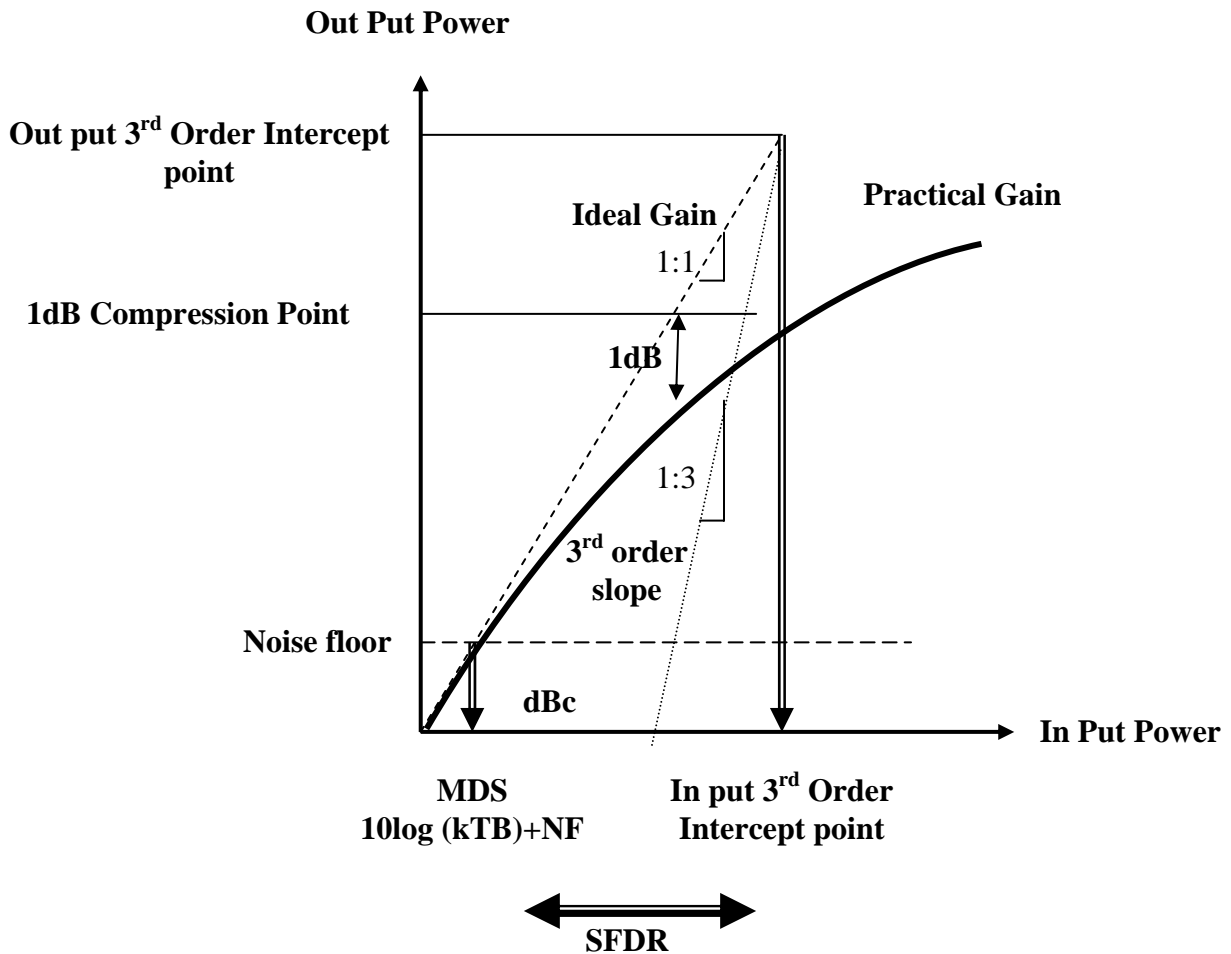


Figure 1. 3rd order Intercept point, 1 dB compression point, Spurious Free Dynamic range and sensitivity

When comparing two receivers, having about the same practical gain curve shape, but different sensitivities, the 3rd order intercept point (and other parameters) will be different too, as depicted in figure 2:

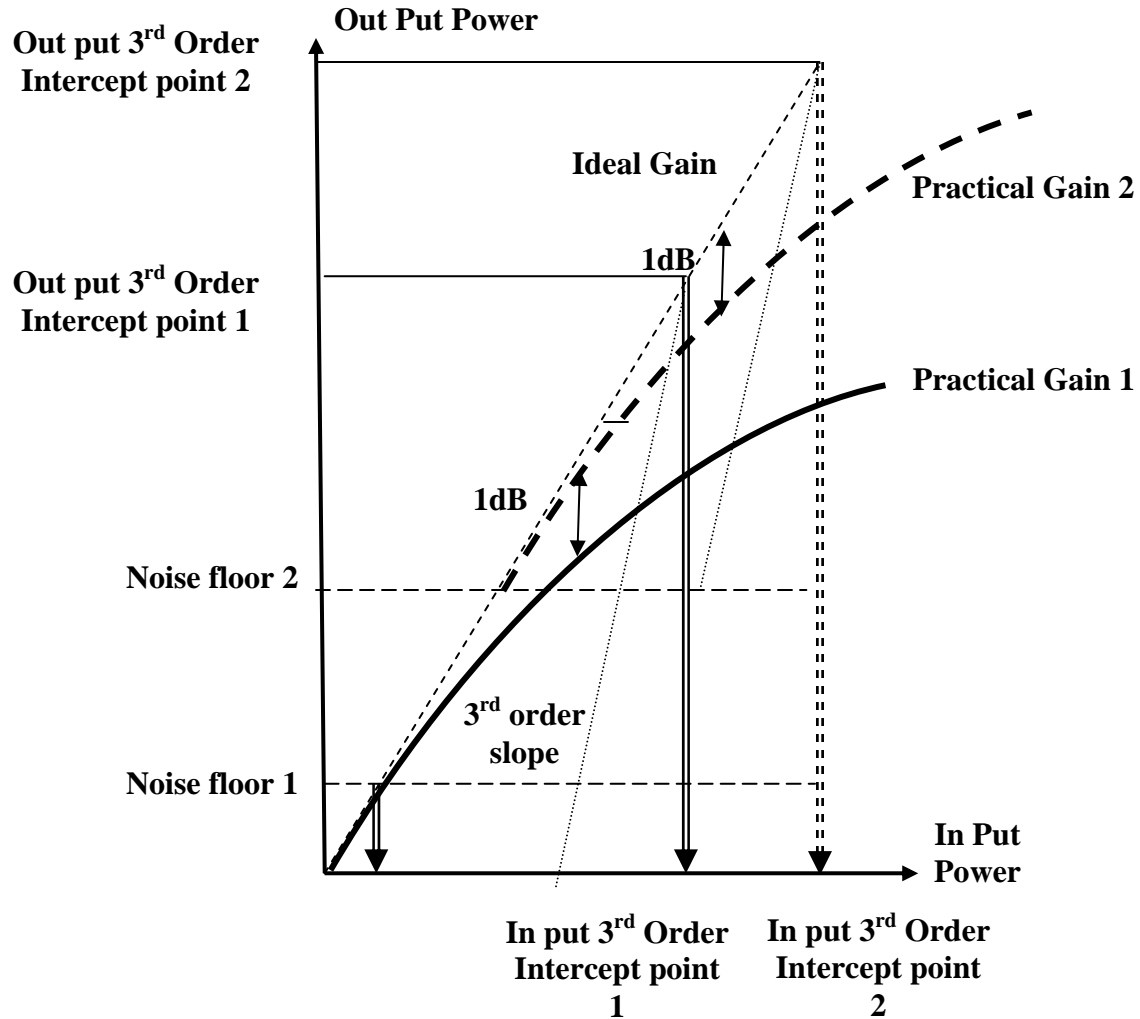


Figure 2. Comparison between the parameters of two receivers with different sensitivities

A receiver (1) with a better sensitivity=lower noise floor, will, in most cases, have a lower 3rd order intercept point than a receiver (2) which has lower sensitivity=higher noise floor., when the Spur Free Dynamic Range of both for this example is about the same.

Comparison of DSI-600 and R&S ESIB
In
Receiver modes of operation
Typical values

R&S ESIB $f < 2\text{GHz}$, Sensitivity @ $\text{BW}=1\text{kHz}$, -115dBm , with preamp, -130dBm
 $2\text{-}40\text{GHz}$, -100dBm , with preamp, -125dBm

3^{rd} order intercept= $+2\text{dBm}$, with preamp, -18dBm

DSI-600, $f < 2\text{GHz}$, Sensitivity @ $\text{BW}=1\text{kHz}$, -130dBm , no preamplifier.
 $2\text{-}40\text{GHz}$, -130dBm ,

3^{rd} order intercept to $2\text{GHz}=\text{+}0\text{dBm}$, to $40\text{GHz}=\text{-}15\text{dBm}$

It can be seen that even though the sensitivity of the DSI-600 is better by 15dB (typical) than that of the R&S ESIB without a pre amplifier, the 3^{rd} order intercept point of R&S is just 2 dB above that of DSI-600. This means that the spur free dynamic range of DSI-600 is better by about 13dB to 2GHz and about the same above 2GHz, when R&S ESIB requires a pre amplifier.

The trade off between sensitivity and 3^{rd} order intercept point has been explained here. The benefit of DSI-600 is in its sensitivity, without the need for external expensive pre amplifiers.