GET TO KNOW YOUR SIGNAL ANALYZER

5 Tips to Optimize Your Transmitter Tests

KEYSIGHT TECHNOLOGIES

Introduction

Optimizing transmitter tests is easier than you thought. This eBook offers 5 tips to become more efficient and get cleaner measurement results. You will learn simple ways to speed up measurement time, reduce measurement errors, and increase the reliability of your measurement results.

Test more effectively by learning how to:

1. Apply corrections for your test setup
2. Optimize resolution bandwidth for speed or accuracy
3. Increase sensitivity when measuring low-level signals
4. Minimize the analyzer’s distortion products
5. Enhance speed, accuracy, and reliability with measurement applications

Contents

Get to Know Your Signal Analyzer
5 Tips to Optimize your Transmitter Tests

TIP 1

Apply Corrections for your Test Setup

Go to Tip 1 >

TIP 2

Optimize Resolution Bandwidth for Speed or Accuracy

Go to Tip 2 >

TIP 3

Increase Sensitivity When Measuring Low-Level Signals

Go to Tip 3 >

TIP 4

Minimize Analyzer Distortion Products

Go to Tip 4 >

TIP 5

Enhance Speed, Accuracy, and Reliability with Measurement Applications

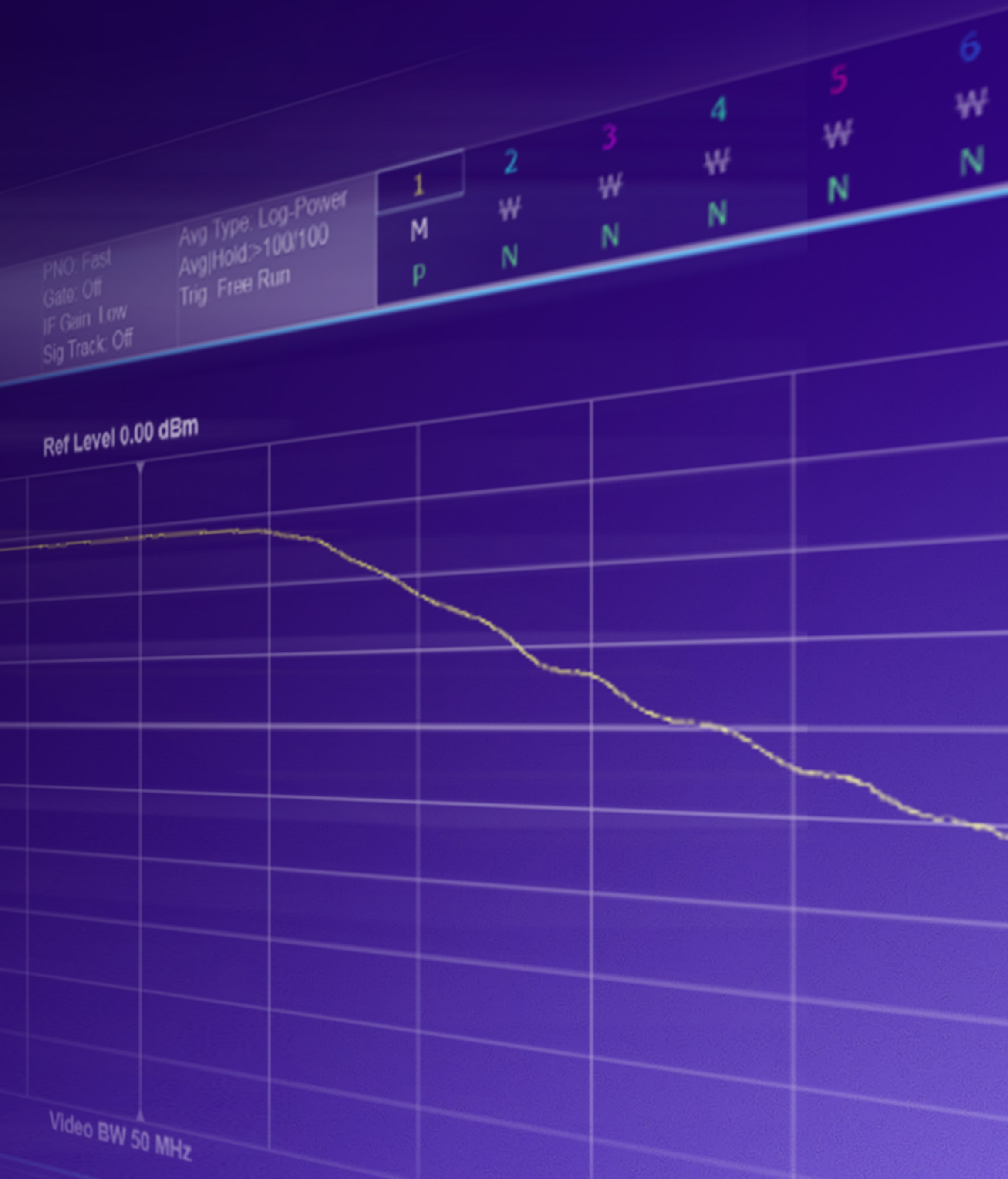
Go to Tip 5 >

SUMMARY

Summary, plus Find out Where to Learn More

TIP 1

Apply Corrections for your Test Setup

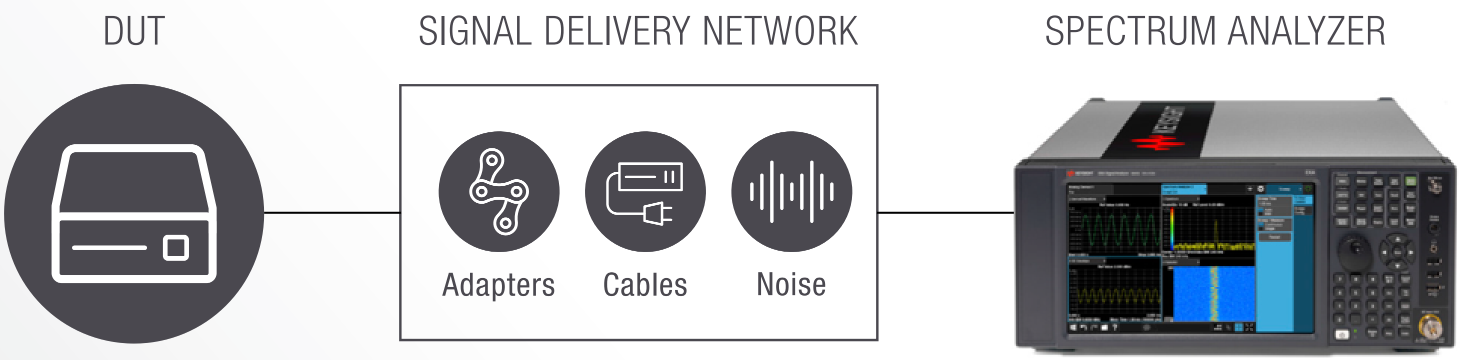


TIP 1

Apply Corrections for your Test Setup

Cables, adapters, and probes can alter the signal from your device under test (DUT) before it even enters any signal analyzer, leading to inaccurate measurements. But hope is not lost. You can restore your signal's accuracy by applying corrections in your Keysight X-Series signal analyzer.

To apply correction, measure your signal-delivery network by stimulating it with a known signal source. Your signal-delivery network refers to everything that you will use to connect your DUT to your signal analyzer, including cables and connectors. These measurements, from a known source, show the effects your delivery system will have on your measurement results when you connect your DUT.



Enter the correction factor measured from your signal-delivery network to compensate for these induced errors into the signal analyzer. You can enter these directly on the user interface, with SCPI commands, or you can load them in from a file.

The X-Series supports eight different correction arrays and eight complex correction arrays which can all be turned on and off as you desire. The images on the right show the frequency response of a signal-delivery network before and after correction.

WATCH NOW

To learn more about applying corrections, watch this video:
How to use Channel Corrections on the Keysight X-Series Signal Generators.

> Use the signal analyzer's built-in correction function to compensate for cables, adapters, and noise.

Before correction

After correction

TIP 2

Optimize Resolution Bandwidth for Speed or Accuracy

TIP 2

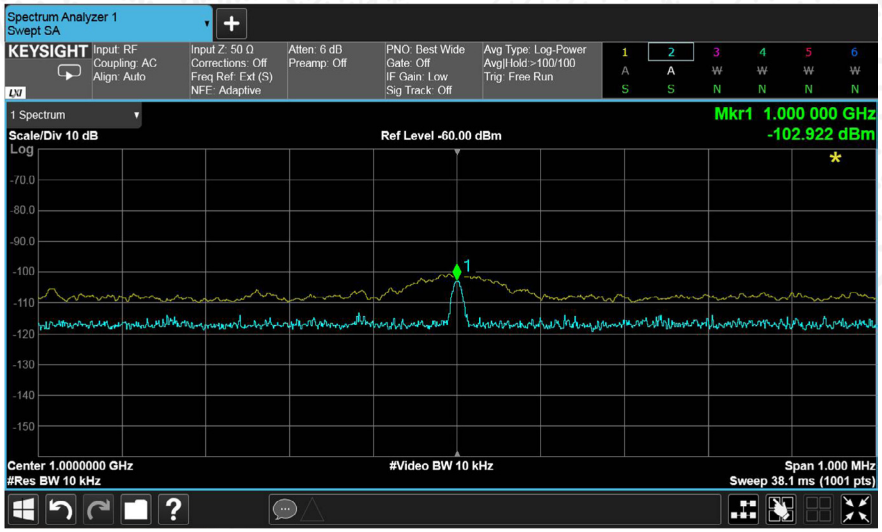
Optimize your Resolution Bandwidth for Speed or Accuracy

Resolution bandwidth (RBW) can have a huge impact on whether you make quick measurements or detailed measurements.

If your goal is to make several check-and-go type measurements quickly, such as verifying quality on several devices in a manufacturing line, you may prefer to set a wide RBW. Resolution bandwidth determines the width of the span that will sweep your measured spectrum. A wide RBW results in a fast sweep and faster tests, but sacrifices detail and accuracy.

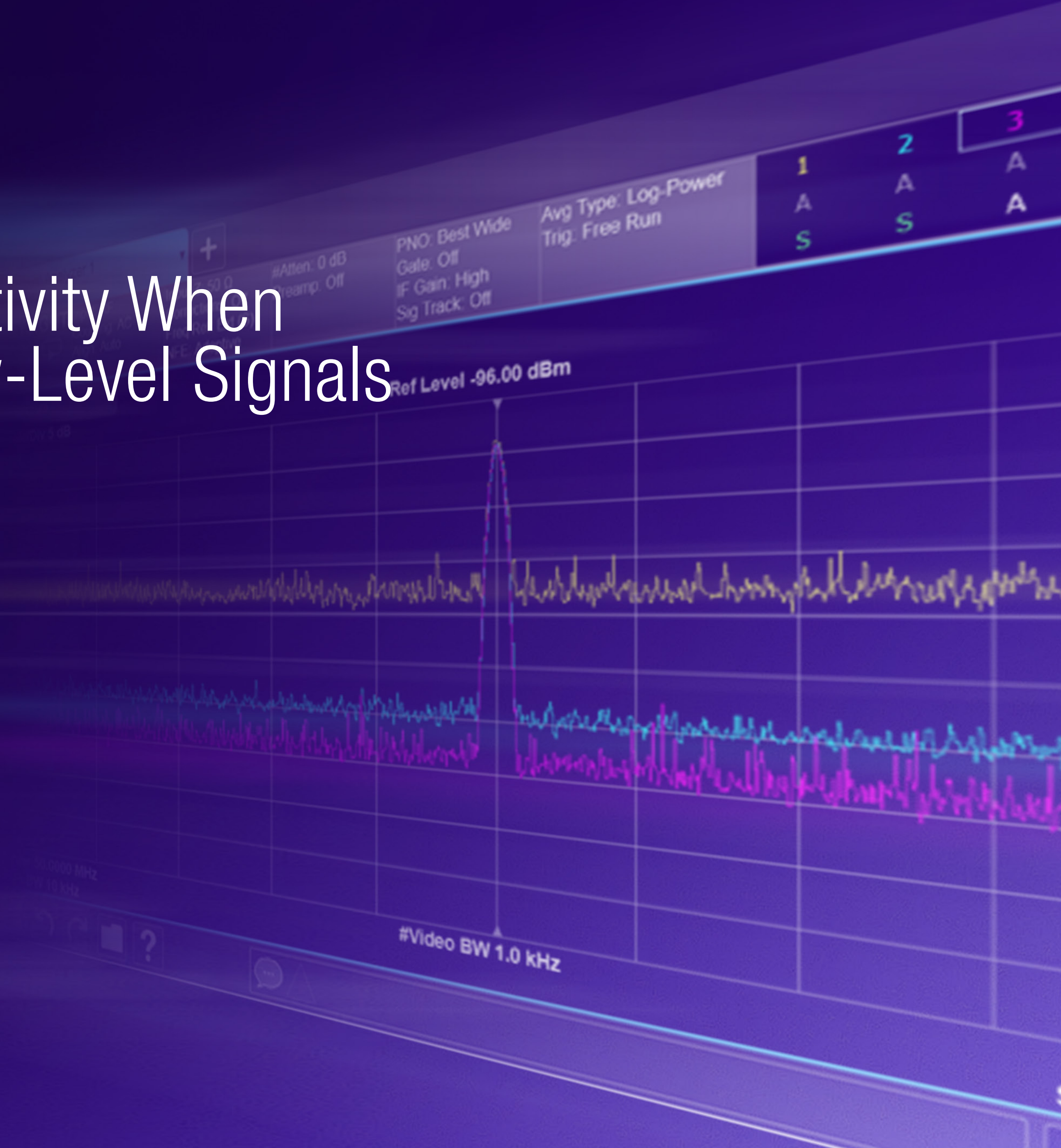
Conversely, if your goal is to make detailed and highly accurate measurements, such as during EMC (electromagnetic compliance) testing or when searching for spurs, you will want to set a narrow RBW. The narrower your RBW, the finer the detail you will capture, meaning you can capture spurs that are closer together.

A narrow RBW also lowers the displayed average noise level (DANL), improving signal-to-noise ratio. But remember, the trade-off is sweep time. For example, a measurement with a 10 kHz RBW over a 200 MHz span could take 2.4 seconds, while a RBW of 3 kHz over the same span could take almost 27 seconds. That's over 10 times slower. Choose the RBW that best suits your measurement needs and test priorities.



TIP 3

Increase Sensitivity When Measuring Low-Level Signals



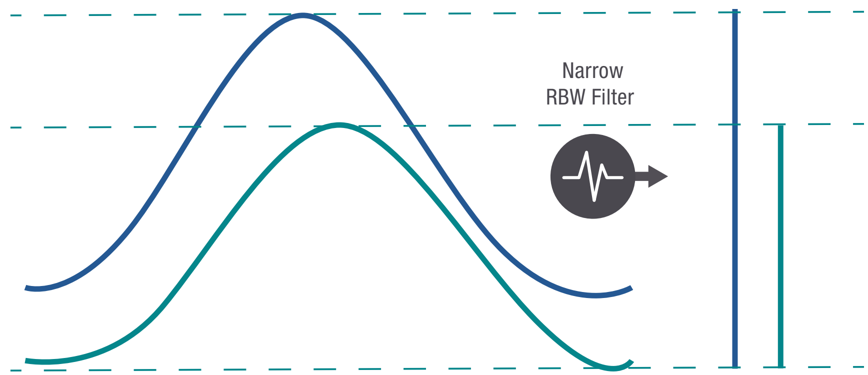
TIP 3

Increase Sensitivity When Measuring Low-Level Signals

Are you struggling to find low-level signals? They love to hide in noise and the skirts of higher power signals. Here are three simple techniques that will help:

1. Minimize your input attenuation
2. Narrow your resolution bandwidth
3. Add a pre-amp to your test setup

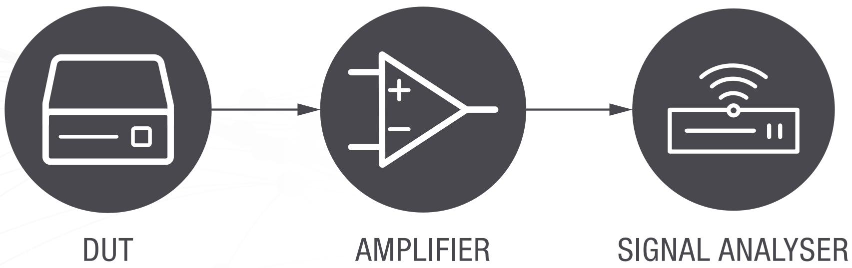
Minimizing input attenuation and adding a pre-amp helps make your signal larger compared to the noise of the analyzer. A narrow resolution bandwidth lowers measurement noise, reduces skirts, and resolves separate signals that are closer together. Applying these techniques will improve signal-to-noise ratio and resolve separate signals clearly so you can find low-level spurs.



A low-level signal can be lost under the skirt of a larger signal. A narrow RBW filter reduces skirts and resolves these signals separately

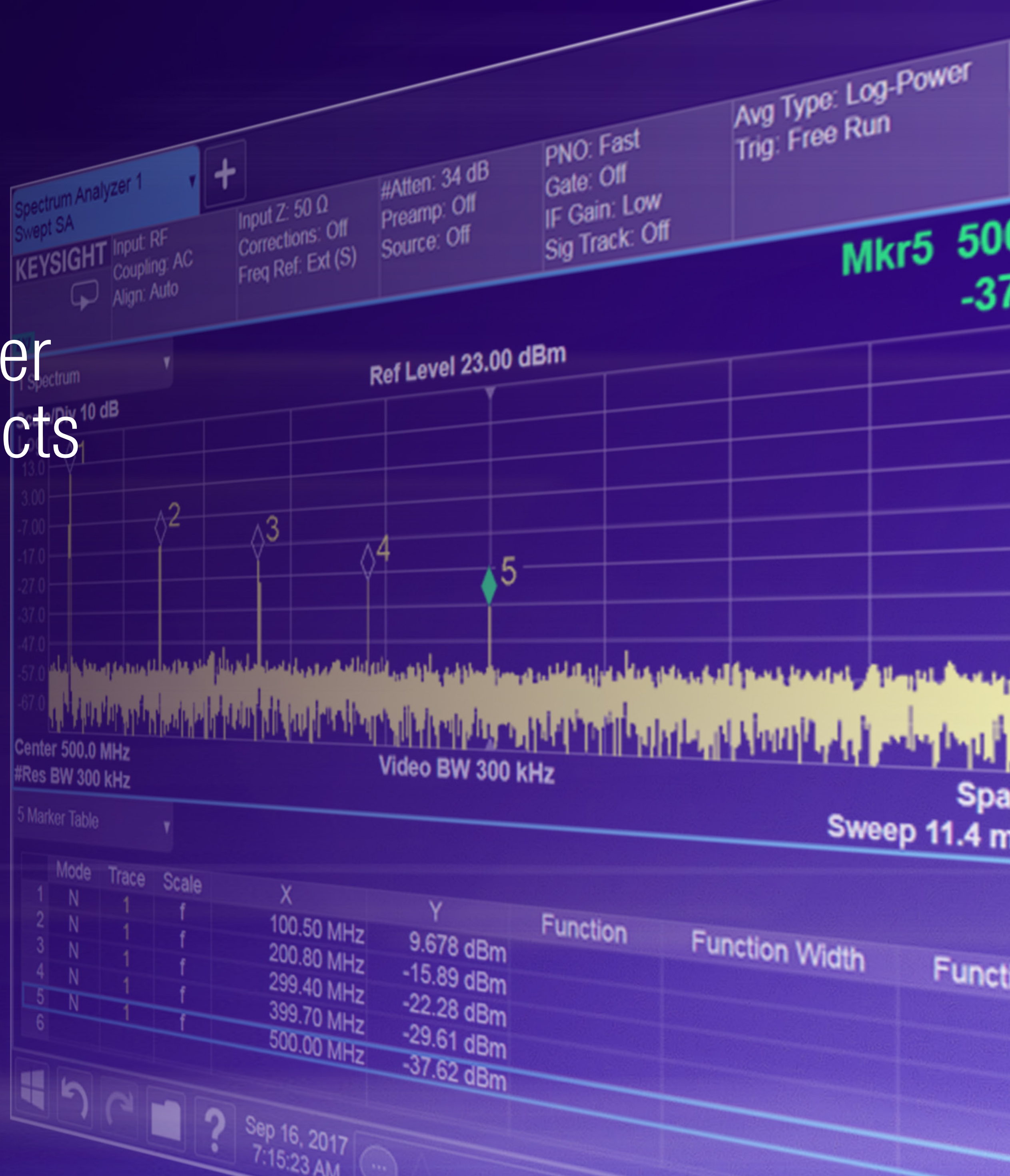
READ NOW

For more details on how each of these three tips work, read Three Tricks for Measuring Low-Level Signals.



TIP 4

Minimize Analyzer Distortion Products



TIP 4

Minimize Analyzer Distortion Products

Signal analyzers are often used to characterize the distortion of an amplifier or mixer. To characterize the device, you look for smaller signals in the presence of larger signals. You have already learned that adjusting RBW and attenuation can help find the signal you are looking for. However, with distortion, there is more to consider.

Every analyzer has distortion, and you must understand whether distortion is coming from your analyzer or from your DUT. Distortions in the analyzer change with respect to power entering the mixer. As you decrease attenuation to lower noise, you increase the input signal power entering the analyzer, increasing the distortion products of the analyzer. Balance reducing noise floor versus increasing distortion by carefully adjusting your attenuator and RBW settings

Advanced Tip: You can also use dual traces to determine if distortion generated in the analyzer is affecting your measurement. For more instruction on this process, read Identify Internal Distortion Products in the Signal Analysis Measurement Fundamentals Application Note.

TIP 5

Enhance Speed, Accuracy, and Reliability with Measurement Applications

TIP 5

Enhance Speed, Accuracy, and Reliability with Measurement Applications

The increasing complexity of wireless and transmitted signals makes it difficult and time-consuming to manually configure transmitter measurements. Fortunately, measurement applications make it easier to set up both complex and traditional measurements on your signal analyzer.

These applications take the work out of setting up measurements by automatically configuring tests, settings, markers, and reporting tools. Measurement applications can be divided into two broad categories: general-purpose and standard-specific.

General-purpose applications are focused on traditional analysis tasks, like measuring channel power, occupied bandwidth, spurious emissions, harmonics, and phase noise. These applications are helpful in the development and manufacturing of RF/microwave transceivers and their components. These general-purpose measurement applications come standard in the X-Series analyzers.

> Test applications supporting specific industry standards accelerate design and troubleshooting. Wireless software packages for standards including LTE, GSM, W-CDMA, and Bluetooth® automatically configure and run RF conformance tests for evaluating and troubleshooting your designs. Whether you are in manufacturing, education, or design, measurement applications are a great way to simplify and standardize test setups.

LEARN MORE

About X-Series Measurement Applications

Summary

Your signal analyzer can quickly reveal better results than you ever thought possible. Keep these simple measurement tips in mind:

1. Apply corrections for your test setup
2. Optimize resolution bandwidth for speed or accuracy
3. Increase sensitivity when measuring low-level signals
4. Minimize analyzer distortion products
5. Enhance speed, accuracy, and reliability with measurement applications

By using these tips, you are likely to see test results improve significantly and test time decrease.

LEARN MORE

About X-Series Signal Analyzer Family

DESIGN, TEST, AND EDUCATE WITH AN INTUITIVE AND COST-EFFECTIVE BENCHTOP SIGNAL ANALYZER

Engineering is all about connecting ideas and solving problems. The N9000B CXA signal analyzer delivers essential performance for signal characterization. It provides a solid foundation for testing in general purpose and educational applications.

Whether you need fast manufacturing verification or a cost-effective platform for lab tutorials, or an all-around benchtop workhorse, the N9000B CXA will help you characterize signals faster.