

## Agilent Technologies

# Innovating Signal Source Measurements E5052A Signal Source Analyzer

- Everything you need in a single instrument
- Provides exceptional performance for fully characterizing signal sources
- Revolutionizes signal source design and test processes

### Time and Accuracy—Critical Issues in Current Signal Source Design

It is inevitable in the signal source design process to frequently make various types of measurements to verify the DUT's performance, including phase noise, frequency, power, spurious, and transients. To perform these measurements, engineers need to employ multiple instruments in the rack-and-stack system, which involves connecting and disconnecting test cables and making complicated setups for each measurement. This tedious process consumes too much time and is prone to error. ***In fact, it often takes an entire day just to set up and calibrate the system and make a phase noise measurement for a single DUT.*** This is the bottleneck for cost reduction, quality improvement, and time-to-market.

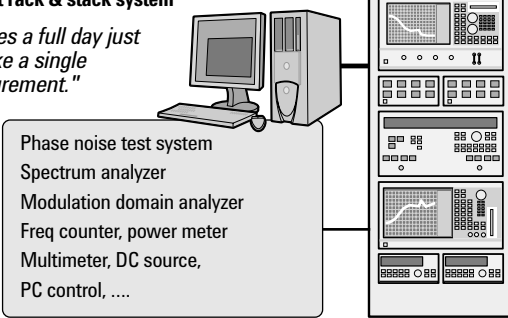

### SSA Provides a Breakthrough in the Signal Source Design Process

The E5052A signal source analyzer (SSA) breaks this paradigm. The SSA is an entirely new class of instrument that is specifically optimized for the majority of signal source measurements. The SSA replaces a complex rack-and-stack test system with a multifunctional single instrument that performs measurements much faster and more accurately. The SSA allows you to make all the key measurements very quickly with just a single connection and a few keystrokes. Each measurement itself is more than ten times faster than before. Furthermore, the SSA's unprecedented ease-of-use dramatically

reduces the actual time spent on the measurement. ***Now a measurement that used to take a full day can be finished within just ten minutes.***

This will lead to a drastic reduction of both the development cost and the development period. In addition, it enables you to make performance verifications for a variety of test conditions and for large volumes of sample DUTs to obtain statistical analysis data in the early prototyping stages, which was not possible with conventional, very slow measurement solutions. This new test process will significantly improve the quality of your products.

Now let's look at some examples of signal source measurement innovations introduced by the SSA.

	<p><b>Current rack &amp; stack system</b></p> <p><i>"It takes a full day just to make a single measurement."</i></p>  <p>Phase noise test system Spectrum analyzer Modulation domain analyzer Freq counter, power meter Multimeter, DC source, PC control, ....</p>	<p><b>New signal source analyzer</b></p> <p><i>"A complete set of measurements is finished within just ten minutes."</i></p>  <ul style="list-style-type: none"> <li>• Phase noise measurement (&lt; -178 dBc/Hz)</li> <li>• Transient measurement (10 ns sampling)</li> <li>• Frequency/power/DC current measurements</li> <li>• Spectrum monitor</li> <li>• Ultra low-noise DC sources</li> </ul>
<b>Cost</b>	A large number of R&D manpower is being spent for measurements.	Drastically reduces R&D manpower spending for measurements.
<b>Quality</b>	Not possible to make performance verifications for many test conditions and many sample DUTs, due to the very long measurement time per DUT.	Enables you to make performance verifications for various test conditions and many sample DUTs to carry out statistical yield analysis during the early prototyping stage.
<b>Time to market</b>	Difficult to shorten the development period.	Significantly shortens the development period for timely release of new products to rapidly changing market needs.

**Table 1.**  
SSA's contribution to your signal source design process



# For the Signal Source Design Process

## SSA enables intensive measurements for design verification and optimization

Here, let's look at an example of the RFIC design process.

In recent monolithic VCOs that are directly fabricated on the substrate, it is very difficult to achieve the desired performance due to various error factors such as parasitic capacitance and resistance. Therefore, it is more important than ever to accurately verify the VCO characteristics such as phase noise, tuning sensitivity, frequency pushing, and RF power versus DC voltage characteristics in the design process by actually measuring these parameters under various test conditions.

Similarly, in the synthesizer design-optimization stage, it is necessary to repeat the measurements for phase noise, close-in spurious, and lockup time many times for optimizing the loop filter constants under various frequency-switching conditions.

However, if conventional stand-alone instruments are used to collect measurements, it takes too long to fully perform these verifications in the limited period for design, and it is very difficult to repeat the cut-and-try troubleshooting cycle sufficiently for design optimization.

The SSA offers exceptionally fast measurements of phase noise, frequency/power for VCOs, transients, and close-in spurious with high performance and ease-of-use. You can quickly loop the cut-and-try troubleshooting cycle in these design stages by fully utilizing the actual measurement data. This will drastically improve the design quality and speed up the design cycle time.

## SSA enables a 100% test at the pre-production stage

In the pre-production stage, where the manufacturing process is still not finalized, it is desirable to rigorously test for RF parameters such as phase noise, thus providing more useful insights for troubleshooting than functional test parameters.

Until now, it was not possible to perform physical performance tests for a large volume of prototype ICs because the measurement time per device was very long.

The SSA's ultra fast measurement, however, allows a 100% test for RF parameters to obtain reliable statistical yield analysis data based on the actual measurement results collected during the early prototyping stage. This will greatly assist you in finding causes of problems earlier, and it will either feed the information back to the design stage or use it for manufacturing process control. You can then speed up the mass-production ramp to achieve your time-to-market goal.

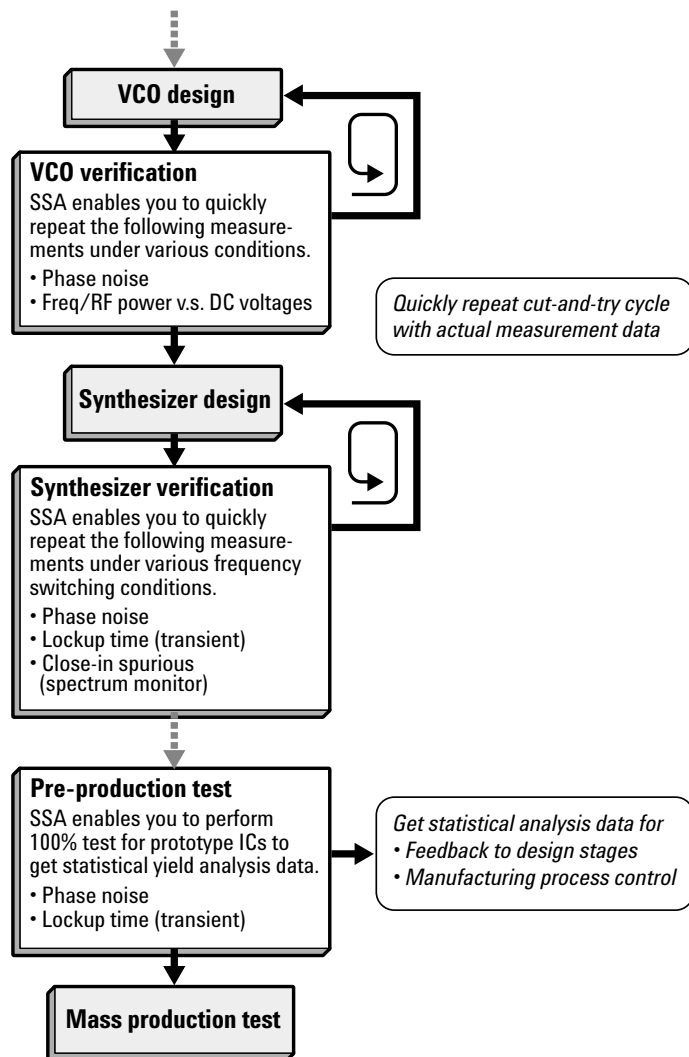


Figure 1. SSA contributions in RFIC design process

# For Quality Assurance Tests at the Mass-Production Stage

## Now anyone can perform a high-quality test

In conventional quality assurance tests conducted at the production stage of high-performance signal sources, such as oscillators for satellite communications, many parameters must be tested under extremely rigorous test specifications. To ensure these requirements are met, highly skilled test engineers, who fully utilize the functionality of complicated rack-and-stack test systems, generally perform the tests.

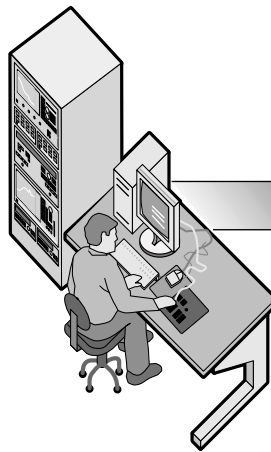
The SSA, however, run the same tests much more easily while occupying much less floor space (just one instrument), and with much lower instrument costs. In fact, even non-skilled people can quickly learn the SSA's operations and perform the tests to the same standard as those employed by professional test engineers. Also, installation and maintenance of the test system are much easier because it is a very simple single-instrument solution. You can easily transfer production lines to outside contract manufacturers or manufacturing sites in other countries, where you can hire operators at lower labor costs.

## Fully automated in-line test

Similarly, in high-volume production of signal sources, such as crystal oscillators for mobile handsets, the phase noise test is historically not a 100% test but sampling quality assurance test because of the very long measurement time of conventional phase noise test systems. This is the first instance of considering the possibility of a 100% test for phase noise.

The SSA's more than tenfold increase in phase noise measurement speed and its smaller footprint make it possible to apply the SSA to an auto-handler system and perform fully automated in-line tests. This will dramatically improve product reliability.

Rack-and-stack system with highly skilled test engineer

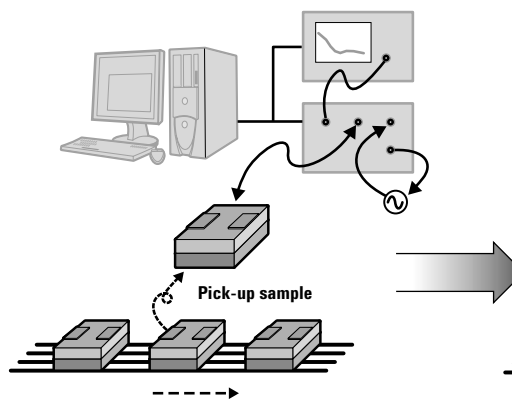


SSA single box with any operator



Figure 2. Anyone can perform high-quality test

Sampling test for phase noise in manual operation



Test phase noise for all crystals with auto-handler system

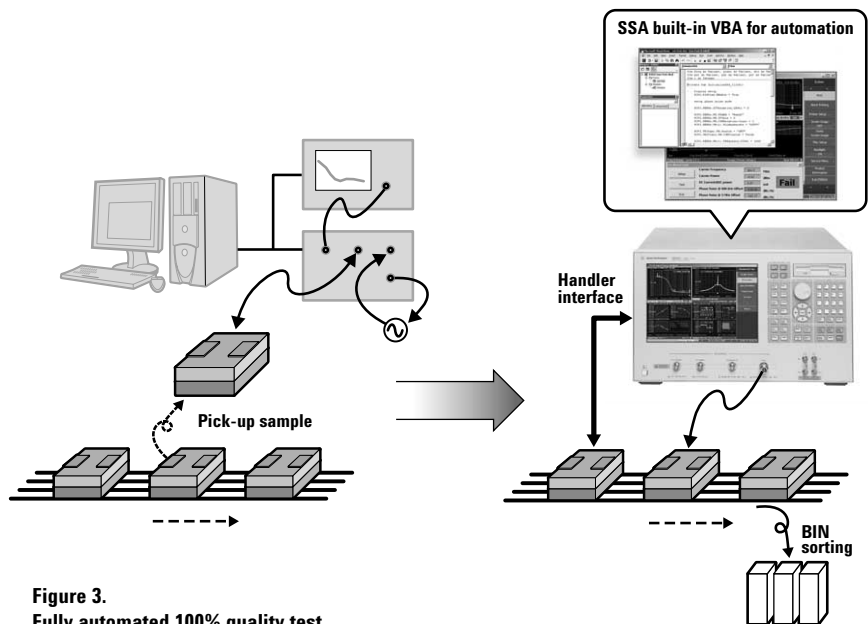


Figure 3. Fully automated 100% quality test

## Conclusion

The E5052A signal source analyzer is the first-ever single-instrument test solution dedicated to comprehensive signal source measurements. It holds unlimited potential to innovate your signal source design and test environments. The SSA is the new standard tool for all engineers working on signal sources.

For more information, visit:  
[www.agilent.com/find/ssa](http://www.agilent.com/find/ssa)

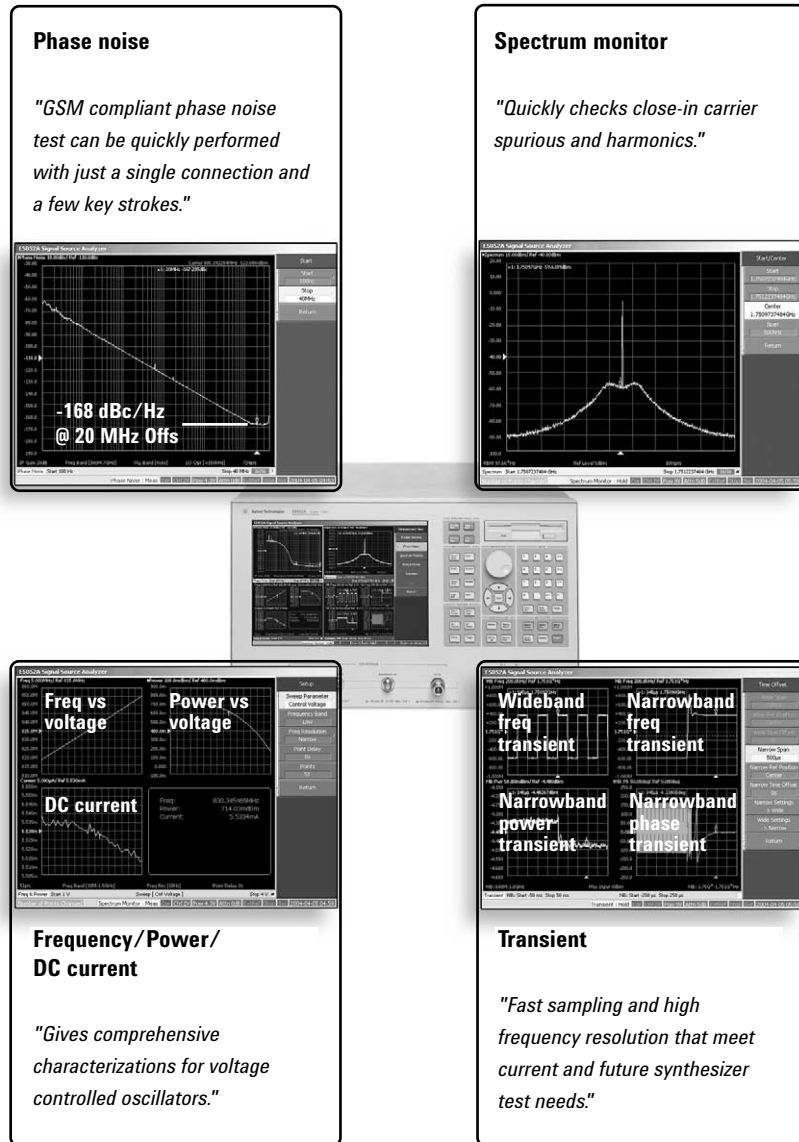


Figure 4. SSA provides comprehensive measurements for fully characterizing signal sources

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