Dynamic range of direct-sampling receivers (SDR)

Figure 1shows the IMD3-History from a 16Bit direct-sampling SDR, the SunSDR2Pro. The red numbers along the DR3-curve (blue) show the calculated Dynamic-Range at DR3 = Pi - IMD3.

When increasing the 2-tone input signal the first IMD3 product appears with 3dB above noise at a level of Pi=2x-60dBm. The calculated dynamic range at this point is DR3 = Pi - IMD3 = -60dBm - (-130dBm) = 70dB. That's the receiver "worst case" dynamic range.

To take this "70dB" as the receiver "Dynamic Range" is not correct, as Rob Sherwood does it in his "Receiver Comparison List" (http://www.sherweng.com/table.html). Rob compares the min. dynamic range of direct-sampling receivers with the max. dynamic range of analog receivers. In contrast to analog receivers, the dynamic range of direct-sampling receivers does not decrease by increasing the input level, but it increases. At a level of Pi=2x-20dBm the SDR shows its highest dynamic range of 105dB. That' the receivers "best case" dynamic range!

As a result we get an IMD3-free Dynamic-Range from 70dB...105dB. What dynamic range should we announce in a comparison list, 70dB, 88dB or 105dB? This example shows once again that a correct dynamic comparison between analog and digital receivers is impossible. The only true answer about the dynamics shows the IMD3-curve.

But if we want to compare the dynamic range of the direct-sampling SDR with analog receivers in a common list, we have to use the max. IMD3-free dynamic range of 105dB, but not 70dB!

Conclusion: It is neither possible nor meaningful to name a simple "dB-value" as the dynamic range of direct-sampling SDR's. The only way to explain the IMD3-free dynamic is to show its IMD3-cuve.

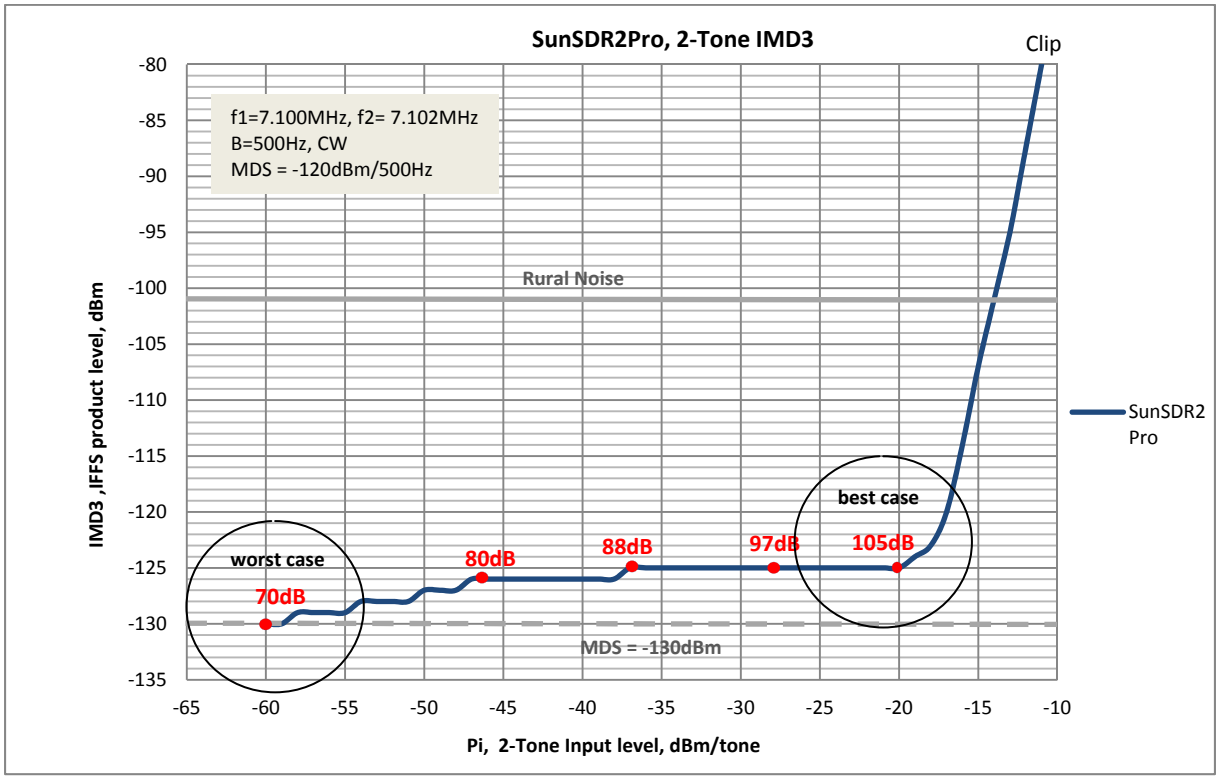

Fig. 1: IMD3-curve of a direct-sampling SDR

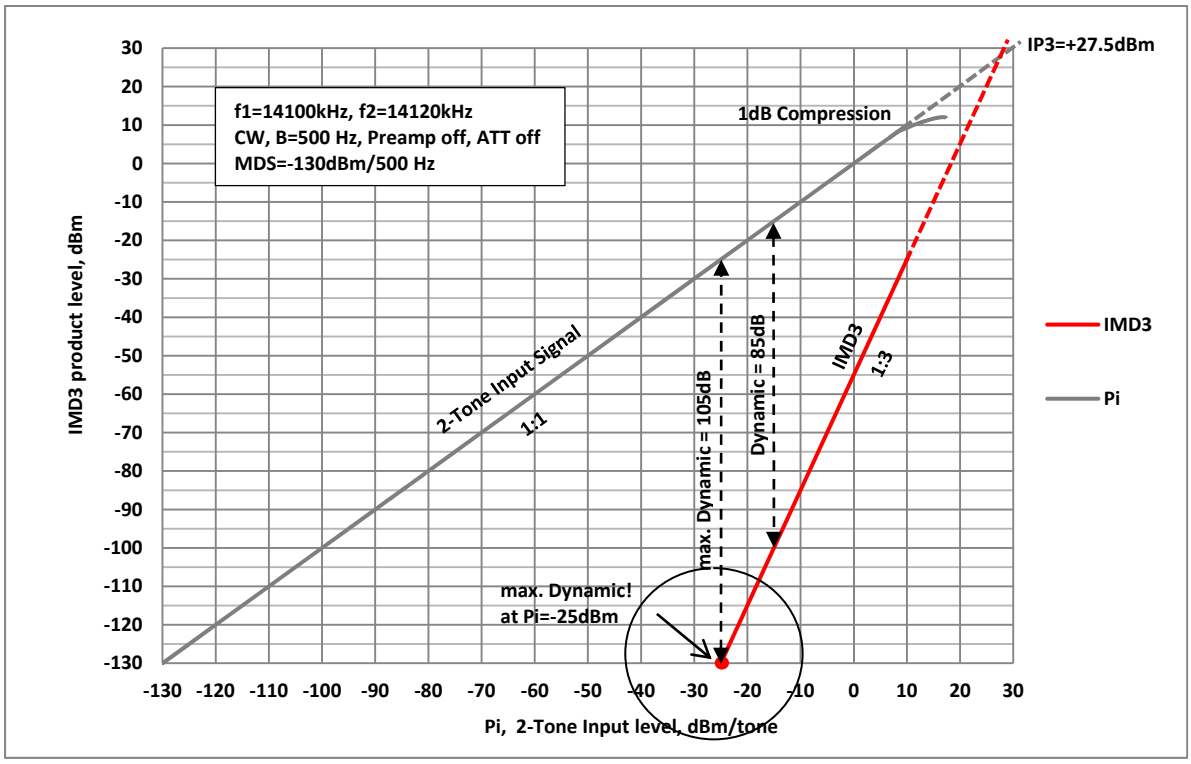

Fig 2: IMD3-curve of an analog receiver

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